Appendix G

Environmental and acid sulphate soil testing report

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12 September 2021

Yan Wang
CMW Geosciences
Level 1, Mitsubishi Admin Building
1 Tonsley Blvd,
TONSLEY SA 5042

Dear Yan,

HEALTHY COORONG HEALTHY BASIN INFRASTRUCTURE FEASIBILITY INVESTIGATIONS ENGINEERING SERVICES – LIMITED SOIL CONTAMINATION ASSESSMENT

1. Introduction

At the request of CMW Geosciences (CMW), Fyfe Pty Ltd (Fyfe) has undertaken a review of analytical data for soil samples collected from investigation locations along Seven Mile Road and from the shallow portion of the Coorong channel in the south west of Meningie, South Australia.

A number of infrastructure upgrade options in the Coorong are being investigated. They involve dredging of sediments or excavation of soils for pipeline construction or upgrading of channels. To support the geotechnical evaluation of the options, information is required on the potential for acid sulfate soils and contaminated soils.

For the purpose of this investigation the work has been separated to two separate 'sites':

- Four boreholes along Seven Mile Road; and
- Seventeen grab samples along the Coorong Lagoon;

This letter outlines the project objective, scope and methodology utilised during CMW's field investigations, provides discussion of the analytical results in comparison to the relevant classification criteria and provides conclusions regarding the chemical and physical suitability of the material for disposal to landfill[1] and/or re-use at a third-party site[2].

Based upon the information provided to Fyfe, we understand the following:

- The source site for the material is described as the 'proposed pipeline upgrade' and the 'proposed dredging pathway', respectively, in the Coorong, South Australia;
- The soils may be excavated as part of construction activities. Some of the generated spoil is likely to be surplus to future needs and as such may require offsite disposal to landfill and/or re-use on a third-party site[1];

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[1] *In accordance with the criteria defined in the South Australian Environment Protection Authority (SA EPA) 'Waste Disposal Information Sheet, Current criteria for the classification of waste – including Industrial and Commercial Waste (Listed) and Waste Soil' (2010);*

[2] *In accordance with the requirements of the EPA (2013) Standard for the production and use of Waste Derived Fill.*

- The soil sampling and logging was undertaken by CMW; and
- The soils subject to the assessment reported here are currently in-situ awaiting excavation and offsite disposal or re-use.

1.1 Objectives

The objectives of this project were to:

- Determine a waste classification for any spoil that may require disposal as part of the proposed construction related activities;
- Identify any potential contamination matters that may affect the progress of site works (such as potential human health risk); and
- Provide recommendations for the management of soil at the site where required.

2. Scope of works

2.1 Field work guidance

Fyfe's review was based on our understanding of the overall project aims and the fieldwork undertaken, in the light of the guidance provided in the following documents:

- *National Environment Protection (Assessment of Site Contamination) Measure 1999* (amended in 2013) (ASC NEPM);
- SA EPA (2018) *Guidelines for the Assessment and Remediation of Site Contamination;*
- Australian Standard AS1726:2017, *Geotechnical site investigations*;
- Australian Standard AS4482.1:2005, *Guide to the investigation and sampling of sites with potentially contaminated soils*;
- South Australia Environment Protection Authority (SA EPA) (2010), *Waste Disposal Information Sheet, Current criteria for the classification of waste – including Industrial and Commercial Waste (Listed) and Waste Soil*;
- SA EPA (2013) *Standard for the production and use of Waste Derived Fill* (the WDF Guideline); and
- EPA Victoria (2009) *Industrial Waste Resource Guidelines, Publication IWRG 702 - Soil Sampling*.

2.2 Field work

Sampling was undertaken by appropriately trained CMW field engineers under direction from a Fyfe environmental scientist on 11 August to 13 August and included the following:

- Collecting a total of 29 primary soil samples (and five duplicate samples) from four boreholes progressed to depths of between approximately 3.0 m and 6.0 m;
- Describing the soil in accordance with *Australian Standard 1726 – Geotechnical Site Investigations*, which included noting the physical characteristics, evidence of contamination (staining, odour) and the presence of waste (if any);

- Collecting samples from clean core trays directly into laboratory supplied jars, using a fresh nitrile glove for each sample;
- Collecting 17 grab samples from below the water in the channel (where dredging is proposed); and
- Freighting the samples on ice in an insulated chilled chest to ALS Laboratory Group (ALS) under standard Chain of Custody protocols

2.3 Chemical analysis

The soil samples were analysed by Australian Laboratory Services (ALS) Laboratory Group, who are NATA accredited for the analytical testing undertaken. The laboratory certificates of analysis, including identification of the analytical methods used, laboratory reporting limits and chemical concentrations, are provided in Attachment 4.

Additional leachability testing was undertaken on the samples with waste fill exceedances.

2.3.1 Initial analysis

The analytical testing undertaken on the collected samples is summarised in Attachment 3. Broadly speaking, the analysis requested included:

- the broad SA Waste Screen suite, which includes 13 metals, total recoverable hydrocarbons (TRH), benzene, toluene, ethylbenzene, xylenes, naphthalene (BTEXN), polycyclic aromatic hydrocarbons (PAHs), phenols, organochlorine pesticides (OCP), polychlorinated biphenyls (PCBs) and total cyanide;
- a suite comprising heavy metals (As, Cd, Cr, Cu, Pb, Zn) and TRH;
- analysis of selected samples for the Suspended Peroxide Oxidation Combined Acidity and Sulphur (SPOCAS) suite; and
- ASLP leachate analysis for samples with the highest value of any analyte if required.

In addition, as summarised in Attachment 3, intra-laboratory duplicate samples were analysed, as well as two equipment rinsate samples for QA/QC purposes. The remaining samples were held at the laboratory in case additional analysis was required.

2.4 Data management

The data was tabulated and compared against the assessment criteria presented in Section 3. The resulting analytical summary tables are provided in Attachment 3, which also includes duplicate summary tables and field blank summary tables. To arrive at a final waste classification of the material, consideration was also given to the physical characteristics of the soil observed during the field work component of the project.

3. Soil disposal criteria

3.1 Chemical criteria

Soil analytical data were compared against the waste soil disposal guidelines published in the EPA SA Waste Disposal Information Sheet entitled *Current Criteria for the Classification of Waste – Including Industrial and Commercial Waste (Listed) and Waste Soil* (2010), which describes the physical and chemical requirements regarding the offsite disposal of surplus soils to landfill, and the EPA SA *Standard for the production and use of Waste Derived Fill* (2013) (the WDF Guideline), which outlines the requirements for re-use of waste soil at a third party site.

Chemical concentrations were compared against the following chemical criteria:

- Waste Fill (WF);
- Intermediate Waste (IW);
- Low-level Contaminated Waste (LLCW) – landfill disposal only.

The following soil assessment criteria have also been adopted for ASS:

- SPOCAS results have been compared to the texture-based ASS criteria detailed in *National Acid Sulfate Soils Guidance* (NASSG) (2018) *National acid sulfate soils sampling and identification methods manual.*

3.2 Physical criteria

3.2.1 Disposal

In addition to the chemical criteria, waste soils are also required to meet the physical requirements for WF. The physical WF definition (as defined in Part 1 of the *Environment Protection Regulations 2009*) defines a suitable waste as consisting of clay, concrete, rock, sand, soil or other inert mineralogical matter in pieces not exceeding 100 millimetres in length, but does not include waste consisting of or containing asbestos or bitumen. (However, the drilling and sampling method used makes it unlikely that this 'oversized' criterion can be applied.)

3.2.2 Re-use

The Waste Derived Fill (WDF) Guideline outlines the requirements for assessing the suitability of waste soils to be used as WDF. Key guidance associated with the physical requirements for use of waste soil as WDF is quoted below:

- Section 1.1 states: "the scope of waste materials potentially suitable for use as fill is intentionally narrow as the WDF must be similar to solid mineralogical materials naturally present in the soil profile (such as inert soil, rock, sand and silt). Deposition to land of mixed wastes or other wastes not demonstrated as suitable fill does not constitute a use of a WDF as intended by this standard, it is a deposition of waste."
- Section 5.1 states: "Waste soil consists of soil, clay, rock, sand or other natural mineralogical matter and must not contain other wastes (minor amounts of naturally occurring inclusions such as wood or other vegetative matter are acceptable)."

3.3 Human health & risk screening criteria

The ASC NEPM sets out the basis for assessing the significance of soil contamination. Given that the site will be used as a road corridor (commercial/industrial) purposes, the following ASC NEPM soil criteria have been adopted to assess the suitability of the site for this particular land use:

- ASC NEPM Health Investigation Levels (Commercial/industrial - HIL D) – site workers;

— ASC NEPM Health Screening Levels (Commercial/industrial – HSL D) for vapour intrusion in sand at relevant depths (adopted as a conservative measure for risk assessment purposes); and

— ASC NEPM management limits for hydrocarbons in coarse-grained soils.

4. Results

4.1 Field observations

Seven Mile Road

Shallow fill was encountered at all four locations up to 0.6 m deep. Fill was generally described as carbonate gravelly sand and sand. Underlying natural material was described as quaternary alluvial deposit and the Bridgewater formation, consisting of sand, and calcareous/carbonate sand. Natural soils were moist and became wet between 2 - 5 m in 3 of the 4 boreholes. No anthropogenic waste, staining or odours were noted in any boreholes.

Sample location plans and Logs (provided by CMW) are presented in Attachments 1 and 2 respectively.

Coorong Lagoon

No field notes were provided to Fyfe about the grab samples from the Coorong Lagoon.

4.2 Analytical results

The laboratory certificates of analysis are presented in Attachment 4. The analytical results are summarised below.

4.2.1 Waste disposal criteria

With respect to the indicative dry weight disposal classification of soils, exceedances of 'Waste Fill' criteria were reported as indicated in Table 4.1 below.

Additional leachability testing was undertaken on sample DCP10-0.0-0.15 for arsenic exceeding waste fill criteria. The leachability result was reported as less than LOR.

Contaminant analytes in all other samples were reported at less than the laboratory limit of reporting (LOR) and/or below the relevant assessment criteria (where established).

Table 4.1 exceedances of Waste Fill criteria

Sample ID	Analyte concentration exceeding criteria (mg/kg)	Waste classification (indicative dry weight)	Leachability Results As (mg/L)
DCP05_0.0-0.15m	Arsenic (35)	Intermediate Waste	-
DCP06_0.0-0.15m	Arsenic (31)	Intermediate Waste	-
DCP10_0.0-0.15m	Arsenic (56)	Intermediate Waste	<0.1
DCP14_0.0-0.15m	Arsenic (44)	Intermediate Waste -	-

4.2.2 Human health criteria

All samples analysed reported concentrations below the laboratory LOR and/or below the applicable human health investigation and screening criteria.

4.2.3 Acid Sulfate Soils

SPOCAS results obtained indicate the following exceedances in regard to the NASSG (2018) action based criteria based on the texture and volume[3] of the material disturbed.

- Seven Mile Road sample BH04 at 2.6-2.7 m BGL (net acidity 26 mole H^+/t and 0.04 % S);
- Coorong sediment sample DCP06 at 0.0-0.15 m BGL (net acidity 288 mole H^+/t and 0.46 % S); and
- Coorong sediment sample DCP16 at 0.0-0.11 m BGL (net acidity 67 mole H^+/t / 0.011 % S).

5. Quality assurance/Quality control

5.1 General

QA/QC procedures were used by CMW and Fyfe personnel as part of the investigation. These QA/QC procedures were based on the requirements of AS 4482.1:2005, the ASC NEPM (1999) and Fyfe's standard procedures. QA/QC procedures adopted included the following:

- Using a new pair of nitrile gloves and a new laboratory jar (with a Teflon® lined lid) to collect each sample;
- Collecting acid sulphate soil samples in zip lock bags, which were squeezed to expel all air and then frozen prior to consignment to the laboratory;
- Collecting and analysing field equipment rinsates and trip bank samples;
- Collecting and analysing field duplicate QA/QC samples; and
- Using NATA accredited laboratories for analysis;
- Preserving and storing samples upon collection and during transport to the laboratory;
- Analysing samples at the laboratory within appropriate sample holding times;
- Tracking sample movements using appropriate COC documentation;
- Checking the results reported for the internal QA/QC tests conducted by the laboratory; and
- Calculating the relative percent differences (RPDs) between the primary samples and the corresponding duplicate.

5.2 Fyfe QC results

The majority of RPD values calculated for the soil duplicate sample pairs were within the acceptable range defined in Schedule B3 of the ASC NEPM (i.e. 30%), or one or both concentrations were reported to be less than the laboratory LOR.

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[3] *For the purposes of this assessment, it has been assumed that 1-1000 t of material will be disturbed. If greater than 1000 t of material is to be disturbed the lowest (i.e. values for coarse and peats texture) should be adopted.*

The three equipment blank rinsate samples all reported LOR for all PCOC with the exception of zinc in Rinsate 1 and Rinsate 2. All primary zinc results are below all applicable criteria. Therefor the decontamination process employed between sample locations was deemed to be sufficient for this investigation.

5.3 Laboratory QC results

No outliers were reported for any of the internal QC laboratory duplicate, laboratory control, blank samples, with the exception of:

- Duplicate RPD Value exceeding LOR based limits for iron in EM2116495--052;

All matrix surrogate recoveries were reported within the acceptable ranges: with the exception of:

- Lab control spike for hexavalent Chromium recovery less than lower data quality objective in EM2116368-009, ES2131210—001 and ES2131210--002

All primary analytical results for analytes with matrix spike recovery outliers were reported below the laboratory LOR and as such considerably below the applicable criterion. It is therefore considered that that any potential concentrations variances potentially attributable to the outlier surrogate recovery would not affect the interpretation of the subject analytical data.

The minor internal laboratory QA/QC outliers noted are not considered to adversely affect the reliability of the analytical data set and/or any reliant conclusions made herein.

Certain samples exceeded recommended hold times for some analytes - see hold time exceedance details in QA/QC Compliance Assessment in the lab certificates in Attachment 4.

Although the hold time exceedances may have resulted in lower concentrations of certain analytes being detected, this is considered unlikely to be significant given that the hold times are generally conservative and the samples were stored on ice immediately and during transport to the analytical laboratory.

5.4 QC results summary

Based on the rationale in Sections 5.2 and 5.3, the analytical data is considered to be acceptable for this soil classification.

6. Summary and conclusions

A summary of the results indicates:

- All target analytes were reported at concentrations below the adopted human health screening/investigation criterion in all samples analysed. Accordingly, the soils across the site do not represent a risk to human health.
- All target analytes were reported below the laboratory LOR or at concentrations below the applicable ‘Waste Fill’ criteria (where established) with the exception of arsenic in the Coorong Lagoon samples DCP05 0.0-0.15, DCP06 0.0-0.15, DCP10 0.0-0.15 and DCP14 0.0-0.15;
- Additional leachability testing conducted on the sample with the highest arsenic concentration confirmed the intermediate soil classification;

- SPOCAS testing confirms the presence of ASS material from within the soils tested from Seven Mile Road (BH04 2.6-2.7) and within material from the Coorong Lagoon (DCP06 and DCP 16). Due to the limited nature of the investigation, it is possible given the nature and origin of coastal acid sulphate soils that ASS materials are present in other areas along Seven Mile Road and within the Coorong Lagoon.

Based upon the above Fyfe concludes that;

- In regards to Acid Sulphate Soils:
    - ASS materials must be managed in accordance with the relevant guidelines (eg NASSG), with an appropriate ASS management plan in place for construction activities. In addition, the presence of ASS materials should be considered to ensure that any relevant structures are designed to have appropriate durability to resist acid attack.
- In regards to Waste Disposal and Health Criteria:
    - the subject soils do not pose a risk to human health;
    - Fyfe recommend that material from the Coorong Lagoon be separated and disposed of separately as intermediate waste to a licenced landfill facility;
    - provided oversize materials are not included, the remaining subject soils can be disposed and/or re-used offsite to a licenced landfill as waste fill.

The conclusions in this letter are subject to the limitations outlined below.

7. Closure

If you require any further clarifications or information regarding this letter, please do not hesitate to contact Stuart Twiss on 0438 851 644.

Kind regards

Stuart Twiss
Environmental Scientist

Reviewed: Dr Brent Davey
Principal Environmental Scientist

Limitations

Fyfe has used the degree of skill and care ordinarily exercised by reputable members of our profession practising in the same or similar locality. This letter has been prepared for CMW Geosciences, for the specific purpose identified in the letter. Fyfe accepts no liability or responsibility to any third party for the accuracy of any information contained in the letter or any opinion or conclusion expressed in the letter. Neither the whole of the letter nor any part or reference thereto may be in any way used, relied upon or reproduced by any third party without Fyfe's prior written approval. This letter must be read in its entirety, including all tables and attachments.

Attachments:

1 Sample Location Plans
2 Soil Borehole Logs
3 Soil Data Summary Tables
4 Laboratory Certificates of Analysis

ATTACHMENT 1

SAMPLE LOCATION PLAN

LEGEND:

⌖ BH01 APPROXIMATE BOREHOLE (BH) LOCATION

NOTES:

1. AERIAL FROM BING MAPS

0 150 300 450 600 750 m

1:15000

CMW Geosciences

CLIENT: **KBR**

PROJECT: **COORONG INFRASTRUCTURE FEASIBILITY ASSESSMENT**

TITLE: **SITE INVESTIGATION PLAN - SHEET 1**

DRAWN: DE

CHECKED: AR

REVISION: A

DATE: 16.08.21

PROJECT: ADL2021-0001

DRAWING: 01

SCALE: 1:15,000

SHEET: A3 L

LEGEND:

● DCP01 APPROXIMATE DCP LOCATION

NOTES:

1. AERIAL FROM BING MAPS

0 600 1200 1800 2400 3000 m

1:60000

CMW Geosciences

CLIENT: **KBR**

PROJECT: **COORONG INFRASTRUCTURE FEASIBILITY ASSESSMENT**

TITLE: **SITE INVESTIGATION PLAN - SHEET 2**

DRAWN:	DE	PROJECT:	ADL2021-0001
CHECKED:	AR	DRAWING:	02
REVISION:	A	SCALE:	1:60,000
DATE:	16.08.21	SHEET:	A3 L

ATTACHMENT 2

SOIL BOREHOLE LOGS

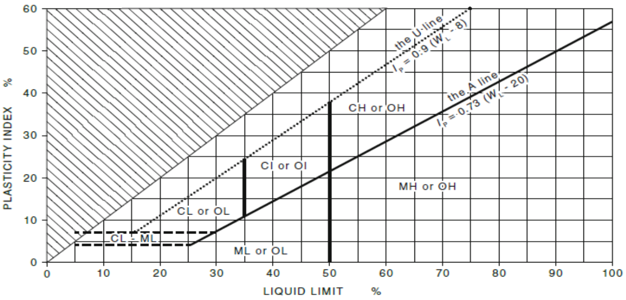
Explanatory Notes – Soil Description

- ▨ **GRAVEL**
- ▨ **SILTY GRAVEL**
- ▨ **CLAYEY GRAVEL**
- ▨ **Sandy GRAVEL**
- ▨ **SAND**
- ▨ **Gravelly SAND**
- ▨ **SILTY SAND**
- ▨ **CLAYEY SAND**
- ▨ **CLAY**
- ▨ **Gravelly CLAY**
- ▨ **Sandy CLAY**
- ▨ **SILT**
- ▨ **Gravelly SILT**
- ▨ **Sandy SILT**
- ▨ **PEAT**
- ▨ **FILL**
- ▨ **TOPSOIL**
- ▨ **COBBLES & BOULDERS**
- ▨ **CONCRETE**
- ☐ **NO CORE**

GP	Poorly Graded Gravel	ML	Low Plasticity Silt
GW	Well Graded Gravel	MH	High Plasticity Silt
GM	Silty Gravel	CL	Low Plasticity Clay
GC	Clayey Gravel	CI	Medium Plasticity Clay
SP	Poorly Graded Sand	CH	High Plasticity Clay
SW	Well Graded Sand	OL	Organic Soils (LP)
SM	Silty Sand	OH	Organic Soils (HP)
SC	Clayey Sand	PT	Peat
	Fill		Cobbles & Boulders

Soil colours based on BGS Internal report IR/05/123 "A Revised scheme for coding unlithified deposits", 2006.

WATER			
▼	Groundwater (Strike)	▽	Groundwater (rise)



CLASSIFICATION AND INFERRED STRATIGRAPHY

Particle Size		
Major Division	Sub Division	Particle Size
Boulders		> 200 mm
Cobbles		63 to 200 mm
Gravel	Coarse	19 to 63 mm
	Medium	6.7 to 19 mm
	Fine	2.36 to 6.7 mm
Sand	Coarse	0.6 to 2.36 mm
	Medium	0.21 to 0.6 mm
	Fine	0.075 to 0.21 mm
Silt		0.002 to 0.075 mm
Clay		< 0.002 mm

SECONDARY/MINOR COMPONENTS	
TERMS FOR SANDS/GRAVELS (Less than 35% Particles < 0.075mm)	**TERMS FOR CLAYS/SILTS** (More than 35% Particles < 0.075mm)
trace… sand/gravel = <15% clay/silt = <5%	**trace…** sand/gravel = <15%
with… sand/gravel = >15%, <30% clay/silt = >5%, <12%	**with…** sand/gravel = >15%, <30%
Sandy… / Gravelly… >30%	**Sandy… / Gravelly…** >30%
Clayey… / Silty … >12%	

MOISTURE CONDITION (Cohesionless Soils)

Symbol	Term	Description
D	**Dry**	Looks and feels dry. Cohesionless and free-running.
M	**Moist**	No free water on remoulding. Soil feels cool, darkened in colour. Soil tends to cohere.
W	**Wet**	Free water on remoulding. Soil feels cool, darkened in colour. Soil tends to cohere.

MOISTURE CONDITION (Cohesive Soils)

Symbol	Term	Description
<PL	**Dry**	Looks and feels dry. Hard and friable or powdery, well dry of the plastic limit
≈PL	**Moist**	Soil feels cool, darkened in colour. Soil can be moulded. Near plastic limit.
>PL	**Wet**	Soils feels cool, darkened in colour. Usually weakened and free water forms when remoulding. Wet of plastic limit.

DENSITY (Cohesionless Soils)

Sym.	Term	Density Index (%)	SPT 'N'
VL	Very Loose	Less than 15	0 to 4
L	Loose	15 to 35	4 to 10
MD	Medium Dense	35 to 65	10 to 30
D	Dense	65 to 85	30 to 50
VD	Very Dense	Above 85	Above 50

STIFFNESS (Cohesive Soils)

Sym.	Term	Undrained Shear Strength
VS	Very Soft	0 to 12 kPa
S	Soft	12 to 25 kPa
F	Firm	25 to 50 kPa
St	Stiff	50 to 100 kPa
VSt	Very Stiff	100 to 200 kPa

SAMPLING AND LABORATORY / INSITU TESTING RESULTS

B	Bulk Disturbed Sample	**U**	Undisturbed Push-in Sample	**CBR**	California Bearing Ratio
BLK	Block Sample	**W**	Water Sample	**UCS**	Unconfined Compressive Strength
C	Core Sample	**LL**	Liquid Limit	**PLI**	Point Load Index
ES	Environmental Soil Sample	**PI**	Plasticity Index	**N**	SPT-N Value
P	Piston Sample	**LS**	Linear Shrinkage		

DRILLING/EXCAVATION METHOD

AC	Air Core	**HA**	Hand Auger	**RC**	Rotary Cored
ADH	Hollow Auger Drilling	**HQ**	Rotary Core 63.5mm	**RO**	Rotary Open Hole
AD/V	Auger with V-Bit	**HQ3**	Rotary Core 61.1mm	**SPT**	Standard Penetration Test
AD/T	Auger with TC-Bit	**PQ3**	Rotary Drill 83mm	**TP**	Test Pit
DPP	Direct Push Probe	**PT**	Push Tube	**W**	Wash Bore

BOREHOLE LOG - BH01

Client: KBR
Project: Coorong Infrastructure Feasibility Assessment
Location: Meningie, SA
Project ID: ADL2021-0001
Date: 13/08/2021

1:30

Sheet 1 of 1

Logged by: Abu Rabbi
Position: E.342336m N.6042630m
Plant used: Rockmaster
Checked by: YW
Elevation:
Angle from horizontal: 90°
Contractor: JR Soil Sampling

Samples & Insitu Tests	
Depth	Type & Results
0.0-0.2	ES
0.5-0.6	ES
0.6-0.8	ES
1.0-1.1	ES
1.2-1.4	ES
1.2-1.4	QC
1.5-1.6	ES
2.0-2.1	ES
2.0-2.1	QC

Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density
TOPSOIL: SAND: fine to medium grained, dark grey, with root fibres.	M	VL
SP: SAND: medium to coarse grained; pale grey to pale brown.		L D
SP-SM: CARBONATE SAND: medium to coarse grained; white to pale brown, with low plasticity silt, trace fine to medium grained gravel, angular; with seashells.	W	VD
SP: CARBONATE SAND: medium to coarse grained; grey and white; with fine to medium grained gravel, angular; trace low plasticity silt; inferred calcrete layer.		
Borehole terminated at 3.10 m		

Dynamic Cone Penetrometer (Blows/100mm)
1
1
3
18
25

Structure & other observations
0.00-0.05m: FILL
0.05-3.10m: BRIDGEWATER FORMATION
0.55-0.75m: Solid auger drilling
1.10-3.10m: Solid auger drilling

DCP/PSP Equipment Ref.: DCP02
In Situ Vane Ref.:
Pocket Penetrometer Equipment Ref.:

Termination Reason: Equipment refusal

Remarks:

This report must be read in conjunction with accompanying notes and abbreviations.

CORE PHOTOGRAPH SHEET - BH01

Client: KBR
Project: Coorong Infrastructure Feasibility Assessment
Location: Meningie, SA
Project ID: ADL2021-0001
Date: 13/08/2021

BH01_0.0 to 3.1m

BH01_Site Photograph

BOREHOLE LOG - BH02

Client: KBR
Project: Coorong Infrastructure Feasibility Assessment
Location: Meningie, SA
Project ID: ADL2021-0001
Date: 13/08/2021

1:30

Sheet 1 of 1

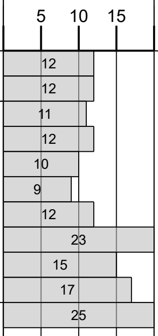
Logged by: Abu Rabbi
Position: E.342703m N.6043231m
Plant used: Rockmaster
Checked by: YW
Elevation:
Angle from horizontal: 90°
Contractor: JR Soil Sampling

Groundwater	Samples & Insitu Tests Depth	Samples & Insitu Tests Type & Results
	0.0-0.2	ES
	0.2-0.4	ES
	0.5-0.6	ES
	1.0-1.2	ES
	1.2-1.3	ES
	1.5-1.6	ES
	2.0-2.2	ES
▼	5.5-5.6	ES

Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density
FILL: CARBONATE GRAVELLY SAND: fine to coarse grained; grey and white; medium to coarse grained, subangular gravel; with low plasticity silt.	D to M	D
SP: CALCAREOUS SAND: fine to medium grained; brown, trace fine to medium grained gravel, subangular.	M	MD to D
SP: CALCAREOUS SAND: fine to coarse grained; white to pale brown; with fine to medium grained gravel, angular; inferred calcrete layer recovered as sand.		D to VD
SP: CALCAREOUS SAND: fine to medium grained; pale brown; with fine to medium grained gravel, subangular.	M	MD
SP: CALCAREOUS GRAVELLY SAND: medium to coarse grained; pale grey to white; fine to medium grained, angular to subangular gravel; trace low plasticity silt.	D to M	D
SP: CALCAREOUS SAND: fine to medium grained; pale brown to pale yellow brown; trace fine to medium grained gravel, subrounded.	M	MD
SP: SAND: medium grained; brown to orange brown; trace fine grained gravel.	W	

Borehole terminated at 6.00 m

Dynamic Cone Penetrometer (Blows/100mm)



Structure & other observations

0.00-0.20m: FILL

0.20-6.00m: BRIDGEWATER FORMATION

DCP/PSP Equipment Ref.: DCP02
In Situ Vane Ref.:
Pocket Penetrometer Equipment Ref.:

Termination Reason: Target depth reached

Remarks:

This report must be read in conjunction with accompanying notes and abbreviations.

CORE PHOTOGRAPH SHEET - BH02

Client: KBR
Project: Coorong Infrastructure Feasibility Assessment
Location: Meningie, SA
Project ID: ADL2021-0001
Date: 13/08/2021

BH02_0.0 to 6.0m

BH02_Site Photograph

BOREHOLE LOG - BH03

Client: KBR
Project: Coorong Infrastructure Feasibility Assessment
Location: Meningie, SA
Project ID: ADL2021-0001
Date: 13/08/2021

1:30
Sheet 1 of 1

Logged by: Abu Rabbi
Checked by: YW
Position: E.342998m N.6043630m
Elevation:
Angle from horizontal: 90°
Plant used: Rockmaster
Contractor: JR Soil Sampling

Well | Groundwater | RL (m) | Depth (m) | Graphic Log

Samples & Insitu Tests

Depth	Type & Results
0.0-0.2	ES
0.3-0.4	ES
0.5-0.6	ES
0.8-0.9	ES
1.0-1.2 1.0-1.2	ES QC
1.5-1.6	ES
2.0-2.2	ES
3.0-3.1	ES

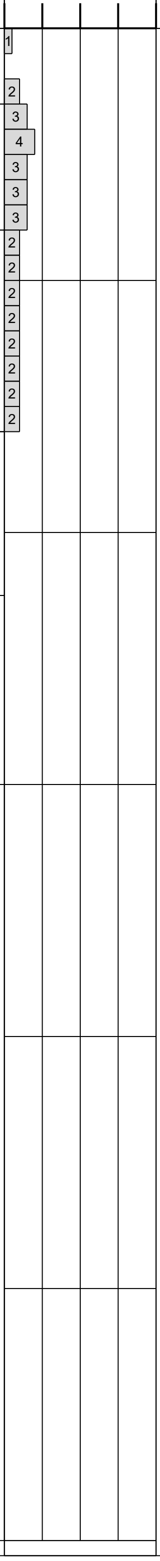
Material Description
Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components

Material Description	Moisture Condition	Consistency/ Relative Density
FILL: SAND: fine to medium grained; pale brown.	M	VL
SP: SAND: fine grained; dark grey.		L to MD
SP: SAND: fine grained; pale brown to brown.		L L to MD
SP: CALCAREOUS SAND: fine to medium grained; pale brown to white; trace low plasticity silt; trace fine to medium grained gravel, subangular to subrounded.		MD to D
SP: SAND: fine to medium grained; pale brown to white, trace fine grained gravel.		MD
SP: SAND: fine to medium grained; orange brown; trace fine to medium grained gravel, subangular.		

Borehole terminated at 6.00 m

Depth (m): 1, 2, 3, 4, 5, 6

Dynamic Cone Penetrometer (Blows/100mm)



Structure & other observations

0.00-0.30m: FILL

0.30-2.25m: QUARTERNARY ALLUVIAL DEPOSITE

2.25-6.00m: BRIDGEWATER FORMATION

DCP/PSP Equipment Ref.: DCP02
In Situ Vane Ref.:
Pocket Penetrometer Equipment Ref.:

Termination Reason: Target depth reached

Remarks:

This report must be read in conjunction with accompanying notes and abbreviations.

CORE PHOTOGRAPH SHEET - BH03

Client: KBR
Project: Coorong Infrastructure Feasibility Assessment
Location: Meningie, SA
Project ID: ADL2021-0001
Date: 13/08/2021

BH03_0.0 to 6.0m

BH03_Site Photograph

BOREHOLE LOG - BH04

Client: KBR
Project: Coorong Infrastructure Feasibility Assessment
Location: Meningie, SA
Project ID: ADL2021-0001
Date: 13/08/2021

1:30 Sheet 1 of 1

Logged by: Abu Rabbi Position: E.343202m N.6043959m Plant used: Rockmaster
Checked by: YW Elevation: Angle from horizontal: 90° Contractor: JR Soil Sampling

Well	Groundwater	Samples & Insitu Tests Depth	Samples & Insitu Tests Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Dynamic Cone Penetrometer (Blows/100mm) 5 10 15	Structure & other observations
		0.0-0.2	ES				FILL: SAND: fine to medium grained; grey to dark grey; trace low plasticity clay.		L	2 2	0.00-0.60m: FILL
		0.5-0.6 0.6-0.8 0.6-0.8	ES ES QC				FILL: SAND: fine to medium grained; dark grey.			3 3 4 4 3	0.60-3.90m: QUATERNARY ALLUVIAL DEPOSIT
		1.0-1.1	ES		1		SP: SAND: fine to medium grained; pale grey to pale brown.	M		3 3 3 3 3 3 3 3	
	▼	1.5-1.6 1.9-2.0 2.0-2.1	ES ES ES		2		SP: SAND: fine to medium grained; pale brown to brown.		L to MD		
		2.6-2.7	ES		3		SP: SAND: fine to medium grained; pale grey.				
					4 5 6		SP: CALCAREOUS SAND: fine to medium grained; pale grey and white; trace low plasticity silt; trace fine to medium grained gravel, angular to subangular.	W	MD		3.90-6.00m: BRIDGEWATER FORMATION

Borehole terminated at 6.00 m

DCP/PSP Equipment Ref.: DCP02 In Situ Vane Ref.: Pocket Penetrometer Equipment Ref.:

Termination Reason: Target depth reached

Remarks:

This report must be read in conjunction with accompanying notes and abbreviations.

CORE PHOTOGRAPH SHEET - BH04

Client: KBR
Project: Coorong Infrastructure Feasibility Assessment
Location: Meningie, SA
Project ID: ADL2021-0001
Date: 13/08/2021

BH04_0.0 to 6.0m

BH04_Site Photograph

ATTACHMENT 3

SOIL DATA SUMMARY TABLES

Table 1 - Analytical Results

		BTEXN								TRH											
		Benzene	Toluene	Ethylbenzene	Xylene (o)	Xylene (m & p)	Xylene Total	Total BTEX	Naphthalene	C6-C10	>C10-C16	>C16-C34	>C34-C40	>C10-C40 (Sum of total)	F1 (C6-C10 minus BTEX)	F2 (>C10-C16 minus Naphthalene)	C6-C9	C10-C14	C15-C28	C29-C36	C10-C36 (Sum of total)
		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL		0.2	0.5	0.5	0.5	0.5	0.5	0.2	0.5	10	50	100	100	50	10	50	10	50	100	100	50
ASC NEPM (1999) HSL Commercial/Industrial, Sand 0 to <1m		3	NL	NL			230		NL						260	NL					
ASC NEPM (1999) HSL Commercial/Industrial, Sand 1 to <2m		3	NL	NL			NL		NL						370	NL					
ASC NEPM (1999) HSL Commercial/Industrial, Sand 2 to <4m		3	NL	NL			NL		NL						630	NL					
NEPM 2013 Table 1B(7) Management Limits Commercial/Industrial, Fine Soil										800	1,000	5,000	10,000								
ASC NEPM (1999) HIL Commercial/Industrial D																					
NASSG (2018) action criteria based on texture and volume of material disturbed																					
Coarse and Peats (sands to loamy sands)																					
Medium (clayey sands to light clays)																					
Fine (light medium to heavy clays)																					
SA EPA Waste Fill Criteria		1	1.4	3.1			14										65				1,000
SA EPA Intermediate Waste - Total Dry Weight Concentrations		5	50	100			180										100				1,000
SA EPA Low-level Contaminated - Total Dry Weight Concentrations		15	500	1,000			1,800										1,000				10,000
Sample No.	**Date**																				
BH01_0.0 - 0.15m	**11/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH01_0.5 - 0.6m	**11/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH01_0.6 - 0.75m	**11/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH01_1.5 - 1.6m	**11/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH02_0.0 - 0.15m	**11/08/2021**	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50
BH02_0.5 - 0.65m	**13/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH02_1.2 - 1.35m	**13/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH02_2.0 - 2.15m	**13/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH03_0.0 - 0.15m	**13/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH03_1.0 - 1.15m	**13/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH03_3.0 - 3.1m	**13/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH04_0.0 - 0.15m	**13/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH04_0.6 - 0.75m	**13/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH04_1.0 - 1.1m	**13/08/2021**	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50
BH04_2.0 - 2.1m	**13/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH04_2.6 - 2.7m	**16/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DCP01_0.0-0.15m	**12/08/2021**	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50
DCP02_0.0-0.15m	**12/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DCP03_0.0-0.15m	**12/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DCP04_0.0-0.15m	**12/08/2021**	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50
DCP05_0.0-0.15m	**12/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DCP06_0.0-0.15m	**11/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DCP07_0.0-0.15m	**11/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DCP08_0.0 - 0.15m	**11/08/2021**	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50
DCP08_0.0-0.15m	**11/08/2021**	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50
DCP09_0.0-0.15m	**11/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DCP10_0.0-0.15m	**11/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DCP11_0.0 - 0.15m	**11/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DCP11_0.0-0.15m	**11/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DCP12_0.0-0.15m	**11/08/2021**	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.8	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50
DCP13_0.0-0.15m	**11/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DCP14_0.0-0.15m	**11/08/2021**	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<1.0	<10	<60	<100	<100	<60	<10	<60	<10	<60	<110	<110	<60
DCP15_0.0-0.15m	**11/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DCP16_0.0-0.15m	**11/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DCP17_0.0-0.15m	**11/08/2021**	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50
Duplicate																					
DCP08_0.0-0.15m	**11/08/2021**	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<10	<50	<100	<100	<50	<10	<50	<10	<50	<100	<100	<50
DCP08_0.0 - 0.15m (QC)	**11/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
RPD		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH03_1.0 - 1.15m	**13/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH03_1.0 - 1.15m (QC)	**13/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
RPD		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rinsate Samples																					
Rinsate 1*	**11/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rinsate 2*	**12/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rinsate 3*	**13/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*** mg/L**

Table 1 - Analytical Results

Sample No.	Date	Metals															Phenols												
		Arsenic	Barium	Beryllium	Cadmium	Chromium (hexavalent)	Chromium (III+VI)	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc	3/4-Methylphenol (m/p-cresol)	2,4,5-Trichlorophenol	2,4,6-Trichlorophenol	2,4-Dichlorophenol	2,4-Dimethylphenol	2,6-Dichlorophenol	2-Chlorophenol	2-Methylphenol	2-Nitrophenol	4-chloro-3-methylphenol	Pentachlorophenol	Phenolics Total	Phenol
		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL		5	10	1	1	0.5	2	2	5	50	5	5	0.1	2	2	5	1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	2	0.5	0.5
ASC NEPM (1999) HSL Commercial/Industrial, Sand 0 to <1m																													
ASC NEPM (1999) HSL Commercial/Industrial, Sand 1 to <2m																													
ASC NEPM (1999) HSL Commercial/Industrial, Sand 2 to <4m																													
NEPM 2013 Table 1B(7) Management Limits Commercial/Industrial, Fine Soil																													
ASC NEPM (1999) HIL Commercial/Industrial D		3000		500	900	3600		4000	240000		1500	60000	730	6000		400000											660		240000
NASSG (2018) action criteria based on texture and volume of material disturbed																													
Coarse and Peats (sands to loamy sands)																													
Medium (clayey sands to light clays)																													
Fine (light medium to heavy clays)																													
SA EPA Waste Fill Criteria		20	300	20	3	1		170	60		300	500	1	60		200												0.5	
SA EPA Intermediate Waste - Total Dry Weight Concentrations		200		40	30	200		170	2,000		1,200	6,000	30	600		14,000												17,000	
SA EPA Low-level Contaminated - Total Dry Weight Concentrations		750		150	60	750		1,000	7,500		5,000	10,000	110	3,000		50,000												50,000	
Sample No.	**Date**																												
BH01_0.0 - 0.15m	11/08/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH01_0.5 - 0.6m	11/08/2021	<5	-	-	<1	-	<2	-	<5	-	<5	-	<0.1	<2	-	11	-	-	-	-	-	-	-	-	-	-	-	-	-
BH01_0.6 - 0.75m	11/08/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH01_1.5 - 1.6m	11/08/2021	10	-	-	<1	-	3	-	<5	-	<5	-	<0.1	<2	-	11	-	-	-	-	-	-	-	-	-	-	-	-	-
BH02_0.0 - 0.15m	11/08/2021	10	50	<1	<1	<0.5	7	3	<5	5,050	<5	54	<0.1	4	<2	10	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5
BH02_0.5 - 0.65m	13/08/2021	15	-	-	<1	-	4	-	<5	-	<5	-	<0.1	<2	-	<5	-	-	-	-	-	-	-	-	-	-	-	-	-
BH02_1.2 - 1.35m	13/08/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH02_2.0 - 2.15m	13/08/2021	12	-	-	<1	-	4	-	<5	-	<5	-	<0.1	<2	-	7	-	-	-	-	-	-	-	-	-	-	-	-	-
BH03_0.0 - 0.15m	13/08/2021	<5	-	-	<1	-	2	-	<5	-	<5	-	<0.1	<2	-	<5	-	-	-	-	-	-	-	-	-	-	-	-	-
BH03_1.0 - 1.15m	13/08/2021	<5	-	-	<1	-	2	-	<5	-	<5	-	<0.1	<2	-	<5	-	-	-	-	-	-	-	-	-	-	-	-	-
BH03_3.0 - 3.1m	13/08/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH04_0.0 - 0.15m	13/08/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH04_0.6 - 0.75m	13/08/2021	<5	-	-	<1	-	<2	-	<5	-	<5	-	<0.1	<2	-	<5	-	-	-	-	-	-	-	-	-	-	-	-	-
BH04_1.0 - 1.1m	13/08/2021	<5	<10	<1	<1	<0.5	<2	<2	<5	1,460	<5	<5	<0.1	<2	<2	<5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5
BH04_2.0 - 2.1m	13/08/2021	9	-	-	<1	-	5	-	<5	-	<5	-	<0.1	<2	-	<5	-	-	-	-	-	-	-	-	-	-	-	-	-
BH04_2.6 - 2.7m	16/08/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DCP01_0.0-0.15m	12/08/2021	<5	<10	<1	<1	<0.5	2	<2	<5	1,660	<5	19	<0.1	<2	<2	<5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5
DCP02_0.0-0.15m	12/08/2021	12	-	-	<1	-	6	-	<5	-	<5	-	<0.1	4	-	9	-	-	-	-	-	-	-	-	-	-	-	-	-
DCP03_0.0-0.15m	12/08/2021	<5	-	-	<1	-	2	-	<5	-	<5	-	<0.1	<2	-	<5	-	-	-	-	-	-	-	-	-	-	-	-	-
DCP04_0.0-0.15m	12/08/2021	<5	<10	<1	<1	<0.5	6	<2	<5	3,590	<5	87	<0.1	<2	<2	<5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5
DCP05_0.0-0.15m	12/08/2021	35	-	-	<1	-	21	-	14	-	<5	-	<0.1	13	-	31	-	-	-	-	-	-	-	-	-	-	-	-	-
DCP06_0.0-0.15m	11/08/2021	31	-	-	<1	-	22	-	14	-	<5	-	<0.1	13	-	32	-	-	-	-	-	-	-	-	-	-	-	-	-
DCP07_0.0-0.15m	11/08/2021	<5	-	-	<1	-	<2	-	<5	-	<5	-	<0.1	<2	-	<5	-	-	-	-	-	-	-	-	-	-	-	-	-
DCP08_0.0 - 0.15m	11/08/2021	10	<10	<1	<1	<0.5	<2	<2	<5	1,060	<5	34	<0.1	<2	<2	11	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5
DCP08_0.0-0.15m	11/08/2021	<5	<10	<1	<1	<0.5	4	<2	<5	2,540	<5	69	<0.1	<2	<2	<5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5
DCP09_0.0-0.15m	11/08/2021	<5	-	-	<1	-	3	-	<5	-	<5	-	<0.1	<2	-	<5	-	-	-	-	-	-	-	-	-	-	-	-	-
DCP10_0.0-0.15m	11/08/2021	56	-	-	<1	-	28	-	20	-	6	-	<0.1	17	-	42	-	-	-	-	-	-	-	-	-	-	-	-	-
DCP11_0.0 - 0.15m	11/08/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DCP11_0.0-0.15m	11/08/2021	20	-	-	<1	-	17	-	11	-	<5	-	<0.1	10	-	24	-	-	-	-	-	-	-	-	-	-	-	-	-
DCP12_0.0-0.15m	11/08/2021	8	20	<1	<1	<0.8	16	6	13	16,100	<5	72	<0.1	14	<2	22	<2	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<2	<0.5	<0.8
DCP13_0.0-0.15m	11/08/2021	13	-	-	<1	-	4	-	<5	-	<5	-	<0.1	<2	-	<5	-	-	-	-	-	-	-	-	-	-	-	-	-
DCP14_0.0-0.15m	11/08/2021	44	70	<1	<1	<1.0	13	3	8	12,200	<5	223	<0.1	8	<2	19	<2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<2	<0.5	<1.0
DCP15_0.0-0.15m	11/08/2021	7	-	-	<1	-	4	-	<5	-	<5	-	<0.1	<2	-	<5	-	-	-	-	-	-	-	-	-	-	-	-	-
DCP16_0.0-0.15m	11/08/2021	<5	-	-	<1	-	<2	-	<5	-	<5	-	<0.1	<2	-	<5	-	-	-	-	-	-	-	-	-	-	-	-	-
DCP17_0.0-0.15m	11/08/2021	9	<10	<1	<1	<0.5	2	<2	<5	1,530	<5	71	<0.1	2	<2	<5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5
Duplicate																													
DCP08_0.0-0.15m	11/08/2021	<5	<10	<1	<1	<0.5	4	<2	<5	2,540	<5	69	<0.1	<2	<2	<5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5
DCP08_0.0 - 0.15m (QC)	11/08/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
RPD		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH03_1.0 - 1.15m	13/08/2021	<5	-	-	<1	-	2	-	<5	-	<5	-	<0.1	<2	-	<5	-	-	-	-	-	-	-	-	-	-	-	-	-
BH03_1.0 - 1.15m (QC)	13/08/2021	<5	-	-	<1	-	2	-	<5	-	<5	-	<0.1	<2	-	<5	-	-	-	-	-	-	-	-	-	-	-	-	-
RPD		-	-	-	-	-	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rinsate Samples																													
Rinsate 1*	11/08/2021	<0.001	-	-	<0.0001	<0.001	-	-	<0.001	-	-	<0.001	<0.0001	<0.001	-	0.092	-	-	-	-	-	-	-	-	-	-	-	-	-
Rinsate 2*	12/08/2021	<0.001	-	-	<0.0001	<0.001	-	-	<0.001	-	-	<0.001	<0.0001	<0.001	-	0.659	-	-	-	-	-	-	-	-	-	-	-	-	-
Rinsate 3*	13/08/2021	<0.001	-	-	<0.0001	<0.001	-	-	<0.001	-	-	<0.001	<0.0001	<0.001	-	<0.005	-	-	-	-	-	-	-	-	-	-	-	-	-

*** mg/L**

Table 1 - Analytical Results

		PAH																		
		Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(b+j)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Phenanthrene	Benzo(a)pyrene TEQ calc (Half)	Pyrene	Benzo(a)pyrene TEQ (LOR)	Benzo(a)pyrene TEQ calc (Zero)	PAHs (Sum of total)
		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
ASC NEPM (1999) HSL Commercial/Industrial, Sand 0 to <1m																				
ASC NEPM (1999) HSL Commercial/Industrial, Sand 1 to <2m																				
ASC NEPM (1999) HSL Commercial/Industrial, Sand 2 to <4m																				
NEPM 2013 Table 1B(7) Management Limits Commercial/Industrial, Fine Soil																				
ASC NEPM (1999) HIL Commercial/Industrial D																		40	40	4000
NASSG (2018) action criteria based on texture and volume of material disturbed																				
Coarse and Peats (sands to loamy sands)																				
Medium (clayey sands to light clays)																				
Fine (light medium to heavy clays)																				
SA EPA Waste Fill Criteria						1														5
SA EPA Intermediate Waste - Total Dry Weight Concentrations						2														40
SA EPA Low-level Contaminated - Total Dry Weight Concentrations						5														200
Sample No.	**Date**																			
BH01_0.0 - 0.15m	**11/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH01_0.5 - 0.6m	**11/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH01_0.6 - 0.75m	**11/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH01_1.5 - 1.6m	**11/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH02_0.0 - 0.15m	**11/08/2021**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**0.6**	<0.5	**1.2**	<0.5	<0.5
BH02_0.5 - 0.65m	**13/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH02_1.2 - 1.35m	**13/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH02_2.0 - 2.15m	**13/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH03_0.0 - 0.15m	**13/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH03_1.0 - 1.15m	**13/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH03_3.0 - 3.1m	**13/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH04_0.0 - 0.15m	**13/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH04_0.6 - 0.75m	**13/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH04_1.0 - 1.1m	**13/08/2021**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**0.6**	<0.5	**1.2**	<0.5	<0.5
BH04_2.0 - 2.1m	**13/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH04_2.6 - 2.7m	**16/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DCP01_0.0-0.15m	**12/08/2021**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**0.6**	<0.5	**1.2**	<0.5	<0.5
DCP02_0.0-0.15m	**12/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DCP03_0.0-0.15m	**12/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DCP04_0.0-0.15m	**12/08/2021**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**0.6**	<0.5	**1.2**	<0.5	<0.5
DCP05_0.0-0.15m	**12/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DCP06_0.0-0.15m	**11/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DCP07_0.0-0.15m	**11/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DCP08_0.0 - 0.15m	**11/08/2021**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**0.6**	<0.5	**1.2**	<0.5	<0.5
DCP08_0.0-0.15m	**11/08/2021**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**0.6**	<0.5	**1.2**	<0.5	<0.5
DCP09_0.0-0.15m	**11/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DCP10_0.0-0.15m	**11/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DCP11_0.0 - 0.15m	**11/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DCP11_0.0-0.15m	**11/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DCP12_0.0-0.15m	**11/08/2021**	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	**1.0**	<0.8	**1.9**	<0.5	<0.5
DCP13_0.0-0.15m	**11/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DCP14_0.0-0.15m	**11/08/2021**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**1.2**	<1.0	**2.4**	<0.5	<0.5
DCP15_0.0-0.15m	**11/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DCP16_0.0-0.15m	**11/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DCP17_0.0-0.15m	**11/08/2021**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**0.6**	<0.5	**1.2**	<0.5	<0.5
Duplicate																				
DCP08_0.0-0.15m	**11/08/2021**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**0.6**	<0.5	**1.2**	<0.5	<0.5
DCP08_0.0 - 0.15m (QC)	**11/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
RPD		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH03_1.0 - 1.15m	**13/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH03_1.0 - 1.15m (QC)	**13/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
RPD		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rinsate Samples																				
Rinsate 1*	**11/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rinsate 2*	**12/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rinsate 3*	**13/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*** mg/L**

		Organochlorine Pesticides																								
		4,4-DDE	a-BHC	Aldrin	Aldrin + Dieldrin	b-BHC	Chlordane	Chlordane (cis)	Chlordane (trans)	d-BHC	DDD	DDT	DDT+DDE+DDD	Dieldrin	Endosulfan	Endosulfan I	Endosulfan II	Endosulfan sulphate	Endrin	Endrin aldehyde	Endrin ketone	g-BHC (Lindane)	Heptachlor	Heptachlor epoxide	Methoxychlor	Hexachlorobenzene
		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.2	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.2	0.05
ASC NEPM (1999) HSL Commercial/Industrial, Sand 0 to <1m																										
ASC NEPM (1999) HSL Commercial/Industrial, Sand 1 to <2m																										
ASC NEPM (1999) HSL Commercial/Industrial, Sand 2 to <4m																										
NEPM 2013 Table 1B(7) Management Limits Commercial/Industrial, Fine Soil																										
ASC NEPM (1999) HIL Commercial/Industrial D					45		530						3600		2000				100				50		2500	80
NASSG (2018) action criteria based on texture and volume of material disturbed																										
Coarse and Peats (sands to loamy sands)																										
Medium (clayey sands to light clays)																										
Fine (light medium to heavy clays)																										
SA EPA Waste Fill Criteria					2		2					2											2			
SA EPA Intermediate Waste - Total Dry Weight Concentrations					2		2					2											2			
SA EPA Low-level Contaminated - Total Dry Weight Concentrations					50		50					50											50			
Sample No.	**Date**																									
BH01_0.0 - 0.15m	**11/08/2021**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05
BH01_0.5 - 0.6m	**11/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH01_0.6 - 0.75m	**11/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH01_1.5 - 1.6m	**11/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH02_0.0 - 0.15m	**11/08/2021**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05
BH02_0.5 - 0.65m	**13/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH02_1.2 - 1.35m	**13/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH02_2.0 - 2.15m	**13/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH03_0.0 - 0.15m	**13/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH03_1.0 - 1.15m	**13/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH03_3.0 - 3.1m	**13/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH04_0.0 - 0.15m	**13/08/2021**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05
BH04_0.6 - 0.75m	**13/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH04_1.0 - 1.1m	**13/08/2021**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05
BH04_2.0 - 2.1m	**13/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH04_2.6 - 2.7m	**16/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DCP01_0.0-0.15m	**12/08/2021**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05
DCP02_0.0-0.15m	**12/08/2021**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05
DCP03_0.0-0.15m	**12/08/2021**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05
DCP04_0.0-0.15m	**12/08/2021**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05
DCP05_0.0-0.15m	**12/08/2021**	<0.12	<0.12	<0.12	<0.05	<0.12	<0.05	<0.12	<0.12	<0.12	<0.12	<0.5	<0.05	<0.12	<0.07	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.5	<0.12
DCP06_0.0-0.15m	**11/08/2021**	<0.12	<0.12	<0.12	<0.05	<0.12	<0.05	<0.12	<0.12	<0.12	<0.12	<0.5	<0.05	<0.12	<0.07	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.5	<0.12
DCP07_0.0-0.15m	**11/08/2021**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05
DCP08_0.0 - 0.15m	**11/08/2021**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05
DCP08_0.0-0.15m	**11/08/2021**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05
DCP09_0.0-0.15m	**11/08/2021**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05
DCP10_0.0-0.15m	**11/08/2021**	<0.12	<0.12	<0.12	<0.05	<0.12	<0.05	<0.12	<0.12	<0.12	<0.12	<0.5	<0.05	<0.12	<0.07	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.5	<0.12
DCP11_0.0 - 0.15m	**11/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DCP11_0.0-0.15m	**11/08/2021**	<0.12	<0.12	<0.12	<0.05	<0.12	<0.05	<0.12	<0.12	<0.12	<0.12	<0.5	<0.05	<0.12	<0.07	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.5	<0.12
DCP12_0.0-0.15m	**11/08/2021**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05
DCP13_0.0-0.15m	**11/08/2021**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05
DCP14_0.0-0.15m	**11/08/2021**	<0.06	<0.06	<0.06	<0.05	<0.06	<0.05	<0.06	<0.06	<0.06	<0.06	<0.3	<0.05	<0.06	<0.05	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.3	<0.06
DCP15_0.0-0.15m	**11/08/2021**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05
DCP16_0.0-0.15m	**11/08/2021**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05
DCP17_0.0-0.15m	**11/08/2021**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05
Duplicate																										
DCP08_0.0-0.15m	**11/08/2021**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05
DCP08_0.0 - 0.15m (QC)	**11/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
RPD		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH03_1.0 - 1.15m	**13/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH03_1.0 - 1.15m (QC)	**13/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
RPD		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rinsate Samples																										
Rinsate 1*	**11/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rinsate 2*	**12/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rinsate 3*	**13/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*** mg/L**

		Organophosphorous Pesticides															Pesticides			
		Azinophos methyl	Bromophos-ethyl	Carbophenothion	Chlorfenvinphos	Chlorpyrifos	Chlorpyrifos-methyl	Diazinon	Dichlorvos	Dimethoate	Ethion	Fenthion	Malathion	Methyl parathion	Monocrotophos	Prothiofos	Demeton-S-methyl	Fenamiphos	Parathion	Pirimphos-ethyl
		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.2	0.2	0.05	0.05	0.05	0.2	0.05
ASC NEPM (1999) HSL Commercial/Industrial, Sand 0 to <1m																				
ASC NEPM (1999) HSL Commercial/Industrial, Sand 1 to <2m																				
ASC NEPM (1999) HSL Commercial/Industrial, Sand 2 to <4m																				
NEPM 2013 Table 1B(7) Management Limits Commercial/Industrial, Fine Soil																				
ASC NEPM (1999) HIL Commercial/Industrial D						2000														
NASSG (2018) action criteria based on texture and volume of material disturbed																				
Coarse and Peats (sands to loamy sands)																				
Medium (clayey sands to light clays)																				
Fine (light medium to heavy clays)																				
SA EPA Waste Fill Criteria																				
SA EPA Intermediate Waste - Total Dry Weight Concentrations																				
SA EPA Low-level Contaminated - Total Dry Weight Concentrations																				
Sample No.	**Date**																			
BH01_0.0 - 0.15m	**11/08/2021**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.05	<0.05	<0.2	<0.05
BH01_0.5 - 0.6m	**11/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH01_0.6 - 0.75m	**11/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH01_1.5 - 1.6m	**11/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH02_0.0 - 0.15m	**11/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH02_0.5 - 0.65m	**13/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH02_1.2 - 1.35m	**13/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH02_2.0 - 2.15m	**13/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH03_0.0 - 0.15m	**13/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH03_1.0 - 1.15m	**13/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH03_3.0 - 3.1m	**13/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH04_0.0 - 0.15m	**13/08/2021**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.05	<0.05	<0.2	<0.05
BH04_0.6 - 0.75m	**13/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH04_1.0 - 1.1m	**13/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH04_2.0 - 2.1m	**13/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH04_2.6 - 2.7m	**16/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DCP01_0.0-0.15m	**12/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DCP02_0.0-0.15m	**12/08/2021**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.05	<0.05	<0.2	<0.05
DCP03_0.0-0.15m	**12/08/2021**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.05	<0.05	<0.2	<0.05
DCP04_0.0-0.15m	**12/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DCP05_0.0-0.15m	**12/08/2021**	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.5	<0.5	<0.12	<0.12	<0.12	<0.5	<0.12
DCP06_0.0-0.15m	**11/08/2021**	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.5	<0.5	<0.12	<0.12	<0.12	<0.5	<0.12
DCP07_0.0-0.15m	**11/08/2021**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.05	<0.05	<0.2	<0.05
DCP08_0.0 - 0.15m	**11/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DCP08_0.0-0.15m	**11/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DCP09_0.0-0.15m	**11/08/2021**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.05	<0.05	<0.2	<0.05
DCP10_0.0-0.15m	**11/08/2021**	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.5	<0.5	<0.12	<0.12	<0.12	<0.5	<0.12
DCP11_0.0 - 0.15m	**11/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DCP11_0.0-0.15m	**11/08/2021**	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.5	<0.5	<0.12	<0.12	<0.12	<0.5	<0.12
DCP12_0.0-0.15m	**11/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DCP13_0.0-0.15m	**11/08/2021**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.05	<0.05	<0.2	<0.05
DCP14_0.0-0.15m	**11/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DCP15_0.0-0.15m	**11/08/2021**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.05	<0.05	<0.2	<0.05
DCP16_0.0-0.15m	**11/08/2021**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.2	<0.05	<0.05	<0.05	<0.2	<0.05
DCP17_0.0-0.15m	**11/08/2021**																			
	Duplicate																			
DCP08_0.0-0.15m	**11/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DCP08_0.0 - 0.15m (QC)	**11/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	RPD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH03_1.0 - 1.15m	**13/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH03_1.0 - 1.15m (QC)	**13/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	RPD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Rinsate Samples																			
Rinsate 1*	**11/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rinsate 2*	**12/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rinsate 3*	**13/08/2021**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*** mg/L**

Table 1 - Analytical Results

		SPOCAS																																Other	
		a-Net Acidity without ANCE	Liming rate without ANCE	s-Net Acidity without ANCE	Acid Reacted Calcium	Acid Reacted Magnesium	acidity - Acid Reacted Calcium	acidity - Acid Reacted Magnesium	acidity - Excess Acid Neutralising Capacity	acidity - Peroxide Oxidisable Sulfur	ANC Fineness Factor	Calcium in Peroxide	Excess Acid Neutralising Capacity	KCl Extractable Calcium	KCl Extractable Magnesium	KCl Extractable Sulfur	Liming Rate	Magnesium in Peroxide	Net Acidity (acidity units)	Net Acidity (sulfur units)	Peroxide Oxidisable Sulfur	pH (KCl)	pH (Ox)	sulfidic - Acid Reacted Calcium	sulfidic - Acid Reacted Magnesium	sulfidic - Excess Acid Neutralising Capacity	sulfidic - Titratable Actual Acidity	sulfidic - Titratable Peroxide Acidity	sulfidic - Titratable Sulfidic Acidity	Sulfur in Peroxide	Titratable Actual Acidity	Titratable Peroxide Acidity	Titratable Sulfidic Acidity	Cyanide Total	PCBs (Sum of total)
		moles H+/t	kg CaCO3/t	% S	%	%	mole H+/t	mole H+/t	mole H+/t	mole H+/t	-	%	% CaCO3	%	%	%	kg CaCO3/t	%	mole H+/t	%S	%	-	-	% S	%S	%S	%S	%S	%S	%	mole H+/t	mole H+/t	mole H+/t	mg/kg	mg/kg
EQL		10	1	0.02	0.02	0.02	10	10	10	10	0.5	0.02	0.02	0.02	0.02	0.02	1	0.02	10	0.02	0.02	0.1	0.1		0.02	0.02	0.02	0.02	0.02	0.02	2	2	2	1	0.1
ASC NEPM (1999) HSL Commercial/Industrial, Sand 0 to <1m																																			
ASC NEPM (1999) HSL Commercial/Industrial, Sand 1 to <2m																																			
ASC NEPM (1999) HSL Commercial/Industrial, Sand 2 to <4m																																			
NEPM 2013 Table 1B(7) Management Limits Commercial/Industrial, Fine Soil																																			
ASC NEPM (1999) HIL Commercial/Industrial D																																			
NASSG (2018) action criteria based on texture and volume of material disturbed																																			
Coarse and Peats (sands to loamy sands)																			18	0.03															
Medium (clayey sands to light clays)																			36	0.06															
Fine (light medium to heavy clays)																			62	0.1															
SA EPA Waste Fill Criteria																																		500	2
SA EPA Intermediate Waste - Total Dry Weight Concentrations																																		1,000	2
SA EPA Low-level Contaminated - Total Dry Weight Concentrations																																		3,500	50
Sample No.	**Date**																																		
BH01_0.0 - 0.15m	11/08/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH01_0.5 - 0.6m	11/08/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH01_0.6 - 0.75m	11/08/2021	21	2	0.03	19.2	0.12	9,600	98	10,000	21	1.5	19.4	50.1	0.125	<0.020	<0.020	<1	0.12	<10	<0.02	0.034	9.8	8.6	15.4	0.158	16	<0.020	<0.020	<0.020	0.034	<2	<2	<2	-	-
BH01_1.5 - 1.6m	11/08/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH02_0.0 - 0.15m	11/08/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	<0.1
BH02_0.5 - 0.65m	13/08/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH02_1.2 - 1.35m	13/08/2021	52	4	0.08	19.4	0.097	9,680	80	10,000	52	1.5	19.5	50.3	0.142	<0.020	0.033	<1	0.097	<10	<0.02	0.083	9.5	8.2	15.5	0.128	16.1	<0.020	<0.020	<0.020	0.116	<2	<2	<2	-	-
BH02_2.0 - 2.15m	13/08/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH03_0.0 - 0.15m	13/08/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH03_1.0 - 1.15m	13/08/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH03_3.0 - 3.1m	13/08/2021	<10	<1	<0.02	7.94	0.12	3,960	99	4,900	<10	1.5	8.08	24.5	0.146	<0.020	<0.020	<1	0.12	<10	<0.02	<0.020	9.6	8.2	6.35	0.159	7.85	<0.020	<0.020	<0.020	<0.020	<2	<2	<2	-	-
BH04_0.0 - 0.15m	13/08/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3+CX14:E	-	-	-	-	-	-	-	-	-
BH04_0.6 - 0.75m	13/08/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH04_1.0 - 1.1m	13/08/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	<0.1
BH04_2.0 - 2.1m	13/08/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH04_2.6 - 2.7m	16/08/2021	35	3	0.06	<0.020	<0.020	<10	<10	-	35	1.5	0.031	-	0.024	<0.020	<0.020	2	<0.020	26	0.04	0.057	7.1	4.1	<0.020	<0.020	-	<0.020	0.034	0.034	0.057	<2	22	22	-	-
DCP01_0.0-0.15m	12/08/2021	56	4	0.09	3.46	0.039	1,730	32	1,850	56	1.5	3.61	9.26	0.144	0.046	0.063	<1	0.085	<10	<0.02	0.089	9.6	8.4	2.77	0.052	2.96	<0.020	<0.020	<0.020	0.152	<2	<2	<2	<1	<0.1
DCP02_0.0-0.15m	12/08/2021	65	5	0.1	5.69	0.134	2,840	110	3,200	65	1.5	5.89	16	0.193	0.135	0.117	<1	0.269	<10	<0.02	0.104	9.5	8.0	4.56	0.176	5.13	<0.020	<0.020	<0.020	0.22	<2	<2	<2	-	-
DCP03_0.0-0.15m	12/08/2021	66	5	0.1	4.59	0.065	2,290	54	2,420	66	1.5	4.74	12.1	0.149	0.091	0.114	<1	0.156	<10	<0.02	0.105	9.6	8.5	3.67	0.086	3.88	<0.020	<0.020	<0.020	0.22	<2	<2	<2	-	-
DCP04_0.0-0.15m	12/08/2021	204	15	0.33	14.5	0.67	7,260	552	7,920	204	1.5	14.9	39.7	0.328	0.366	0.403	<1	1.04	<10	<0.02	0.327	9.1	8.0	11.6	0.884	12.7	<0.020	<0.020	<0.020	0.73	<2	<2	<2	<1	<0.1
DCP05_0.0-0.15m	12/08/2021	410	31	0.66	9.14	0.291	4,560	239	4,710	410	1.5	9.64	23.6	0.5	0.551	0.458	<1	0.842	<10	<0.02	0.657	8.9	7.2	7.31	0.383	7.55	<0.020	<0.020	<0.020	1.11	<2	<2	<2	-	-
DCP06_0.0-0.15m	11/08/2021	475	36	0.76	0.358	0.13	178	107	-	475	1.5	0.921	-	0.564	0.856	0.649	22	0.987	288	0.46	0.762	8.5	4.4	0.286	0.172	-	<0.020	0.313	0.313	1.41	<2	195	195	-	-
DCP07_0.0-0.15m	11/08/2021	38	3	0.06	3.36	0.042	1,680	34	1,840	38	1.5	3.52	9.23	0.159	0.119	0.118	<1	0.161	<10	<0.02	0.06	9.6	8.3	2.69	0.055	2.95	<0.020	<0.020	<0.020	0.179	<2	<2	<2	-	-
DCP08_0.0 - 0.15m	11/08/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	<0.1
DCP08_0.0-0.15m	11/08/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	<0.1
DCP09_0.0-0.15m	11/08/2021	121	9	0.19	12.9	0.202	6,420	166	7,220	121	1.5	13.1	36.1	0.192	0.131	0.166	<1	0.333	<10	<0.02	0.194	9.3	8.7	10.3	0.267	11.6	<0.020	<0.020	<0.020	0.36	<2	<2	<2	-	-
DCP10_0.0-0.15m	11/08/2021	421	32	0.67	1.32	0.346	661	284	837	421	1.5	2.06	4.19	0.731	0.938	0.675	<1	1.28	<10	<0.02	0.674	8.7	7.0	1.06	0.456	1.34	<0.020	<0.020	<0.020	1.35	<2	<2	<2	-	-
DCP11_0.0 - 0.15m	11/08/2021	106	8	0.17	9.86	0.127	4,920	104	5,650	106	1.5	10.1	28.3	0.209	0.138	0.182	<1	0.265	<10	<0.02	0.169	9.3	8.4	7.88	0.168	9.04	<0.020	<0.020	<0.020	0.351	<2	<2	<2	-	-
DCP11_0.0-0.15m	11/08/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DCP12_0.0-0.15m	11/08/2021	20	1	0.03	9.90	0.046	4,940	38	6,530	20	1.5	10.3	32.7	0.365	0.354	0.386	<1	0.4	<10	<0.02	0.031	9.4	8.2	7.92	0.061	10.5	<0.020	<0.020	<0.020	0.417	<2	<2	<2	<2	<0.1
DCP13_0.0-0.15m	11/08/2021	<10	<1	<0.02	0.159	0.036	79	29	263	<10	1.5	0.473	1.32	0.314	0.075	<0.020	<1	0.111	<10	<0.02	<0.020	8.4	9.2	0.127	0.047	0.422	<0.020	<0.020	<0.020	<0.020	<2	<2	<2	-	-
DCP14_0.0-0.15m	11/08/2021	126	9	0.2	2.09	0.075	1,040	62	1,060	126	1.5	2.25	5.30	0.158	0.083	0.163	<1	0.158	<10	<0.02	0.202	9.4	8.3	1.67	0.099	1.70	<0.020	<0.020	<0.020	0.365	<2	<2	<2	<2	<0.1
DCP15_0.0-0.15m	11/08/2021	162	12	0.26	8.24	0.1	4,110	82	5,100	162	1.5	8.64	25.5	0.405	0.366	0.354	<1	0.466	<10	<0.02	0.26	8.9	7.6	6.59	0.132	8.17	<0.020	<0.020	<0.020	0.614	<2	<2	<2	-	-
DCP16_0.0-0.15m	11/08/2021	92	7	0.15	<0.020	<0.020	<10	<10	-	92	1.5	0.06	-	0.059	0.092	0.084	5	0.096	67	0.11	0.147	8.2	3.0	<0.020	<0.020	-	<0.020	0.087	0.087	0.231	<2	54	54	-	-
DCP17_0.0-0.15m	11/08/2021	130	10	0.21	5.97	0.097	2980	80	3050	130	1.5	6.19	15.3	0.228	0.087	0.222	<1	0.184	<10	<0.02	0.208	9.1	8.5	4.77	0.128	4.89	<0.020	<0.020	<0.020	0.43	<2	<2	<2	<1	<0.1
Duplicate																																			
DCP08_0.0-0.15m	11/08/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	<0.1
DCP08_0.0 - 0.15m (QC)	11/08/2021	24	2	0.04	15.6	0.12	7780	99	8300	24	1.5	15.7	41.5	0.136	<0.020	<0.020	<1	0.12	<10	<0.02	0.039	9.7	8.6	12.5	0.159	13.3	<0.020	<0.020	<0.020	0.039	<2	<2	<2	-	-
RPD		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH03_1.0 - 1.15m	13/08/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH03_1.0 - 1.15m (QC)	13/08/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
RPD		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rinsate Samples																																			
Rinsate 1*	11/08/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rinsate 2*	12/08/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rinsate 3*	13/08/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*** mg/L**

ATTACHMENT 4

LABORATORY CERTIFICATES OF ANALYSIS

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order : **EM2116495**
Client : **FYFE PTY LTD**
Contact : STUART TWISS
Address : LEVEL 1, 124 SOUTH TERRACE
ADELAIDE SOUTH AUSTRALIA 5000
Telephone : ----
Project : 80963-1
Order number : 11415
C-O-C number : 80963-1_Coorong_COC
Sampler : SCT
Site :
Quote number : AD/060/21
No. of samples received : 71
No. of samples analysed : 36

Page : 1 of 30
Laboratory : Environmental Division Melbourne
Contact : Kieren Burns
Address : 4 Westall Rd Springvale VIC Australia 3171
Telephone : +61881625130
Date Samples Received : 17-Aug-2021 10:50
Date Analysis Commenced : 23-Aug-2021
Issue Date : 03-Sep-2021 14:30

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Organics, Springvale, VIC
Xing Lin	Senior Organic Chemist	Melbourne Organics, Springvale, VIC

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the 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.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

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
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EG048G: EM2116368 sample #9 poor matrix spike recovery for Hexavalent Chromium due to matrix effects. Confirmed by re-analysis.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) per the NEPM (2013) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.
- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EP068: Where reported, Total Chlordane (sum) is the sum of the reported concentrations of cis-Chlordane and trans-Chlordane at or above the LOR.
- EP068: Where reported, Total OCP is the sum of the reported concentrations of all Organochlorine Pesticides at or above LOR.
- EP075(SIM): Where reported, Total Cresol is the sum of the reported concentrations of 2-Methylphenol and 3- & 4-Methylphenol at or above the LOR.
- EG005T: EM2116495 #52 Poor duplicate precision for Iron due to sample heterogeneity. Confirmed by re-extraction and re-analysis.
- ASS: EA029 (SPOCAS): Retained Acidity not required because pH KCl greater than or equal to 4.5
- ASS: EA029 (SPOCAS): Laboratory determinations of ANC needs to be corroborated by effectiveness of the measured ANC in relation to incubation ANC. Unless corroborated, the results of ANC testing should be discounted when determining Net Acidity for comparison with action criteria, or for the determination of the acidity hazard and required liming amounts.
- ASS: EA029 (SPOCAS): Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO3) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from kg/t dry weight to kg/m3 in-situ soil, multiply reported results x wet bulk density of soil in t/m3.

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**BH01_0.0 - 0.15m**	**BH01_0.5 - 0.6m**	**BH01_0.6 - 0.75m**	**BH01_1.5 - 1.6m**	**BH02_0.0 - 0.15m**
			Sampling date / time	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EM2116495-001**	**EM2116495-002**	**EM2116495-003**	**EM2116495-006**	**EM2116495-009**
				Result	Result	Result	Result	Result
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	----	----	**9.8**	----	----
pH OX (23B)	----	0.1	pH Unit	----	----	**8.6**	----	----
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	----	----	<2	----	----
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	----	----	<2	----	----
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	----	----	<2	----	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.020	% pyrite S	----	----	<0.020	----	----
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.020	% pyrite S	----	----	<0.020	----	----
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.020	% pyrite S	----	----	<0.020	----	----
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.020	% S	----	----	<0.020	----	----
Peroxide Sulfur (23De)	----	0.020	% S	----	----	**0.034**	----	----
Peroxide Oxidisable Sulfur (23E)	----	0.020	% S	----	----	**0.034**	----	----
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	----	----	**21**	----	----
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.020	% Ca	----	----	**0.125**	----	----
Peroxide Calcium (23Wh)	----	0.020	% Ca	----	----	**19.4**	----	----
Acid Reacted Calcium (23X)	----	0.020	% Ca	----	----	**19.2**	----	----
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	----	----	**9600**	----	----
sulfidic - Acid Reacted Calcium (s-23X)	----	0.020	% S	----	----	**15.4**	----	----
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.020	% Mg	----	----	<0.020	----	----
Peroxide Magnesium (23Tm)	----	0.020	% Mg	----	----	**0.120**	----	----
Acid Reacted Magnesium (23U)	----	0.020	% Mg	----	----	**0.120**	----	----
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	----	----	**98**	----	----
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.020	% S	----	----	**0.158**	----	----
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.020	% CaCO3	----	----	**50.1**	----	----
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	----	----	**10000**	----	----
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.020	% S	----	----	**16.0**	----	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**BH01_0.0 - 0.15m**	**BH01_0.5 - 0.6m**	**BH01_0.6 - 0.75m**	**BH01_1.5 - 1.6m**	**BH02_0.0 - 0.15m**
			Sampling date / time	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EM2116495-001**	**EM2116495-002**	**EM2116495-003**	**EM2116495-006**	**EM2116495-009**
				Result	Result	Result	Result	Result
EA029-F: Excess Acid Neutralising Capacity - Continued								
EA029-H: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	----	----	**1.5**	----	----
Net Acidity (sulfur units)	----	0.02	% S	----	----	<0.02	----	----
Net Acidity (acidity units)	----	10	mole H+ / t	----	----	<10	----	----
Liming Rate	----	1	kg CaCO3/t	----	----	<1	----	----
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	----	----	**0.03**	----	----
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	----	----	**21**	----	----
Liming Rate excluding ANC	----	1	kg CaCO3/t	----	----	**2**	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	**5.0**	**8.2**	----	**15.0**	**10.4**
EG005(ED093)T: Total Metals by ICP-AES								
Barium	7440-39-3	10	mg/kg	----	----	----	----	**50**
Beryllium	7440-41-7	1	mg/kg	----	----	----	----	<1
Cobalt	7440-48-4	2	mg/kg	----	----	----	----	**3**
Iron	7439-89-6	50	mg/kg	----	----	----	----	**5050**
Manganese	7439-96-5	5	mg/kg	----	----	----	----	**54**
Silver	7440-22-4	2	mg/kg	----	----	----	----	<2
Arsenic	7440-38-2	5	mg/kg	----	<5	----	**10**	**10**
Cadmium	7440-43-9	1	mg/kg	----	<1	----	<1	<1
Chromium	7440-47-3	2	mg/kg	----	<2	----	**3**	**7**
Copper	7440-50-8	5	mg/kg	----	<5	----	<5	<5
Lead	7439-92-1	5	mg/kg	----	<5	----	<5	<5
Nickel	7440-02-0	2	mg/kg	----	<2	----	<2	**4**
Zinc	7440-66-6	5	mg/kg	----	**11**	----	**11**	**10**
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	----	<0.1	----	<0.1	<0.1
EG048: Hexavalent Chromium (Alkaline Digest)								
Hexavalent Chromium	18540-29-9	0.5	mg/kg	----	----	----	----	<0.5
EK026SF: Total CN by Segmented Flow Analyser								
Total Cyanide	57-12-5	1	mg/kg	----	----	----	----	<1
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	----	----	----	----	<0.1
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	----	----	----	<0.05

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**BH01_0.0 - 0.15m**	**BH01_0.5 - 0.6m**	**BH01_0.6 - 0.75m**	**BH01_1.5 - 1.6m**	**BH02_0.0 - 0.15m**
			Sampling date / time	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EM2116495-001**	**EM2116495-002**	**EM2116495-003**	**EM2116495-006**	**EM2116495-009**
				Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued								
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	----	----	----	<0.05
beta-BHC	319-85-7	0.05	mg/kg	<0.05	----	----	----	<0.05
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	----	----	----	<0.05
delta-BHC	319-86-8	0.05	mg/kg	<0.05	----	----	----	<0.05
Heptachlor	76-44-8	0.05	mg/kg	<0.05	----	----	----	<0.05
Aldrin	309-00-2	0.05	mg/kg	<0.05	----	----	----	<0.05
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	----	----	----	<0.05
^ **Total Chlordane (sum)**	----	0.05	mg/kg	<0.05	----	----	----	<0.05
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	----	----	----	<0.05
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	----	----	----	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	----	----	----	<0.05
Dieldrin	60-57-1	0.05	mg/kg	<0.05	----	----	----	<0.05
4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	----	----	----	<0.05
Endrin	72-20-8	0.05	mg/kg	<0.05	----	----	----	<0.05
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	----	----	----	<0.05
^ **Endosulfan (sum)**	115-29-7	0.05	mg/kg	<0.05	----	----	----	<0.05
4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	----	----	----	<0.05
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	----	----	----	<0.05
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	----	----	----	<0.05
4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	----	----	----	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	----	----	----	<0.05
Methoxychlor	72-43-5	0.2	mg/kg	<0.2	----	----	----	<0.2
^ **Sum of Aldrin + Dieldrin**	309-00-2/60-57-1	0.05	mg/kg	<0.05	----	----	----	<0.05
^ **Sum of DDD + DDE + DDT**	72-54-8/72-55-9/50-2	0.05	mg/kg	<0.05	----	----	----	<0.05
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.05	mg/kg	<0.05	----	----	----	----
Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	----	----	----	----
Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	----	----	----	----
Dimethoate	60-51-5	0.05	mg/kg	<0.05	----	----	----	----
Diazinon	333-41-5	0.05	mg/kg	<0.05	----	----	----	----
Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	----	----	----	----
Parathion-methyl	298-00-0	0.2	mg/kg	<0.2	----	----	----	----
Malathion	121-75-5	0.05	mg/kg	<0.05	----	----	----	----
Fenthion	55-38-9	0.05	mg/kg	<0.05	----	----	----	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**BH01_0.0 - 0.15m**	**BH01_0.5 - 0.6m**	**BH01_0.6 - 0.75m**	**BH01_1.5 - 1.6m**	**BH02_0.0 - 0.15m**
			Sampling date / time	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EM2116495-001**	**EM2116495-002**	**EM2116495-003**	**EM2116495-006**	**EM2116495-009**
				Result	Result	Result	Result	Result
EP068B: Organophosphorus Pesticides (OP) - Continued								
Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	----	----	----	----
Parathion	56-38-2	0.2	mg/kg	<0.2	----	----	----	----
Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	----	----	----	----
Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	----	----	----	----
Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	----	----	----	----
Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	----	----	----	----
Prothiofos	34643-46-4	0.05	mg/kg	<0.05	----	----	----	----
Ethion	563-12-2	0.05	mg/kg	<0.05	----	----	----	----
Carbophenothion	786-19-6	0.05	mg/kg	<0.05	----	----	----	----
Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	----	----	----	----
EP075(SIM)A: Phenolic Compounds								
Phenol	108-95-2	0.5	mg/kg	----	----	----	----	<0.5
2-Chlorophenol	95-57-8	0.5	mg/kg	----	----	----	----	<0.5
2-Methylphenol	95-48-7	0.5	mg/kg	----	----	----	----	<0.5
3- & 4-Methylphenol	1319-77-3	1	mg/kg	----	----	----	----	<1
2-Nitrophenol	88-75-5	0.5	mg/kg	----	----	----	----	<0.5
2.4-Dimethylphenol	105-67-9	0.5	mg/kg	----	----	----	----	<0.5
2.4-Dichlorophenol	120-83-2	0.5	mg/kg	----	----	----	----	<0.5
2.6-Dichlorophenol	87-65-0	0.5	mg/kg	----	----	----	----	<0.5
4-Chloro-3-methylphenol	59-50-7	0.5	mg/kg	----	----	----	----	<0.5
2.4.6-Trichlorophenol	88-06-2	0.5	mg/kg	----	----	----	----	<0.5
2.4.5-Trichlorophenol	95-95-4	0.5	mg/kg	----	----	----	----	<0.5
Pentachlorophenol	87-86-5	2	mg/kg	----	----	----	----	<2
^ **Sum of Phenols**	----	0.5	mg/kg	----	----	----	----	<0.5
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	----	----	----	----	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	----	----	----	----	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	----	----	----	----	<0.5
Fluorene	86-73-7	0.5	mg/kg	----	----	----	----	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	----	----	----	----	<0.5
Anthracene	120-12-7	0.5	mg/kg	----	----	----	----	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	----	----	----	----	<0.5
Pyrene	129-00-0	0.5	mg/kg	----	----	----	----	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	----	----	----	----	<0.5

Analytical Results

Sub-Matrix: **SOIL**
(Matrix: **SOIL**)

			Sample ID	**BH01_0.0 - 0.15m**	**BH01_0.5 - 0.6m**	**BH01_0.6 - 0.75m**	**BH01_1.5 - 1.6m**	**BH02_0.0 - 0.15m**
			Sampling date / time	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EM2116495-001**	**EM2116495-002**	**EM2116495-003**	**EM2116495-006**	**EM2116495-009**
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Chrysene	218-01-9	0.5	mg/kg	----	----	----	----	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	----	----	----	----	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	----	----	----	----	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	----	----	----	----	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	----	----	----	----	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	----	----	----	----	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	----	----	----	----	<0.5
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg	----	----	----	----	<0.5
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	mg/kg	----	----	----	----	<0.5
^ **Benzo(a)pyrene TEQ (half LOR)**	----	0.5	mg/kg	----	----	----	----	**0.6**
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg	----	----	----	----	**1.2**
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	----	----	----	----	<10
C10 - C14 Fraction	----	50	mg/kg	----	----	----	----	<50
C15 - C28 Fraction	----	100	mg/kg	----	----	----	----	<100
C29 - C36 Fraction	----	100	mg/kg	----	----	----	----	<100
^ **C10 - C36 Fraction (sum)**	----	50	mg/kg	----	----	----	----	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	----	----	----	----	<10
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	10	mg/kg	----	----	----	----	<10
>C10 - C16 Fraction	----	50	mg/kg	----	----	----	----	<50
>C16 - C34 Fraction	----	100	mg/kg	----	----	----	----	<100
>C34 - C40 Fraction	----	100	mg/kg	----	----	----	----	<100
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg	----	----	----	----	<50
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg	----	----	----	----	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	----	----	----	----	<0.2
Toluene	108-88-3	0.5	mg/kg	----	----	----	----	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	----	----	----	----	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	----	----	----	----	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	----	----	----	----	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg	----	----	----	----	<0.2
^ **Total Xylenes**	----	0.5	mg/kg	----	----	----	----	<0.5

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Sample ID	**BH01_0.0 - 0.15m**	**BH01_0.5 - 0.6m**	**BH01_0.6 - 0.75m**	**BH01_1.5 - 1.6m**	**BH02_0.0 - 0.15m**
			Sampling date / time	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00
Compound	CAS Number	LOR	Unit	**EM2116495-001**	**EM2116495-002**	**EM2116495-003**	**EM2116495-006**	**EM2116495-009**
				Result	Result	Result	Result	Result
EP080: BTEXN - Continued								
Naphthalene	91-20-3	1	mg/kg	----	----	----	----	<1
EP066S: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	0.1	%	----	----	----	----	**76.7**
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	**92.4**	----	----	----	**94.0**
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	**98.3**	----	----	----	**102**
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	----	----	----	----	**75.6**
2-Chlorophenol-D4	93951-73-6	0.5	%	----	----	----	----	**82.8**
2.4.6-Tribromophenol	118-79-6	0.5	%	----	----	----	----	**54.9**
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	----	----	----	----	**89.2**
Anthracene-d10	1719-06-8	0.5	%	----	----	----	----	**108**
4-Terphenyl-d14	1718-51-0	0.5	%	----	----	----	----	**97.1**
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	----	----	----	----	**87.1**
Toluene-D8	2037-26-5	0.2	%	----	----	----	----	**89.1**
4-Bromofluorobenzene	460-00-4	0.2	%	----	----	----	----	**87.2**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**BH02_0.5 - 0.65m**	**BH02_1.2 - 1.35m**	**BH02_2.0 - 2.15m**	**BH03_0.0 - 0.15m**	**BH03_1.0 - 1.15m**
			Sampling date / time	13-Aug-2021 00:00	13-Aug-2021 00:00	13-Aug-2021 00:00	13-Aug-2021 00:00	13-Aug-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EM2116495-011**	**EM2116495-013**	**EM2116495-015**	**EM2116495-017**	**EM2116495-021**
				Result	Result	Result	Result	Result
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	----	**9.5**	----	----	----
pH OX (23B)	----	0.1	pH Unit	----	**8.2**	----	----	----
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	----	<2	----	----	----
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	----	<2	----	----	----
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	----	<2	----	----	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.020	% pyrite S	----	<0.020	----	----	----
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.020	% pyrite S	----	<0.020	----	----	----
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.020	% pyrite S	----	<0.020	----	----	----
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.020	% S	----	**0.033**	----	----	----
Peroxide Sulfur (23De)	----	0.020	% S	----	**0.116**	----	----	----
Peroxide Oxidisable Sulfur (23E)	----	0.020	% S	----	**0.083**	----	----	----
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	----	**52**	----	----	----
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.020	% Ca	----	**0.142**	----	----	----
Peroxide Calcium (23Wh)	----	0.020	% Ca	----	**19.5**	----	----	----
Acid Reacted Calcium (23X)	----	0.020	% Ca	----	**19.4**	----	----	----
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	----	**9680**	----	----	----
sulfidic - Acid Reacted Calcium (s-23X)	----	0.020	% S	----	**15.5**	----	----	----
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.020	% Mg	----	<0.020	----	----	----
Peroxide Magnesium (23Tm)	----	0.020	% Mg	----	**0.097**	----	----	----
Acid Reacted Magnesium (23U)	----	0.020	% Mg	----	**0.097**	----	----	----
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	----	**80**	----	----	----
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.020	% S	----	**0.128**	----	----	----
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.020	% CaCO3	----	**50.3**	----	----	----
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	----	**10000**	----	----	----
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.020	% S	----	**16.1**	----	----	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**BH02_0.5 - 0.65m**	**BH02_1.2 - 1.35m**	**BH02_2.0 - 2.15m**	**BH03_0.0 - 0.15m**	**BH03_1.0 - 1.15m**
			Sampling date / time	13-Aug-2021 00:00	13-Aug-2021 00:00	13-Aug-2021 00:00	13-Aug-2021 00:00	13-Aug-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EM2116495-011**	**EM2116495-013**	**EM2116495-015**	**EM2116495-017**	**EM2116495-021**
				Result	Result	Result	Result	Result
EA029-F: Excess Acid Neutralising Capacity - Continued								
EA029-H: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	----	**1.5**	----	----	----
Net Acidity (sulfur units)	----	0.02	% S	----	<0.02	----	----	----
Net Acidity (acidity units)	----	10	mole H+ / t	----	<10	----	----	----
Liming Rate	----	1	kg CaCO3/t	----	<1	----	----	----
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	----	**0.08**	----	----	----
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	----	**52**	----	----	----
Liming Rate excluding ANC	----	1	kg CaCO3/t	----	**4**	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	**8.5**	----	**5.6**	**2.9**	**4.8**
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	**15**	----	**12**	<5	<5
Cadmium	7440-43-9	1	mg/kg	<1	----	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	**4**	----	**4**	**2**	**2**
Copper	7440-50-8	5	mg/kg	<5	----	<5	<5	<5
Lead	7439-92-1	5	mg/kg	<5	----	<5	<5	<5
Nickel	7440-02-0	2	mg/kg	<2	----	<2	<2	<2
Zinc	7440-66-6	5	mg/kg	<5	----	**7**	<5	<5
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	----	<0.1	<0.1	<0.1

Analytical Results

Sub-Matrix: **SOIL**
(Matrix: **SOIL**)

Compound	CAS Number	LOR	Unit	BH03_1.0 - 1.15m (QC)	BH03_3.0 - 3.1m	BH04_0.0 - 0.15m	BH04_0.6 - 0.75m	BH04_1.0 - 1.1m
			Sampling date / time	13-Aug-2021 00:00	13-Aug-2021 00:00	13-Aug-2021 00:00	13-Aug-2021 00:00	13-Aug-2021 00:00
				EM2116495-022	EM2116495-025	EM2116495-026	EM2116495-028	EM2116495-030
				Result	Result	Result	Result	Result
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	----	**9.6**	----	----	----
pH OX (23B)	----	0.1	pH Unit	----	**8.2**	----	----	----
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	----	<2	----	----	----
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	----	<2	----	----	----
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	----	<2	----	----	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.020	% pyrite S	----	<0.020	----	----	----
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.020	% pyrite S	----	<0.020	----	----	----
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.020	% pyrite S	----	<0.020	----	----	----
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.020	% S	----	<0.020	----	----	----
Peroxide Sulfur (23De)	----	0.020	% S	----	<0.020	----	----	----
Peroxide Oxidisable Sulfur (23E)	----	0.020	% S	----	<0.020	----	----	----
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	----	<10	----	----	----
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.020	% Ca	----	**0.146**	----	----	----
Peroxide Calcium (23Wh)	----	0.020	% Ca	----	**8.08**	----	----	----
Acid Reacted Calcium (23X)	----	0.020	% Ca	----	**7.94**	----	----	----
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	----	**3960**	----	----	----
sulfidic - Acid Reacted Calcium (s-23X)	----	0.020	% S	----	**6.35**	----	----	----
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.020	% Mg	----	<0.020	----	----	----
Peroxide Magnesium (23Tm)	----	0.020	% Mg	----	**0.120**	----	----	----
Acid Reacted Magnesium (23U)	----	0.020	% Mg	----	**0.120**	----	----	----
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	----	**99**	----	----	----
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.020	% S	----	**0.159**	----	----	----
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.020	% CaCO3	----	**24.5**	----	----	----
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	----	**4900**	----	----	----
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.020	% S	----	**7.85**	----	----	----

Analytical Results

Sub-Matrix: **SOIL**
(Matrix: **SOIL**)

			Sample ID	**BH03_1.0 - 1.15m (QC)**	**BH03_3.0 - 3.1m**	**BH04_0.0 - 0.15m**	**BH04_0.6 - 0.75m**	**BH04_1.0 - 1.1m**
			Sampling date / time	13-Aug-2021 00:00	13-Aug-2021 00:00	13-Aug-2021 00:00	13-Aug-2021 00:00	13-Aug-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EM2116495-022**	**EM2116495-025**	**EM2116495-026**	**EM2116495-028**	**EM2116495-030**
				Result	Result	Result	Result	Result
EA029-F: Excess Acid Neutralising Capacity - Continued								
EA029-H: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	----	**1.5**	----	----	----
Net Acidity (sulfur units)	----	0.02	% S	----	<0.02	----	----	----
Net Acidity (acidity units)	----	10	mole H+ / t	----	<10	----	----	----
Liming Rate	----	1	kg CaCO3/t	----	<1	----	----	----
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	----	<0.02	----	----	----
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	----	<10	----	----	----
Liming Rate excluding ANC	----	1	kg CaCO3/t	----	<1	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	**4.4**	----	**11.3**	**4.0**	**4.3**
EG005(ED093)T: Total Metals by ICP-AES								
Barium	7440-39-3	10	mg/kg	----	----	----	----	<10
Beryllium	7440-41-7	1	mg/kg	----	----	----	----	<1
Cobalt	7440-48-4	2	mg/kg	----	----	----	----	<2
Iron	7439-89-6	50	mg/kg	----	----	----	----	**1460**
Manganese	7439-96-5	5	mg/kg	----	----	----	----	<5
Silver	7440-22-4	2	mg/kg	----	----	----	----	<2
Arsenic	7440-38-2	5	mg/kg	<5	----	----	<5	<5
Cadmium	7440-43-9	1	mg/kg	<1	----	----	<1	<1
Chromium	7440-47-3	2	mg/kg	**2**	----	----	<2	<2
Copper	7440-50-8	5	mg/kg	<5	----	----	<5	<5
Lead	7439-92-1	5	mg/kg	<5	----	----	<5	<5
Nickel	7440-02-0	2	mg/kg	<2	----	----	<2	<2
Zinc	7440-66-6	5	mg/kg	<5	----	----	<5	<5
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	----	----	<0.1	<0.1
EG048: Hexavalent Chromium (Alkaline Digest)								
Hexavalent Chromium	18540-29-9	0.5	mg/kg	----	----	----	----	<0.5
EK026SF: Total CN by Segmented Flow Analyser								
Total Cyanide	57-12-5	1	mg/kg	----	----	----	----	<1
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	----	----	----	----	<0.1
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	----	----	<0.05	----	<0.05

Analytical Results

Sub-Matrix: **SOIL**
(Matrix: **SOIL**)

			Sample ID	**BH03_1.0 - 1.15m (QC)**	**BH03_3.0 - 3.1m**	**BH04_0.0 - 0.15m**	**BH04_0.6 - 0.75m**	**BH04_1.0 - 1.1m**
			Sampling date / time	13-Aug-2021 00:00	13-Aug-2021 00:00	13-Aug-2021 00:00	13-Aug-2021 00:00	13-Aug-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EM2116495-022**	**EM2116495-025**	**EM2116495-026**	**EM2116495-028**	**EM2116495-030**
				Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued								
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	----	----	<0.05	----	<0.05
beta-BHC	319-85-7	0.05	mg/kg	----	----	<0.05	----	<0.05
gamma-BHC	58-89-9	0.05	mg/kg	----	----	<0.05	----	<0.05
delta-BHC	319-86-8	0.05	mg/kg	----	----	<0.05	----	<0.05
Heptachlor	76-44-8	0.05	mg/kg	----	----	<0.05	----	<0.05
Aldrin	309-00-2	0.05	mg/kg	----	----	<0.05	----	<0.05
Heptachlor epoxide	1024-57-3	0.05	mg/kg	----	----	<0.05	----	<0.05
^ **Total Chlordane (sum)**	----	0.05	mg/kg	----	----	<0.05	----	<0.05
trans-Chlordane	5103-74-2	0.05	mg/kg	----	----	<0.05	----	<0.05
alpha-Endosulfan	959-98-8	0.05	mg/kg	----	----	<0.05	----	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg	----	----	<0.05	----	<0.05
Dieldrin	60-57-1	0.05	mg/kg	----	----	<0.05	----	<0.05
4.4`-DDE	72-55-9	0.05	mg/kg	----	----	<0.05	----	<0.05
Endrin	72-20-8	0.05	mg/kg	----	----	<0.05	----	<0.05
beta-Endosulfan	33213-65-9	0.05	mg/kg	----	----	<0.05	----	<0.05
^ **Endosulfan (sum)**	115-29-7	0.05	mg/kg	----	----	<0.05	----	<0.05
4.4`-DDD	72-54-8	0.05	mg/kg	----	----	<0.05	----	<0.05
Endrin aldehyde	7421-93-4	0.05	mg/kg	----	----	<0.05	----	<0.05
Endosulfan sulfate	1031-07-8	0.05	mg/kg	----	----	<0.05	----	<0.05
4.4`-DDT	50-29-3	0.2	mg/kg	----	----	<0.2	----	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg	----	----	<0.05	----	<0.05
Methoxychlor	72-43-5	0.2	mg/kg	----	----	<0.2	----	<0.2
^ **Sum of Aldrin + Dieldrin**	309-00-2/60-57-1	0.05	mg/kg	----	----	<0.05	----	<0.05
^ **Sum of DDD + DDE + DDT**	72-54-8/72-55-9/50-2	0.05	mg/kg	----	----	<0.05	----	<0.05
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.05	mg/kg	----	----	<0.05	----	----
Demeton-S-methyl	919-86-8	0.05	mg/kg	----	----	<0.05	----	----
Monocrotophos	6923-22-4	0.2	mg/kg	----	----	<0.2	----	----
Dimethoate	60-51-5	0.05	mg/kg	----	----	<0.05	----	----
Diazinon	333-41-5	0.05	mg/kg	----	----	<0.05	----	----
Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	----	----	<0.05	----	----
Parathion-methyl	298-00-0	0.2	mg/kg	----	----	<0.2	----	----
Malathion	121-75-5	0.05	mg/kg	----	----	<0.05	----	----
Fenthion	55-38-9	0.05	mg/kg	----	----	<0.05	----	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**BH03_1.0 - 1.15m (QC)**	**BH03_3.0 - 3.1m**	**BH04_0.0 - 0.15m**	**BH04_0.6 - 0.75m**	**BH04_1.0 - 1.1m**
			Sampling date / time	13-Aug-2021 00:00	13-Aug-2021 00:00	13-Aug-2021 00:00	13-Aug-2021 00:00	13-Aug-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EM2116495-022**	**EM2116495-025**	**EM2116495-026**	**EM2116495-028**	**EM2116495-030**
				Result	Result	Result	Result	Result
EP068B: Organophosphorus Pesticides (OP) - Continued								
Chlorpyrifos	2921-88-2	0.05	mg/kg	----	----	<0.05	----	----
Parathion	56-38-2	0.2	mg/kg	----	----	<0.2	----	----
Pirimphos-ethyl	23505-41-1	0.05	mg/kg	----	----	<0.05	----	----
Chlorfenvinphos	470-90-6	0.05	mg/kg	----	----	<0.05	----	----
Bromophos-ethyl	4824-78-6	0.05	mg/kg	----	----	<0.05	----	----
Fenamiphos	22224-92-6	0.05	mg/kg	----	----	<0.05	----	----
Prothiofos	34643-46-4	0.05	mg/kg	----	----	<0.05	----	----
Ethion	563-12-2	0.05	mg/kg	----	----	<0.05	----	----
Carbophenothion	786-19-6	0.05	mg/kg	----	----	<0.05	----	----
Azinphos Methyl	86-50-0	0.05	mg/kg	----	----	<0.05	----	----
EP075(SIM)A: Phenolic Compounds								
Phenol	108-95-2	0.5	mg/kg	----	----	----	----	<0.5
2-Chlorophenol	95-57-8	0.5	mg/kg	----	----	----	----	<0.5
2-Methylphenol	95-48-7	0.5	mg/kg	----	----	----	----	<0.5
3- & 4-Methylphenol	1319-77-3	1	mg/kg	----	----	----	----	<1
2-Nitrophenol	88-75-5	0.5	mg/kg	----	----	----	----	<0.5
2.4-Dimethylphenol	105-67-9	0.5	mg/kg	----	----	----	----	<0.5
2.4-Dichlorophenol	120-83-2	0.5	mg/kg	----	----	----	----	<0.5
2.6-Dichlorophenol	87-65-0	0.5	mg/kg	----	----	----	----	<0.5
4-Chloro-3-methylphenol	59-50-7	0.5	mg/kg	----	----	----	----	<0.5
2.4.6-Trichlorophenol	88-06-2	0.5	mg/kg	----	----	----	----	<0.5
2.4.5-Trichlorophenol	95-95-4	0.5	mg/kg	----	----	----	----	<0.5
Pentachlorophenol	87-86-5	2	mg/kg	----	----	----	----	<2
^ **Sum of Phenols**	----	0.5	mg/kg	----	----	----	----	<0.5
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	----	----	----	----	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	----	----	----	----	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	----	----	----	----	<0.5
Fluorene	86-73-7	0.5	mg/kg	----	----	----	----	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	----	----	----	----	<0.5
Anthracene	120-12-7	0.5	mg/kg	----	----	----	----	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	----	----	----	----	<0.5
Pyrene	129-00-0	0.5	mg/kg	----	----	----	----	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	----	----	----	----	<0.5

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**BH03_1.0 - 1.15m (QC)**	**BH03_3.0 - 3.1m**	**BH04_0.0 - 0.15m**	**BH04_0.6 - 0.75m**	**BH04_1.0 - 1.1m**
			Sampling date / time	13-Aug-2021 00:00	13-Aug-2021 00:00	13-Aug-2021 00:00	13-Aug-2021 00:00	13-Aug-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EM2116495-022**	**EM2116495-025**	**EM2116495-026**	**EM2116495-028**	**EM2116495-030**
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Chrysene	218-01-9	0.5	mg/kg	----	----	----	----	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	----	----	----	----	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	----	----	----	----	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	----	----	----	----	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	----	----	----	----	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	----	----	----	----	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	----	----	----	----	<0.5
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg	----	----	----	----	<0.5
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	mg/kg	----	----	----	----	<0.5
^ **Benzo(a)pyrene TEQ (half LOR)**	----	0.5	mg/kg	----	----	----	----	**0.6**
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg	----	----	----	----	**1.2**
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	----	----	----	----	<10
C10 - C14 Fraction	----	50	mg/kg	----	----	----	----	<50
C15 - C28 Fraction	----	100	mg/kg	----	----	----	----	<100
C29 - C36 Fraction	----	100	mg/kg	----	----	----	----	<100
^ **C10 - C36 Fraction (sum)**	----	50	mg/kg	----	----	----	----	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	----	----	----	----	<10
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	10	mg/kg	----	----	----	----	<10
>C10 - C16 Fraction	----	50	mg/kg	----	----	----	----	<50
>C16 - C34 Fraction	----	100	mg/kg	----	----	----	----	<100
>C34 - C40 Fraction	----	100	mg/kg	----	----	----	----	<100
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg	----	----	----	----	<50
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg	----	----	----	----	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	----	----	----	----	<0.2
Toluene	108-88-3	0.5	mg/kg	----	----	----	----	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	----	----	----	----	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	----	----	----	----	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	----	----	----	----	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg	----	----	----	----	<0.2
^ **Total Xylenes**	----	0.5	mg/kg	----	----	----	----	<0.5

Analytical Results

Sub-Matrix: **SOIL**
(Matrix: **SOIL**)

			Sample ID	**BH03_1.0 - 1.15m (QC)**	**BH03_3.0 - 3.1m**	**BH04_0.0 - 0.15m**	**BH04_0.6 - 0.75m**	**BH04_1.0 - 1.1m**
			Sampling date / time	13-Aug-2021 00:00	13-Aug-2021 00:00	13-Aug-2021 00:00	13-Aug-2021 00:00	13-Aug-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EM2116495-022**	**EM2116495-025**	**EM2116495-026**	**EM2116495-028**	**EM2116495-030**
				Result	Result	Result	Result	Result
EP080: BTEXN - Continued								
Naphthalene	91-20-3	1	mg/kg	----	----	----	----	<1
EP066S: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	0.1	%	----	----	----	----	**80.0**
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	----	----	**104**	----	**96.2**
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	----	----	**110**	----	**113**
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	----	----	----	----	**77.2**
2-Chlorophenol-D4	93951-73-6	0.5	%	----	----	----	----	**84.4**
2.4.6-Tribromophenol	118-79-6	0.5	%	----	----	----	----	**61.2**
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	----	----	----	----	**92.6**
Anthracene-d10	1719-06-8	0.5	%	----	----	----	----	**111**
4-Terphenyl-d14	1718-51-0	0.5	%	----	----	----	----	**97.9**
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	----	----	----	----	**85.0**
Toluene-D8	2037-26-5	0.2	%	----	----	----	----	**86.7**
4-Bromofluorobenzene	460-00-4	0.2	%	----	----	----	----	**87.1**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**BH04_2.0 - 2.1m**	**BH04_2.6 - 2.7m**	**DCP01_0.0 - 0.15m**	**DCP02_0.0 - 0.15m**	**DCP03_0.0 - 0.15m**
			Sampling date / time	13-Aug-2021 00:00	16-Aug-2021 00:00	12-Aug-2021 00:00	12-Aug-2021 00:00	12-Aug-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EM2116495-033**	**EM2116495-034**	**EM2116495-039**	**EM2116495-041**	**EM2116495-043**
				Result	Result	Result	Result	Result
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	----	**7.1**	**9.6**	**9.5**	**9.6**
pH OX (23B)	----	0.1	pH Unit	----	**4.1**	**8.4**	**8.0**	**8.5**
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	----	<2	<2	<2	<2
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	----	**22**	<2	<2	<2
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	----	**22**	<2	<2	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.020	% pyrite S	----	<0.020	<0.020	<0.020	<0.020
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.020	% pyrite S	----	**0.034**	<0.020	<0.020	<0.020
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.020	% pyrite S	----	**0.034**	<0.020	<0.020	<0.020
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.020	% S	----	<0.020	**0.063**	**0.117**	**0.114**
Peroxide Sulfur (23De)	----	0.020	% S	----	**0.057**	**0.152**	**0.220**	**0.220**
Peroxide Oxidisable Sulfur (23E)	----	0.020	% S	----	**0.057**	**0.089**	**0.104**	**0.105**
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	----	**35**	**56**	**65**	**66**
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.020	% Ca	----	**0.024**	**0.144**	**0.193**	**0.149**
Peroxide Calcium (23Wh)	----	0.020	% Ca	----	**0.031**	**3.61**	**5.89**	**4.74**
Acid Reacted Calcium (23X)	----	0.020	% Ca	----	<0.020	**3.46**	**5.69**	**4.59**
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	----	<10	**1730**	**2840**	**2290**
sulfidic - Acid Reacted Calcium (s-23X)	----	0.020	% S	----	<0.020	**2.77**	**4.56**	**3.67**
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.020	% Mg	----	<0.020	**0.046**	**0.135**	**0.091**
Peroxide Magnesium (23Tm)	----	0.020	% Mg	----	<0.020	**0.085**	**0.269**	**0.156**
Acid Reacted Magnesium (23U)	----	0.020	% Mg	----	<0.020	**0.039**	**0.134**	**0.065**
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	----	<10	**32**	**110**	**54**
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.020	% S	----	<0.020	**0.052**	**0.176**	**0.086**
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.020	% CaCO3	----	----	**9.26**	**16.0**	**12.1**
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	----	----	**1850**	**3200**	**2420**
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.020	% S	----	----	**2.96**	**5.13**	**3.88**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**BH04_2.0 - 2.1m**	**BH04_2.6 - 2.7m**	**DCP01_0.0 - 0.15m**	**DCP02_0.0 - 0.15m**	**DCP03_0.0 - 0.15m**
			Sampling date / time	13-Aug-2021 00:00	16-Aug-2021 00:00	12-Aug-2021 00:00	12-Aug-2021 00:00	12-Aug-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EM2116495-033**	**EM2116495-034**	**EM2116495-039**	**EM2116495-041**	**EM2116495-043**
				Result	Result	Result	Result	Result
EA029-F: Excess Acid Neutralising Capacity - Continued								
EA029-H: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	----	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S	----	**0.04**	<0.02	<0.02	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t	----	**26**	<10	<10	<10
Liming Rate	----	1	kg CaCO3/t	----	**2**	<1	<1	<1
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	----	**0.06**	**0.09**	**0.10**	**0.10**
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	----	**35**	**56**	**65**	**66**
Liming Rate excluding ANC	----	1	kg CaCO3/t	----	**3**	**4**	**5**	**5**
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	**16.9**	----	----	----	----
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	**9**	----	----	----	----
Cadmium	7440-43-9	1	mg/kg	<1	----	----	----	----
Chromium	7440-47-3	2	mg/kg	**5**	----	----	----	----
Copper	7440-50-8	5	mg/kg	<5	----	----	----	----
Lead	7439-92-1	5	mg/kg	<5	----	----	----	----
Nickel	7440-02-0	2	mg/kg	<2	----	----	----	----
Zinc	7440-66-6	5	mg/kg	<5	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	----	----	----	----

Analytical Results

Sub-Matrix: **SOIL**
(Matrix: **SOIL**)

			Sample ID	**DCP04_0.0 - 0.15m**	**DCP05_0.0 - 0.15m**	**DCP06_0.0 - 0.15m**	**DCP07_0.0 - 0.15m**	**DCP08_0.0 - 0.15m**
			Sampling date / time	12-Aug-2021 00:00	12-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00
Compound	CAS Number	LOR	Unit	**EM2116495-045**	**EM2116495-047**	**EM2116495-049**	**EM2116495-051**	**EM2116495-052**
				Result	Result	Result	Result	Result
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	**9.1**	**8.9**	**8.5**	**9.6**	----
pH OX (23B)	----	0.1	pH Unit	**8.0**	**7.2**	**4.4**	**8.3**	----
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	----
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	<2	**195**	<2	----
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	<2	**195**	<2	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.020	% pyrite S	<0.020	<0.020	<0.020	<0.020	----
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.020	% pyrite S	<0.020	<0.020	**0.313**	<0.020	----
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.020	% pyrite S	<0.020	<0.020	**0.313**	<0.020	----
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.020	% S	**0.403**	**0.458**	**0.649**	**0.118**	----
Peroxide Sulfur (23De)	----	0.020	% S	**0.730**	**1.11**	**1.41**	**0.179**	----
Peroxide Oxidisable Sulfur (23E)	----	0.020	% S	**0.327**	**0.657**	**0.762**	**0.060**	----
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	**204**	**410**	**475**	**38**	----
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.020	% Ca	**0.328**	**0.500**	**0.564**	**0.159**	----
Peroxide Calcium (23Wh)	----	0.020	% Ca	**14.9**	**9.64**	**0.921**	**3.52**	----
Acid Reacted Calcium (23X)	----	0.020	% Ca	**14.5**	**9.14**	**0.358**	**3.36**	----
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	**7260**	**4560**	**178**	**1680**	----
sulfidic - Acid Reacted Calcium (s-23X)	----	0.020	% S	**11.6**	**7.31**	**0.286**	**2.69**	----
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.020	% Mg	**0.366**	**0.551**	**0.856**	**0.119**	----
Peroxide Magnesium (23Tm)	----	0.020	% Mg	**1.04**	**0.842**	**0.987**	**0.161**	----
Acid Reacted Magnesium (23U)	----	0.020	% Mg	**0.670**	**0.291**	**0.130**	**0.042**	----
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	**552**	**239**	**107**	**34**	----
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.020	% S	**0.884**	**0.383**	**0.172**	**0.055**	----
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.020	% CaCO3	**39.7**	**23.6**	----	**9.23**	----
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	**7920**	**4710**	----	**1840**	----
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.020	% S	**12.7**	**7.55**	----	**2.95**	----

Analytical Results

Sub-Matrix: **SOIL**
(Matrix: **SOIL**)

			Sample ID	**DCP04_0.0 - 0.15m**	**DCP05_0.0 - 0.15m**	**DCP06_0.0 - 0.15m**	**DCP07_0.0 - 0.15m**	**DCP08_0.0 - 0.15m**
			Sampling date / time	12-Aug-2021 00:00	12-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EM2116495-045**	**EM2116495-047**	**EM2116495-049**	**EM2116495-051**	**EM2116495-052**
				Result	Result	Result	Result	Result
EA029-F: Excess Acid Neutralising Capacity - Continued								
EA029-H: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	**1.5**	**1.5**	**1.5**	----
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	**0.46**	<0.02	----
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	**288**	<10	----
Liming Rate	----	1	kg CaCO3/t	<1	<1	**22**	<1	----
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	**0.33**	**0.66**	**0.76**	**0.06**	----
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	**204**	**410**	**475**	**38**	----
Liming Rate excluding ANC	----	1	kg CaCO3/t	**15**	**31**	**36**	**3**	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	----	----	----	----	**13.4**
EG005(ED093)T: Total Metals by ICP-AES								
Barium	7440-39-3	10	mg/kg	----	----	----	----	<10
Beryllium	7440-41-7	1	mg/kg	----	----	----	----	<1
Cobalt	7440-48-4	2	mg/kg	----	----	----	----	<2
Iron	7439-89-6	50	mg/kg	----	----	----	----	**1060**
Manganese	7439-96-5	5	mg/kg	----	----	----	----	**34**
Silver	7440-22-4	2	mg/kg	----	----	----	----	<2
Arsenic	7440-38-2	5	mg/kg	----	----	----	----	**10**
Cadmium	7440-43-9	1	mg/kg	----	----	----	----	<1
Chromium	7440-47-3	2	mg/kg	----	----	----	----	<2
Copper	7440-50-8	5	mg/kg	----	----	----	----	<5
Lead	7439-92-1	5	mg/kg	----	----	----	----	<5
Nickel	7440-02-0	2	mg/kg	----	----	----	----	<2
Zinc	7440-66-6	5	mg/kg	----	----	----	----	**11**
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	----	----	----	----	<0.1
EG048: Hexavalent Chromium (Alkaline Digest)								
Hexavalent Chromium	18540-29-9	0.5	mg/kg	----	----	----	----	<0.5
EK026SF: Total CN by Segmented Flow Analyser								
Total Cyanide	57-12-5	1	mg/kg	----	----	----	----	<1
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	----	----	----	----	<0.1
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	----	----	----	----	<0.05

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Sample ID	**DCP04_0.0 - 0.15m**	**DCP05_0.0 - 0.15m**	**DCP06_0.0 - 0.15m**	**DCP07_0.0 - 0.15m**	**DCP08_0.0 - 0.15m**
			Sampling date / time	12-Aug-2021 00:00	12-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00
Compound	CAS Number	LOR	Unit	**EM2116495-045**	**EM2116495-047**	**EM2116495-049**	**EM2116495-051**	**EM2116495-052**
				Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued								
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	----	----	----	----	<0.05
beta-BHC	319-85-7	0.05	mg/kg	----	----	----	----	<0.05
gamma-BHC	58-89-9	0.05	mg/kg	----	----	----	----	<0.05
delta-BHC	319-86-8	0.05	mg/kg	----	----	----	----	<0.05
Heptachlor	76-44-8	0.05	mg/kg	----	----	----	----	<0.05
Aldrin	309-00-2	0.05	mg/kg	----	----	----	----	<0.05
Heptachlor epoxide	1024-57-3	0.05	mg/kg	----	----	----	----	<0.05
^ **Total Chlordane (sum)**	----	0.05	mg/kg	----	----	----	----	<0.05
trans-Chlordane	5103-74-2	0.05	mg/kg	----	----	----	----	<0.05
alpha-Endosulfan	959-98-8	0.05	mg/kg	----	----	----	----	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg	----	----	----	----	<0.05
Dieldrin	60-57-1	0.05	mg/kg	----	----	----	----	<0.05
4.4`-DDE	72-55-9	0.05	mg/kg	----	----	----	----	<0.05
Endrin	72-20-8	0.05	mg/kg	----	----	----	----	<0.05
beta-Endosulfan	33213-65-9	0.05	mg/kg	----	----	----	----	<0.05
^ **Endosulfan (sum)**	115-29-7	0.05	mg/kg	----	----	----	----	<0.05
4.4`-DDD	72-54-8	0.05	mg/kg	----	----	----	----	<0.05
Endrin aldehyde	7421-93-4	0.05	mg/kg	----	----	----	----	<0.05
Endosulfan sulfate	1031-07-8	0.05	mg/kg	----	----	----	----	<0.05
4.4`-DDT	50-29-3	0.2	mg/kg	----	----	----	----	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg	----	----	----	----	<0.05
Methoxychlor	72-43-5	0.2	mg/kg	----	----	----	----	<0.2
^ **Sum of Aldrin + Dieldrin**	309-00-2/60-57-1	0.05	mg/kg	----	----	----	----	<0.05
^ **Sum of DDD + DDE + DDT**	72-54-8/72-55-9/50-2	0.05	mg/kg	----	----	----	----	<0.05
EP075(SIM)A: Phenolic Compounds								
Phenol	108-95-2	0.5	mg/kg	----	----	----	----	<0.5
2-Chlorophenol	95-57-8	0.5	mg/kg	----	----	----	----	<0.5
2-Methylphenol	95-48-7	0.5	mg/kg	----	----	----	----	<0.5
3- & 4-Methylphenol	1319-77-3	1	mg/kg	----	----	----	----	<1
2-Nitrophenol	88-75-5	0.5	mg/kg	----	----	----	----	<0.5
2.4-Dimethylphenol	105-67-9	0.5	mg/kg	----	----	----	----	<0.5
2.4-Dichlorophenol	120-83-2	0.5	mg/kg	----	----	----	----	<0.5
2.6-Dichlorophenol	87-65-0	0.5	mg/kg	----	----	----	----	<0.5
4-Chloro-3-methylphenol	59-50-7	0.5	mg/kg	----	----	----	----	<0.5

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Sample ID	**DCP04_0.0 - 0.15m**	**DCP05_0.0 - 0.15m**	**DCP06_0.0 - 0.15m**	**DCP07_0.0 - 0.15m**	**DCP08_0.0 - 0.15m**
			Sampling date / time	12-Aug-2021 00:00	12-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00
Compound	CAS Number	LOR	Unit	**EM2116495-045**	**EM2116495-047**	**EM2116495-049**	**EM2116495-051**	**EM2116495-052**
				Result	Result	Result	Result	Result
EP075(SIM)A: Phenolic Compounds - Continued								
2.4.6-Trichlorophenol	88-06-2	0.5	mg/kg	----	----	----	----	<0.5
2.4.5-Trichlorophenol	95-95-4	0.5	mg/kg	----	----	----	----	<0.5
Pentachlorophenol	87-86-5	2	mg/kg	----	----	----	----	<2
^ **Sum of Phenols**	----	0.5	mg/kg	----	----	----	----	<0.5
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	----	----	----	----	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	----	----	----	----	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	----	----	----	----	<0.5
Fluorene	86-73-7	0.5	mg/kg	----	----	----	----	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	----	----	----	----	<0.5
Anthracene	120-12-7	0.5	mg/kg	----	----	----	----	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	----	----	----	----	<0.5
Pyrene	129-00-0	0.5	mg/kg	----	----	----	----	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	----	----	----	----	<0.5
Chrysene	218-01-9	0.5	mg/kg	----	----	----	----	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	----	----	----	----	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	----	----	----	----	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	----	----	----	----	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	----	----	----	----	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	----	----	----	----	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	----	----	----	----	<0.5
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg	----	----	----	----	<0.5
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	mg/kg	----	----	----	----	<0.5
^ **Benzo(a)pyrene TEQ (half LOR)**	----	0.5	mg/kg	----	----	----	----	**0.6**
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg	----	----	----	----	**1.2**
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	----	----	----	----	<10
C10 - C14 Fraction	----	50	mg/kg	----	----	----	----	<50
C15 - C28 Fraction	----	100	mg/kg	----	----	----	----	<100
C29 - C36 Fraction	----	100	mg/kg	----	----	----	----	<100
^ **C10 - C36 Fraction (sum)**	----	50	mg/kg	----	----	----	----	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	----	----	----	----	<10

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Sample ID	**DCP04_0.0 - 0.15m**	**DCP05_0.0 - 0.15m**	**DCP06_0.0 - 0.15m**	**DCP07_0.0 - 0.15m**	**DCP08_0.0 - 0.15m**
			Sampling date / time	12-Aug-2021 00:00	12-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00
Compound	CAS Number	LOR	Unit	**EM2116495-045**	**EM2116495-047**	**EM2116495-049**	**EM2116495-051**	**EM2116495-052**
				Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued								
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	10	mg/kg	----	----	----	----	<10
>C10 - C16 Fraction	----	50	mg/kg	----	----	----	----	<50
>C16 - C34 Fraction	----	100	mg/kg	----	----	----	----	<100
>C34 - C40 Fraction	----	100	mg/kg	----	----	----	----	<100
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg	----	----	----	----	<50
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg	----	----	----	----	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	----	----	----	----	<0.2
Toluene	108-88-3	0.5	mg/kg	----	----	----	----	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	----	----	----	----	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	----	----	----	----	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	----	----	----	----	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg	----	----	----	----	<0.2
^ **Total Xylenes**	----	0.5	mg/kg	----	----	----	----	<0.5
Naphthalene	91-20-3	1	mg/kg	----	----	----	----	<1
EP066S: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	0.1	%	----	----	----	----	**76.2**
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	----	----	----	----	**89.6**
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	----	----	----	----	**98.7**
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	----	----	----	----	**74.2**
2-Chlorophenol-D4	93951-73-6	0.5	%	----	----	----	----	**78.1**
2.4.6-Tribromophenol	118-79-6	0.5	%	----	----	----	----	**53.8**
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	----	----	----	----	**88.5**
Anthracene-d10	1719-06-8	0.5	%	----	----	----	----	**110**
4-Terphenyl-d14	1718-51-0	0.5	%	----	----	----	----	**101**
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	----	----	----	----	**78.6**
Toluene-D8	2037-26-5	0.2	%	----	----	----	----	**77.3**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Sample ID	**DCP04_0.0 - 0.15m**	**DCP05_0.0 - 0.15m**	**DCP06_0.0 - 0.15m**	**DCP07_0.0 - 0.15m**	**DCP08_0.0 - 0.15m**
			Sampling date / time	12-Aug-2021 00:00	12-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00
Compound	CAS Number	LOR	Unit	**EM2116495-045**	**EM2116495-047**	**EM2116495-049**	**EM2116495-051**	**EM2116495-052**
				Result	Result	Result	Result	Result
EP080S: TPH(V)/BTEX Surrogates - Continued								
4-Bromofluorobenzene	460-00-4	0.2	%	**----**	**----**	**----**	**----**	**77.8**

Analytical Results

Sub-Matrix: **SOIL**
(Matrix: **SOIL)**

			Sample ID	**DCP08_0.0 - 0.15m (QC)**	**DCP09_0.0 - 0.15m**	**DCP10_0.0 - 0.15m**	**DCP11_0.0 - 0.15m**	**DCP12_0.0 - 0.15m**
			Sampling date / time	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EM2116495-053**	**EM2116495-055**	**EM2116495-057**	**EM2116495-059**	**EM2116495-061**
				Result	Result	Result	Result	Result
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	**9.7**	**9.3**	**8.7**	**9.3**	**9.4**
pH OX (23B)	----	0.1	pH Unit	**8.6**	**8.7**	**7.0**	**8.4**	**8.2**
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	<2	<2	<2	<2
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	<2	<2	<2	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.020	% pyrite S	<0.020	<0.020	<0.020	<0.020	<0.020
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.020	% pyrite S	<0.020	<0.020	<0.020	<0.020	<0.020
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.020	% pyrite S	<0.020	<0.020	<0.020	<0.020	<0.020
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.020	% S	<0.020	**0.166**	**0.675**	**0.182**	**0.386**
Peroxide Sulfur (23De)	----	0.020	% S	**0.039**	**0.360**	**1.35**	**0.351**	**0.417**
Peroxide Oxidisable Sulfur (23E)	----	0.020	% S	**0.039**	**0.194**	**0.674**	**0.169**	**0.031**
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	**24**	**121**	**421**	**106**	**20**
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.020	% Ca	**0.136**	**0.192**	**0.731**	**0.209**	**0.365**
Peroxide Calcium (23Wh)	----	0.020	% Ca	**15.7**	**13.1**	**2.06**	**10.1**	**10.3**
Acid Reacted Calcium (23X)	----	0.020	% Ca	**15.6**	**12.9**	**1.32**	**9.86**	**9.90**
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	**7780**	**6420**	**661**	**4920**	**4940**
sulfidic - Acid Reacted Calcium (s-23X)	----	0.020	% S	**12.5**	**10.3**	**1.06**	**7.88**	**7.92**
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.020	% Mg	<0.020	**0.131**	**0.938**	**0.138**	**0.354**
Peroxide Magnesium (23Tm)	----	0.020	% Mg	**0.120**	**0.333**	**1.28**	**0.265**	**0.400**
Acid Reacted Magnesium (23U)	----	0.020	% Mg	**0.120**	**0.202**	**0.346**	**0.127**	**0.046**
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	**99**	**166**	**284**	**104**	**38**
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.020	% S	**0.159**	**0.267**	**0.456**	**0.168**	**0.061**
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.020	% CaCO3	**41.5**	**36.1**	**4.19**	**28.3**	**32.7**
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	**8300**	**7220**	**837**	**5650**	**6530**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**DCP08_0.0 - 0.15m (QC)**	**DCP09_0.0 - 0.15m**	**DCP10_0.0 - 0.15m**	**DCP11_0.0 - 0.15m**	**DCP12_0.0 - 0.15m**
			Sampling date / time	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EM2116495-053**	**EM2116495-055**	**EM2116495-057**	**EM2116495-059**	**EM2116495-061**
				Result	Result	Result	Result	Result
EA029-F: Excess Acid Neutralising Capacity - Continued								
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.020	% S	**13.3**	**11.6**	**1.34**	**9.04**	**10.5**
EA029-H: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	<10
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	<1	<1
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	**0.04**	**0.19**	**0.67**	**0.17**	**0.03**
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	**24**	**121**	**421**	**106**	**20**
Liming Rate excluding ANC	----	1	kg CaCO3/t	**2**	**9**	**32**	**8**	**1**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**DCP13_0.0 - 0.15m**	**DCP14_0.0 - 0.15m**	**DCP15_0.0 - 0.15m**	**DCP16_0.0 - 0.15m**	**DCP17_0.0 - 0.15m**
			Sampling date / time	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EM2116495-063**	**EM2116495-065**	**EM2116495-067**	**EM2116495-069**	**EM2116495-071**
				Result	Result	Result	Result	Result
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	**8.4**	**9.4**	**8.9**	**8.2**	**9.1**
pH OX (23B)	----	0.1	pH Unit	**9.2**	**8.3**	**7.6**	**3.0**	**8.5**
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	<2	<2	**54**	<2
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	<2	<2	**54**	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.020	% pyrite S	<0.020	<0.020	<0.020	<0.020	<0.020
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.020	% pyrite S	<0.020	<0.020	<0.020	**0.087**	<0.020
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.020	% pyrite S	<0.020	<0.020	<0.020	**0.087**	<0.020
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.020	% S	<0.020	**0.163**	**0.354**	**0.084**	**0.222**
Peroxide Sulfur (23De)	----	0.020	% S	<0.020	**0.365**	**0.614**	**0.231**	**0.430**
Peroxide Oxidisable Sulfur (23E)	----	0.020	% S	<0.020	**0.202**	**0.260**	**0.147**	**0.208**
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	<10	**126**	**162**	**92**	**130**
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.020	% Ca	**0.314**	**0.158**	**0.405**	**0.059**	**0.228**
Peroxide Calcium (23Wh)	----	0.020	% Ca	**0.473**	**2.25**	**8.64**	**0.060**	**6.19**
Acid Reacted Calcium (23X)	----	0.020	% Ca	**0.159**	**2.09**	**8.24**	<0.020	**5.97**
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	**79**	**1040**	**4110**	<10	**2980**
sulfidic - Acid Reacted Calcium (s-23X)	----	0.020	% S	**0.127**	**1.67**	**6.59**	<0.020	**4.77**
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.020	% Mg	**0.075**	**0.083**	**0.366**	**0.092**	**0.087**
Peroxide Magnesium (23Tm)	----	0.020	% Mg	**0.111**	**0.158**	**0.466**	**0.096**	**0.184**
Acid Reacted Magnesium (23U)	----	0.020	% Mg	**0.036**	**0.075**	**0.100**	<0.020	**0.097**
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	**29**	**62**	**82**	<10	**80**
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.020	% S	**0.047**	**0.099**	**0.132**	<0.020	**0.128**
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.020	% CaCO3	**1.32**	**5.30**	**25.5**	**----**	**15.3**
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	**263**	**1060**	**5100**	**----**	**3050**
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.020	% S	**0.422**	**1.70**	**8.17**	**----**	**4.89**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL)**			Sample ID	**DCP13_0.0 - 0.15m**	**DCP14_0.0 - 0.15m**	**DCP15_0.0 - 0.15m**	**DCP16_0.0 - 0.15m**	**DCP17_0.0 - 0.15m**
			Sampling date / time	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00
Compound	CAS Number	LOR	Unit	**EM2116495-063**	**EM2116495-065**	**EM2116495-067**	**EM2116495-069**	**EM2116495-071**
				Result	Result	Result	Result	Result
EA029-F: Excess Acid Neutralising Capacity - Continued								
EA029-H: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	**0.11**	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	**67**	<10
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	**5**	<1
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	<0.02	**0.20**	**0.26**	**0.15**	**0.21**
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	<10	**126**	**162**	**92**	**130**
Liming Rate excluding ANC	----	1	kg CaCO3/t	<1	**9**	**12**	**7**	**10**

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Sample ID	**RINSATE 3**	----	----	----	----
			Sampling date / time	13-Aug-2021 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	**EM2116495-037**	--------	--------	--------	--------
				Result	----	----	----	----
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	----	----	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	----	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	<0.005	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	----	----	----	----

Surrogate Control Limits

Sub-Matrix: **SOIL**

Compound	CAS Number	Recovery Limits (%) Low	Recovery Limits (%) High
EP066S: PCB Surrogate			
Decachlorobiphenyl	2051-24-3	36	140
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	62	128
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	40	139
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	54	125
2-Chlorophenol-D4	93951-73-6	65	123
2.4.6-Tribromophenol	118-79-6	34	122
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	61	125
Anthracene-d10	1719-06-8	62	130
4-Terphenyl-d14	1718-51-0	67	133
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	51	125
Toluene-D8	2037-26-5	55	125
4-Bromofluorobenzene	460-00-4	56	124

Inter-Laboratory Testing

Analysis conducted by ALS Brisbane, NATA accreditation no. 825, site no. 818 (Chemistry) 18958 (Biology).

(SOIL) EA029-D: Calcium Values

(SOIL) EA029-E: Magnesium Values

(SOIL) EA029-F: Excess Acid Neutralising Capacity

(SOIL) EA029-H: Acid Base Accounting

(SOIL) EA029-G: Retained Acidity

(SOIL) EA029-A: pH Measurements

(SOIL) EA029-C: Sulfur Trail

(SOIL) EA029-B: Acidity Trail

QUALITY CONTROL REPORT

Work Order : **EM2116495**

Client : **FYFE PTY LTD**
Contact : STUART TWISS
Address : LEVEL 1, 124 SOUTH TERRACE
ADELAIDE SOUTH AUSTRALIA 5000
Telephone : ----
Project : 80963-1
Order number : 11415
C-O-C number : 80963-1_Coorong_COC
Sampler : SCT
Site :
Quote number : AD/060/21
No. of samples received : 71
No. of samples analysed : 36

Page : 1 of 21

Laboratory : Environmental Division Melbourne
Contact : Kieren Burns
Address : 4 Westall Rd Springvale VIC Australia 3171
Telephone : +61881625130
Date Samples Received : 17-Aug-2021
Date Analysis Commenced : 23-Aug-2021
Issue Date : 03-Sep-2021

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

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

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Organics, Springvale, VIC
Xing Lin	Senior Organic Chemist	Melbourne Organics, Springvale, VIC

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the 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**: SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EG005(ED093)T: Total Metals by ICP-AES (QC Lot: 3859903)									
EM2116475-037	Anonymous	EG005T: Beryllium	7440-41-7	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	10	10	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	4	4	0.0	No Limit
		EG005T: Cobalt	7440-48-4	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Silver	7440-22-4	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Manganese	7439-96-5	5	mg/kg	34	32	4.1	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	10	7	36.5	No Limit
		EG005T: Iron	7439-89-6	50	mg/kg	3210	3300	2.7	0% - 20%
EM2116475-055	Anonymous	EG005T: Beryllium	7440-41-7	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	20	20	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	7	7	0.0	No Limit
		EG005T: Cobalt	7440-48-4	2	mg/kg	<2	2	0.0	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	<2	2	0.0	No Limit
		EG005T: Silver	7440-22-4	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	16	17	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Manganese	7439-96-5	5	mg/kg	62	85	30.5	0% - 50%

Sub-Matrix: **SOIL**				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EG005(ED093)T: Total Metals by ICP-AES (QC Lot: 3859903) - continued									
EM2116475-055	Anonymous	EG005T: Zinc	7440-66-6	5	mg/kg	17	16	0.0	No Limit
		EG005T: Iron	7439-89-6	50	mg/kg	4360	4610	5.6	0% - 20%
EG005(ED093)T: Total Metals by ICP-AES (QC Lot: 3860948)									
EM2116495-052	DCP08_0.0 - 0.15m	EG005T: Beryllium	7440-41-7	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	<10	<10	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Cobalt	7440-48-4	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Silver	7440-22-4	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	10	5	62.6	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Manganese	7439-96-5	5	mg/kg	34	43	21.7	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	11	10	0.0	No Limit
		EG005T: Iron	7439-89-6	50	mg/kg	1060	# 1320	22.0	0% - 20%
EM2116455-019	Anonymous	EG005T: Beryllium	7440-41-7	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	100	130	29.6	0% - 50%
		EG005T: Chromium	7440-47-3	2	mg/kg	35	41	16.9	0% - 20%
		EG005T: Cobalt	7440-48-4	2	mg/kg	27	27	0.0	0% - 50%
		EG005T: Nickel	7440-02-0	2	mg/kg	92	88	5.1	0% - 20%
		EG005T: Silver	7440-22-4	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	5	7	27.9	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	41	34	18.3	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	13	13	0.0	No Limit
		EG005T: Manganese	7439-96-5	5	mg/kg	475	506	6.2	0% - 20%
		EG005T: Zinc	7440-66-6	5	mg/kg	62	60	3.6	0% - 50%
		EG005T: Iron	7439-89-6	50	mg/kg	46900	42500	9.8	0% - 20%
EA029-A: pH Measurements (QC Lot: 3875699)									
EM2116495-003	BH01_0.6 - 0.75m	EA029: pH KCl (23A)	----	0.1	pH Unit	9.8	9.8	0.0	0% - 20%
		EA029: pH OX (23B)	----	0.1	pH Unit	8.6	8.6	0.0	0% - 20%
EM2116495-051	DCP07_0.0 - 0.15m	EA029: pH KCl (23A)	----	0.1	pH Unit	9.6	9.6	0.0	0% - 20%
		EA029: pH OX (23B)	----	0.1	pH Unit	8.3	8.2	1.2	0% - 20%
EA029-A: pH Measurements (QC Lot: 3877880)									
EM2116495-063	DCP13_0.0 - 0.15m	EA029: pH KCl (23A)	----	0.1	pH Unit	8.4	8.4	0.0	0% - 20%
		EA029: pH OX (23B)	----	0.1	pH Unit	9.2	9.2	0.0	0% - 20%
EA029-B: Acidity Trail (QC Lot: 3875699)									
EM2116495-003	BH01_0.6 - 0.75m	EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.020	<0.020	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EA029-B: Acidity Trail (QC Lot: 3875699) - continued									
EM2116495-003	BH01_0.6 - 0.75m	EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.020	<0.020	0.0	No Limit
		EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.020	<0.020	0.0	No Limit
		EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	<2	0.0	No Limit
EM2116495-051	DCP07_0.0 - 0.15m	EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.020	<0.020	0.0	No Limit
		EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.020	<0.020	0.0	No Limit
		EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.020	<0.020	0.0	No Limit
		EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	<2	0.0	No Limit
EA029-B: Acidity Trail (QC Lot: 3877880)									
EM2116495-063	DCP13_0.0 - 0.15m	EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.020	<0.020	0.0	No Limit
		EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.020	<0.020	0.0	No Limit
		EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.020	<0.020	0.0	No Limit
		EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	<2	0.0	No Limit
EA029-C: Sulfur Trail (QC Lot: 3875699)									
EM2116495-003	BH01_0.6 - 0.75m	EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	<0.020	<0.020	0.0	No Limit
		EA029: Peroxide Sulfur (23De)	----	0.02	% S	0.034	0.035	0.0	No Limit
		EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	0.034	0.035	0.0	No Limit
		EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	21	22	0.0	No Limit
EM2116495-051	DCP07_0.0 - 0.15m	EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.118	0.116	1.6	No Limit
		EA029: Peroxide Sulfur (23De)	----	0.02	% S	0.179	0.173	3.3	No Limit
		EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	0.060	0.056	6.8	No Limit
		EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	38	35	6.8	No Limit
EA029-C: Sulfur Trail (QC Lot: 3877880)									
EM2116495-063	DCP13_0.0 - 0.15m	EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	<0.020	<0.020	0.0	No Limit
		EA029: Peroxide Sulfur (23De)	----	0.02	% S	<0.020	<0.020	0.0	No Limit
		EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	<0.020	<0.020	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EA029-C: Sulfur Trail (QC Lot: 3877880) - continued									
EM2116495-063	DCP13_0.0 - 0.15m	EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	<10	<10	0.0	No Limit
EA029-D: Calcium Values (QC Lot: 3875699)									
EM2116495-003	BH01_0.6 - 0.75m	EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.125	0.124	0.8	No Limit
		EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	19.4	19.0	1.8	0% - 20%
		EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	19.2	18.9	1.8	0% - 20%
		EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	15.4	15.1	1.8	0% - 20%
		EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	9600	9430	1.8	0% - 20%
EM2116495-051	DCP07_0.0 - 0.15m	EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.159	0.156	2.0	No Limit
		EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	3.52	3.37	4.4	0% - 20%
		EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	3.36	3.21	4.5	0% - 20%
		EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	2.69	2.57	4.5	0% - 20%
		EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	1680	1600	4.5	0% - 20%
EA029-D: Calcium Values (QC Lot: 3877880)									
EM2116495-063	DCP13_0.0 - 0.15m	EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.314	0.322	2.6	0% - 50%
		EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	0.473	0.481	1.8	0% - 20%
		EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	0.159	0.159	0.0	No Limit
		EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	0.127	0.127	0.0	No Limit
		EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	79	79	0.0	No Limit
EA029-E: Magnesium Values (QC Lot: 3875699)									
EM2116495-003	BH01_0.6 - 0.75m	EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	<0.020	<0.020	0.0	No Limit
		EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.120	0.120	0.0	No Limit
		EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.120	0.120	0.0	No Limit
		EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.158	0.159	0.0	No Limit
		EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	98	99	0.0	No Limit
EM2116495-051	DCP07_0.0 - 0.15m	EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.119	0.117	1.9	No Limit
		EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.161	0.159	1.3	No Limit
		EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.042	0.042	0.0	No Limit
		EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.055	0.055	0.0	No Limit
		EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	34	34	0.0	No Limit
EA029-E: Magnesium Values (QC Lot: 3877880)									
EM2116495-063	DCP13_0.0 - 0.15m	EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.075	0.076	0.0	No Limit
		EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.111	0.103	7.2	No Limit
		EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.036	0.027	26.5	No Limit
		EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.047	0.036	26.5	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EA029-E: Magnesium Values (QC Lot: 3877880) - continued									
EM2116495-063	DCP13_0.0 - 0.15m	EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	29	22	26.5	No Limit
EA029-F: Excess Acid Neutralising Capacity (QC Lot: 3875699)									
EM2116495-003	BH01_0.6 - 0.75m	EA029: Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	50.1	50.0	0.1	0% - 20%
		EA029: sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	16.0	16.0	0.1	0% - 20%
		EA029: acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	10000	10000	0.1	0% - 20%
EM2116495-051	DCP07_0.0 - 0.15m	EA029: Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	9.23	9.12	1.2	0% - 20%
		EA029: sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	2.95	2.92	1.2	0% - 20%
		EA029: acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	1840	1820	1.2	0% - 20%
EA029-F: Excess Acid Neutralising Capacity (QC Lot: 3877880)									
EM2116495-063	DCP13_0.0 - 0.15m	EA029: Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	1.32	1.37	3.9	0% - 20%
		EA029: sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	0.422	0.438	3.9	0% - 20%
		EA029: acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	263	274	3.9	0% - 20%
EA029-H: Acid Base Accounting (QC Lot: 3875699)									
EM2116495-003	BH01_0.6 - 0.75m	EA029: ANC Fineness Factor	----	0.5	-	1.5	1.5	0.0	No Limit
		EA029: Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA029: Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.03	0.03	0.0	No Limit
		EA029: Liming Rate	----	1	kg CaCO3/t	<1	<1	0.0	No Limit
		EA029: Liming Rate excluding ANC	----	1	kg CaCO3/t	2	2	0.0	No Limit
		EA029: Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	0.0	No Limit
		EA029: Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	21	22	0.0	No Limit
EM2116495-051	DCP07_0.0 - 0.15m	EA029: ANC Fineness Factor	----	0.5	-	1.5	1.5	0.0	No Limit
		EA029: Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA029: Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.06	0.06	0.0	No Limit
		EA029: Liming Rate	----	1	kg CaCO3/t	<1	<1	0.0	No Limit
		EA029: Liming Rate excluding ANC	----	1	kg CaCO3/t	3	3	0.0	No Limit
		EA029: Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	0.0	No Limit
		EA029: Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	38	35	6.8	No Limit
EA029-H: Acid Base Accounting (QC Lot: 3877880)									
EM2116495-063	DCP13_0.0 - 0.15m	EA029: ANC Fineness Factor	----	0.5	-	1.5	1.5	0.0	No Limit
		EA029: Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA029: Net Acidity excluding ANC (sulfur units)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA029: Liming Rate	----	1	kg CaCO3/t	<1	<1	0.0	No Limit
		EA029: Liming Rate excluding ANC	----	1	kg CaCO3/t	<1	<1	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EA029-H: Acid Base Accounting (QC Lot: 3877880) - continued									
EM2116495-063	DCP13_0.0 - 0.15m	EA029: Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	0.0	No Limit
		EA029: Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	<10	<10	0.0	No Limit
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 3860004)									
EM2116475-036	Anonymous	EA055: Moisture Content	----	0.1	%	5.5	5.2	4.6	No Limit
EM2116475-055	Anonymous	EA055: Moisture Content	----	0.1	%	4.8	5.2	7.0	No Limit
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 3860005)									
EM2116495-011	BH02_0.5 - 0.65m	EA055: Moisture Content	----	0.1	%	8.5	4.9	53.5	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 3859904)									
EM2116475-037	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EM2116475-055	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 3860949)									
EM2116455-019	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EG048: Hexavalent Chromium (Alkaline Digest) (QC Lot: 3864588)									
EM2116368-001	Anonymous	EG048G: Hexavalent Chromium	18540-29-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
EM2116455-017	Anonymous	EG048G: Hexavalent Chromium	18540-29-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
EG048: Hexavalent Chromium (Alkaline Digest) (QC Lot: 3864589)									
EM2116495-052	DCP08_0.0 - 0.15m	EG048G: Hexavalent Chromium	18540-29-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
EK026SF: Total CN by Segmented Flow Analyser (QC Lot: 3860972)									
EM2116463-010	Anonymous	EK026SF: Total Cyanide	57-12-5	1	mg/kg	<1	<1	0.0	No Limit
EM2116475-047	Anonymous	EK026SF: Total Cyanide	57-12-5	1	mg/kg	<1	<1	0.0	No Limit
EP066: Polychlorinated Biphenyls (PCB) (QC Lot: 3859809)									
EM2116238-001	Anonymous	EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EM2116495-052	DCP08_0.0 - 0.15m	EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EP068A: Organochlorine Pesticides (OC) (QC Lot: 3859808)									
EM2116238-001	Anonymous	EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP068A: Organochlorine Pesticides (OC) (QC Lot: 3859808) - continued									
EM2116238-001	Anonymous	EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
EM2116495-052	DCP08_0.0 - 0.15m	EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
EP068B: Organophosphorus Pesticides (OP) (QC Lot: 3859808)									
EM2116238-001	Anonymous	EP068: Dichlorvos	62-73-7	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Dimethoate	60-51-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Diazinon	333-41-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Malathion	121-75-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Fenthion	55-38-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP068B: Organophosphorus Pesticides (OP) (QC Lot: 3859808) - continued									
EM2116238-001	Anonymous	EP068: Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Prothiofos	34643-46-4	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Ethion	563-12-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Carbophenothion	786-19-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP068: Parathion-methyl	298-00-0	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP068: Parathion	56-38-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
EM2116495-052	DCP08_0.0 - 0.15m	EP068: Dichlorvos	62-73-7	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Dimethoate	60-51-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Diazinon	333-41-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Malathion	121-75-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Fenthion	55-38-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Prothiofos	34643-46-4	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Ethion	563-12-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Carbophenothion	786-19-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP068: Parathion-methyl	298-00-0	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP068: Parathion	56-38-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
EP075(SIM)A: Phenolic Compounds (QC Lot: 3859807)									
EM2116238-001	Anonymous	EP075(SIM): Phenol	108-95-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2-Chlorophenol	95-57-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2-Methylphenol	95-48-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2-Nitrophenol	88-75-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2.4-Dimethylphenol	105-67-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2.4-Dichlorophenol	120-83-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2.6-Dichlorophenol	87-65-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 4-Chloro-3-methylphenol	59-50-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2.4.6-Trichlorophenol	88-06-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2.4.5-Trichlorophenol	95-95-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 3- & 4-Methylphenol	1319-77-3	1	mg/kg	<1	<1	0.0	No Limit
		EP075(SIM): Pentachlorophenol	87-86-5	2	mg/kg	<2	<2	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP075(SIM)A: Phenolic Compounds (QC Lot: 3859807) - continued									
EM2116495-052	DCP08_0.0 - 0.15m	EP075(SIM): Phenol	108-95-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2-Chlorophenol	95-57-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2-Methylphenol	95-48-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2-Nitrophenol	88-75-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2.4-Dimethylphenol	105-67-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2.4-Dichlorophenol	120-83-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2.6-Dichlorophenol	87-65-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 4-Chloro-3-methylphenol	59-50-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2.4.6-Trichlorophenol	88-06-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2.4.5-Trichlorophenol	95-95-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 3- & 4-Methylphenol	1319-77-3	1	mg/kg	<1	<1	0.0	No Limit
		EP075(SIM): Pentachlorophenol	87-86-5	2	mg/kg	<2	<2	0.0	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 3859807)									
EM2116238-001	Anonymous	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
EM2116495-052	DCP08_0.0 - 0.15m	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 3859807) - continued									
EM2116495-052	DCP08_0.0 - 0.15m	EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 3859497)									
EM2116368-030	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
EM2116475-058	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 3859806)									
EM2116238-001	Anonymous	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
		EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	0.0	No Limit
EM2116495-052	DCP08_0.0 - 0.15m	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
		EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 3859497)									
EM2116368-030	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.0	No Limit
EM2116475-058	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 3859806)									
EM2116238-001	Anonymous	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
		EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	0.0	No Limit
EM2116495-052	DCP08_0.0 - 0.15m	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
		EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	0.0	No Limit
EP080: BTEXN (QC Lot: 3859497)									
EM2116368-030	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP080: BTEXN (QC Lot: 3859497) - continued									
EM2116475-058	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EG020T: Total Metals by ICP-MS (QC Lot: 3862070)									
EM2116452-005	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: Nickel	7440-02-0	0.001	mg/L	0.003	0.003	0.0	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.0	No Limit
EM2116536-001	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	0.003	0.003	0.0	No Limit
		EG020A-T: Lead	7439-92-1	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	0.012	0.013	0.0	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 3862354)									
EM2116219-036	Anonymous	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EM2116387-006	Anonymous	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit

Method Blank (MB) and Laboratory Control Sample (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: **SOIL**

				Method Blank (MB) Report	*Laboratory Control Spike (LCS) Report*			
					Spike	*Spike Recovery (%)*	*Acceptable Limits (%)*	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 3859903)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	123 mg/kg	105	70.0	130
EG005T: Barium	7440-39-3	10	mg/kg	<10	99.3 mg/kg	97.2	70.0	130
EG005T: Beryllium	7440-41-7	1	mg/kg	<1	0.67 mg/kg	96.2	70.0	130
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	1.23 mg/kg	59.3	50.0	130
EG005T: Chromium	7440-47-3	2	mg/kg	<2	20.2 mg/kg	105	70.0	130
EG005T: Cobalt	7440-48-4	2	mg/kg	<2	11.2 mg/kg	90.4	70.0	130
EG005T: Copper	7440-50-8	5	mg/kg	<5	55.9 mg/kg	118	70.0	130
EG005T: Iron	7439-89-6	50	mg/kg	<50	33227 mg/kg	108	70.0	130
EG005T: Lead	7439-92-1	5	mg/kg	<5	62.4 mg/kg	95.1	70.0	130
EG005T: Manganese	7439-96-5	5	mg/kg	<5	590 mg/kg	92.1	70.0	130
EG005T: Nickel	7440-02-0	2	mg/kg	<2	15.4 mg/kg	96.8	70.0	130
EG005T: Silver	7440-22-4	2	mg/kg	<2	2.9 mg/kg	80.6	70.0	130
EG005T: Zinc	7440-66-6	5	mg/kg	<5	162 mg/kg	77.2	70.0	130
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 3860948)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	123 mg/kg	95.4	70.0	130
EG005T: Barium	7440-39-3	10	mg/kg	<10	99.3 mg/kg	94.6	70.0	130
EG005T: Beryllium	7440-41-7	1	mg/kg	<1	0.67 mg/kg	97.6	70.0	130
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	1.23 mg/kg	57.8	50.0	130
EG005T: Chromium	7440-47-3	2	mg/kg	<2	20.2 mg/kg	101	70.0	130
EG005T: Cobalt	7440-48-4	2	mg/kg	<2	11.2 mg/kg	88.2	70.0	130
EG005T: Copper	7440-50-8	5	mg/kg	<5	55.9 mg/kg	91.1	70.0	130
EG005T: Iron	7439-89-6	50	mg/kg	<50	33227 mg/kg	102	70.0	130
EG005T: Lead	7439-92-1	5	mg/kg	<5	62.4 mg/kg	88.4	70.0	130
EG005T: Manganese	7439-96-5	5	mg/kg	<5	590 mg/kg	88.6	70.0	130
EG005T: Nickel	7440-02-0	2	mg/kg	<2	15.4 mg/kg	94.3	70.0	130
EG005T: Silver	7440-22-4	2	mg/kg	<2	2.9 mg/kg	81.1	70.0	130
EG005T: Zinc	7440-66-6	5	mg/kg	<5	162 mg/kg	72.5	70.0	130
EA029-A: pH Measurements (QCLot: 3875699)								
EA029: pH KCl (23A)	----	0.1	pH Unit	<0.1	4.4 pH Unit	100	70.0	130
EA029: pH OX (23B)	----	0.1	pH Unit	<0.1	4.2 pH Unit	107	70.0	130
EA029-A: pH Measurements (QCLot: 3877880)								
EA029: pH KCl (23A)	----	0.1	pH Unit	<0.1	4.4 pH Unit	101	70.0	130
EA029: pH OX (23B)	----	0.1	pH Unit	<0.1	4.2 pH Unit	106	70.0	130
EA029-B: Acidity Trail (QCLot: 3875699)								

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA029-B: Acidity Trail (QCLot: 3875699) - continued								
EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	15 mole H+ / t	75.5	70.0	130
EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	27.5 mole H+ / t	90.2	70.0	130
EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	----	----	----	----
EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.020	----	----	----	----
EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.020	----	----	----	----
EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.020	----	----	----	----
EA029-B: Acidity Trail (QCLot: 3877880)								
EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	15 mole H+ / t	91.5	70.0	130
EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	27.5 mole H+ / t	94.9	70.0	130
EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	----	----	----	----
EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.020	----	----	----	----
EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.020	----	----	----	----
EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.020	----	----	----	----
EA029-C: Sulfur Trail (QCLot: 3875699)								
EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	<0.020	0.04779 % S	104	70.0	130
EA029: Peroxide Sulfur (23De)	----	0.02	% S	<0.020	0.20322 % S	82.6	70.0	130
EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	<0.020	----	----	----	----
EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	<10	----	----	----	----
EA029-C: Sulfur Trail (QCLot: 3877880)								
EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	<0.020	0.04779 % S	101	70.0	130
EA029: Peroxide Sulfur (23De)	----	0.02	% S	<0.020	0.20322 % S	89.6	70.0	130
EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	<0.020	----	----	----	----
EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	<10	----	----	----	----
EA029-D: Calcium Values (QCLot: 3875699)								
EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	<0.020	0.14152 % Ca	114	70.0	130
EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	<0.020	0.19926 % Ca	90.6	70.0	130
EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.020	----	----	----	----
EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.020	----	----	----	----
EA029-D: Calcium Values (QCLot: 3877880)								
EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	<0.020	0.14152 % Ca	113	70.0	130
EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	<0.020	0.19926 % Ca	96.0	70.0	130
EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.020	----	----	----	----
EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.020	----	----	----	----
EA029-E: Magnesium Values (QCLot: 3875699)								
EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	<0.020	0.213 % Mg	81.1	70.0	130
EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	<0.020	0.22344 % Mg	91.2	70.0	130

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EA029-E: Magnesium Values (QCLot: 3875699) - continued								
EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.020	----	----	----	----
EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.020	----	----	----	----
EA029-E: Magnesium Values (QCLot: 3877880)								
EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	<0.020	0.213 % Mg	90.9	70.0	130
EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	<0.020	0.22344 % Mg	98.6	70.0	130
EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.020	----	----	----	----
EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.020	----	----	----	----
EA029-F: Excess Acid Neutralising Capacity (QCLot: 3875699)								
EA029: Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	<0.020	----	----	----	----
EA029: acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	<0.020	----	----	----	----
EA029-F: Excess Acid Neutralising Capacity (QCLot: 3877880)								
EA029: Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	<0.020	----	----	----	----
EA029: acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	<0.020	----	----	----	----
EA029-H: Acid Base Accounting (QCLot: 3875699)								
EA029: ANC Fineness Factor	----	0.5	-	<0.5	----	----	----	----
EA029: Net Acidity (sulfur units)	----	0.02	% S	<0.02	----	----	----	----
EA029: Net Acidity (acidity units)	----	10	mole H+ / t	<10	----	----	----	----
EA029: Liming Rate	----	1	kg CaCO3/t	<1	----	----	----	----
EA029: Net Acidity excluding ANC (sulfur units)	----	0.02	% S	<0.02	----	----	----	----
EA029: Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	<10	----	----	----	----
EA029: Liming Rate excluding ANC	----	1	kg CaCO3/t	<1	----	----	----	----
EA029-H: Acid Base Accounting (QCLot: 3877880)								
EA029: ANC Fineness Factor	----	0.5	-	<0.5	----	----	----	----
EA029: Net Acidity (sulfur units)	----	0.02	% S	<0.02	----	----	----	----
EA029: Net Acidity (acidity units)	----	10	mole H+ / t	<10	----	----	----	----
EA029: Liming Rate	----	1	kg CaCO3/t	<1	----	----	----	----
EA029: Net Acidity excluding ANC (sulfur units)	----	0.02	% S	<0.02	----	----	----	----
EA029: Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	<10	----	----	----	----
EA029: Liming Rate excluding ANC	----	1	kg CaCO3/t	<1	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3859904)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	0.64 mg/kg	93.0	70.0	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3860949)								

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low	High
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3860949) - continued								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	0.64 mg/kg	95.3	70.0	130
EG048: Hexavalent Chromium (Alkaline Digest) (QCLot: 3864588)								
EG048G: Hexavalent Chromium	18540-29-9	0.5	mg/kg	<0.5	20 mg/kg	71.6	70.0	130
EG048: Hexavalent Chromium (Alkaline Digest) (QCLot: 3864589)								
EG048G: Hexavalent Chromium	18540-29-9	0.5	mg/kg	<0.5	20 mg/kg	72.8	70.0	130
EK026SF: Total CN by Segmented Flow Analyser (QCLot: 3860972)								
EK026SF: Total Cyanide	57-12-5	1	mg/kg	<1	20 mg/kg	95.5	70.0	130
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 3859809)								
EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	1 mg/kg	89.8	68.0	133
EP068A: Organochlorine Pesticides (OC) (QCLot: 3859808)								
EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	0.5 mg/kg	92.6	71.8	126
EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	0.5 mg/kg	92.8	72.2	125
EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	0.5 mg/kg	93.5	70.0	124
EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	0.5 mg/kg	92.1	69.1	124
EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	0.5 mg/kg	90.2	69.2	125
EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	0.5 mg/kg	76.5	66.6	122
EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	0.5 mg/kg	91.0	68.8	123
EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	0.5 mg/kg	91.1	67.2	124
EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	0.5 mg/kg	91.9	66.0	126
EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	0.5 mg/kg	92.4	70.2	126
EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	0.5 mg/kg	90.6	72.1	124
EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	0.5 mg/kg	92.5	68.0	122
EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	0.5 mg/kg	93.5	68.9	124
EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	0.5 mg/kg	73.6	55.8	130
EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	0.5 mg/kg	93.5	67.9	124
EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	0.5 mg/kg	90.5	72.0	127
EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	0.5 mg/kg	97.0	66.3	131
EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	0.5 mg/kg	89.9	62.4	131
EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	0.5 mg/kg	85.8	55.4	130
EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	0.5 mg/kg	92.5	68.8	128
EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	0.5 mg/kg	85.2	55.5	132
EP068B: Organophosphorus Pesticides (OP) (QCLot: 3859808)								
EP068: Dichlorvos	62-73-7	0.05	mg/kg	<0.05	0.5 mg/kg	88.5	65.6	127
EP068: Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	0.5 mg/kg	82.6	63.0	129
EP068: Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	0.5 mg/kg	81.0	10.0	136
EP068: Dimethoate	60-51-5	0.05	mg/kg	<0.05	0.5 mg/kg	87.6	58.3	128
EP068: Diazinon	333-41-5	0.05	mg/kg	<0.05	0.5 mg/kg	91.9	69.0	122
EP068: Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	0.5 mg/kg	88.6	68.0	122

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	*Laboratory Control Spike (LCS) Report*			
					Spike	*Spike Recovery (%)*	*Acceptable Limits (%)*	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EP068B: Organophosphorus Pesticides (OP) (QCLot: 3859808) - continued								
EP068: Parathion-methyl	298-00-0	0.2	mg/kg	<0.2	0.5 mg/kg	77.4	59.6	124
EP068: Malathion	121-75-5	0.05	mg/kg	<0.05	0.5 mg/kg	88.4	63.8	128
EP068: Fenthion	55-38-9	0.05	mg/kg	<0.05	0.5 mg/kg	90.8	71.1	124
EP068: Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	0.5 mg/kg	91.7	67.4	126
EP068: Parathion	56-38-2	0.2	mg/kg	<0.2	0.5 mg/kg	75.6	57.9	122
EP068: Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	0.5 mg/kg	90.2	66.2	123
EP068: Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	0.5 mg/kg	82.4	59.8	123
EP068: Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	0.5 mg/kg	89.4	65.4	127
EP068: Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	0.5 mg/kg	81.6	52.1	128
EP068: Prothiofos	34643-46-4	0.05	mg/kg	<0.05	0.5 mg/kg	87.0	65.2	122
EP068: Ethion	563-12-2	0.05	mg/kg	<0.05	0.5 mg/kg	88.0	63.2	124
EP068: Carbophenothion	786-19-6	0.05	mg/kg	<0.05	0.5 mg/kg	90.1	65.9	127
EP068: Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	0.5 mg/kg	72.7	43.1	131
EP075(SIM)A: Phenolic Compounds (QCLot: 3859807)								
EP075(SIM): Phenol	108-95-2	0.5	mg/kg	<0.5	3 mg/kg	93.8	81.2	121
EP075(SIM): 2-Chlorophenol	95-57-8	0.5	mg/kg	<0.5	3 mg/kg	95.6	83.2	120
EP075(SIM): 2-Methylphenol	95-48-7	0.5	mg/kg	<0.5	3 mg/kg	95.3	81.6	123
EP075(SIM): 3- & 4-Methylphenol	1319-77-3	1	mg/kg	<1	6 mg/kg	91.8	79.7	129
EP075(SIM): 2-Nitrophenol	88-75-5	0.5	mg/kg	<0.5	3 mg/kg	61.2	49.8	129
EP075(SIM): 2.4-Dimethylphenol	105-67-9	0.5	mg/kg	<0.5	3 mg/kg	94.2	81.5	127
EP075(SIM): 2.4-Dichlorophenol	120-83-2	0.5	mg/kg	<0.5	3 mg/kg	86.9	74.2	125
EP075(SIM): 2.6-Dichlorophenol	87-65-0	0.5	mg/kg	<0.5	3 mg/kg	90.2	79.8	121
EP075(SIM): 4-Chloro-3-methylphenol	59-50-7	0.5	mg/kg	<0.5	3 mg/kg	89.8	71.5	121
EP075(SIM): 2.4.6-Trichlorophenol	88-06-2	0.5	mg/kg	<0.5	3 mg/kg	79.5	67.8	119
EP075(SIM): 2.4.5-Trichlorophenol	95-95-4	0.5	mg/kg	<0.5	3 mg/kg	83.4	64.5	126
EP075(SIM): Pentachlorophenol	87-86-5	2	mg/kg	<2	6 mg/kg	48.4	9.68	118
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3859807)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	3 mg/kg	103	85.7	123
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	3 mg/kg	114	81.0	123
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	3 mg/kg	110	83.6	120
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	3 mg/kg	98.7	81.3	126
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	3 mg/kg	106	79.4	123
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	3 mg/kg	109	81.7	127
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	3 mg/kg	108	78.3	124
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	3 mg/kg	111	79.9	128
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	3 mg/kg	109	76.9	123
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	3 mg/kg	116	80.9	130
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	3 mg/kg	101	70.0	121

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	*Laboratory Control Spike (LCS) Report*			
					Spike	*Spike Recovery (%)*	*Acceptable Limits (%)*	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3859807) - continued								
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	3 mg/kg	106	80.4	130
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	3 mg/kg	109	70.2	123
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	3 mg/kg	96.8	67.9	122
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	3 mg/kg	101	65.8	123
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	3 mg/kg	99.3	65.8	127
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3859497)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	36 mg/kg	103	58.6	131
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3859806)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	840 mg/kg	97.6	75.0	128
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	2900 mg/kg	96.4	82.0	123
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	1490 mg/kg	95.5	82.4	121
EP071: C10 - C36 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3859497)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	45 mg/kg	99.6	59.3	128
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3859806)								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	1110 mg/kg	93.8	77.0	130
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	3900 mg/kg	96.6	81.5	120
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	290 mg/kg	99.3	73.3	137
EP071: >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	----	----	----	----
EP080: BTEXN (QCLot: 3859497)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	2 mg/kg	99.2	61.6	117
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	2 mg/kg	102	65.8	125
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	2 mg/kg	96.5	65.8	124
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	4 mg/kg	101	64.8	134
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	2 mg/kg	98.5	68.7	132
EP080: Naphthalene	91-20-3	1	mg/kg	<1	0.5 mg/kg	107	61.8	123

Sub-Matrix: **WATER**

				Method Blank (MB) Report	*Laboratory Control Spike (LCS) Report*			
					Spike	*Spike Recovery (%)*	*Acceptable Limits (%)*	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EG020T: Total Metals by ICP-MS (QCLot: 3862070)								
EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	113	89.2	115
EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	109	86.4	115
EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	107	86.9	112
EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	107	86.9	111
EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	107	88.3	112
EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	108	87.9	113
EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	111	86.7	117

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3862354)								
EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	111	73.4	119

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: **SOIL**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
				Concentration	MS	Low	High
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 3859903)							
EM2116475-039	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	105	78.0	124
		EG005T: Cadmium	7440-43-9	50 mg/kg	85.8	79.7	116
		EG005T: Chromium	7440-47-3	50 mg/kg	89.7	79.0	121
		EG005T: Copper	7440-50-8	250 mg/kg	103	80.0	120
		EG005T: Lead	7439-92-1	250 mg/kg	91.2	80.0	120
		EG005T: Nickel	7440-02-0	50 mg/kg	83.6	78.0	120
		EG005T: Zinc	7440-66-6	250 mg/kg	87.4	80.0	120
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 3860948)							
EM2116455-021	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	78.9	78.0	124
		EG005T: Cadmium	7440-43-9	50 mg/kg	91.9	79.7	116
		EG005T: Chromium	7440-47-3	50 mg/kg	99.1	79.0	121
		EG005T: Copper	7440-50-8	250 mg/kg	93.6	80.0	120
		EG005T: Lead	7439-92-1	250 mg/kg	92.6	80.0	120
		EG005T: Nickel	7440-02-0	50 mg/kg	90.6	78.0	120
		EG005T: Zinc	7440-66-6	250 mg/kg	87.1	80.0	120
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3859904)							
EM2116475-039	Anonymous	EG035T: Mercury	7439-97-6	0.5 mg/kg	103	76.0	116
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3860949)							
EM2116455-021	Anonymous	EG035T: Mercury	7439-97-6	0.5 mg/kg	106	76.0	116
EG048: Hexavalent Chromium (Alkaline Digest) (QCLot: 3864588)							
EM2116368-009	Anonymous	EG048G: Hexavalent Chromium	18540-29-9	20 mg/kg	# 38.4	58.0	114
EM2116368-009	Anonymous	EG048G: Hexavalent Chromium	18540-29-9	20 mg/kg	# 46.4	58.0	114
EG048: Hexavalent Chromium (Alkaline Digest) (QCLot: 3864589)							
EM2116590-010	Anonymous	EG048G: Hexavalent Chromium	18540-29-9	20 mg/kg	61.0	58.0	114
EM2116590-010	Anonymous	EG048G: Hexavalent Chromium	18540-29-9	20 mg/kg	73.3	58.0	114
EK026SF: Total CN by Segmented Flow Analyser (QCLot: 3860972)							
EM2116463-013	Anonymous	EK026SF: Total Cyanide	57-12-5	20 mg/kg	95.6	70.0	130

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 3859809)							
EM2116238-002	Anonymous	EP066: Total Polychlorinated biphenyls	----	1 mg/kg	80.8	63.2	144
EP068A: Organochlorine Pesticides (OC) (QCLot: 3859808)							
EM2116238-007	Anonymous	EP068: gamma-BHC	58-89-9	0.5 mg/kg	97.9	51.4	139
		EP068: Heptachlor	76-44-8	0.5 mg/kg	79.8	49.1	130
		EP068: Aldrin	309-00-2	0.5 mg/kg	94.8	38.4	135
		EP068: Dieldrin	60-57-1	0.5 mg/kg	98.9	58.4	136
		EP068: Endrin	72-20-8	0.5 mg/kg	137	33.0	146
		EP068: 4.4`-DDT	50-29-3	0.5 mg/kg	81.1	20.0	133
EP068B: Organophosphorus Pesticides (OP) (QCLot: 3859808)							
EM2116238-007	Anonymous	EP068: Diazinon	333-41-5	0.5 mg/kg	102	65.1	135
		EP068: Chlorpyrifos-methyl	5598-13-0	0.5 mg/kg	96.7	56.3	127
		EP068: Pirimphos-ethyl	23505-41-1	0.5 mg/kg	91.9	55.0	133
		EP068: Bromophos-ethyl	4824-78-6	0.5 mg/kg	91.9	55.1	133
		EP068: Prothiofos	34643-46-4	0.5 mg/kg	70.0	43.8	128
EP075(SIM)A: Phenolic Compounds (QCLot: 3859807)							
EM2116238-007	Anonymous	EP075(SIM): Phenol	108-95-2	3 mg/kg	81.1	77.1	119
		EP075(SIM): 2-Chlorophenol	95-57-8	3 mg/kg	85.3	78.9	123
		EP075(SIM): 2-Nitrophenol	88-75-5	3 mg/kg	66.4	43.8	136
		EP075(SIM): 4-Chloro-3-methylphenol	59-50-7	3 mg/kg	70.0	61.5	120
		EP075(SIM): Pentachlorophenol	87-86-5	3 mg/kg	55.2	15.3	139
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3859807)							
EM2116238-007	Anonymous	EP075(SIM): Acenaphthene	83-32-9	3 mg/kg	95.2	77.2	116
		EP075(SIM): Pyrene	129-00-0	3 mg/kg	94.9	65.5	136
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3859497)							
EM2116414-002	Anonymous	EP080: C6 - C9 Fraction	----	28 mg/kg	84.4	33.4	124
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3859806)							
EM2116238-002	Anonymous	EP071: C10 - C14 Fraction	----	840 mg/kg	97.3	71.2	125
		EP071: C15 - C28 Fraction	----	2900 mg/kg	95.3	75.6	122
		EP071: C29 - C36 Fraction	----	1490 mg/kg	94.0	78.0	120
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3859497)							
EM2116414-002	Anonymous	EP080: C6 - C10 Fraction	C6_C10	33 mg/kg	82.3	30.8	120
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3859806)							
EM2116238-002	Anonymous	EP071: >C10 - C16 Fraction	----	1110 mg/kg	93.3	72.2	128
		EP071: >C16 - C34 Fraction	----	3900 mg/kg	95.3	76.5	119
		EP071: >C34 - C40 Fraction	----	290 mg/kg	98.8	66.8	138
EP080: BTEXN (QCLot: 3859497)							

Sub-Matrix: **SOIL**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report Spike Concentration	SpikeRecovery(%) MS	Acceptable Limits (%) Low	High
EP080: BTEXN (QCLot: 3859497) - continued							
EM2116414-002	Anonymous	EP080: Benzene	71-43-2	2 mg/kg	83.6	54.4	127
		EP080: Toluene	108-88-3	2 mg/kg	86.5	57.1	131

Sub-Matrix: **WATER**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report Spike Concentration	SpikeRecovery(%) MS	Acceptable Limits (%) Low	High
EG020T: Total Metals by ICP-MS (QCLot: 3862070)							
EM2116452-005	Anonymous	EG020A-T: Arsenic	7440-38-2	1 mg/L	106	82.0	123
		EG020A-T: Cadmium	7440-43-9	0.25 mg/L	112	81.8	123
		EG020A-T: Chromium	7440-47-3	1 mg/L	101	78.9	119
		EG020A-T: Copper	7440-50-8	1 mg/L	104	80.4	118
		EG020A-T: Lead	7439-92-1	1 mg/L	106	80.5	121
		EG020A-T: Nickel	7440-02-0	1 mg/L	103	80.0	118
		EG020A-T: Zinc	7440-66-6	1 mg/L	104	74.0	120
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3862354)							
EM2116219-037	Anonymous	EG035T: Mercury	7439-97-6	0.01 mg/L	89.0	70.0	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EM2116495**	Page	: 1 of 16
Client	: **FYFE PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: STUART TWISS	Telephone	: +61881625130
Project	: 80963-1	Date Samples Received	: 17-Aug-2021
Site	:	Issue Date	: 03-Sep-2021
Sampler	: SCT	No. of samples received	: 71
Order number	: 11415	No. of samples analysed	: 36

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Duplicate outliers exist - please see following pages for full details.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Duplicate (DUP) RPDs							
EG005(ED093)T: Total Metals by ICP-AES	EM2116495--052	DCP08_0.0 - 0.15m	**Iron**	7439-89-6	22.0 %	0% - 20%	**RPD exceeds LOR based limits**
Matrix Spike (MS) Recoveries							
EG048: Hexavalent Chromium (Alkaline Digest)	EM2116368--009	Anonymous	**Hexavalent Chromium**	18540-29-9	38.4 %	58.0-114%	**Recovery less than lower data quality objective**
EG048: Hexavalent Chromium (Alkaline Digest)	EM2116368--009	Anonymous	**Hexavalent Chromium**	18540-29-9	46.4 %	58.0-114%	**Recovery less than lower data quality objective**

Outliers : Analysis Holding Time Compliance

Matrix: **SOIL**

Method	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)	*Date extracted*	*Due for extraction*	***Days overdue***	*Date analysed*	*Due for analysis*	***Days overdue***
EA029-A: pH Measurements						
Snap Lock Bag BH01_0.6 - 0.75m, DCP06_0.0 - 0.15m, DCP07_0.0 - 0.15m, DCP08_0.0 - 0.15m (QC)	01-Sep-2021	12-Aug-2021	**20**	----	----	----
Snap Lock Bag DCP09_0.0 - 0.15m, DCP10_0.0 - 0.15m, DCP11_0.0 - 0.15m, DCP12_0.0 - 0.15m, DCP13_0.0 - 0.15m, DCP14_0.0 - 0.15m, DCP15_0.0 - 0.15m, DCP16_0.0 - 0.15m, DCP17_0.0 - 0.15m	02-Sep-2021	12-Aug-2021	**21**	----	----	----
Snap Lock Bag DCP01_0.0 - 0.15m, DCP02_0.0 - 0.15m, DCP03_0.0 - 0.15m, DCP04_0.0 - 0.15m, DCP05_0.0 - 0.15m	01-Sep-2021	13-Aug-2021	**19**	----	----	----
Snap Lock Bag BH02_1.2 - 1.35m, BH03_3.0 - 3.1m	01-Sep-2021	14-Aug-2021	**18**	----	----	----
Snap Lock Bag BH04_2.6 - 2.7m	01-Sep-2021	17-Aug-2021	**15**	----	----	----
EA029-B: Acidity Trail						
Snap Lock Bag BH01_0.6 - 0.75m, DCP06_0.0 - 0.15m, DCP07_0.0 - 0.15m, DCP08_0.0 - 0.15m (QC)	01-Sep-2021	12-Aug-2021	**20**	----	----	----
Snap Lock Bag DCP09_0.0 - 0.15m, DCP10_0.0 - 0.15m, DCP11_0.0 - 0.15m, DCP12_0.0 - 0.15m, DCP13_0.0 - 0.15m, DCP14_0.0 - 0.15m, DCP15_0.0 - 0.15m, DCP16_0.0 - 0.15m, DCP17_0.0 - 0.15m	02-Sep-2021	12-Aug-2021	**21**	----	----	----

Matrix: **SOIL**

Method	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)	*Date extracted*	*Due for extraction*	***Days overdue***	*Date analysed*	*Due for analysis*	***Days overdue***
EA029-B: Acidity Trail - Analysis Holding Time Compliance						
Snap Lock Bag DCP01_0.0 - 0.15m, DCP02_0.0 - 0.15m, DCP03_0.0 - 0.15m, DCP04_0.0 - 0.15m, DCP05_0.0 - 0.15m	01-Sep-2021	13-Aug-2021	**19**	----	----	----
Snap Lock Bag BH02_1.2 - 1.35m, BH03_3.0 - 3.1m	01-Sep-2021	14-Aug-2021	**18**	----	----	----
Snap Lock Bag BH04_2.6 - 2.7m	01-Sep-2021	17-Aug-2021	**15**	----	----	----
EA029-C: Sulfur Trail						
Snap Lock Bag BH01_0.6 - 0.75m, DCP06_0.0 - 0.15m, DCP07_0.0 - 0.15m, DCP08_0.0 - 0.15m (QC)	01-Sep-2021	12-Aug-2021	**20**	----	----	----
Snap Lock Bag DCP09_0.0 - 0.15m, DCP10_0.0 - 0.15m, DCP11_0.0 - 0.15m, DCP12_0.0 - 0.15m, DCP13_0.0 - 0.15m, DCP14_0.0 - 0.15m, DCP15_0.0 - 0.15m, DCP16_0.0 - 0.15m, DCP17_0.0 - 0.15m	02-Sep-2021	12-Aug-2021	**21**	----	----	----
Snap Lock Bag DCP01_0.0 - 0.15m, DCP02_0.0 - 0.15m, DCP03_0.0 - 0.15m, DCP04_0.0 - 0.15m, DCP05_0.0 - 0.15m	01-Sep-2021	13-Aug-2021	**19**	----	----	----
Snap Lock Bag BH02_1.2 - 1.35m, BH03_3.0 - 3.1m	01-Sep-2021	14-Aug-2021	**18**	----	----	----
Snap Lock Bag BH04_2.6 - 2.7m	01-Sep-2021	17-Aug-2021	**15**	----	----	----
EA029-D: Calcium Values						
Snap Lock Bag BH01_0.6 - 0.75m, DCP06_0.0 - 0.15m, DCP07_0.0 - 0.15m, DCP08_0.0 - 0.15m (QC)	01-Sep-2021	12-Aug-2021	**20**	----	----	----
Snap Lock Bag DCP09_0.0 - 0.15m, DCP10_0.0 - 0.15m, DCP11_0.0 - 0.15m, DCP12_0.0 - 0.15m, DCP13_0.0 - 0.15m, DCP14_0.0 - 0.15m, DCP15_0.0 - 0.15m, DCP16_0.0 - 0.15m, DCP17_0.0 - 0.15m	02-Sep-2021	12-Aug-2021	**21**	----	----	----
Snap Lock Bag DCP01_0.0 - 0.15m, DCP02_0.0 - 0.15m, DCP03_0.0 - 0.15m, DCP04_0.0 - 0.15m, DCP05_0.0 - 0.15m	01-Sep-2021	13-Aug-2021	**19**	----	----	----

Matrix: **SOIL**

Method	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)	*Date extracted*	*Due for extraction*	***Days overdue***	*Date analysed*	*Due for analysis*	***Days overdue***
EA029-D: Calcium Values - Analysis Holding Time Compliance						
Snap Lock Bag BH02_1.2 - 1.35m, BH03_3.0 - 3.1m	01-Sep-2021	14-Aug-2021	**18**	----	----	----
Snap Lock Bag BH04_2.6 - 2.7m	01-Sep-2021	17-Aug-2021	**15**	----	----	----
EA029-E: Magnesium Values						
Snap Lock Bag BH01_0.6 - 0.75m, DCP06_0.0 - 0.15m, DCP07_0.0 - 0.15m, DCP08_0.0 - 0.15m (QC)	01-Sep-2021	12-Aug-2021	**20**	----	----	----
Snap Lock Bag DCP09_0.0 - 0.15m, DCP10_0.0 - 0.15m, DCP11_0.0 - 0.15m, DCP12_0.0 - 0.15m, DCP13_0.0 - 0.15m, DCP14_0.0 - 0.15m, DCP15_0.0 - 0.15m, DCP16_0.0 - 0.15m, DCP17_0.0 - 0.15m	02-Sep-2021	12-Aug-2021	**21**	----	----	----
Snap Lock Bag DCP01_0.0 - 0.15m, DCP02_0.0 - 0.15m, DCP03_0.0 - 0.15m, DCP04_0.0 - 0.15m, DCP05_0.0 - 0.15m	01-Sep-2021	13-Aug-2021	**19**	----	----	----
Snap Lock Bag BH02_1.2 - 1.35m, BH03_3.0 - 3.1m	01-Sep-2021	14-Aug-2021	**18**	----	----	----
Snap Lock Bag BH04_2.6 - 2.7m	01-Sep-2021	17-Aug-2021	**15**	----	----	----
EA029-F: Excess Acid Neutralising Capacity						
Snap Lock Bag BH01_0.6 - 0.75m, DCP06_0.0 - 0.15m, DCP07_0.0 - 0.15m, DCP08_0.0 - 0.15m (QC)	01-Sep-2021	12-Aug-2021	**20**	----	----	----
Snap Lock Bag DCP09_0.0 - 0.15m, DCP10_0.0 - 0.15m, DCP11_0.0 - 0.15m, DCP12_0.0 - 0.15m, DCP13_0.0 - 0.15m, DCP14_0.0 - 0.15m, DCP15_0.0 - 0.15m, DCP16_0.0 - 0.15m, DCP17_0.0 - 0.15m	02-Sep-2021	12-Aug-2021	**21**	----	----	----
Snap Lock Bag DCP01_0.0 - 0.15m, DCP02_0.0 - 0.15m, DCP03_0.0 - 0.15m, DCP04_0.0 - 0.15m, DCP05_0.0 - 0.15m	01-Sep-2021	13-Aug-2021	**19**	----	----	----
Snap Lock Bag BH02_1.2 - 1.35m, BH03_3.0 - 3.1m	01-Sep-2021	14-Aug-2021	**18**	----	----	----
Snap Lock Bag BH04_2.6 - 2.7m	01-Sep-2021	17-Aug-2021	**15**	----	----	----
EA029-G: Retained Acidity						

Matrix: **SOIL**

Method	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)	*Date extracted*	*Due for extraction*	***Days overdue***	*Date analysed*	*Due for analysis*	***Days overdue***
EA029-G: Retained Acidity - Analysis Holding Time Compliance						
Snap Lock Bag BH01_0.6 - 0.75m, DCP06_0.0 - 0.15m, DCP07_0.0 - 0.15m, DCP08_0.0 - 0.15m (QC)	01-Sep-2021	12-Aug-2021	**20**	----	----	----
Snap Lock Bag DCP09_0.0 - 0.15m, DCP10_0.0 - 0.15m, DCP11_0.0 - 0.15m, DCP12_0.0 - 0.15m, DCP13_0.0 - 0.15m, DCP14_0.0 - 0.15m, DCP15_0.0 - 0.15m, DCP16_0.0 - 0.15m, DCP17_0.0 - 0.15m	02-Sep-2021	12-Aug-2021	**21**	----	----	----
Snap Lock Bag DCP01_0.0 - 0.15m, DCP02_0.0 - 0.15m, DCP03_0.0 - 0.15m, DCP04_0.0 - 0.15m, DCP05_0.0 - 0.15m	01-Sep-2021	13-Aug-2021	**19**	----	----	----
Snap Lock Bag BH02_1.2 - 1.35m, BH03_3.0 - 3.1m	01-Sep-2021	14-Aug-2021	**18**	----	----	----
Snap Lock Bag BH04_2.6 - 2.7m	01-Sep-2021	17-Aug-2021	**15**	----	----	----
EA029-H: Acid Base Accounting						
Snap Lock Bag BH01_0.6 - 0.75m, DCP06_0.0 - 0.15m, DCP07_0.0 - 0.15m, DCP08_0.0 - 0.15m (QC)	01-Sep-2021	12-Aug-2021	**20**	----	----	----
Snap Lock Bag DCP09_0.0 - 0.15m, DCP10_0.0 - 0.15m, DCP11_0.0 - 0.15m, DCP12_0.0 - 0.15m, DCP13_0.0 - 0.15m, DCP14_0.0 - 0.15m, DCP15_0.0 - 0.15m, DCP16_0.0 - 0.15m, DCP17_0.0 - 0.15m	02-Sep-2021	12-Aug-2021	**21**	----	----	----
Snap Lock Bag DCP01_0.0 - 0.15m, DCP02_0.0 - 0.15m, DCP03_0.0 - 0.15m, DCP04_0.0 - 0.15m, DCP05_0.0 - 0.15m	01-Sep-2021	13-Aug-2021	**19**	----	----	----
Snap Lock Bag BH02_1.2 - 1.35m, BH03_3.0 - 3.1m	01-Sep-2021	14-Aug-2021	**18**	----	----	----
Snap Lock Bag BH04_2.6 - 2.7m	01-Sep-2021	17-Aug-2021	**15**	----	----	----

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

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*
EA029-A: pH Measurements							
Snap Lock Bag (EA029) BH01_0.6 - 0.75m, DCP06_0.0 - 0.15m, DCP07_0.0 - 0.15m, DCP08_0.0 - 0.15m (QC)	**11-Aug-2021**	**01-Sep-2021**	12-Aug-2021	✗	**01-Sep-2021**	30-Nov-2021	✓
Snap Lock Bag (EA029) DCP09_0.0 - 0.15m, DCP10_0.0 - 0.15m, DCP11_0.0 - 0.15m, DCP12_0.0 - 0.15m, DCP13_0.0 - 0.15m, DCP14_0.0 - 0.15m, DCP15_0.0 - 0.15m, DCP16_0.0 - 0.15m, DCP17_0.0 - 0.15m	**11-Aug-2021**	**02-Sep-2021**	12-Aug-2021	✗	**02-Sep-2021**	01-Dec-2021	✓
Snap Lock Bag (EA029) DCP01_0.0 - 0.15m, DCP02_0.0 - 0.15m, DCP03_0.0 - 0.15m, DCP04_0.0 - 0.15m, DCP05_0.0 - 0.15m	**12-Aug-2021**	**01-Sep-2021**	13-Aug-2021	✗	**01-Sep-2021**	30-Nov-2021	✓
Snap Lock Bag (EA029) BH02_1.2 - 1.35m, BH03_3.0 - 3.1m	**13-Aug-2021**	**01-Sep-2021**	14-Aug-2021	✗	**01-Sep-2021**	30-Nov-2021	✓
Snap Lock Bag (EA029) BH04_2.6 - 2.7m	**16-Aug-2021**	**01-Sep-2021**	17-Aug-2021	✗	**01-Sep-2021**	30-Nov-2021	✓

Matrix: **SOIL**

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*
EA029-B: Acidity Trail							
Snap Lock Bag (EA029) BH01_0.6 - 0.75m, DCP06_0.0 - 0.15m, DCP07_0.0 - 0.15m, DCP08_0.0 - 0.15m (QC)	**11-Aug-2021**	**01-Sep-2021**	12-Aug-2021	✗	**01-Sep-2021**	30-Nov-2021	✓
Snap Lock Bag (EA029) DCP09_0.0 - 0.15m, DCP10_0.0 - 0.15m, DCP11_0.0 - 0.15m, DCP12_0.0 - 0.15m, DCP13_0.0 - 0.15m, DCP14_0.0 - 0.15m, DCP15_0.0 - 0.15m, DCP16_0.0 - 0.15m, DCP17_0.0 - 0.15m	**11-Aug-2021**	**02-Sep-2021**	12-Aug-2021	✗	**02-Sep-2021**	01-Dec-2021	✓
Snap Lock Bag (EA029) DCP01_0.0 - 0.15m, DCP02_0.0 - 0.15m, DCP03_0.0 - 0.15m, DCP04_0.0 - 0.15m, DCP05_0.0 - 0.15m	**12-Aug-2021**	**01-Sep-2021**	13-Aug-2021	✗	**01-Sep-2021**	30-Nov-2021	✓
Snap Lock Bag (EA029) BH02_1.2 - 1.35m, BH03_3.0 - 3.1m	**13-Aug-2021**	**01-Sep-2021**	14-Aug-2021	✗	**01-Sep-2021**	30-Nov-2021	✓
Snap Lock Bag (EA029) BH04_2.6 - 2.7m	**16-Aug-2021**	**01-Sep-2021**	17-Aug-2021	✗	**01-Sep-2021**	30-Nov-2021	✓
EA029-C: Sulfur Trail							
Snap Lock Bag (EA029) BH01_0.6 - 0.75m, DCP06_0.0 - 0.15m, DCP07_0.0 - 0.15m, DCP08_0.0 - 0.15m (QC)	**11-Aug-2021**	**01-Sep-2021**	12-Aug-2021	✗	**01-Sep-2021**	30-Nov-2021	✓
Snap Lock Bag (EA029) DCP09_0.0 - 0.15m, DCP10_0.0 - 0.15m, DCP11_0.0 - 0.15m, DCP12_0.0 - 0.15m, DCP13_0.0 - 0.15m, DCP14_0.0 - 0.15m, DCP15_0.0 - 0.15m, DCP16_0.0 - 0.15m, DCP17_0.0 - 0.15m	**11-Aug-2021**	**02-Sep-2021**	12-Aug-2021	✗	**02-Sep-2021**	01-Dec-2021	✓
Snap Lock Bag (EA029) DCP01_0.0 - 0.15m, DCP02_0.0 - 0.15m, DCP03_0.0 - 0.15m, DCP04_0.0 - 0.15m, DCP05_0.0 - 0.15m	**12-Aug-2021**	**01-Sep-2021**	13-Aug-2021	✗	**01-Sep-2021**	30-Nov-2021	✓
Snap Lock Bag (EA029) BH02_1.2 - 1.35m, BH03_3.0 - 3.1m	**13-Aug-2021**	**01-Sep-2021**	14-Aug-2021	✗	**01-Sep-2021**	30-Nov-2021	✓
Snap Lock Bag (EA029) BH04_2.6 - 2.7m	**16-Aug-2021**	**01-Sep-2021**	17-Aug-2021	✗	**01-Sep-2021**	30-Nov-2021	✓

Matrix: **SOIL**

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*
EA029-D: Calcium Values							
Snap Lock Bag (EA029) BH01_0.6 - 0.75m, DCP06_0.0 - 0.15m, DCP07_0.0 - 0.15m, DCP08_0.0 - 0.15m (QC)	**11-Aug-2021**	**01-Sep-2021**	12-Aug-2021	×	**01-Sep-2021**	30-Nov-2021	✓
Snap Lock Bag (EA029) DCP09_0.0 - 0.15m, DCP10_0.0 - 0.15m, DCP11_0.0 - 0.15m, DCP12_0.0 - 0.15m, DCP13_0.0 - 0.15m, DCP14_0.0 - 0.15m, DCP15_0.0 - 0.15m, DCP16_0.0 - 0.15m, DCP17_0.0 - 0.15m	**11-Aug-2021**	**02-Sep-2021**	12-Aug-2021	×	**02-Sep-2021**	01-Dec-2021	✓
Snap Lock Bag (EA029) DCP01_0.0 - 0.15m, DCP02_0.0 - 0.15m, DCP03_0.0 - 0.15m, DCP04_0.0 - 0.15m, DCP05_0.0 - 0.15m	**12-Aug-2021**	**01-Sep-2021**	13-Aug-2021	×	**01-Sep-2021**	30-Nov-2021	✓
Snap Lock Bag (EA029) BH02_1.2 - 1.35m, BH03_3.0 - 3.1m	**13-Aug-2021**	**01-Sep-2021**	14-Aug-2021	×	**01-Sep-2021**	30-Nov-2021	✓
Snap Lock Bag (EA029) BH04_2.6 - 2.7m	**16-Aug-2021**	**01-Sep-2021**	17-Aug-2021	×	**01-Sep-2021**	30-Nov-2021	✓
EA029-E: Magnesium Values							
Snap Lock Bag (EA029) BH01_0.6 - 0.75m, DCP06_0.0 - 0.15m, DCP07_0.0 - 0.15m, DCP08_0.0 - 0.15m (QC)	**11-Aug-2021**	**01-Sep-2021**	12-Aug-2021	×	**01-Sep-2021**	30-Nov-2021	✓
Snap Lock Bag (EA029) DCP09_0.0 - 0.15m, DCP10_0.0 - 0.15m, DCP11_0.0 - 0.15m, DCP12_0.0 - 0.15m, DCP13_0.0 - 0.15m, DCP14_0.0 - 0.15m, DCP15_0.0 - 0.15m, DCP16_0.0 - 0.15m, DCP17_0.0 - 0.15m	**11-Aug-2021**	**02-Sep-2021**	12-Aug-2021	×	**02-Sep-2021**	01-Dec-2021	✓
Snap Lock Bag (EA029) DCP01_0.0 - 0.15m, DCP02_0.0 - 0.15m, DCP03_0.0 - 0.15m, DCP04_0.0 - 0.15m, DCP05_0.0 - 0.15m	**12-Aug-2021**	**01-Sep-2021**	13-Aug-2021	×	**01-Sep-2021**	30-Nov-2021	✓
Snap Lock Bag (EA029) BH02_1.2 - 1.35m, BH03_3.0 - 3.1m	**13-Aug-2021**	**01-Sep-2021**	14-Aug-2021	×	**01-Sep-2021**	30-Nov-2021	✓
Snap Lock Bag (EA029) BH04_2.6 - 2.7m	**16-Aug-2021**	**01-Sep-2021**	17-Aug-2021	×	**01-Sep-2021**	30-Nov-2021	✓

Matrix: **SOIL** 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*
EA029-F: Excess Acid Neutralising Capacity							
Snap Lock Bag (EA029) BH01_0.6 - 0.75m, DCP06_0.0 - 0.15m, DCP07_0.0 - 0.15m, DCP08_0.0 - 0.15m (QC)	**11-Aug-2021**	**01-Sep-2021**	12-Aug-2021	×	**01-Sep-2021**	30-Nov-2021	✓
Snap Lock Bag (EA029) DCP09_0.0 - 0.15m, DCP10_0.0 - 0.15m, DCP11_0.0 - 0.15m, DCP12_0.0 - 0.15m, DCP13_0.0 - 0.15m, DCP14_0.0 - 0.15m, DCP15_0.0 - 0.15m, DCP16_0.0 - 0.15m, DCP17_0.0 - 0.15m	**11-Aug-2021**	**02-Sep-2021**	12-Aug-2021	×	**02-Sep-2021**	01-Dec-2021	✓
Snap Lock Bag (EA029) DCP01_0.0 - 0.15m, DCP02_0.0 - 0.15m, DCP03_0.0 - 0.15m, DCP04_0.0 - 0.15m, DCP05_0.0 - 0.15m	**12-Aug-2021**	**01-Sep-2021**	13-Aug-2021	×	**01-Sep-2021**	30-Nov-2021	✓
Snap Lock Bag (EA029) BH02_1.2 - 1.35m, BH03_3.0 - 3.1m	**13-Aug-2021**	**01-Sep-2021**	14-Aug-2021	×	**01-Sep-2021**	30-Nov-2021	✓
Snap Lock Bag (EA029) BH04_2.6 - 2.7m	**16-Aug-2021**	**01-Sep-2021**	17-Aug-2021	×	**01-Sep-2021**	30-Nov-2021	✓
EA029-G: Retained Acidity							
Snap Lock Bag (EA029) BH01_0.6 - 0.75m, DCP06_0.0 - 0.15m, DCP07_0.0 - 0.15m, DCP08_0.0 - 0.15m (QC)	**11-Aug-2021**	**01-Sep-2021**	12-Aug-2021	×	**01-Sep-2021**	30-Nov-2021	✓
Snap Lock Bag (EA029) DCP09_0.0 - 0.15m, DCP10_0.0 - 0.15m, DCP11_0.0 - 0.15m, DCP12_0.0 - 0.15m, DCP13_0.0 - 0.15m, DCP14_0.0 - 0.15m, DCP15_0.0 - 0.15m, DCP16_0.0 - 0.15m, DCP17_0.0 - 0.15m	**11-Aug-2021**	**02-Sep-2021**	12-Aug-2021	×	**02-Sep-2021**	01-Dec-2021	✓
Snap Lock Bag (EA029) DCP01_0.0 - 0.15m, DCP02_0.0 - 0.15m, DCP03_0.0 - 0.15m, DCP04_0.0 - 0.15m, DCP05_0.0 - 0.15m	**12-Aug-2021**	**01-Sep-2021**	13-Aug-2021	×	**01-Sep-2021**	30-Nov-2021	✓
Snap Lock Bag (EA029) BH02_1.2 - 1.35m, BH03_3.0 - 3.1m	**13-Aug-2021**	**01-Sep-2021**	14-Aug-2021	×	**01-Sep-2021**	30-Nov-2021	✓
Snap Lock Bag (EA029) BH04_2.6 - 2.7m	**16-Aug-2021**	**01-Sep-2021**	17-Aug-2021	×	**01-Sep-2021**	30-Nov-2021	✓

Matrix: **SOIL**

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*
EA029-H: Acid Base Accounting							
Snap Lock Bag (EA029) BH01_0.6 - 0.75m, DCP06_0.0 - 0.15m, DCP07_0.0 - 0.15m, DCP08_0.0 - 0.15m (QC)	**11-Aug-2021**	**01-Sep-2021**	12-Aug-2021	×	**01-Sep-2021**	30-Nov-2021	✓
Snap Lock Bag (EA029) DCP09_0.0 - 0.15m, DCP10_0.0 - 0.15m, DCP11_0.0 - 0.15m, DCP12_0.0 - 0.15m, DCP13_0.0 - 0.15m, DCP14_0.0 - 0.15m, DCP15_0.0 - 0.15m, DCP16_0.0 - 0.15m, DCP17_0.0 - 0.15m	**11-Aug-2021**	**02-Sep-2021**	12-Aug-2021	×	**02-Sep-2021**	01-Dec-2021	✓
Snap Lock Bag (EA029) DCP01_0.0 - 0.15m, DCP02_0.0 - 0.15m, DCP03_0.0 - 0.15m, DCP04_0.0 - 0.15m, DCP05_0.0 - 0.15m	**12-Aug-2021**	**01-Sep-2021**	13-Aug-2021	×	**01-Sep-2021**	30-Nov-2021	✓
Snap Lock Bag (EA029) BH02_1.2 - 1.35m, BH03_3.0 - 3.1m	**13-Aug-2021**	**01-Sep-2021**	14-Aug-2021	×	**01-Sep-2021**	30-Nov-2021	✓
Snap Lock Bag (EA029) BH04_2.6 - 2.7m	**16-Aug-2021**	**01-Sep-2021**	17-Aug-2021	×	**01-Sep-2021**	30-Nov-2021	✓
EA055: Moisture Content (Dried @ 105-110°C)							
Soil Glass Jar - Unpreserved (EA055) BH01_0.0 - 0.15m, BH01_0.5 - 0.6m, BH01_1.5 - 1.6m, BH02_0.0 - 0.15m, DCP08_0.0 - 0.15m	**11-Aug-2021**	**----**	----	----	**23-Aug-2021**	25-Aug-2021	✓
Soil Glass Jar - Unpreserved (EA055) BH02_0.5 - 0.65m, BH02_2.0 - 2.15m, BH03_0.0 - 0.15m, BH03_1.0 - 1.15m, BH03_1.0 - 1.15m (QC), BH04_0.0 - 0.15m, BH04_0.6 - 0.75m, BH04_1.0 - 1.1m, BH04_2.0 - 2.1m	**13-Aug-2021**	**----**	----	----	**23-Aug-2021**	27-Aug-2021	✓
EG005(ED093)T: Total Metals by ICP-AES							
Soil Glass Jar - Unpreserved (EG005T) DCP08_0.0 - 0.15m	**11-Aug-2021**	**23-Aug-2021**	07-Feb-2022	✓	**23-Aug-2021**	07-Feb-2022	✓
Soil Glass Jar - Unpreserved (EG005T) BH01_0.5 - 0.6m, BH01_1.5 - 1.6m, BH02_0.0 - 0.15m	**11-Aug-2021**	**23-Aug-2021**	07-Feb-2022	✓	**24-Aug-2021**	07-Feb-2022	✓
Soil Glass Jar - Unpreserved (EG005T) BH03_0.0 - 0.15m, BH03_1.0 - 1.15m, BH03_1.0 - 1.15m (QC), BH04_0.6 - 0.75m, BH04_1.0 - 1.1m, BH04_2.0 - 2.1m	**13-Aug-2021**	**23-Aug-2021**	09-Feb-2022	✓	**23-Aug-2021**	09-Feb-2022	✓
Soil Glass Jar - Unpreserved (EG005T) BH02_0.5 - 0.65m, BH02_2.0 - 2.15m	**13-Aug-2021**	**23-Aug-2021**	09-Feb-2022	✓	**24-Aug-2021**	09-Feb-2022	✓

Matrix: **SOIL**

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*
EG035T: Total Recoverable Mercury by FIMS							
Soil Glass Jar - Unpreserved (EG035T) BH01_0.5 - 0.6m, BH01_1.5 - 1.6m, BH02_0.0 - 0.15m, DCP08_0.0 - 0.15m	**11-Aug-2021**	**23-Aug-2021**	08-Sep-2021	✓	**24-Aug-2021**	08-Sep-2021	✓
Soil Glass Jar - Unpreserved (EG035T) BH02_0.5 - 0.65m, BH02_2.0 - 2.15m, BH03_0.0 - 0.15m, BH03_1.0 - 1.15m, BH03_1.0 - 1.15m (QC), BH04_0.6 - 0.75m, BH04_1.0 - 1.1m, BH04_2.0 - 2.1m	**13-Aug-2021**	**23-Aug-2021**	10-Sep-2021	✓	**24-Aug-2021**	10-Sep-2021	✓
EG048: Hexavalent Chromium (Alkaline Digest)							
Soil Glass Jar - Unpreserved (EG048G) BH02_0.0 - 0.15m, DCP08_0.0 - 0.15m	**11-Aug-2021**	**25-Aug-2021**	08-Sep-2021	✓	**25-Aug-2021**	01-Sep-2021	✓
Soil Glass Jar - Unpreserved (EG048G) BH04_1.0 - 1.1m	**13-Aug-2021**	**25-Aug-2021**	10-Sep-2021	✓	**25-Aug-2021**	01-Sep-2021	✓
EK026SF: Total CN by Segmented Flow Analyser							
Soil Glass Jar - Unpreserved (EK026SF) BH02_0.0 - 0.15m, DCP08_0.0 - 0.15m	**11-Aug-2021**	**23-Aug-2021**	25-Aug-2021	✓	**24-Aug-2021**	06-Sep-2021	✓
Soil Glass Jar - Unpreserved (EK026SF) BH04_1.0 - 1.1m	**13-Aug-2021**	**23-Aug-2021**	27-Aug-2021	✓	**24-Aug-2021**	06-Sep-2021	✓
EP066: Polychlorinated Biphenyls (PCB)							
Soil Glass Jar - Unpreserved (EP066) BH02_0.0 - 0.15m, DCP08_0.0 - 0.15m	**11-Aug-2021**	**23-Aug-2021**	25-Aug-2021	✓	**24-Aug-2021**	02-Oct-2021	✓
Soil Glass Jar - Unpreserved (EP066) BH04_1.0 - 1.1m	**13-Aug-2021**	**23-Aug-2021**	27-Aug-2021	✓	**24-Aug-2021**	02-Oct-2021	✓
EP068A: Organochlorine Pesticides (OC)							
Soil Glass Jar - Unpreserved (EP068) BH01_0.0 - 0.15m, BH02_0.0 - 0.15m, DCP08_0.0 - 0.15m	**11-Aug-2021**	**23-Aug-2021**	25-Aug-2021	✓	**24-Aug-2021**	02-Oct-2021	✓
Soil Glass Jar - Unpreserved (EP068) BH04_0.0 - 0.15m, BH04_1.0 - 1.1m	**13-Aug-2021**	**23-Aug-2021**	27-Aug-2021	✓	**24-Aug-2021**	02-Oct-2021	✓
EP068B: Organophosphorus Pesticides (OP)							
Soil Glass Jar - Unpreserved (EP068) BH01_0.0 - 0.15m	**11-Aug-2021**	**23-Aug-2021**	25-Aug-2021	✓	**24-Aug-2021**	02-Oct-2021	✓
Soil Glass Jar - Unpreserved (EP068) BH04_0.0 - 0.15m	**13-Aug-2021**	**23-Aug-2021**	27-Aug-2021	✓	**24-Aug-2021**	02-Oct-2021	✓
EP075(SIM)A: Phenolic Compounds							
Soil Glass Jar - Unpreserved (EP075(SIM)) BH02_0.0 - 0.15m, DCP08_0.0 - 0.15m	**11-Aug-2021**	**23-Aug-2021**	25-Aug-2021	✓	**24-Aug-2021**	02-Oct-2021	✓
Soil Glass Jar - Unpreserved (EP075(SIM)) BH04_1.0 - 1.1m	**13-Aug-2021**	**23-Aug-2021**	27-Aug-2021	✓	**24-Aug-2021**	02-Oct-2021	✓

Matrix: **SOIL**

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							
Soil Glass Jar - Unpreserved (EP075(SIM)) BH02_0.0 - 0.15m, DCP08_0.0 - 0.15m	**11-Aug-2021**	**23-Aug-2021**	25-Aug-2021	✓	**24-Aug-2021**	02-Oct-2021	✓
Soil Glass Jar - Unpreserved (EP075(SIM)) BH04_1.0 - 1.1m	**13-Aug-2021**	**23-Aug-2021**	27-Aug-2021	✓	**24-Aug-2021**	02-Oct-2021	✓
EP080/071: Total Petroleum Hydrocarbons							
Soil Glass Jar - Unpreserved (EP080) BH02_0.0 - 0.15m, DCP08_0.0 - 0.15m	**11-Aug-2021**	**23-Aug-2021**	25-Aug-2021	✓	**23-Aug-2021**	25-Aug-2021	✓
Soil Glass Jar - Unpreserved (EP071) BH02_0.0 - 0.15m, DCP08_0.0 - 0.15m	**11-Aug-2021**	**23-Aug-2021**	25-Aug-2021	✓	**24-Aug-2021**	02-Oct-2021	✓
Soil Glass Jar - Unpreserved (EP080) BH04_1.0 - 1.1m	**13-Aug-2021**	**23-Aug-2021**	27-Aug-2021	✓	**23-Aug-2021**	27-Aug-2021	✓
Soil Glass Jar - Unpreserved (EP071) BH04_1.0 - 1.1m	**13-Aug-2021**	**23-Aug-2021**	27-Aug-2021	✓	**24-Aug-2021**	02-Oct-2021	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Soil Glass Jar - Unpreserved (EP080) BH02_0.0 - 0.15m, DCP08_0.0 - 0.15m	**11-Aug-2021**	**23-Aug-2021**	25-Aug-2021	✓	**23-Aug-2021**	25-Aug-2021	✓
Soil Glass Jar - Unpreserved (EP071) BH02_0.0 - 0.15m, DCP08_0.0 - 0.15m	**11-Aug-2021**	**23-Aug-2021**	25-Aug-2021	✓	**24-Aug-2021**	02-Oct-2021	✓
Soil Glass Jar - Unpreserved (EP080) BH04_1.0 - 1.1m	**13-Aug-2021**	**23-Aug-2021**	27-Aug-2021	✓	**23-Aug-2021**	27-Aug-2021	✓
Soil Glass Jar - Unpreserved (EP071) BH04_1.0 - 1.1m	**13-Aug-2021**	**23-Aug-2021**	27-Aug-2021	✓	**24-Aug-2021**	02-Oct-2021	✓
EP080: BTEXN							
Soil Glass Jar - Unpreserved (EP080) BH02_0.0 - 0.15m, DCP08_0.0 - 0.15m	**11-Aug-2021**	**23-Aug-2021**	25-Aug-2021	✓	**23-Aug-2021**	25-Aug-2021	✓
Soil Glass Jar - Unpreserved (EP080) BH04_1.0 - 1.1m	**13-Aug-2021**	**23-Aug-2021**	27-Aug-2021	✓	**23-Aug-2021**	27-Aug-2021	✓

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 HDPE (U-T ORC) - Unfiltered; Lab-acidified (EG020A-T) RINSATE 3	**13-Aug-2021**	**24-Aug-2021**	09-Feb-2022	✓	**24-Aug-2021**	09-Feb-2022	✓
EG035T: Total Recoverable Mercury by FIMS							
Clear HDPE (U-T ORC) - Unfiltered; Lab-acidified (EG035T) RINSATE 3	**13-Aug-2021**	**----**	----	----	**24-Aug-2021**	10-Sep-2021	✓

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(were) 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: **SOIL**

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)							
Hexavalent Chromium by Alkaline Digestion and DA Finish	EG048G	3	22	**13.64**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055	3	30	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	2	13	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	2	15	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	2	11	**18.18**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspension Peroxide Oxidation-Combined Acidity and Sulphate	EA029	3	21	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	2	15	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	3	29	**10.34**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	4	30	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	13	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	16	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Hexavalent Chromium by Alkaline Digestion and DA Finish	EG048G	4	22	**18.18**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspension Peroxide Oxidation-Combined Acidity and Sulphate	EA029	2	21	**9.52**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	29	**6.90**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	30	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Hexavalent Chromium by Alkaline Digestion and DA Finish	EG048G	2	22	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspension Peroxide Oxidation-Combined Acidity and Sulphate	EA029	2	21	**9.52**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	29	**6.90**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	30	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **SOIL**

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*	
Matrix Spikes (MS)							
Hexavalent Chromium by Alkaline Digestion and DA Finish	EG048G	4	22	**18.18**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	29	**6.90**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	30	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

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)							
Total Mercury by FIMS	EG035T	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	2	12	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Total Mercury by FIMS	EG035T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Total Mercury by FIMS	EG035T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Total Mercury by FIMS	EG035T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

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*
Suspension Peroxide Oxidation-Combined Acidity and Sulphate	EA029	SOIL	In house: Referenced to Ahern et al 2004 - a suspension peroxide oxidation method following the 'sulfur trail' by determining the level of 1M KCL extractable sulfur and the sulfur level after oxidation of soil sulphides. The 'acidity trail' is followed by measurement of TAA, TPA and TSA. Liming Rate is based on results for samples as submitted and incorporates a minimum safety factor of 1.5.
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM Schedule B(3).
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2) (Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. 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 Schedule B(3)
Hexavalent Chromium by Alkaline Digestion and DA Finish	EG048G	SOIL	In house: Referenced to USEPA SW846, Method 3060. Hexavalent chromium is extracted by alkaline digestion. The digest is determined by photometrically by automatic discrete analyser, following pH adjustment. The instrument uses colour development using dephenylcarbazide. Each run of samples is measured against a five-point calibration curve. This method is compliant with NEPM Schedule B(3)
Total Cyanide by Segmented Flow Analyser	EK026SF	SOIL	In house: Referenced to APHA 4500-CN C / ASTM D7511 / ISO 14403. Caustic leachates of soil samples are introduced into an automated segmented flow analyser. Complex bound cyanide is decomposed in a continuously flowing stream, at a pH of 3.8, by the effect of UV light. A UV-B lamp (312 nm) and a decomposition spiral of borosilicate glass are used to filter out UV light with a wavelength of less than 290 nm thus preventing the conversion of thiocyanate into cyanide. The hydrogen cyanide present at a pH of 3.8 is separated by gas dialysis. The hydrogen cyanide is then determined photometrically, based on the reaction of cyanide with chloramine-T to form cyanogen chloride. This then reacts with 4-pyridine carboxylic acid and 1,3-dimethylbarbituric acid to give a red colour which is measured at 600 nm. This method is compliant with NEPM Schedule B(3).
Polychlorinated Biphenyls (PCB)	EP066	SOIL	In house: Referenced to USEPA SW 846 - 8270 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 Schedule B(3).
Pesticides by GCMS	EP068	SOIL	In house: Referenced to USEPA SW 846 - 8270 Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This technique is compliant with NEPM Schedule B(3).
TRH - Semivolatile Fraction	EP071	SOIL	In house: Referenced to USEPA SW 846 - 8015 Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40. Compliant with NEPM Schedule B(3).

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
PAH/Phenols (SIM)	EP075(SIM)	SOIL	In house: Referenced to USEPA SW 846 - 8270. Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM Schedule B(3)
TRH Volatiles/BTEX	EP080	SOIL	In house: Referenced to USEPA SW 846 - 8260. Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. Compliant with NEPM Schedule B(3) amended.
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	In house: Referenced to APHA 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	In house: Referenced to AS 3550, APHA 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 Schedule B(3).

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*
NaOH leach for CN in Soils	CN-PR	SOIL	In house: APHA 4500 CN. Samples are extracted by end-over-end tumbling with NaOH.
Alkaline digestion for Hexavalent Chromium	EG048PR	SOIL	In house: Referenced to USEPA SW846, Method 3060A.
Drying at 85 degrees, bagging and labelling (ASS)	EN020PR	SOIL	In house
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM Schedule B(3).
Methanolic Extraction of Soils for Purge and Trap	ORG16	SOIL	In house: Referenced to USEPA SW 846 - 5030A. 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids	ORG17	SOIL	In house: Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.
Digestion for Total Recoverable Metals	EN25	WATER	In house: Referenced to 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 Schedule B(3)

CERTIFICATE OF ANALYSIS

Work Order	: **ES2129952**	Page	: 1 of 24
Client	: **FYFE PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: STUART TWISS	Contact	: Kieren Burns
Address	: LEVEL 1, 124 SOUTH TERRACE ADELAIDE SOUTH AUSTRALIA 5000	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61881625130
Project	: 80963-1	Date Samples Received	: 26-Aug-2021 09:30
Order number	: 11415	Date Analysis Commenced	: 27-Aug-2021
C-O-C number	: 80963-1_Coorong_COC	Issue Date	: 01-Sep-2021 19:14
Sampler	: SCT		
Site	:		
Quote number	: AD/060/21		
No. of samples received	: 19		
No. of samples analysed	: 19		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Alex Rossi	Organic Chemist	Sydney Organics, Smithfield, NSW
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Franco Lentini	LCMS Coordinator	Sydney Inorganics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW
Sanjeshni Jyoti	Senior Chemist Volatiles	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the 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.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

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
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EG048G: Poor spike recovery for Hexavalent Chromium by Alkaline Digestion due to matrix interferences.
- EG048G: LOR raised for Hexavalent Chromium by Alkaline Digestion on samples 14 & 16 due to sample matrix.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) per the NEPM (2013) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.
- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EP068: Where reported, Total Chlordane (sum) is the sum of the reported concentrations of cis-Chlordane and trans-Chlordane at or above the LOR.
- EP068: Where reported, Total OCP is the sum of the reported concentrations of all Organochlorine Pesticides at or above LOR.
- EP075(SIM): Where reported, Total Cresol is the sum of the reported concentrations of 2-Methylphenol and 3- & 4-Methylphenol at or above the LOR.
- EG020: Positive results for sample ES2129952-#001 and #002 have been confirmed by re-digestion and re-analysis.
- EP071: LOR of sample raised due to the high amount of moisture content present.
- EP075(SIM): LOR raised due to the high amount of moisture present.
- EP068: LOR for sample raised due to the high amount of moisture present.

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**DCP01_0.0-0.15m**	**DCP02_0.0-0.15m**	**DCP03_0.0-0.15m**	**DCP04_0.0-0.15m**	**DCP05_0.0-0.15m**
			Sampling date / time	12-Aug-2021 00:00	12-Aug-2021 00:00	12-Aug-2021 00:00	12-Aug-2021 00:00	12-Aug-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2129952-003**	**ES2129952-004**	**ES2129952-005**	**ES2129952-006**	**ES2129952-007**
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	**23.5**	**55.0**	**28.1**	**24.9**	**83.4**
EG005(ED093)T: Total Metals by ICP-AES								
Barium	7440-39-3	10	mg/kg	<10	----	----	<10	----
Beryllium	7440-41-7	1	mg/kg	<1	----	----	<1	----
Cobalt	7440-48-4	2	mg/kg	<2	----	----	<2	----
Iron	7439-89-6	50	mg/kg	**1660**	----	----	**3590**	----
Manganese	7439-96-5	5	mg/kg	**19**	----	----	**87**	----
Silver	7440-22-4	2	mg/kg	<2	----	----	<2	----
Arsenic	7440-38-2	5	mg/kg	<5	**12**	<5	<5	**35**
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	**2**	**6**	**2**	**6**	**21**
Copper	7440-50-8	5	mg/kg	<5	<5	<5	<5	**14**
Lead	7439-92-1	5	mg/kg	<5	<5	<5	<5	<5
Nickel	7440-02-0	2	mg/kg	<2	**4**	<2	<2	**13**
Zinc	7440-66-6	5	mg/kg	<5	**9**	<5	<5	**31**
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EG048: Hexavalent Chromium (Alkaline Digest)								
Hexavalent Chromium	18540-29-9	0.5	mg/kg	<0.5	----	----	<0.5	----
EK026SF: Total CN by Segmented Flow Analyser								
Total Cyanide	57-12-5	1	mg/kg	<1	----	----	<1	----
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	----	----	<0.1	----
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.12
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.12
beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.12
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.12
delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.12
Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.12
Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.12
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.12
^ **Total Chlordane (sum)**	----	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.12

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**DCP01_0.0-0.15m**	**DCP02_0.0-0.15m**	**DCP03_0.0-0.15m**	**DCP04_0.0-0.15m**	**DCP05_0.0-0.15m**
			Sampling date / time	12-Aug-2021 00:00	12-Aug-2021 00:00	12-Aug-2021 00:00	12-Aug-2021 00:00	12-Aug-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2129952-003**	**ES2129952-004**	**ES2129952-005**	**ES2129952-006**	**ES2129952-007**
				Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued								
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.12
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.12
Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.12
4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.12
Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.12
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.12
^ **Endosulfan (sum)**	115-29-7	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.07
4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.12
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.12
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.12
4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.5
Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.12
Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.5
^ **Sum of Aldrin + Dieldrin**	309-00-2/60-57-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
^ **Sum of DDD + DDE + DDT**	72-54-8/72-55-9/50-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.05	mg/kg	----	<0.05	<0.05	----	<0.12
Demeton-S-methyl	919-86-8	0.05	mg/kg	----	<0.05	<0.05	----	<0.12
Monocrotophos	6923-22-4	0.2	mg/kg	----	<0.2	<0.2	----	<0.5
Dimethoate	60-51-5	0.05	mg/kg	----	<0.05	<0.05	----	<0.12
Diazinon	333-41-5	0.05	mg/kg	----	<0.05	<0.05	----	<0.12
Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	----	<0.05	<0.05	----	<0.12
Parathion-methyl	298-00-0	0.2	mg/kg	----	<0.2	<0.2	----	<0.5
Malathion	121-75-5	0.05	mg/kg	----	<0.05	<0.05	----	<0.12
Fenthion	55-38-9	0.05	mg/kg	----	<0.05	<0.05	----	<0.12
Chlorpyrifos	2921-88-2	0.05	mg/kg	----	<0.05	<0.05	----	<0.12
Parathion	56-38-2	0.2	mg/kg	----	<0.2	<0.2	----	<0.5
Pirimphos-ethyl	23505-41-1	0.05	mg/kg	----	<0.05	<0.05	----	<0.12
Chlorfenvinphos	470-90-6	0.05	mg/kg	----	<0.05	<0.05	----	<0.12
Bromophos-ethyl	4824-78-6	0.05	mg/kg	----	<0.05	<0.05	----	<0.12
Fenamiphos	22224-92-6	0.05	mg/kg	----	<0.05	<0.05	----	<0.12
Prothiofos	34643-46-4	0.05	mg/kg	----	<0.05	<0.05	----	<0.12
Ethion	563-12-2	0.05	mg/kg	----	<0.05	<0.05	----	<0.12
Carbophenothion	786-19-6	0.05	mg/kg	----	<0.05	<0.05	----	<0.12

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**DCP01_0.0-0.15m**	**DCP02_0.0-0.15m**	**DCP03_0.0-0.15m**	**DCP04_0.0-0.15m**	**DCP05_0.0-0.15m**
			Sampling date / time	12-Aug-2021 00:00	12-Aug-2021 00:00	12-Aug-2021 00:00	12-Aug-2021 00:00	12-Aug-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2129952-003**	**ES2129952-004**	**ES2129952-005**	**ES2129952-006**	**ES2129952-007**
				Result	Result	Result	Result	Result
EP068B: Organophosphorus Pesticides (OP) - Continued								
Azinphos Methyl	86-50-0	0.05	mg/kg	----	<0.05	<0.05	----	<0.12
EP075(SIM)A: Phenolic Compounds								
Phenol	108-95-2	0.5	mg/kg	<0.5	----	----	<0.5	----
2-Chlorophenol	95-57-8	0.5	mg/kg	<0.5	----	----	<0.5	----
2-Methylphenol	95-48-7	0.5	mg/kg	<0.5	----	----	<0.5	----
3- & 4-Methylphenol	1319-77-3	1	mg/kg	<1	----	----	<1	----
2-Nitrophenol	88-75-5	0.5	mg/kg	<0.5	----	----	<0.5	----
2.4-Dimethylphenol	105-67-9	0.5	mg/kg	<0.5	----	----	<0.5	----
2.4-Dichlorophenol	120-83-2	0.5	mg/kg	<0.5	----	----	<0.5	----
2.6-Dichlorophenol	87-65-0	0.5	mg/kg	<0.5	----	----	<0.5	----
4-Chloro-3-methylphenol	59-50-7	0.5	mg/kg	<0.5	----	----	<0.5	----
2.4.6-Trichlorophenol	88-06-2	0.5	mg/kg	<0.5	----	----	<0.5	----
2.4.5-Trichlorophenol	95-95-4	0.5	mg/kg	<0.5	----	----	<0.5	----
Pentachlorophenol	87-86-5	2	mg/kg	<2	----	----	<2	----
^ **Sum of Phenols**	----	0.5	mg/kg	<0.5	----	----	<0.5	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	----	----	<0.5	----
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	----	----	<0.5	----
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	----	----	<0.5	----
Fluorene	86-73-7	0.5	mg/kg	<0.5	----	----	<0.5	----
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	----	----	<0.5	----
Anthracene	120-12-7	0.5	mg/kg	<0.5	----	----	<0.5	----
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	----	----	<0.5	----
Pyrene	129-00-0	0.5	mg/kg	<0.5	----	----	<0.5	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	----	----	<0.5	----
Chrysene	218-01-9	0.5	mg/kg	<0.5	----	----	<0.5	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	----	----	<0.5	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	----	----	<0.5	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	----	----	<0.5	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	----	----	<0.5	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	----	----	<0.5	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	----	----	<0.5	----
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg	<0.5	----	----	<0.5	----
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	mg/kg	<0.5	----	----	<0.5	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Sample ID	**DCP01_0.0-0.15m**	**DCP02_0.0-0.15m**	**DCP03_0.0-0.15m**	**DCP04_0.0-0.15m**	**DCP05_0.0-0.15m**
			Sampling date / time	12-Aug-2021 00:00	12-Aug-2021 00:00	12-Aug-2021 00:00	12-Aug-2021 00:00	12-Aug-2021 00:00
Compound	CAS Number	LOR	Unit	**ES2129952-003**	**ES2129952-004**	**ES2129952-005**	**ES2129952-006**	**ES2129952-007**
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
^ **Benzo(a)pyrene TEQ (half LOR)**	----	0.5	mg/kg	**0.6**	----	----	**0.6**	----
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg	**1.2**	----	----	**1.2**	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	----	----	<10	----
C10 - C14 Fraction	----	50	mg/kg	<50	----	----	<50	----
C15 - C28 Fraction	----	100	mg/kg	<100	----	----	<100	----
C29 - C36 Fraction	----	100	mg/kg	<100	----	----	<100	----
^ **C10 - C36 Fraction (sum)**	----	50	mg/kg	<50	----	----	<50	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	----	----	<10	----
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	10	mg/kg	<10	----	----	<10	----
>C10 - C16 Fraction	----	50	mg/kg	<50	----	----	<50	----
>C16 - C34 Fraction	----	100	mg/kg	<100	----	----	<100	----
>C34 - C40 Fraction	----	100	mg/kg	<100	----	----	<100	----
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg	<50	----	----	<50	----
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg	<50	----	----	<50	----
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	----	----	<0.2	----
Toluene	108-88-3	0.5	mg/kg	<0.5	----	----	<0.5	----
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	----	----	<0.5	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	----	----	<0.5	----
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	----	----	<0.5	----
^ **Sum of BTEX**	----	0.2	mg/kg	<0.2	----	----	<0.2	----
^ **Total Xylenes**	----	0.5	mg/kg	<0.5	----	----	<0.5	----
Naphthalene	91-20-3	1	mg/kg	<1	----	----	<1	----
EP066S: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	0.1	%	**97.1**	----	----	**87.3**	----
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	**117**	**116**	**86.7**	**102**	**123**
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	**85.8**	**99.1**	**74.3**	**91.4**	**113**
EP075(SIM)S: Phenolic Compound Surrogates								

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL)**			*Sample ID*	**DCP01_0.0-0.15m**	**DCP02_0.0-0.15m**	**DCP03_0.0-0.15m**	**DCP04_0.0-0.15m**	**DCP05_0.0-0.15m**
			Sampling date / time	12-Aug-2021 00:00	12-Aug-2021 00:00	12-Aug-2021 00:00	12-Aug-2021 00:00	12-Aug-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2129952-003**	**ES2129952-004**	**ES2129952-005**	**ES2129952-006**	**ES2129952-007**
				Result	Result	Result	Result	Result
EP075(SIM)S: Phenolic Compound Surrogates - Continued								
Phenol-d6	13127-88-3	0.5	%	**90.2**	----	----	**82.4**	----
2-Chlorophenol-D4	93951-73-6	0.5	%	**93.7**	----	----	**85.4**	----
2.4.6-Tribromophenol	118-79-6	0.5	%	**67.1**	----	----	**61.1**	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	**101**	----	----	**94.8**	----
Anthracene-d10	1719-06-8	0.5	%	**97.6**	----	----	**92.9**	----
4-Terphenyl-d14	1718-51-0	0.5	%	**96.1**	----	----	**89.9**	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	**83.3**	----	----	**83.7**	----
Toluene-D8	2037-26-5	0.2	%	**98.5**	----	----	**97.4**	----
4-Bromofluorobenzene	460-00-4	0.2	%	**86.5**	----	----	**85.1**	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Sample ID	**DCP06_0.0-0.15m**	**DCP07_0.0-0.15m**	**DCP08_0.0-0.15m**	**DCP09_0.0-0.15m**	**DCP10_0.0-0.15m**
			Sampling date / time	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00
Compound	CAS Number	LOR	Unit	**ES2129952-008**	**ES2129952-009**	**ES2129952-010**	**ES2129952-011**	**ES2129952-012**
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	**82.2**	**26.8**	**29.8**	**36.7**	**80.5**
EG005(ED093)T: Total Metals by ICP-AES								
Barium	7440-39-3	10	mg/kg	----	----	<10	----	----
Beryllium	7440-41-7	1	mg/kg	----	----	<1	----	----
Cobalt	7440-48-4	2	mg/kg	----	----	<2	----	----
Iron	7439-89-6	50	mg/kg	----	----	**2540**	----	----
Manganese	7439-96-5	5	mg/kg	----	----	**69**	----	----
Silver	7440-22-4	2	mg/kg	----	----	<2	----	----
Arsenic	7440-38-2	5	mg/kg	**31**	<5	<5	<5	**56**
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	**22**	<2	**4**	**3**	**28**
Copper	7440-50-8	5	mg/kg	**14**	<5	<5	<5	**20**
Lead	7439-92-1	5	mg/kg	<5	<5	<5	<5	**6**
Nickel	7440-02-0	2	mg/kg	**13**	<2	<2	<2	**17**
Zinc	7440-66-6	5	mg/kg	**32**	<5	<5	<5	**42**
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EG048: Hexavalent Chromium (Alkaline Digest)								
Hexavalent Chromium	18540-29-9	0.5	mg/kg	----	----	<0.5	----	----
EK026SF: Total CN by Segmented Flow Analyser								
Total Cyanide	57-12-5	1	mg/kg	----	----	<1	----	----
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	----	----	<0.1	----	----
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.12	<0.05	<0.05	<0.05	<0.12
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.12	<0.05	<0.05	<0.05	<0.12
beta-BHC	319-85-7	0.05	mg/kg	<0.12	<0.05	<0.05	<0.05	<0.12
gamma-BHC	58-89-9	0.05	mg/kg	<0.12	<0.05	<0.05	<0.05	<0.12
delta-BHC	319-86-8	0.05	mg/kg	<0.12	<0.05	<0.05	<0.05	<0.12
Heptachlor	76-44-8	0.05	mg/kg	<0.12	<0.05	<0.05	<0.05	<0.12
Aldrin	309-00-2	0.05	mg/kg	<0.12	<0.05	<0.05	<0.05	<0.12
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.12	<0.05	<0.05	<0.05	<0.12
^ **Total Chlordane (sum)**	----	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.12	<0.05	<0.05	<0.05	<0.12

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**DCP06_0.0-0.15m**	**DCP07_0.0-0.15m**	**DCP08_0.0-0.15m**	**DCP09_0.0-0.15m**	**DCP10_0.0-0.15m**
			Sampling date / time	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2129952-008**	**ES2129952-009**	**ES2129952-010**	**ES2129952-011**	**ES2129952-012**
				Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued								
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.12	<0.05	<0.05	<0.05	<0.12
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.12	<0.05	<0.05	<0.05	<0.12
Dieldrin	60-57-1	0.05	mg/kg	<0.12	<0.05	<0.05	<0.05	<0.12
4.4`-DDE	72-55-9	0.05	mg/kg	<0.12	<0.05	<0.05	<0.05	<0.12
Endrin	72-20-8	0.05	mg/kg	<0.12	<0.05	<0.05	<0.05	<0.12
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.12	<0.05	<0.05	<0.05	<0.12
^ **Endosulfan (sum)**	115-29-7	0.05	mg/kg	<0.07	<0.05	<0.05	<0.05	<0.07
4.4`-DDD	72-54-8	0.05	mg/kg	<0.12	<0.05	<0.05	<0.05	<0.12
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.12	<0.05	<0.05	<0.05	<0.12
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.12	<0.05	<0.05	<0.05	<0.12
4.4`-DDT	50-29-3	0.2	mg/kg	<0.5	<0.2	<0.2	<0.2	<0.5
Endrin ketone	53494-70-5	0.05	mg/kg	<0.12	<0.05	<0.05	<0.05	<0.12
Methoxychlor	72-43-5	0.2	mg/kg	<0.5	<0.2	<0.2	<0.2	<0.5
^ **Sum of Aldrin + Dieldrin**	309-00-2/60-57-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
^ **Sum of DDD + DDE + DDT**	72-54-8/72-55-9/50-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.05	mg/kg	<0.12	<0.05	----	<0.05	<0.12
Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.12	<0.05	----	<0.05	<0.12
Monocrotophos	6923-22-4	0.2	mg/kg	<0.5	<0.2	----	<0.2	<0.5
Dimethoate	60-51-5	0.05	mg/kg	<0.12	<0.05	----	<0.05	<0.12
Diazinon	333-41-5	0.05	mg/kg	<0.12	<0.05	----	<0.05	<0.12
Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.12	<0.05	----	<0.05	<0.12
Parathion-methyl	298-00-0	0.2	mg/kg	<0.5	<0.2	----	<0.2	<0.5
Malathion	121-75-5	0.05	mg/kg	<0.12	<0.05	----	<0.05	<0.12
Fenthion	55-38-9	0.05	mg/kg	<0.12	<0.05	----	<0.05	<0.12
Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.12	<0.05	----	<0.05	<0.12
Parathion	56-38-2	0.2	mg/kg	<0.5	<0.2	----	<0.2	<0.5
Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.12	<0.05	----	<0.05	<0.12
Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.12	<0.05	----	<0.05	<0.12
Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.12	<0.05	----	<0.05	<0.12
Fenamiphos	22224-92-6	0.05	mg/kg	<0.12	<0.05	----	<0.05	<0.12
Prothiofos	34643-46-4	0.05	mg/kg	<0.12	<0.05	----	<0.05	<0.12
Ethion	563-12-2	0.05	mg/kg	<0.12	<0.05	----	<0.05	<0.12
Carbophenothion	786-19-6	0.05	mg/kg	<0.12	<0.05	----	<0.05	<0.12

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Sample ID	**DCP06_0.0-0.15m**	**DCP07_0.0-0.15m**	**DCP08_0.0-0.15m**	**DCP09_0.0-0.15m**	**DCP10_0.0-0.15m**
			Sampling date / time	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2129952-008**	**ES2129952-009**	**ES2129952-010**	**ES2129952-011**	**ES2129952-012**
				Result	Result	Result	Result	Result
EP068B: Organophosphorus Pesticides (OP) - Continued								
Azinphos Methyl	86-50-0	0.05	mg/kg	<0.12	<0.05	----	<0.05	<0.12
EP075(SIM)A: Phenolic Compounds								
Phenol	108-95-2	0.5	mg/kg	----	----	<0.5	----	----
2-Chlorophenol	95-57-8	0.5	mg/kg	----	----	<0.5	----	----
2-Methylphenol	95-48-7	0.5	mg/kg	----	----	<0.5	----	----
3- & 4-Methylphenol	1319-77-3	1	mg/kg	----	----	<1	----	----
2-Nitrophenol	88-75-5	0.5	mg/kg	----	----	<0.5	----	----
2.4-Dimethylphenol	105-67-9	0.5	mg/kg	----	----	<0.5	----	----
2.4-Dichlorophenol	120-83-2	0.5	mg/kg	----	----	<0.5	----	----
2.6-Dichlorophenol	87-65-0	0.5	mg/kg	----	----	<0.5	----	----
4-Chloro-3-methylphenol	59-50-7	0.5	mg/kg	----	----	<0.5	----	----
2.4.6-Trichlorophenol	88-06-2	0.5	mg/kg	----	----	<0.5	----	----
2.4.5-Trichlorophenol	95-95-4	0.5	mg/kg	----	----	<0.5	----	----
Pentachlorophenol	87-86-5	2	mg/kg	----	----	<2	----	----
^ **Sum of Phenols**	----	0.5	mg/kg	----	----	<0.5	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	----	----	<0.5	----	----
Acenaphthylene	208-96-8	0.5	mg/kg	----	----	<0.5	----	----
Acenaphthene	83-32-9	0.5	mg/kg	----	----	<0.5	----	----
Fluorene	86-73-7	0.5	mg/kg	----	----	<0.5	----	----
Phenanthrene	85-01-8	0.5	mg/kg	----	----	<0.5	----	----
Anthracene	120-12-7	0.5	mg/kg	----	----	<0.5	----	----
Fluoranthene	206-44-0	0.5	mg/kg	----	----	<0.5	----	----
Pyrene	129-00-0	0.5	mg/kg	----	----	<0.5	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	----	----	<0.5	----	----
Chrysene	218-01-9	0.5	mg/kg	----	----	<0.5	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	----	----	<0.5	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	----	----	<0.5	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	----	----	<0.5	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	----	----	<0.5	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	----	----	<0.5	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	----	----	<0.5	----	----
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg	----	----	<0.5	----	----
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	mg/kg	----	----	<0.5	----	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**DCP06_0.0-0.15m**	**DCP07_0.0-0.15m**	**DCP08_0.0-0.15m**	**DCP09_0.0-0.15m**	**DCP10_0.0-0.15m**
			Sampling date / time	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2129952-008**	**ES2129952-009**	**ES2129952-010**	**ES2129952-011**	**ES2129952-012**
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
^ **Benzo(a)pyrene TEQ (half LOR)**	----	0.5	mg/kg	----	----	**0.6**	----	----
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg	----	----	**1.2**	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	----	----	<10	----	----
C10 - C14 Fraction	----	50	mg/kg	----	----	<50	----	----
C15 - C28 Fraction	----	100	mg/kg	----	----	<100	----	----
C29 - C36 Fraction	----	100	mg/kg	----	----	<100	----	----
^ **C10 - C36 Fraction (sum)**	----	50	mg/kg	----	----	<50	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	----	----	<10	----	----
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	10	mg/kg	----	----	<10	----	----
>C10 - C16 Fraction	----	50	mg/kg	----	----	<50	----	----
>C16 - C34 Fraction	----	100	mg/kg	----	----	<100	----	----
>C34 - C40 Fraction	----	100	mg/kg	----	----	<100	----	----
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg	----	----	<50	----	----
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg	----	----	<50	----	----
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	----	----	<0.2	----	----
Toluene	108-88-3	0.5	mg/kg	----	----	<0.5	----	----
Ethylbenzene	100-41-4	0.5	mg/kg	----	----	<0.5	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	----	----	<0.5	----	----
ortho-Xylene	95-47-6	0.5	mg/kg	----	----	<0.5	----	----
^ **Sum of BTEX**	----	0.2	mg/kg	----	----	<0.2	----	----
^ **Total Xylenes**	----	0.5	mg/kg	----	----	<0.5	----	----
Naphthalene	91-20-3	1	mg/kg	----	----	<1	----	----
EP066S: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	0.1	%	----	----	**99.7**	----	----
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	**89.8**	**118**	**121**	**79.5**	**83.9**
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	**95.7**	**105**	**110**	**86.4**	**84.7**
EP075(SIM)S: Phenolic Compound Surrogates								

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL)**			*Sample ID*	**DCP06_0.0-0.15m**	**DCP07_0.0-0.15m**	**DCP08_0.0-0.15m**	**DCP09_0.0-0.15m**	**DCP10_0.0-0.15m**
			Sampling date / time	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2129952-008**	**ES2129952-009**	**ES2129952-010**	**ES2129952-011**	**ES2129952-012**
				Result	Result	Result	Result	Result
EP075(SIM)S: Phenolic Compound Surrogates - Continued								
Phenol-d6	13127-88-3	0.5	%	----	----	**81.7**	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%	----	----	**86.6**	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%	----	----	**59.6**	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	----	----	**95.4**	----	----
Anthracene-d10	1719-06-8	0.5	%	----	----	**92.5**	----	----
4-Terphenyl-d14	1718-51-0	0.5	%	----	----	**90.0**	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	----	----	**87.7**	----	----
Toluene-D8	2037-26-5	0.2	%	----	----	**102**	----	----
4-Bromofluorobenzene	460-00-4	0.2	%	----	----	**89.1**	----	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**DCP11_0.0-0.15m1**	**DCP12_0.0-0.15m**	**DCP13_0.0-0.15m**	**DCP14_0.0-0.15m**	**DCP15_0.0-0.15m**
			Sampling date / time	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2129952-013**	**ES2129952-014**	**ES2129952-015**	**ES2129952-016**	**ES2129952-017**
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	**80.7**	**63.7**	**27.4**	**76.8**	**22.6**
EG005(ED093)T: Total Metals by ICP-AES								
Barium	7440-39-3	10	mg/kg	----	**20**	----	**70**	----
Beryllium	7440-41-7	1	mg/kg	----	<1	----	<1	----
Cobalt	7440-48-4	2	mg/kg	----	**6**	----	**3**	----
Iron	7439-89-6	50	mg/kg	----	**16100**	----	**12200**	----
Manganese	7439-96-5	5	mg/kg	----	**72**	----	**223**	----
Silver	7440-22-4	2	mg/kg	----	<2	----	<2	----
Arsenic	7440-38-2	5	mg/kg	**20**	**8**	**13**	**44**	**7**
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	**17**	**16**	**4**	**13**	**4**
Copper	7440-50-8	5	mg/kg	**11**	**13**	<5	**8**	<5
Lead	7439-92-1	5	mg/kg	<5	<5	<5	<5	<5
Nickel	7440-02-0	2	mg/kg	**10**	**14**	<2	**8**	<2
Zinc	7440-66-6	5	mg/kg	**24**	**22**	<5	**19**	<5
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EG048: Hexavalent Chromium (Alkaline Digest)								
Hexavalent Chromium	18540-29-9	0.5	mg/kg	----	<0.8	----	<1.0	----
EK026SF: Total CN by Segmented Flow Analyser								
Total Cyanide	57-12-5	1	mg/kg	----	<2	----	<2	----
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	----	<0.1	----	<0.1	----
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.12	<0.05	<0.05	<0.06	<0.05
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.12	<0.05	<0.05	<0.06	<0.05
beta-BHC	319-85-7	0.05	mg/kg	<0.12	<0.05	<0.05	<0.06	<0.05
gamma-BHC	58-89-9	0.05	mg/kg	<0.12	<0.05	<0.05	<0.06	<0.05
delta-BHC	319-86-8	0.05	mg/kg	<0.12	<0.05	<0.05	<0.06	<0.05
Heptachlor	76-44-8	0.05	mg/kg	<0.12	<0.05	<0.05	<0.06	<0.05
Aldrin	309-00-2	0.05	mg/kg	<0.12	<0.05	<0.05	<0.06	<0.05
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.12	<0.05	<0.05	<0.06	<0.05
^ **Total Chlordane (sum)**	----	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.12	<0.05	<0.05	<0.06	<0.05

Analytical Results

Sub-Matrix: **SOIL**
(Matrix: **SOIL)**

			Sample ID	**DCP11_0.0-0.15m1**	**DCP12_0.0-0.15m**	**DCP13_0.0-0.15m**	**DCP14_0.0-0.15m**	**DCP15_0.0-0.15m**
			Sampling date / time	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2129952-013**	**ES2129952-014**	**ES2129952-015**	**ES2129952-016**	**ES2129952-017**
				Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued								
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.12	<0.05	<0.05	<0.06	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.12	<0.05	<0.05	<0.06	<0.05
Dieldrin	60-57-1	0.05	mg/kg	<0.12	<0.05	<0.05	<0.06	<0.05
4.4`-DDE	72-55-9	0.05	mg/kg	<0.12	<0.05	<0.05	<0.06	<0.05
Endrin	72-20-8	0.05	mg/kg	<0.12	<0.05	<0.05	<0.06	<0.05
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.12	<0.05	<0.05	<0.06	<0.05
^ **Endosulfan (sum)**	115-29-7	0.05	mg/kg	<0.07	<0.05	<0.05	<0.05	<0.05
4.4`-DDD	72-54-8	0.05	mg/kg	<0.12	<0.05	<0.05	<0.06	<0.05
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.12	<0.05	<0.05	<0.06	<0.05
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.12	<0.05	<0.05	<0.06	<0.05
4.4`-DDT	50-29-3	0.2	mg/kg	<0.5	<0.2	<0.2	<0.3	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg	<0.12	<0.05	<0.05	<0.06	<0.05
Methoxychlor	72-43-5	0.2	mg/kg	<0.5	<0.2	<0.2	<0.3	<0.2
^ **Sum of Aldrin + Dieldrin**	309-00-2/60-57-1	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
^ **Sum of DDD + DDE + DDT**	72-54-8/72-55-9/50-2	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.05	mg/kg	<0.12	----	<0.05	----	<0.05
Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.12	----	<0.05	----	<0.05
Monocrotophos	6923-22-4	0.2	mg/kg	<0.5	----	<0.2	----	<0.2
Dimethoate	60-51-5	0.05	mg/kg	<0.12	----	<0.05	----	<0.05
Diazinon	333-41-5	0.05	mg/kg	<0.12	----	<0.05	----	<0.05
Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.12	----	<0.05	----	<0.05
Parathion-methyl	298-00-0	0.2	mg/kg	<0.5	----	<0.2	----	<0.2
Malathion	121-75-5	0.05	mg/kg	<0.12	----	<0.05	----	<0.05
Fenthion	55-38-9	0.05	mg/kg	<0.12	----	<0.05	----	<0.05
Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.12	----	<0.05	----	<0.05
Parathion	56-38-2	0.2	mg/kg	<0.5	----	<0.2	----	<0.2
Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.12	----	<0.05	----	<0.05
Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.12	----	<0.05	----	<0.05
Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.12	----	<0.05	----	<0.05
Fenamiphos	22224-92-6	0.05	mg/kg	<0.12	----	<0.05	----	<0.05
Prothiofos	34643-46-4	0.05	mg/kg	<0.12	----	<0.05	----	<0.05
Ethion	563-12-2	0.05	mg/kg	<0.12	----	<0.05	----	<0.05
Carbophenothion	786-19-6	0.05	mg/kg	<0.12	----	<0.05	----	<0.05

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**DCP11_0.0-0.15m1**	**DCP12_0.0-0.15m**	**DCP13_0.0-0.15m**	**DCP14_0.0-0.15m**	**DCP15_0.0-0.15m**
			Sampling date / time	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2129952-013**	**ES2129952-014**	**ES2129952-015**	**ES2129952-016**	**ES2129952-017**
				Result	Result	Result	Result	Result
EP068B: Organophosphorus Pesticides (OP) - Continued								
Azinphos Methyl	86-50-0	0.05	mg/kg	<0.12	----	<0.05	----	<0.05
EP075(SIM)A: Phenolic Compounds								
Phenol	108-95-2	0.5	mg/kg	----	<0.8	----	<1.0	----
2-Chlorophenol	95-57-8	0.5	mg/kg	----	<0.8	----	<1.0	----
2-Methylphenol	95-48-7	0.5	mg/kg	----	<0.8	----	<1.0	----
3- & 4-Methylphenol	1319-77-3	1	mg/kg	----	<2	----	<2	----
2-Nitrophenol	88-75-5	0.5	mg/kg	----	<0.8	----	<1.0	----
2.4-Dimethylphenol	105-67-9	0.5	mg/kg	----	<0.8	----	<1.0	----
2.4-Dichlorophenol	120-83-2	0.5	mg/kg	----	<0.8	----	<1.0	----
2.6-Dichlorophenol	87-65-0	0.5	mg/kg	----	<0.8	----	<1.0	----
4-Chloro-3-methylphenol	59-50-7	0.5	mg/kg	----	<0.8	----	<1.0	----
2.4.6-Trichlorophenol	88-06-2	0.5	mg/kg	----	<0.8	----	<1.0	----
2.4.5-Trichlorophenol	95-95-4	0.5	mg/kg	----	<0.8	----	<1.0	----
Pentachlorophenol	87-86-5	2	mg/kg	----	<2	----	<2	----
^ **Sum of Phenols**	----	0.5	mg/kg	----	<0.5	----	<0.5	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	----	<0.8	----	<1.0	----
Acenaphthylene	208-96-8	0.5	mg/kg	----	<0.8	----	<1.0	----
Acenaphthene	83-32-9	0.5	mg/kg	----	<0.8	----	<1.0	----
Fluorene	86-73-7	0.5	mg/kg	----	<0.8	----	<1.0	----
Phenanthrene	85-01-8	0.5	mg/kg	----	<0.8	----	<1.0	----
Anthracene	120-12-7	0.5	mg/kg	----	<0.8	----	<1.0	----
Fluoranthene	206-44-0	0.5	mg/kg	----	<0.8	----	<1.0	----
Pyrene	129-00-0	0.5	mg/kg	----	<0.8	----	<1.0	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	----	<0.8	----	<1.0	----
Chrysene	218-01-9	0.5	mg/kg	----	<0.8	----	<1.0	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	----	<0.8	----	<1.0	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	----	<0.8	----	<1.0	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	----	<0.8	----	<1.0	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	----	<0.8	----	<1.0	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	----	<0.8	----	<1.0	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	----	<0.8	----	<1.0	----
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg	----	<0.5	----	<0.5	----
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	mg/kg	----	<0.5	----	<0.5	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**DCP11_0.0-0.15m1**	**DCP12_0.0-0.15m**	**DCP13_0.0-0.15m**	**DCP14_0.0-0.15m**	**DCP15_0.0-0.15m**
			Sampling date / time	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2129952-013**	**ES2129952-014**	**ES2129952-015**	**ES2129952-016**	**ES2129952-017**
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
^ **Benzo(a)pyrene TEQ (half LOR)**	----	0.5	mg/kg	----	**1.0**	----	**1.2**	----
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg	----	**1.9**	----	**2.4**	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	----	<10	----	<10	----
C10 - C14 Fraction	----	50	mg/kg	----	<50	----	<60	----
C15 - C28 Fraction	----	100	mg/kg	----	<100	----	<110	----
C29 - C36 Fraction	----	100	mg/kg	----	<100	----	<110	----
^ **C10 - C36 Fraction (sum)**	----	50	mg/kg	----	<50	----	<60	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	----	<10	----	<10	----
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	10	mg/kg	----	<10	----	<10	----
>C10 - C16 Fraction	----	50	mg/kg	----	<50	----	<60	----
>C16 - C34 Fraction	----	100	mg/kg	----	<100	----	<100	----
>C34 - C40 Fraction	----	100	mg/kg	----	<100	----	<100	----
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg	----	<50	----	<60	----
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg	----	<50	----	<60	----
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	----	<0.2	----	<0.2	----
Toluene	108-88-3	0.5	mg/kg	----	<0.5	----	<0.5	----
Ethylbenzene	100-41-4	0.5	mg/kg	----	<0.5	----	<0.5	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	----	<0.5	----	<0.5	----
ortho-Xylene	95-47-6	0.5	mg/kg	----	<0.5	----	<0.5	----
^ **Sum of BTEX**	----	0.2	mg/kg	----	<0.2	----	<0.2	----
^ **Total Xylenes**	----	0.5	mg/kg	----	<0.5	----	<0.5	----
Naphthalene	91-20-3	1	mg/kg	----	<1	----	<1	----
EP066S: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	0.1	%	----	**87.2**	----	**83.1**	----
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	**130**	**105**	**96.5**	**98.1**	**90.2**
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	**108**	**100**	**89.2**	**103**	**79.9**
EP075(SIM)S: Phenolic Compound Surrogates								

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL)**			*Sample ID*	**DCP11_0.0-0.15m1**	**DCP12_0.0-0.15m**	**DCP13_0.0-0.15m**	**DCP14_0.0-0.15m**	**DCP15_0.0-0.15m**
			Sampling date / time	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00	11-Aug-2021 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES2129952-013**	**ES2129952-014**	**ES2129952-015**	**ES2129952-016**	**ES2129952-017**
				Result	Result	Result	Result	Result
EP075(SIM)S: Phenolic Compound Surrogates - Continued								
Phenol-d6	13127-88-3	0.5	%	----	**81.2**	----	**94.7**	----
2-Chlorophenol-D4	93951-73-6	0.5	%	----	**87.4**	----	**93.7**	----
2.4.6-Tribromophenol	118-79-6	0.5	%	----	**59.2**	----	**75.9**	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	----	**96.6**	----	**99.0**	----
Anthracene-d10	1719-06-8	0.5	%	----	**93.3**	----	**99.4**	----
4-Terphenyl-d14	1718-51-0	0.5	%	----	**91.2**	----	**95.4**	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	----	**80.6**	----	**75.8**	----
Toluene-D8	2037-26-5	0.2	%	----	**88.6**	----	**86.1**	----
4-Bromofluorobenzene	460-00-4	0.2	%	----	**77.8**	----	**78.7**	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Sample ID	**DCP16_0.0-0.15m**	**DCP17_0.0-0.15m**	----	----	----
			Sampling date / time	11-Aug-2021 00:00	11-Aug-2021 00:00	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**ES2129952-018**	**ES2129952-019**	--------	--------	--------
				Result	Result	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	**23.1**	**22.4**	----	----	----
EG005(ED093)T: Total Metals by ICP-AES								
Barium	7440-39-3	10	mg/kg	----	<10	----	----	----
Beryllium	7440-41-7	1	mg/kg	----	<1	----	----	----
Cobalt	7440-48-4	2	mg/kg	----	<2	----	----	----
Iron	7439-89-6	50	mg/kg	----	**1530**	----	----	----
Manganese	7439-96-5	5	mg/kg	----	**71**	----	----	----
Silver	7440-22-4	2	mg/kg	----	<2	----	----	----
Arsenic	7440-38-2	5	mg/kg	<5	**9**	----	----	----
Cadmium	7440-43-9	1	mg/kg	<1	<1	----	----	----
Chromium	7440-47-3	2	mg/kg	<2	**2**	----	----	----
Copper	7440-50-8	5	mg/kg	<5	<5	----	----	----
Lead	7439-92-1	5	mg/kg	<5	<5	----	----	----
Nickel	7440-02-0	2	mg/kg	<2	**2**	----	----	----
Zinc	7440-66-6	5	mg/kg	<5	<5	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	----	----	----
EG048: Hexavalent Chromium (Alkaline Digest)								
Hexavalent Chromium	18540-29-9	0.5	mg/kg	----	<0.5	----	----	----
EK026SF: Total CN by Segmented Flow Analyser								
Total Cyanide	57-12-5	1	mg/kg	----	<1	----	----	----
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	----	<0.1	----	----	----
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	----	----	----
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	----	----	----
beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	----	----	----
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	----	----	----
delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	----	----	----
Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	----	----	----
Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	----	----	----
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	----	----	----
^ **Total Chlordane (sum)**	----	0.05	mg/kg	<0.05	<0.05	----	----	----
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	----	----	----

Analytical Results

Sub-Matrix: **SOIL**
(Matrix: **SOIL**)

			Sample ID	**DCP16_0.0-0.15m**	**DCP17_0.0-0.15m**	**----**	**----**	**----**
			Sampling date / time	11-Aug-2021 00:00	11-Aug-2021 00:00	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**ES2129952-018**	**ES2129952-019**	--------	--------	--------
				Result	Result	----	----	----
EP068A: Organochlorine Pesticides (OC) - Continued								
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	----	----	----
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	----	----	----
Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	----	----	----
4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	----	----	----
Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	----	----	----
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	----	----	----
^ **Endosulfan (sum)**	115-29-7	0.05	mg/kg	<0.05	<0.05	----	----	----
4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	----	----	----
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	----	----	----
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	----	----	----
4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	----	----	----
Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	----	----	----
Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	----	----	----
^ **Sum of Aldrin + Dieldrin**	309-00-2/60-57-1	0.05	mg/kg	<0.05	<0.05	----	----	----
^ **Sum of DDD + DDE + DDT**	72-54-8/72-55-9/50-2	0.05	mg/kg	<0.05	<0.05	----	----	----
EP068B: Organophosphorus Pesticides (OP)								
Dichlorvos	62-73-7	0.05	mg/kg	<0.05	----	----	----	----
Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	----	----	----	----
Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	----	----	----	----
Dimethoate	60-51-5	0.05	mg/kg	<0.05	----	----	----	----
Diazinon	333-41-5	0.05	mg/kg	<0.05	----	----	----	----
Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	----	----	----	----
Parathion-methyl	298-00-0	0.2	mg/kg	<0.2	----	----	----	----
Malathion	121-75-5	0.05	mg/kg	<0.05	----	----	----	----
Fenthion	55-38-9	0.05	mg/kg	<0.05	----	----	----	----
Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	----	----	----	----
Parathion	56-38-2	0.2	mg/kg	<0.2	----	----	----	----
Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	----	----	----	----
Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	----	----	----	----
Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	----	----	----	----
Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	----	----	----	----
Prothiofos	34643-46-4	0.05	mg/kg	<0.05	----	----	----	----
Ethion	563-12-2	0.05	mg/kg	<0.05	----	----	----	----
Carbophenothion	786-19-6	0.05	mg/kg	<0.05	----	----	----	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**DCP16_0.0-0.15m**	**DCP17_0.0-0.15m**	----	----	----
			Sampling date / time	11-Aug-2021 00:00	11-Aug-2021 00:00	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**ES2129952-018**	**ES2129952-019**	--------	--------	--------
				Result	Result	----	----	----
EP068B: Organophosphorus Pesticides (OP) - Continued								
Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	----	----	----	----
EP075(SIM)A: Phenolic Compounds								
Phenol	108-95-2	0.5	mg/kg	----	<0.5	----	----	----
2-Chlorophenol	95-57-8	0.5	mg/kg	----	<0.5	----	----	----
2-Methylphenol	95-48-7	0.5	mg/kg	----	<0.5	----	----	----
3- & 4-Methylphenol	1319-77-3	1	mg/kg	----	<1	----	----	----
2-Nitrophenol	88-75-5	0.5	mg/kg	----	<0.5	----	----	----
2.4-Dimethylphenol	105-67-9	0.5	mg/kg	----	<0.5	----	----	----
2.4-Dichlorophenol	120-83-2	0.5	mg/kg	----	<0.5	----	----	----
2.6-Dichlorophenol	87-65-0	0.5	mg/kg	----	<0.5	----	----	----
4-Chloro-3-methylphenol	59-50-7	0.5	mg/kg	----	<0.5	----	----	----
2.4.6-Trichlorophenol	88-06-2	0.5	mg/kg	----	<0.5	----	----	----
2.4.5-Trichlorophenol	95-95-4	0.5	mg/kg	----	<0.5	----	----	----
Pentachlorophenol	87-86-5	2	mg/kg	----	<2	----	----	----
^ **Sum of Phenols**	----	0.5	mg/kg	----	<0.5	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	----	<0.5	----	----	----
Acenaphthylene	208-96-8	0.5	mg/kg	----	<0.5	----	----	----
Acenaphthene	83-32-9	0.5	mg/kg	----	<0.5	----	----	----
Fluorene	86-73-7	0.5	mg/kg	----	<0.5	----	----	----
Phenanthrene	85-01-8	0.5	mg/kg	----	<0.5	----	----	----
Anthracene	120-12-7	0.5	mg/kg	----	<0.5	----	----	----
Fluoranthene	206-44-0	0.5	mg/kg	----	<0.5	----	----	----
Pyrene	129-00-0	0.5	mg/kg	----	<0.5	----	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	----	<0.5	----	----	----
Chrysene	218-01-9	0.5	mg/kg	----	<0.5	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	----	<0.5	----	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	----	<0.5	----	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	----	<0.5	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	----	<0.5	----	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	----	<0.5	----	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	----	<0.5	----	----	----
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg	----	<0.5	----	----	----
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	mg/kg	----	<0.5	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	DCP16_0.0-0.15m	DCP17_0.0-0.15m	----	----	----
			Sampling date / time	11-Aug-2021 00:00	11-Aug-2021 00:00	----	----	----
Compound	CAS Number	LOR	Unit	ES2129952-018	ES2129952-019	--------	--------	--------
				Result	Result	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	----	0.6	----	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	----	1.2	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	----	<10	----	----	----
C10 - C14 Fraction	----	50	mg/kg	----	<50	----	----	----
C15 - C28 Fraction	----	100	mg/kg	----	<100	----	----	----
C29 - C36 Fraction	----	100	mg/kg	----	<100	----	----	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg	----	<50	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	----	<10	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	----	<10	----	----	----
>C10 - C16 Fraction	----	50	mg/kg	----	<50	----	----	----
>C16 - C34 Fraction	----	100	mg/kg	----	<100	----	----	----
>C34 - C40 Fraction	----	100	mg/kg	----	<100	----	----	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	----	<50	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	----	<50	----	----	----
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	----	<0.2	----	----	----
Toluene	108-88-3	0.5	mg/kg	----	<0.5	----	----	----
Ethylbenzene	100-41-4	0.5	mg/kg	----	<0.5	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	----	<0.5	----	----	----
ortho-Xylene	95-47-6	0.5	mg/kg	----	<0.5	----	----	----
^ Sum of BTEX	----	0.2	mg/kg	----	<0.2	----	----	----
^ Total Xylenes	----	0.5	mg/kg	----	<0.5	----	----	----
Naphthalene	91-20-3	1	mg/kg	----	<1	----	----	----
EP066S: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	0.1	%	----	78.8	----	----	----
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	84.6	81.9	----	----	----
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	92.0	90.8	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates								

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Sample ID	**DCP16_0.0-0.15m**	**DCP17_0.0-0.15m**	**----**	**----**	**----**
			Sampling date / time	11-Aug-2021 00:00	11-Aug-2021 00:00	----	----	----
Compound	CAS Number	LOR	Unit	**ES2129952-018**	**ES2129952-019**	**--------**	**--------**	**--------**
				Result	Result	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates - Continued								
Phenol-d6	13127-88-3	0.5	%	----	**88.1**	----	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%	----	**90.2**	----	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%	----	**62.5**	----	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	----	**100**	----	----	----
Anthracene-d10	1719-06-8	0.5	%	----	**96.0**	----	----	----
4-Terphenyl-d14	1718-51-0	0.5	%	----	**94.2**	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	----	**86.9**	----	----	----
Toluene-D8	2037-26-5	0.2	%	----	**97.6**	----	----	----
4-Bromofluorobenzene	460-00-4	0.2	%	----	**84.3**	----	----	----

Analytical Results

Sub-Matrix: **WATER**
(Matrix: **WATER)**

			Sample ID	**Rinsate 1**	**Rinsate 2**	**----**	**----**	**----**
			Sampling date / time	11-Aug-2021 00:00	12-Aug-2021 00:00	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**ES2129952-001**	**ES2129952-002**	**--------**	**--------**	**--------**
				Result	Result	----	----	----
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	----	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	----	----	----
Zinc	7440-66-6	0.005	mg/L	**0.092**	**0.659**	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	----	----	----

Surrogate Control Limits

Sub-Matrix: **SOIL**

Compound	*CAS Number*	*Recovery Limits (%)*	
		Low	***High***
EP066S: PCB Surrogate			
Decachlorobiphenyl	2051-24-3	39	149
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	49	147
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	35	143
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	63	123
2-Chlorophenol-D4	93951-73-6	66	122
2.4.6-Tribromophenol	118-79-6	40	138
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	70	122
Anthracene-d10	1719-06-8	66	128
4-Terphenyl-d14	1718-51-0	65	129
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	73	133
Toluene-D8	2037-26-5	74	132
4-Bromofluorobenzene	460-00-4	72	130

QUALITY CONTROL REPORT

Work Order	: **ES2129952**	Page	: 1 of 13
Client	: **FYFE PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: STUART TWISS	Contact	: Kieren Burns
Address	: LEVEL 1, 124 SOUTH TERRACE ADELAIDE SOUTH AUSTRALIA 5000	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61881625130
Project	: 80963-1	Date Samples Received	: 26-Aug-2021
Order number	: 11415	Date Analysis Commenced	: 27-Aug-2021
C-O-C number	: 80963-1_Coorong_COC	Issue Date	: 01-Sep-2021
Sampler	: SCT		
Site	:		
Quote number	: AD/060/21		
No. of samples received	: 19		
No. of samples analysed	: 19		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

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

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Alex Rossi	Organic Chemist	Sydney Organics, Smithfield, NSW
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Franco Lentini	LCMS Coordinator	Sydney Inorganics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW
Sanjeshni Jyoti	Senior Chemist Volatiles	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the 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**: SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EG005(ED093)T: Total Metals by ICP-AES (QC Lot: 3872317)									
ES2129952-003	DCP01_0.0-0.15m	EG005T: Beryllium	7440-41-7	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	<10	<10	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	2	3	0.0	No Limit
		EG005T: Cobalt	7440-48-4	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	<2	3	46.7	No Limit
		EG005T: Silver	7440-22-4	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Manganese	7439-96-5	5	mg/kg	19	29	43.8	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Iron	7439-89-6	50	mg/kg	1660	1760	6.0	0% - 20%
ES2129952-013	DCP11_0.0-0.15m1	EG005T: Beryllium	7440-41-7	1	mg/kg	<2	<2	0.0	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	70	70	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	17	17	0.0	No Limit
		EG005T: Cobalt	7440-48-4	2	mg/kg	3	3	0.0	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	10	11	0.0	No Limit
		EG005T: Silver	7440-22-4	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	20	19	6.4	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	11	11	0.0	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Manganese	7439-96-5	5	mg/kg	126	121	4.2	0% - 20%

Sub-Matrix: **SOIL**				*Laboratory Duplicate (DUP) Report*					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EG005(ED093)T: Total Metals by ICP-AES (QC Lot: 3872317) - continued									
ES2129952-013	DCP11_0.0-0.15m1	EG005T: Zinc	7440-66-6	5	mg/kg	24	25	4.7	No Limit
		EG005T: Iron	7439-89-6	50	mg/kg	13600	14300	4.8	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 3872323)									
ES2129952-005	DCP03_0.0-0.15m	EA055: Moisture Content	----	0.1	%	28.1	26.5	6.1	0% - 20%
ES2129952-016	DCP14_0.0-0.15m	EA055: Moisture Content	----	0.1	%	76.8	76.3	0.7	0% - 20%
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 3872316)									
ES2129952-003	DCP01_0.0-0.15m	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
ES2129952-013	DCP11_0.0-0.15m1	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EG048: Hexavalent Chromium (Alkaline Digest) (QC Lot: 3872243)									
ES2131210-001	Anonymous	EG048G: Hexavalent Chromium	18540-29-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
ES2131210-003	Anonymous	EG048G: Hexavalent Chromium	18540-29-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
EK026SF: Total CN by Segmented Flow Analyser (QC Lot: 3874132)									
ES2129952-003	DCP01_0.0-0.15m	EK026SF: Total Cyanide	57-12-5	1	mg/kg	<1	<1	0.0	No Limit
EP066: Polychlorinated Biphenyls (PCB) (QC Lot: 3870807)									
ES2129952-003	DCP01_0.0-0.15m	EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EP068A: Organochlorine Pesticides (OC) (QC Lot: 3870812)									
ES2129952-013	DCP11_0.0-0.15m1	EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.12	<0.12	0.0	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.12	<0.12	0.0	No Limit
		EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.12	<0.12	0.0	No Limit
		EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.12	<0.12	0.0	No Limit
		EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.12	<0.12	0.0	No Limit
		EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.12	<0.12	0.0	No Limit
		EP068: Aldrin	309-00-2	0.05	mg/kg	<0.12	<0.12	0.0	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.12	<0.12	0.0	No Limit
		EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.12	<0.12	0.0	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.12	<0.12	0.0	No Limit
		EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.12	<0.12	0.0	No Limit
		EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.12	<0.12	0.0	No Limit
		EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.12	<0.12	0.0	No Limit
		EP068: Endrin	72-20-8	0.05	mg/kg	<0.12	<0.12	0.0	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.12	<0.12	0.0	No Limit
		EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.12	<0.12	0.0	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.12	<0.12	0.0	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.12	<0.12	0.0	No Limit
		EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.12	<0.12	0.0	No Limit
		EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.5	<0.5	0.0	No Limit
		EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.5	<0.5	0.0	No Limit
ES2129952-003	DCP01_0.0-0.15m	EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP068A: Organochlorine Pesticides (OC) (QC Lot: 3870812) - continued									
ES2129952-003	DCP01_0.0-0.15m	EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
EP068B: Organophosphorus Pesticides (OP) (QC Lot: 3870812)									
ES2129952-013	DCP11_0.0-0.15m1	EP068: Dichlorvos	62-73-7	0.05	mg/kg	<0.12	<0.12	0.0	No Limit
		EP068: Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.12	<0.12	0.0	No Limit
		EP068: Dimethoate	60-51-5	0.05	mg/kg	<0.12	<0.12	0.0	No Limit
		EP068: Diazinon	333-41-5	0.05	mg/kg	<0.12	<0.12	0.0	No Limit
		EP068: Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.12	<0.12	0.0	No Limit
		EP068: Malathion	121-75-5	0.05	mg/kg	<0.12	<0.12	0.0	No Limit
		EP068: Fenthion	55-38-9	0.05	mg/kg	<0.12	<0.12	0.0	No Limit
		EP068: Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.12	<0.12	0.0	No Limit
		EP068: Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.12	<0.12	0.0	No Limit
		EP068: Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.12	<0.12	0.0	No Limit
		EP068: Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.12	<0.12	0.0	No Limit
		EP068: Fenamiphos	22224-92-6	0.05	mg/kg	<0.12	<0.12	0.0	No Limit
		EP068: Prothiofos	34643-46-4	0.05	mg/kg	<0.12	<0.12	0.0	No Limit
		EP068: Ethion	563-12-2	0.05	mg/kg	<0.12	<0.12	0.0	No Limit
		EP068: Carbophenothion	786-19-6	0.05	mg/kg	<0.12	<0.12	0.0	No Limit
		EP068: Azinphos Methyl	86-50-0	0.05	mg/kg	<0.12	<0.12	0.0	No Limit
		EP068: Monocrotophos	6923-22-4	0.2	mg/kg	<0.5	<0.5	0.0	No Limit
		EP068: Parathion-methyl	298-00-0	0.2	mg/kg	<0.5	<0.5	0.0	No Limit
		EP068: Parathion	56-38-2	0.2	mg/kg	<0.5	<0.5	0.0	No Limit
ES2129952-003	DCP01_0.0-0.15m	EP068: Dichlorvos	62-73-7	0.05	mg/kg	<0.05	<0.05	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP068B: Organophosphorus Pesticides (OP) (QC Lot: 3870812) - continued									
ES2129952-003	DCP01_0.0-0.15m	EP068: Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Dimethoate	60-51-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Diazinon	333-41-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Malathion	121-75-5	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Fenthion	55-38-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Prothiofos	34643-46-4	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Ethion	563-12-2	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Carbophenothion	786-19-6	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP068: Parathion-methyl	298-00-0	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP068: Parathion	56-38-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
EP075(SIM)A: Phenolic Compounds (QC Lot: 3870811)									
ES2129952-003	DCP01_0.0-0.15m	EP075(SIM): Phenol	108-95-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2-Chlorophenol	95-57-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2-Methylphenol	95-48-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2-Nitrophenol	88-75-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2.4-Dimethylphenol	105-67-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2.4-Dichlorophenol	120-83-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2.6-Dichlorophenol	87-65-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 4-Chloro-3-methylphenol	59-50-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2.4.6-Trichlorophenol	88-06-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 2.4.5-Trichlorophenol	95-95-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): 3- & 4-Methylphenol	1319-77-3	1	mg/kg	<1	<1	0.0	No Limit
		EP075(SIM): Pentachlorophenol	87-86-5	2	mg/kg	<2	<2	0.0	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 3870811)									
ES2129952-003	DCP01_0.0-0.15m	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 3870811) - continued									
ES2129952-003	DCP01_0.0-0.15m	EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 3870788)									
ES2129952-003	DCP01_0.0-0.15m	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
ES2131106-016	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 3870810)									
ES2129952-003	DCP01_0.0-0.15m	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 3870788)									
ES2129952-003	DCP01_0.0-0.15m	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.0	No Limit
ES2131106-016	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 3870810)									
ES2129952-003	DCP01_0.0-0.15m	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
EP080: BTEXN (QC Lot: 3870788)									
ES2129952-003	DCP01_0.0-0.15m	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit
ES2131106-016	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
				Laboratory Duplicate (DUP) Report					
EP080: BTEXN (QC Lot: 3870788) - continued									
ES2131106-016	Anonymous	EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit

Sub-Matrix: **WATER**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
				Laboratory Duplicate (DUP) Report					
EG020T: Total Metals by ICP-MS (QC Lot: 3872654)									
ES2129952-001	Rinsate 1	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: 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	0.092	0.092	0.0	0% - 50%
ES2131079-001	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	0.098	0.103	4.7	0% - 20%
		EG020A-T: Lead	7439-92-1	0.001	mg/L	0.109	0.117	7.1	0% - 20%
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	0.001	0.006	123	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	0.092	0.097	5.7	0% - 50%
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 3872696)									
ES2130492-011	Anonymous	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
ES2131156-008	Anonymous	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit

Method Blank (MB) and Laboratory Control Sample (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: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 3872317)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	121.1 mg/kg	88.2	88.0	113
EG005T: Barium	7440-39-3	10	mg/kg	<10	90.5 mg/kg	102	65.0	136
EG005T: Beryllium	7440-41-7	1	mg/kg	<1	0.5 mg/kg	107	70.0	130
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	0.74 mg/kg	100	70.0	130
EG005T: Chromium	7440-47-3	2	mg/kg	<2	19.6 mg/kg	102	68.0	132
EG005T: Cobalt	7440-48-4	2	mg/kg	<2	10.4 mg/kg	86.3	83.0	117
EG005T: Copper	7440-50-8	5	mg/kg	<5	52.9 mg/kg	98.3	89.0	111
EG005T: Iron	7439-89-6	50	mg/kg	<50	31660 mg/kg	92.7	89.0	112
EG005T: Lead	7439-92-1	5	mg/kg	<5	60.8 mg/kg	86.6	82.0	119
EG005T: Manganese	7439-96-5	5	mg/kg	<5	534 mg/kg	97.3	83.0	117
EG005T: Nickel	7440-02-0	2	mg/kg	<2	15.3 mg/kg	89.4	80.0	120
EG005T: Silver	7440-22-4	2	mg/kg	<2	2.3 mg/kg	115	42.0	158
EG005T: Zinc	7440-66-6	5	mg/kg	<5	139.3 mg/kg	87.7	66.0	133
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3872316)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	0.087 mg/kg	97.1	70.0	125
EG048: Hexavalent Chromium (Alkaline Digest) (QCLot: 3872243)								
EG048G: Hexavalent Chromium	18540-29-9	0.5	mg/kg	<0.5	20 mg/kg	101	68.0	114
EK026SF: Total CN by Segmented Flow Analyser (QCLot: 3874132)								
EK026SF: Total Cyanide	57-12-5	1	mg/kg	<1	40 mg/kg	113	81.0	129
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 3870807)								
EP066: Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	1 mg/kg	122	62.0	126
EP068A: Organochlorine Pesticides (OC) (QCLot: 3870812)								
EP068: alpha-BHC	319-84-6	0.05	mg/kg	<0.05	0.5 mg/kg	101	69.0	113
EP068: Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	0.5 mg/kg	102	65.0	117
EP068: beta-BHC	319-85-7	0.05	mg/kg	<0.05	0.5 mg/kg	102	67.0	119
EP068: gamma-BHC	58-89-9	0.05	mg/kg	<0.05	0.5 mg/kg	100	68.0	116
EP068: delta-BHC	319-86-8	0.05	mg/kg	<0.05	0.5 mg/kg	96.4	65.0	117
EP068: Heptachlor	76-44-8	0.05	mg/kg	<0.05	0.5 mg/kg	94.9	67.0	115
EP068: Aldrin	309-00-2	0.05	mg/kg	<0.05	0.5 mg/kg	98.0	69.0	115
EP068: Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	0.5 mg/kg	93.8	62.0	118
EP068: trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	0.5 mg/kg	93.9	63.0	117
EP068: alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	0.5 mg/kg	97.1	66.0	116
EP068: cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	0.5 mg/kg	92.5	64.0	116
EP068: Dieldrin	60-57-1	0.05	mg/kg	<0.05	0.5 mg/kg	105	66.0	116

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP068A: Organochlorine Pesticides (OC) (QCLot: 3870812) - continued								
EP068: 4.4`-DDE	72-55-9	0.05	mg/kg	<0.05	0.5 mg/kg	96.9	67.0	115
EP068: Endrin	72-20-8	0.05	mg/kg	<0.05	0.5 mg/kg	95.3	67.0	123
EP068: beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	0.5 mg/kg	104	69.0	115
EP068: 4.4`-DDD	72-54-8	0.05	mg/kg	<0.05	0.5 mg/kg	105	69.0	121
EP068: Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	0.5 mg/kg	90.4	56.0	120
EP068: Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	0.5 mg/kg	100	62.0	124
EP068: 4.4`-DDT	50-29-3	0.2	mg/kg	<0.2	0.5 mg/kg	89.2	66.0	120
EP068: Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	0.5 mg/kg	100	64.0	122
EP068: Methoxychlor	72-43-5	0.2	mg/kg	<0.2	0.5 mg/kg	86.3	54.0	130
EP068B: Organophosphorus Pesticides (OP) (QCLot: 3870812)								
EP068: Dichlorvos	62-73-7	0.05	mg/kg	<0.05	0.5 mg/kg	97.8	59.0	119
EP068: Demeton-S-methyl	919-86-8	0.05	mg/kg	<0.05	0.5 mg/kg	123	62.0	128
EP068: Monocrotophos	6923-22-4	0.2	mg/kg	<0.2	0.5 mg/kg	108	54.0	126
EP068: Dimethoate	60-51-5	0.05	mg/kg	<0.05	0.5 mg/kg	108	67.0	119
EP068: Diazinon	333-41-5	0.05	mg/kg	<0.05	0.5 mg/kg	103	70.0	120
EP068: Chlorpyrifos-methyl	5598-13-0	0.05	mg/kg	<0.05	0.5 mg/kg	95.2	72.0	120
EP068: Parathion-methyl	298-00-0	0.2	mg/kg	<0.2	0.5 mg/kg	93.5	68.0	120
EP068: Malathion	121-75-5	0.05	mg/kg	<0.05	0.5 mg/kg	102	68.0	122
EP068: Fenthion	55-38-9	0.05	mg/kg	<0.05	0.5 mg/kg	94.8	69.0	117
EP068: Chlorpyrifos	2921-88-2	0.05	mg/kg	<0.05	0.5 mg/kg	97.5	76.0	118
EP068: Parathion	56-38-2	0.2	mg/kg	<0.2	0.5 mg/kg	92.4	64.0	122
EP068: Pirimphos-ethyl	23505-41-1	0.05	mg/kg	<0.05	0.5 mg/kg	94.2	70.0	116
EP068: Chlorfenvinphos	470-90-6	0.05	mg/kg	<0.05	0.5 mg/kg	99.8	69.0	121
EP068: Bromophos-ethyl	4824-78-6	0.05	mg/kg	<0.05	0.5 mg/kg	93.6	66.0	118
EP068: Fenamiphos	22224-92-6	0.05	mg/kg	<0.05	0.5 mg/kg	99.6	68.0	124
EP068: Prothiofos	34643-46-4	0.05	mg/kg	<0.05	0.5 mg/kg	95.2	62.0	112
EP068: Ethion	563-12-2	0.05	mg/kg	<0.05	0.5 mg/kg	107	68.0	120
EP068: Carbophenothion	786-19-6	0.05	mg/kg	<0.05	0.5 mg/kg	98.4	65.0	127
EP068: Azinphos Methyl	86-50-0	0.05	mg/kg	<0.05	0.5 mg/kg	79.2	41.0	123
EP075(SIM)A: Phenolic Compounds (QCLot: 3870811)								
EP075(SIM): Phenol	108-95-2	0.5	mg/kg	<0.5	6 mg/kg	96.8	71.0	125
EP075(SIM): 2-Chlorophenol	95-57-8	0.5	mg/kg	<0.5	6 mg/kg	95.7	72.0	124
EP075(SIM): 2-Methylphenol	95-48-7	0.5	mg/kg	<0.5	6 mg/kg	88.5	71.0	123
EP075(SIM): 3- & 4-Methylphenol	1319-77-3	1	mg/kg	<1	12 mg/kg	92.3	67.0	127
EP075(SIM): 2-Nitrophenol	88-75-5	0.5	mg/kg	<0.5	6 mg/kg	73.4	54.0	114
EP075(SIM): 2.4-Dimethylphenol	105-67-9	0.5	mg/kg	<0.5	6 mg/kg	89.3	68.0	126
EP075(SIM): 2.4-Dichlorophenol	120-83-2	0.5	mg/kg	<0.5	6 mg/kg	84.0	66.0	120
EP075(SIM): 2.6-Dichlorophenol	87-65-0	0.5	mg/kg	<0.5	6 mg/kg	85.0	70.0	120
EP075(SIM): 4-Chloro-3-methylphenol	59-50-7	0.5	mg/kg	<0.5	6 mg/kg	83.0	70.0	116

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EP075(SIM)A: Phenolic Compounds (QCLot: 3870811) - continued								
EP075(SIM): 2.4.6-Trichlorophenol	88-06-2	0.5	mg/kg	<0.5	6 mg/kg	74.1	54.0	114
EP075(SIM): 2.4.5-Trichlorophenol	95-95-4	0.5	mg/kg	<0.5	6 mg/kg	77.0	60.0	114
EP075(SIM): Pentachlorophenol	87-86-5	2	mg/kg	<2	12 mg/kg	35.4	10.0	57.0
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3870811)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	6 mg/kg	95.0	77.0	125
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	6 mg/kg	86.7	72.0	124
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	6 mg/kg	94.9	73.0	127
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	6 mg/kg	90.3	72.0	126
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	6 mg/kg	92.6	75.0	127
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	6 mg/kg	93.9	77.0	127
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	6 mg/kg	91.8	73.0	127
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	6 mg/kg	91.8	74.0	128
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	6 mg/kg	82.1	69.0	123
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	6 mg/kg	93.9	75.0	127
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	6 mg/kg	79.9	68.0	116
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	6 mg/kg	91.1	74.0	126
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	6 mg/kg	88.4	70.0	126
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	6 mg/kg	76.9	61.0	121
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	6 mg/kg	78.4	62.0	118
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	6 mg/kg	79.8	63.0	121
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3870788)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	26 mg/kg	102	68.4	128
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3870810)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	300 mg/kg	105	75.0	129
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	450 mg/kg	104	77.0	131
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	300 mg/kg	101	71.0	129
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3870788)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	31 mg/kg	103	68.4	128
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3870810)								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	375 mg/kg	106	77.0	125
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	525 mg/kg	101	74.0	138
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	225 mg/kg	100	63.0	131
EP080: BTEXN (QCLot: 3870788)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	94.6	62.0	116
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	89.2	67.0	121
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	90.2	65.0	117

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	***CAS Number***	***LOR***	***Unit***	***Result***	***Concentration***	***LCS***	***Low***	***High***
EP080: BTEXN (QCLot: 3870788) - continued								
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	2 mg/kg	95.8	66.0	118
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	85.4	68.0	120
EP080: Naphthalene	91-20-3	1	mg/kg	<1	1 mg/kg	80.0	63.0	119

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	***CAS Number***	***LOR***	***Unit***	***Result***	***Concentration***	***LCS***	***Low***	***High***
EG020T: Total Metals by ICP-MS (QCLot: 3872654)								
EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	89.6	82.0	114
EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	89.7	84.0	112
EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	89.9	86.0	116
EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	91.8	83.0	118
EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	89.2	85.0	115
EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	90.1	84.0	116
EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	90.1	79.0	117
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3872696)								
EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	94.7	77.0	111

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: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	***Sample ID***	***Method: Compound***	***CAS Number***	***Concentration***	***MS***	***Low***	***High***
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 3872317)							
ES2129952-003	DCP01_0.0-0.15m	EG005T: Arsenic	7440-38-2	50 mg/kg	101	70.0	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	87.6	70.0	130
		EG005T: Chromium	7440-47-3	50 mg/kg	91.9	68.0	132
		EG005T: Copper	7440-50-8	250 mg/kg	96.2	70.0	130
		EG005T: Lead	7439-92-1	250 mg/kg	90.8	70.0	130
		EG005T: Nickel	7440-02-0	50 mg/kg	88.1	70.0	130
		EG005T: Zinc	7440-66-6	250 mg/kg	89.7	66.0	133
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3872316)							
ES2129952-003	DCP01_0.0-0.15m	EG035T: Mercury	7439-97-6	5 mg/kg	112	70.0	130
EG048: Hexavalent Chromium (Alkaline Digest) (QCLot: 3872243)							
ES2131210-001	Anonymous	EG048G: Hexavalent Chromium	18540-29-9	20 mg/kg	# 68.8	70.0	130

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG048: Hexavalent Chromium (Alkaline Digest) (QCLot: 3872243) - continued							
ES2131210-002	Anonymous	EG048G: Hexavalent Chromium	18540-29-9	20 mg/kg	# 43.5	70.0	130
EK026SF: Total CN by Segmented Flow Analyser (QCLot: 3874132)							
ES2129952-003	DCP01_0.0-0.15m	EK026SF: Total Cyanide	57-12-5	40 mg/kg	111	70.0	130
EP066: Polychlorinated Biphenyls (PCB) (QCLot: 3870807)							
ES2129952-003	DCP01_0.0-0.15m	EP066: Total Polychlorinated biphenyls	----	1 mg/kg	98.2	70.0	130
EP068A: Organochlorine Pesticides (OC) (QCLot: 3870812)							
ES2129952-003	DCP01_0.0-0.15m	EP068: gamma-BHC	58-89-9	0.5 mg/kg	86.8	70.0	130
		EP068: Heptachlor	76-44-8	0.5 mg/kg	85.4	70.0	130
		EP068: Aldrin	309-00-2	0.5 mg/kg	78.2	70.0	130
		EP068: Dieldrin	60-57-1	0.5 mg/kg	89.3	70.0	130
		EP068: Endrin	72-20-8	2 mg/kg	75.9	70.0	130
		EP068: 4.4`-DDT	50-29-3	2 mg/kg	79.8	70.0	130
EP068B: Organophosphorus Pesticides (OP) (QCLot: 3870812)							
ES2129952-003	DCP01_0.0-0.15m	EP068: Diazinon	333-41-5	0.5 mg/kg	96.1	70.0	130
		EP068: Chlorpyrifos-methyl	5598-13-0	0.5 mg/kg	82.8	70.0	130
		EP068: Pirimphos-ethyl	23505-41-1	0.5 mg/kg	77.5	70.0	130
		EP068: Bromophos-ethyl	4824-78-6	0.5 mg/kg	76.8	70.0	130
		EP068: Prothiofos	34643-46-4	0.5 mg/kg	77.9	70.0	130
EP075(SIM)A: Phenolic Compounds (QCLot: 3870811)							
ES2129952-003	DCP01_0.0-0.15m	EP075(SIM): Phenol	108-95-2	10 mg/kg	97.0	70.0	130
		EP075(SIM): 2-Chlorophenol	95-57-8	10 mg/kg	95.0	70.0	130
		EP075(SIM): 2-Nitrophenol	88-75-5	10 mg/kg	67.1	60.0	130
		EP075(SIM): 4-Chloro-3-methylphenol	59-50-7	10 mg/kg	86.5	70.0	130
		EP075(SIM): Pentachlorophenol	87-86-5	10 mg/kg	49.0	20.0	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3870811)							
ES2129952-003	DCP01_0.0-0.15m	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	94.6	70.0	130
		EP075(SIM): Pyrene	129-00-0	10 mg/kg	99.3	70.0	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3870788)							
ES2129952-003	DCP01_0.0-0.15m	EP080: C6 - C9 Fraction	----	32.5 mg/kg	98.6	70.0	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3870810)							
ES2129952-003	DCP01_0.0-0.15m	EP071: C10 - C14 Fraction	----	480 mg/kg	106	73.0	137
		EP071: C15 - C28 Fraction	----	3100 mg/kg	110	53.0	131
		EP071: C29 - C36 Fraction	----	2060 mg/kg	113	52.0	132
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3870788)							
ES2129952-003	DCP01_0.0-0.15m	EP080: C6 - C10 Fraction	C6_C10	37.5 mg/kg	99.1	70.0	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3870810)							

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	*SpikeRecovery(%)*	*Acceptable Limits (%)*	
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3870810) - continued							
ES2129952-003	DCP01_0.0-0.15m	EP071: >C10 - C16 Fraction	----	860 mg/kg	112	73.0	137
		EP071: >C16 - C34 Fraction	----	4320 mg/kg	114	53.0	131
		EP071: >C34 - C40 Fraction	----	890 mg/kg	93.2	52.0	132
EP080: BTEXN (QCLot: 3870788)							
ES2129952-003	DCP01_0.0-0.15m	EP080: Benzene	71-43-2	2.5 mg/kg	85.4	70.0	130
		EP080: Toluene	108-88-3	2.5 mg/kg	87.3	70.0	130
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	87.1	70.0	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2.5 mg/kg	88.8	70.0	130
		EP080: ortho-Xylene	95-47-6	2.5 mg/kg	89.3	70.0	130
		EP080: Naphthalene	91-20-3	2.5 mg/kg	77.2	70.0	130

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	*SpikeRecovery(%)*	*Acceptable Limits (%)*	
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EG020T: Total Metals by ICP-MS (QCLot: 3872654)							
ES2129952-002	Rinsate 2	EG020A-T: Arsenic	7440-38-2	1 mg/L	96.4	70.0	130
		EG020A-T: Cadmium	7440-43-9	0.25 mg/L	104	70.0	130
		EG020A-T: Chromium	7440-47-3	1 mg/L	104	70.0	130
		EG020A-T: Copper	7440-50-8	1 mg/L	102	70.0	130
		EG020A-T: Lead	7439-92-1	1 mg/L	98.9	70.0	130
		EG020A-T: Nickel	7440-02-0	1 mg/L	102	70.0	130
		EG020A-T: Zinc	7440-66-6	1 mg/L	95.6	70.0	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3872696)							
ES2129663-002	Anonymous	EG035T: Mercury	7439-97-6	0.01 mg/L	82.2	70.0	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES2129952**	Page	: 1 of 12
Client	: **FYFE PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: STUART TWISS	Telephone	: +61881625130
Project	: 80963-1	Date Samples Received	: 26-Aug-2021
Site	:	Issue Date	: 01-Sep-2021
Sampler	: SCT	No. of samples received	: 19
Order number	: 11415	No. of samples analysed	: 19

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	**Analyte**	CAS Number	Data	Limits	**Comment**
Matrix Spike (MS) Recoveries							
EG048: Hexavalent Chromium (Alkaline Digest)	ES2131210--001	Anonymous	**Hexavalent Chromium**	18540-29-9	68.8 %	70.0-130%	**Recovery less than lower data quality objective**
EG048: Hexavalent Chromium (Alkaline Digest)	ES2131210--002	Anonymous	**Hexavalent Chromium**	18540-29-9	43.5 %	70.0-130%	**Recovery less than lower data quality objective**

Outliers : Analysis Holding Time Compliance

Matrix: **SOIL**

Method	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)	*Date extracted*	*Due for extraction*	***Days overdue***	*Date analysed*	*Due for analysis*	***Days overdue***
EA055: Moisture Content (Dried @ 105-110°C)						
Soil Glass Jar - Unpreserved DCP06_0.0-0.15m, DCP07_0.0-0.15m, DCP08_0.0-0.15m, DCP09_0.0-0.15m, DCP10_0.0-0.15m, DCP11_0.0-0.15m1, DCP12_0.0-0.15m, DCP13_0.0-0.15m, DCP14_0.0-0.15m, DCP15_0.0-0.15m, DCP16_0.0-0.15m, DCP17_0.0-0.15m	----	----	----	30-Aug-2021	25-Aug-2021	**5**
Soil Glass Jar - Unpreserved DCP01_0.0-0.15m, DCP02_0.0-0.15m, DCP03_0.0-0.15m, DCP04_0.0-0.15m, DCP05_0.0-0.15m	----	----	----	30-Aug-2021	26-Aug-2021	**4**
EK026SF: Total CN by Segmented Flow Analyser						
Soil Glass Jar - Unpreserved DCP08_0.0-0.15m, DCP12_0.0-0.15m, DCP14_0.0-0.15m, DCP17_0.0-0.15m	30-Aug-2021	25-Aug-2021	**5**	----	----	----
Soil Glass Jar - Unpreserved DCP01_0.0-0.15m, DCP04_0.0-0.15m	30-Aug-2021	26-Aug-2021	**4**	----	----	----
EP066: Polychlorinated Biphenyls (PCB)						
Soil Glass Jar - Unpreserved DCP08_0.0-0.15m, DCP12_0.0-0.15m, DCP14_0.0-0.15m, DCP17_0.0-0.15m	30-Aug-2021	25-Aug-2021	**5**	----	----	----
Soil Glass Jar - Unpreserved DCP01_0.0-0.15m, DCP04_0.0-0.15m	30-Aug-2021	26-Aug-2021	**4**	----	----	----
EP068A: Organochlorine Pesticides (OC)						

Matrix: **SOIL**

Method		*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)		*Date extracted*	*Due for extraction*	***Days overdue***	*Date analysed*	*Due for analysis*	***Days overdue***
EP068A: Organochlorine Pesticides (OC) - Analysis Holding Time Compliance							
Soil Glass Jar - Unpreserved							
DCP06_0.0-0.15m,	DCP07_0.0-0.15m,	30-Aug-2021	25-Aug-2021	**5**	----	----	----
DCP08_0.0-0.15m,	DCP09_0.0-0.15m,						
DCP10_0.0-0.15m,	DCP11_0.0-0.15m1,						
DCP12_0.0-0.15m,	DCP13_0.0-0.15m,						
DCP14_0.0-0.15m,	DCP15_0.0-0.15m,						
DCP16_0.0-0.15m,	DCP17_0.0-0.15m						
Soil Glass Jar - Unpreserved							
DCP01_0.0-0.15m,	DCP02_0.0-0.15m,	30-Aug-2021	26-Aug-2021	**4**	----	----	----
DCP03_0.0-0.15m,	DCP04_0.0-0.15m,						
DCP05_0.0-0.15m							
EP068B: Organophosphorus Pesticides (OP)							
Soil Glass Jar - Unpreserved							
DCP06_0.0-0.15m,	DCP07_0.0-0.15m,	30-Aug-2021	25-Aug-2021	**5**	----	----	----
DCP09_0.0-0.15m,	DCP10_0.0-0.15m,						
DCP11_0.0-0.15m1,	DCP13_0.0-0.15m,						
DCP15_0.0-0.15m,	DCP16_0.0-0.15m						
Soil Glass Jar - Unpreserved							
DCP02_0.0-0.15m,	DCP03_0.0-0.15m,	30-Aug-2021	26-Aug-2021	**4**	----	----	----
DCP05_0.0-0.15m							
EP075(SIM)A: Phenolic Compounds							
Soil Glass Jar - Unpreserved							
DCP08_0.0-0.15m,	DCP12_0.0-0.15m,	30-Aug-2021	25-Aug-2021	**5**	----	----	----
DCP14_0.0-0.15m,	DCP17_0.0-0.15m						
Soil Glass Jar - Unpreserved							
DCP01_0.0-0.15m,	DCP04_0.0-0.15m	30-Aug-2021	26-Aug-2021	**4**	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Soil Glass Jar - Unpreserved							
DCP08_0.0-0.15m,	DCP12_0.0-0.15m,	30-Aug-2021	25-Aug-2021	**5**	----	----	----
DCP14_0.0-0.15m,	DCP17_0.0-0.15m						
Soil Glass Jar - Unpreserved							
DCP01_0.0-0.15m,	DCP04_0.0-0.15m	30-Aug-2021	26-Aug-2021	**4**	----	----	----
EP080/071: Total Petroleum Hydrocarbons							
Soil Glass Jar - Unpreserved							
DCP08_0.0-0.15m,	DCP12_0.0-0.15m,	27-Aug-2021	25-Aug-2021	**2**	31-Aug-2021	25-Aug-2021	**6**
DCP14_0.0-0.15m,	DCP17_0.0-0.15m						
Soil Glass Jar - Unpreserved							
DCP08_0.0-0.15m,	DCP12_0.0-0.15m,	30-Aug-2021	25-Aug-2021	**5**	----	----	----
DCP14_0.0-0.15m,	DCP17_0.0-0.15m						

Matrix: **SOIL**

Method	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)	*Date extracted*	*Due for extraction*	***Days overdue***	*Date analysed*	*Due for analysis*	***Days overdue***
EP080/071: Total Petroleum Hydrocarbons - Analysis Holding Time Compliance						
Soil Glass Jar - Unpreserved DCP01_0.0-0.15m, DCP04_0.0-0.15m	27-Aug-2021	26-Aug-2021	**1**	31-Aug-2021	26-Aug-2021	**5**
Soil Glass Jar - Unpreserved DCP01_0.0-0.15m, DCP04_0.0-0.15m	30-Aug-2021	26-Aug-2021	**4**	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions						
Soil Glass Jar - Unpreserved DCP08_0.0-0.15m, DCP12_0.0-0.15m, DCP14_0.0-0.15m, DCP17_0.0-0.15m	27-Aug-2021	25-Aug-2021	**2**	31-Aug-2021	25-Aug-2021	**6**
Soil Glass Jar - Unpreserved DCP08_0.0-0.15m, DCP12_0.0-0.15m, DCP14_0.0-0.15m, DCP17_0.0-0.15m	30-Aug-2021	25-Aug-2021	**5**	----	----	----
Soil Glass Jar - Unpreserved DCP01_0.0-0.15m, DCP04_0.0-0.15m	27-Aug-2021	26-Aug-2021	**1**	31-Aug-2021	26-Aug-2021	**5**
Soil Glass Jar - Unpreserved DCP01_0.0-0.15m, DCP04_0.0-0.15m	30-Aug-2021	26-Aug-2021	**4**	----	----	----
EP080: BTEXN						
Soil Glass Jar - Unpreserved DCP08_0.0-0.15m, DCP12_0.0-0.15m, DCP14_0.0-0.15m, DCP17_0.0-0.15m	27-Aug-2021	25-Aug-2021	**2**	31-Aug-2021	25-Aug-2021	**6**
Soil Glass Jar - Unpreserved DCP01_0.0-0.15m, DCP04_0.0-0.15m	27-Aug-2021	26-Aug-2021	**1**	31-Aug-2021	26-Aug-2021	**5**

Outliers : Frequency of Quality Control Samples

Matrix: **SOIL**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Control Samples (LCS)					
Hexavalent Chromium by Alkaline Digestion and DA Finish	1	13	7.69	10.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

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*

Matrix: **SOIL**

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*
EA055: Moisture Content (Dried @ 105-110°C)							
Soil Glass Jar - Unpreserved (EA055) DCP06_0.0-0.15m, DCP07_0.0-0.15m, DCP08_0.0-0.15m, DCP09_0.0-0.15m, DCP10_0.0-0.15m, DCP11_0.0-0.15m1, DCP12_0.0-0.15m, DCP13_0.0-0.15m, DCP14_0.0-0.15m, DCP15_0.0-0.15m, DCP16_0.0-0.15m, DCP17_0.0-0.15m	**11-Aug-2021**	**----**	----	----	**30-Aug-2021**	25-Aug-2021	✘
Soil Glass Jar - Unpreserved (EA055) DCP01_0.0-0.15m, DCP02_0.0-0.15m, DCP03_0.0-0.15m, DCP04_0.0-0.15m, DCP05_0.0-0.15m	**12-Aug-2021**	**----**	----	----	**30-Aug-2021**	26-Aug-2021	✘
EG005(ED093)T: Total Metals by ICP-AES							
Soil Glass Jar - Unpreserved (EG005T) DCP06_0.0-0.15m, DCP07_0.0-0.15m, DCP08_0.0-0.15m, DCP09_0.0-0.15m, DCP10_0.0-0.15m, DCP11_0.0-0.15m1, DCP12_0.0-0.15m, DCP13_0.0-0.15m, DCP14_0.0-0.15m, DCP15_0.0-0.15m, DCP16_0.0-0.15m, DCP17_0.0-0.15m	**11-Aug-2021**	**30-Aug-2021**	07-Feb-2022	✓	**30-Aug-2021**	07-Feb-2022	✓
Soil Glass Jar - Unpreserved (EG005T) DCP01_0.0-0.15m, DCP02_0.0-0.15m, DCP03_0.0-0.15m, DCP04_0.0-0.15m, DCP05_0.0-0.15m	**12-Aug-2021**	**30-Aug-2021**	08-Feb-2022	✓	**30-Aug-2021**	08-Feb-2022	✓
EG035T: Total Recoverable Mercury by FIMS							
Soil Glass Jar - Unpreserved (EG035T) DCP06_0.0-0.15m, DCP07_0.0-0.15m, DCP08_0.0-0.15m, DCP09_0.0-0.15m, DCP10_0.0-0.15m, DCP11_0.0-0.15m1, DCP12_0.0-0.15m, DCP13_0.0-0.15m, DCP14_0.0-0.15m, DCP15_0.0-0.15m, DCP16_0.0-0.15m, DCP17_0.0-0.15m	**11-Aug-2021**	**30-Aug-2021**	08-Sep-2021	✓	**31-Aug-2021**	08-Sep-2021	✓
Soil Glass Jar - Unpreserved (EG035T) DCP01_0.0-0.15m, DCP02_0.0-0.15m, DCP03_0.0-0.15m, DCP04_0.0-0.15m, DCP05_0.0-0.15m	**12-Aug-2021**	**30-Aug-2021**	09-Sep-2021	✓	**31-Aug-2021**	09-Sep-2021	✓
EG048: Hexavalent Chromium (Alkaline Digest)							
Soil Glass Jar - Unpreserved (EG048G) DCP08_0.0-0.15m, DCP12_0.0-0.15m, DCP14_0.0-0.15m, DCP17_0.0-0.15m	**11-Aug-2021**	**30-Aug-2021**	08-Sep-2021	✓	**30-Aug-2021**	06-Sep-2021	✓
Soil Glass Jar - Unpreserved (EG048G) DCP01_0.0-0.15m, DCP04_0.0-0.15m	**12-Aug-2021**	**30-Aug-2021**	09-Sep-2021	✓	**30-Aug-2021**	06-Sep-2021	✓

Matrix: **SOIL**

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*
EK026SF: Total CN by Segmented Flow Analyser							
Soil Glass Jar - Unpreserved (EK026SF) DCP08_0.0-0.15m, DCP12_0.0-0.15m, DCP14_0.0-0.15m, DCP17_0.0-0.15m	**11-Aug-2021**	**30-Aug-2021**	25-Aug-2021	×	**31-Aug-2021**	13-Sep-2021	✓
Soil Glass Jar - Unpreserved (EK026SF) DCP01_0.0-0.15m, DCP04_0.0-0.15m	**12-Aug-2021**	**30-Aug-2021**	26-Aug-2021	×	**31-Aug-2021**	13-Sep-2021	✓
EP066: Polychlorinated Biphenyls (PCB)							
Soil Glass Jar - Unpreserved (EP066) DCP08_0.0-0.15m, DCP12_0.0-0.15m, DCP14_0.0-0.15m, DCP17_0.0-0.15m	**11-Aug-2021**	**30-Aug-2021**	25-Aug-2021	×	**31-Aug-2021**	09-Oct-2021	✓
Soil Glass Jar - Unpreserved (EP066) DCP01_0.0-0.15m, DCP04_0.0-0.15m	**12-Aug-2021**	**30-Aug-2021**	26-Aug-2021	×	**31-Aug-2021**	09-Oct-2021	✓
EP068A: Organochlorine Pesticides (OC)							
Soil Glass Jar - Unpreserved (EP068) DCP06_0.0-0.15m, DCP07_0.0-0.15m, DCP08_0.0-0.15m, DCP09_0.0-0.15m, DCP10_0.0-0.15m, DCP11_0.0-0.15m1, DCP12_0.0-0.15m, DCP13_0.0-0.15m, DCP14_0.0-0.15m, DCP15_0.0-0.15m, DCP16_0.0-0.15m, DCP17_0.0-0.15m	**11-Aug-2021**	**30-Aug-2021**	25-Aug-2021	×	**31-Aug-2021**	09-Oct-2021	✓
Soil Glass Jar - Unpreserved (EP068) DCP01_0.0-0.15m, DCP02_0.0-0.15m, DCP03_0.0-0.15m, DCP04_0.0-0.15m, DCP05_0.0-0.15m	**12-Aug-2021**	**30-Aug-2021**	26-Aug-2021	×	**31-Aug-2021**	09-Oct-2021	✓
EP068B: Organophosphorus Pesticides (OP)							
Soil Glass Jar - Unpreserved (EP068) DCP06_0.0-0.15m, DCP07_0.0-0.15m, DCP09_0.0-0.15m, DCP10_0.0-0.15m, DCP11_0.0-0.15m1, DCP13_0.0-0.15m, DCP15_0.0-0.15m, DCP16_0.0-0.15m	**11-Aug-2021**	**30-Aug-2021**	25-Aug-2021	×	**31-Aug-2021**	09-Oct-2021	✓
Soil Glass Jar - Unpreserved (EP068) DCP02_0.0-0.15m, DCP03_0.0-0.15m, DCP05_0.0-0.15m	**12-Aug-2021**	**30-Aug-2021**	26-Aug-2021	×	**31-Aug-2021**	09-Oct-2021	✓
EP075(SIM)A: Phenolic Compounds							
Soil Glass Jar - Unpreserved (EP075(SIM)) DCP08_0.0-0.15m, DCP12_0.0-0.15m, DCP14_0.0-0.15m, DCP17_0.0-0.15m	**11-Aug-2021**	**30-Aug-2021**	25-Aug-2021	×	**31-Aug-2021**	09-Oct-2021	✓
Soil Glass Jar - Unpreserved (EP075(SIM)) DCP01_0.0-0.15m, DCP04_0.0-0.15m	**12-Aug-2021**	**30-Aug-2021**	26-Aug-2021	×	**31-Aug-2021**	09-Oct-2021	✓

Matrix: **SOIL** 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*
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Soil Glass Jar - Unpreserved (EP075(SIM)) DCP08_0.0-0.15m, DCP12_0.0-0.15m, DCP14_0.0-0.15m, DCP17_0.0-0.15m	**11-Aug-2021**	**30-Aug-2021**	25-Aug-2021	✗	**31-Aug-2021**	09-Oct-2021	✓
Soil Glass Jar - Unpreserved (EP075(SIM)) DCP01_0.0-0.15m, DCP04_0.0-0.15m	**12-Aug-2021**	**30-Aug-2021**	26-Aug-2021	✗	**31-Aug-2021**	09-Oct-2021	✓
EP080/071: Total Petroleum Hydrocarbons							
Soil Glass Jar - Unpreserved (EP080) DCP08_0.0-0.15m, DCP12_0.0-0.15m, DCP14_0.0-0.15m, DCP17_0.0-0.15m	**11-Aug-2021**	**27-Aug-2021**	25-Aug-2021	✗	**31-Aug-2021**	25-Aug-2021	✗
Soil Glass Jar - Unpreserved (EP071) DCP08_0.0-0.15m, DCP12_0.0-0.15m, DCP14_0.0-0.15m, DCP17_0.0-0.15m	**11-Aug-2021**	**30-Aug-2021**	25-Aug-2021	✗	**31-Aug-2021**	09-Oct-2021	✓
Soil Glass Jar - Unpreserved (EP080) DCP01_0.0-0.15m, DCP04_0.0-0.15m	**12-Aug-2021**	**27-Aug-2021**	26-Aug-2021	✗	**31-Aug-2021**	26-Aug-2021	✗
Soil Glass Jar - Unpreserved (EP071) DCP01_0.0-0.15m, DCP04_0.0-0.15m	**12-Aug-2021**	**30-Aug-2021**	26-Aug-2021	✗	**31-Aug-2021**	09-Oct-2021	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Soil Glass Jar - Unpreserved (EP080) DCP08_0.0-0.15m, DCP12_0.0-0.15m, DCP14_0.0-0.15m, DCP17_0.0-0.15m	**11-Aug-2021**	**27-Aug-2021**	25-Aug-2021	✗	**31-Aug-2021**	25-Aug-2021	✗
Soil Glass Jar - Unpreserved (EP071) DCP08_0.0-0.15m, DCP12_0.0-0.15m, DCP14_0.0-0.15m, DCP17_0.0-0.15m	**11-Aug-2021**	**30-Aug-2021**	25-Aug-2021	✗	**31-Aug-2021**	09-Oct-2021	✓
Soil Glass Jar - Unpreserved (EP080) DCP01_0.0-0.15m, DCP04_0.0-0.15m	**12-Aug-2021**	**27-Aug-2021**	26-Aug-2021	✗	**31-Aug-2021**	26-Aug-2021	✗
Soil Glass Jar - Unpreserved (EP071) DCP01_0.0-0.15m, DCP04_0.0-0.15m	**12-Aug-2021**	**30-Aug-2021**	26-Aug-2021	✗	**31-Aug-2021**	09-Oct-2021	✓
EP080: BTEXN							
Soil Glass Jar - Unpreserved (EP080) DCP08_0.0-0.15m, DCP12_0.0-0.15m, DCP14_0.0-0.15m, DCP17_0.0-0.15m	**11-Aug-2021**	**27-Aug-2021**	25-Aug-2021	✗	**31-Aug-2021**	25-Aug-2021	✗
Soil Glass Jar - Unpreserved (EP080) DCP01_0.0-0.15m, DCP04_0.0-0.15m	**12-Aug-2021**	**27-Aug-2021**	26-Aug-2021	✗	**31-Aug-2021**	26-Aug-2021	✗

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*
EG020T: Total Metals by ICP-MS							
Clear Plastic Bottle - Unfiltered; Lab-acidified (EG020A-T) Rinsate 1	**11-Aug-2021**	**30-Aug-2021**	07-Feb-2022	✓	**30-Aug-2021**	07-Feb-2022	✓
Clear Plastic Bottle - Unfiltered; Lab-acidified (EG020A-T) Rinsate 2	**12-Aug-2021**	**30-Aug-2021**	08-Feb-2022	✓	**30-Aug-2021**	08-Feb-2022	✓

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
EG035T: Total Recoverable Mercury by FIMS							
Clear Plastic Bottle - Unfiltered; Lab-acidified (EG035T)							
Rinsate 1	**11-Aug-2021**	**----**	----	----	**30-Aug-2021**	08-Sep-2021	✓
Clear Plastic Bottle - Unfiltered; Lab-acidified (EG035T)							
Rinsate 2	**12-Aug-2021**	**----**	----	----	**30-Aug-2021**	09-Sep-2021	✓

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(were) 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: **SOIL**

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)							
Hexavalent Chromium by Alkaline Digestion and DA Finish	EG048G	2	13	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	1	7	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	6	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	1	8	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	6	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Hexavalent Chromium by Alkaline Digestion and DA Finish	EG048G	1	13	**7.69**	**10.00**	✗	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	2	8	**25.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Hexavalent Chromium by Alkaline Digestion and DA Finish	EG048G	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Hexavalent Chromium by Alkaline Digestion and DA Finish	EG048G	2	13	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Polychlorinated Biphenyls (PCB)	EP066	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **SOIL**

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*	
Matrix Spikes (MS) - Continued							
Total Mercury by FIMS	EG035T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

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)							
Total Mercury by FIMS	EG035T	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Total Mercury by FIMS	EG035T	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Total Mercury by FIMS	EG035T	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Total Mercury by FIMS	EG035T	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

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*
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM Schedule B(3).
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2) (Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. 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 Schedule B(3)
Hexavalent Chromium by Alkaline Digestion and DA Finish	EG048G	SOIL	In house: Referenced to USEPA SW846, Method 3060. Hexavalent chromium is extracted by alkaline digestion. The digest is determined by photometrically by automatic discrete analyser, following pH adjustment. The instrument uses colour development using dephenylcarbazide. Each run of samples is measured against a five-point calibration curve. This method is compliant with NEPM Schedule B(3)
Total Cyanide by Segmented Flow Analyser	EK026SF	SOIL	In house: Referenced to APHA 4500-CN C / ASTM D7511 / ISO 14403. Caustic leachates of soil samples are introduced into an automated segmented flow analyser. Complex bound cyanide is decomposed in a continuously flowing stream, at a pH of 3.8, by the effect of UV light. A UV-B lamp (312 nm) and a decomposition spiral of borosilicate glass are used to filter out UV light with a wavelength of less than 290 nm thus preventing the conversion of thiocyanate into cyanide. The hydrogen cyanide present at a pH of 3.8 is separated by gas dialysis. The hydrogen cyanide is then determined photometrically, based on the reaction of cyanide with chloramine-T to form cyanogen chloride. This then reacts with 4-pyridine carboxylic acid and 1,3-dimethylbarbituric acid to give a red colour which is measured at 600 nm. This method is compliant with NEPM Schedule B(3).
Polychlorinated Biphenyls (PCB)	EP066	SOIL	In house: Referenced to USEPA SW 846 - 8270 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 Schedule B(3).
Pesticides by GCMS	EP068	SOIL	In house: Referenced to USEPA SW 846 - 8270 Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This technique is compliant with NEPM Schedule B(3).
TRH - Semivolatile Fraction	EP071	SOIL	In house: Referenced to USEPA SW 846 - 8015 Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40. Compliant with NEPM Schedule B(3).
PAH/Phenols (SIM)	EP075(SIM)	SOIL	In house: Referenced to USEPA SW 846 - 8270. Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM Schedule B(3)

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
TRH Volatiles/BTEX	EP080	SOIL	In house: Referenced to USEPA SW 846 - 8260. Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. Compliant with NEPM Schedule B(3) amended.
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	In house: Referenced to APHA 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	In house: Referenced to AS 3550, APHA 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 Schedule B(3).

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*
NaOH leach for CN in Soils	CN-PR	SOIL	In house: APHA 4500 CN. Samples are extracted by end-over-end tumbling with NaOH.
Alkaline digestion for Hexavalent Chromium	EG048PR	SOIL	In house: Referenced to USEPA SW846, Method 3060A.
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM Schedule B(3).
Methanolic Extraction of Soils for Purge and Trap	ORG16	SOIL	In house: Referenced to USEPA SW 846 - 5030A. 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids	ORG17	SOIL	In house: Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.
Digestion for Total Recoverable Metals	EN25	WATER	In house: Referenced to 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 Schedule B(3)

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EM2117663**	Page	: 1 of 4
Client	: **FYFE PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: STUART TWISS	Contact	: Kieren Burns
Address	: LEVEL 1, 124 SOUTH TERRACE ADELAIDE SOUTH AUSTRALIA 5000	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: ----	Telephone	: +61881625130
Project	: 80963-1	Date Samples Received	: 17-Aug-2021 10:50
Order number	: 11415	Date Analysis Commenced	: 07-Sep-2021
C-O-C number	: ----	Issue Date	: 09-Sep-2021 16:50
Sampler	: ----		
Site	:		
Quote number	: AD/060/21		
No. of samples received	: 1		
No. of samples analysed	: 1		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Mark Hallas	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the 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.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

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
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- This is a rebatch of EM2116495.
- EN60: Where leachable PFAS analysis is requested, centrifugation rather than pressure filtration is used as the default approach for removal of particulates, in line with AS 4439.3.

Analytical Results

Sub-Matrix: **ASLP LEACHATE** (Matrix: **WATER**)			Sample ID	**DCP10_0.0 - 0.15m**	----	----	----	----
			Sampling date / time	11-Aug-2021 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	**EM2117663-001**	--------	--------	--------	--------
				Result	----	----	----	----
EG005(ED093)C: Leachable Metals by ICPAES								
Arsenic	7440-38-2	0.1	mg/L	<0.1	----	----	----	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL)**			Sample ID	**DCP10_0.0 - 0.15m**	**----**	**----**	**----**	**----**
			Sampling date / time	11-Aug-2021 00:00	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EM2117663-001**	**--------**	**--------**	**--------**	**--------**
				Result	----	----	----	----
EN60: ASLP Leaching Procedure - Inorganics/PFAS (Plastic Vessel)								
Initial pH	----	0.1	pH Unit	**8.2**	**----**	**----**	**----**	**----**
After HCl pH	----	0.1	pH Unit	**2.0**	**----**	**----**	**----**	**----**
Extraction Fluid pH	----	0.1	pH Unit	**5.0**	**----**	**----**	**----**	**----**
Final pH	----	0.1	pH Unit	**5.1**	**----**	**----**	**----**	**----**

Inter-Laboratory Testing

Analysis conducted by ALS Brisbane, NATA accreditation no. 825, site no. 818 (Chemistry) 18958 (Biology).

(SOIL) EN60: ASLP Leaching Procedure - Inorganics/PFAS (Plastic Vessel)

(WATER) EG005(ED093)C: Leachable Metals by ICPAES

QUALITY CONTROL REPORT

Work Order	: **EM2117663**	Page	: 1 of 3
Client	: **FYFE PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: STUART TWISS	Contact	: Kieren Burns
Address	: LEVEL 1, 124 SOUTH TERRACE ADELAIDE SOUTH AUSTRALIA 5000	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: ----	Telephone	: +61881625130
Project	: 80963-1	Date Samples Received	: 17-Aug-2021
Order number	: 11415	Date Analysis Commenced	: 07-Sep-2021
C-O-C number	: ----	Issue Date	: 09-Sep-2021
Sampler	: ----		
Site	:		
Quote number	: AD/060/21		
No. of samples received	: 1		
No. of samples analysed	: 1		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

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

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Mark Hallas	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the 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	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EG005(ED093)C: Leachable Metals by ICPAES (QC Lot: 3891736)									
EB2123333-049	Anonymous	EG005C: Arsenic	7440-38-2	0.1	mg/L	<0.1	<0.1	0.0	No Limit

Method Blank (MB) and Laboratory Control Sample (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: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EN60: ASLP Leaching Procedure - Inorganics/PFAS (Plastic Vessel) (QCLot: 3887255)								
EN60a-P: Initial pH	----	0.1	pH Unit	5.0	----	----	----	----
EN60a-P: After HCl pH	----	0.1	pH Unit	5.0	----	----	----	----
EN60a-P: Extraction Fluid pH	----	0.1	pH Unit	5.0	----	----	----	----
EN60a-P: Final pH	----	0.1	pH Unit	5.0	----	----	----	----

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG005(ED093)C: Leachable Metals by ICPAES (QCLot: 3891736)								
EG005C: Arsenic	7440-38-2	0.1	mg/L	<0.1	0.1 mg/L	114	89.0	123

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	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG005(ED093)C: Leachable Metals by ICPAES (QCLot: 3891736)							
EB2123333-053	Anonymous	EG005C: Arsenic	7440-38-2	1 mg/L	108	70.0	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EM2117663**	Page	: 1 of 4
Client	: **FYFE PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: STUART TWISS	Telephone	: +61881625130
Project	: 80963-1	Date Samples Received	: 17-Aug-2021
Site	:	Issue Date	: 09-Sep-2021
Sampler	: ----	No. of samples received	: 1
Order number	: 11415	No. of samples analysed	: 1

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL** 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*
EN60: ASLP Leaching Procedure - Inorganics/PFAS (Plastic Vessel)							
Non-Volatile Leach: 180 day HT (e.g. PFAS, metals ex.Hg) (EN60a-P) DCP10_0.0 - 0.15m	**11-Aug-2021**	**07-Sep-2021**	07-Feb-2022	✓	**----**	----	----

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*
EG005(ED093)C: Leachable Metals by ICPAES							
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG005C) DCP10_0.0 - 0.15m	**07-Sep-2021**	**09-Sep-2021**	06-Mar-2022	✓	**09-Sep-2021**	06-Mar-2022	✓

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(were) 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: **SOIL**

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)							
ASLP for Non & Semivolatile Analytes - Plastic Leaching Vessel	EN60a-P	1	1	**100.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

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)							
Leachable Metals by ICPAES	EG005C	1	7	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Leachable Metals by ICPAES	EG005C	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Leachable Metals by ICPAES	EG005C	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Leachable Metals by ICPAES	EG005C	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

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*
Leachable Metals by ICPAES	EG005C	SOIL	In house: referenced to APHA 3120; USEPA SW 846 - 6010: The ICPAES technique ionises leachate sample atoms emitting a characteristic spectrum. This spectrum is then compared against matrix matched standards for quantification. This method is compliant with NEPM Schedule B(3).

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*
Digestion for Total Recoverable Metals in TCLP Leachate	EN25C	SOIL	In house: Referenced to 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 Schedule B(3)
ASLP for Non & Semivolatile Analytes - Plastic Leaching Vessel	EN60a-P	SOIL	In house QWI-EN/60 referenced to AS4439.3 Preparation of Leachates.

Appendix H

Geophysical survey report (marine and terrestrial)

Client:

KBR

Project:

Healthy Coorong Basin Infrastructure Feasibility Investigations - Geophysical Surveys

DATE: 3 DECEMBER 2021
REFERENCE: MES_908_COORONG_AC

Project Name: Healthy Coorong Basin Infrastructure Feasibility Investigations - Geophysical Surveys

Client Name: KBR

Client Ref:

Prepared For: Phil Staniford

MES Job No. MES_908

QUALITY INFORMATION

Document Name MES_908_Coorong_ac

Date 3/12/2021

Prepared By RF/DPK

Reviewed By DPK

Revision History

Rev	Revision Date	Details	Name/Position	Signature
1	3/12/2021	Version ac	DPK/PM	

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1 INTRODUCTION

Marine and Earth Sciences Pty Ltd (MES) was commissioned by KBR to conduct a combination of marine and land based geophysical studies and hydrographic surveys to assist planning and design of the proposed pipeline between The Coorong and Southern Ocean, approximately 100km northeast of Cape Jaffa, South Australia.

The geophysical study objectives are to map the seabed and subsurface geological features across the study area to assess tunnelling conditions for the proposed water intake pipelines. Specifically, the objectives of the survey are to:

- Map seabed features and current seabed levels.
- Determine the thickness of sediments across the site and confirm the presence, continuity, and nature of any bedrock identified within 20-35m of the seabed.
- Map the vertical and lateral distribution of subsurface seismic velocities along predefined alignments both offshore and onshore.

A location plan showing the onshore and offshore study areas is presented in Figure 1.

The marine surveys as part of the study were conducted during periods of calm sea state to allow good quality data to be captured as well as achieve coverage as close as possible to the shoreline where surging waves presented a navigational safety concern. In periods on unfavourable sea state, the onshore components were completed. Data acquisition was completed between 26th October and 5th November 2021. The survey was performed in accordance with the project specific safety and environmental management plans (MES_908_JSEA and MES_908_Marine_EMP) with no incidents occurring for the duration of the work program.

2 SCOPE OF WORKS

Multi-Phase Echo Sounder and Side Scan Sonar survey to simultaneously map seabed levels and capture side scan sonar data for mapping seabed characteristics and surface expressions of geological structures if present.

Sub-Bottom Profiling survey using a boomer system to map sub-surface geological layers over the footprint of the site.

Magnetometer survey to measure variations in the earth's magnetic field over the site. Geological features and lateral boundaries of geological units as well as man-made ferrous objects can distort the earth's magnetic field and these distortions can be measured and mapped to assist understanding the geological setting and nature of materials.

Continuous Marine Seismic Refraction survey to map subsurface seismic velocities, enabling assessment of geological materials density, strength, and weathering.

Camera Drops to calibrate the side scan sonar characteristics and allow a better appreciation of seabed materials to ground truth any features identified.

Onshore Seismic Refraction survey along two predefined alignments to map thickness of sands, rock levels and weathering and strength characteristics.

3 FIELD TECHNIQUES AND EQUIPMENT SPECIFICATIONS

3.1 Multi-Phase Echo Sounder and Side Scan Sonar Survey

The sonar used for the survey was an Edgetech 6205 Multiphase Echo Sounder (MPES). The ET6205 produces real-time, high-resolution, three-dimensional maps of the seafloor whilst providing co-registered simultaneous dual frequency side scan imagery. For the bathymetry, the ET6205 uses ten receive element transducers and one discrete transmit element. The high number of channels enables superior rejection of multipath effects, reverberation and acoustic noise commonly encountered in the shallow water survey environment. An AML Micro-X Sound Velocity Sensor (SVS) at the head of the sonar provided sound velocity information required for beam steering on a per ping basis. The Micro-X has capabilities for measuring sound velocity ranges from 1375 m/s to 1625 m/s at an accuracy of 0.025 m/s.

The positioning and orientation solution for the survey was an Applanix POS MV SurfMaster consisting of a small form factor POS control system with IP68 water submersible titanium sealed IMU and two Trimble antennas. An AML Micro-X sound velocity sensor at the head of the sonar provided sound velocity information required for beam steering on a per ping basis. The Micro-X has capabilities for measuring sound velocity ranges from 1375 m/s to 1625 m/s at an accuracy of 0.025 m/s.

The POS MV SurfMaster is a state-of-the-art system designed to provide accurate attitude, heading, heave, position, and velocity data. A Fugro Marinestar navigation aiding subscription was activated as part of the survey, improving the real-time positioning of the system to approximately 10cm horizontally and 15cm vertically. Roll and pitch accuracy from the IMU were approximately 0.03°, with heave accuracy around 5cm. Heading accuracy post-calibration was around 0.1.

To correct for refraction through the water column a sound velocity probe must be employed during any hydrographic survey. The unit used for this survey was a SonTek CastAway CTD. Designed for coastal profiling, the CastAway-CTD incorporates a 6-electrode conductivity cell, coupled with a fast response thermistor to provide highly accurate, high resolution CTD measurements to depths of 100m. The sound velocity accuracy derived from the CTD is 0.15 m/s. The unit has an in- built GNSS chip that captures the time and location of the CTD profile, and Bluetooth capability for transferring data.

During acquisition, a comparison between the currently loaded SVP and the sound velocity measured at the transducer head was monitored. If differences became too pronounced, then another CTD cast was implemented. At a minimum a cast was made at the start, the middle, and the end of each survey day.

The QPS QINSy package was used data acquisition. The software is stable and provides a number of useful online quality control displays for data monitoring. QINSy logs all raw data in a proprietary DB format, and geospatially corrected data (XYZ solution) in a QPD format. Further post processing of the data was done in the QPS Qimera and Chesapeake SonarWiz software packages.

The MPES system was operated from MES survey vessel using a universal sonar mount (USM) system with the transducer head mounted over the side and antennas and motion sensors fitted to the USM antenna pole with pre-set offsets and angle corrections.

After the POS MV system was installed and all systems were interfaced, basic system communication tests were conducted to ensure that all sensors composing the POS MV were receiving or sending data. This included checking whether the Marinestar navigation aiding solution was being received by the satellite data link.

For the POS MV calibrations, the vessel performed a series of manoeuvres to maximise angular rates and accelerations in the IMU to derive a Primary GNSS to Secondary GNSS XYZ vector. This vector forms the POS MV heading solution, also called GNSS Azimuth Measurement System (GAMS). After establishing the GAMS solution, a series of lines were run over features identified across the seabed to determine the mounting biases associated with the ET6205 transducer head relative to the vessel reference frame. Roll, pitch, and yaw biases were established for each transducer (Port and Starboard).

3.2 Sub-Bottom Profiling Survey

An Applied Acoustics boomer system was used to acquire SBP data for mapping geological layers across the study area. The boomer seismic source was operated at energy levels ranging from 200 to 300 joules and a firing rate of 3 to 4 pulses per second. Return signals were received via the 12-element hydrophone array streamer interfaced to a 24-bit analogue to digital converter which in turn was interfaced to Chesapeake Technology acquisition system. The seismic acquisition system was interfaced to the GPS system with position, heading, speed and ping number appended in the seg-y seismic file. The hydrophone streamer and transducer catamaran were towed 20m behind the vessel with a separation of approximately 3m. The vessel speed was maintained between 2.0 and 2.5 knots. Prestart equipment checks included a tap test on the hydrophones array and checking response on the digital oscilloscope.

3.3 Marine Magnetometer Survey

A Marine Magnetics Sea Spy magnetometer was used to measure the magnetic flux density using an Overhauser sensor over the study area. The magnetometer was interfaced through the BOB software package and towed 40m behind the survey vessel. The magnetometer was set to sample at 1Hz and was interfaced to the acquisition computer which receives the magnetic and position data and was recorded to the internal hard drive. Positioning of the towfish was referenced to the DGPS antenna. Prestart equipment checks included internal system check on start-up and deploying the towfish off the stern of the vessel and initiating sampling to assess data quality and stability. The magnetometer data was acquired simultaneously with the sub-bottom profiling survey.

3.4 Continuous Marine Seismic Refraction Survey

The CMSR technique is a bottom towed velocity profiler, designed to measure the compressional p-wave velocity of sub-bottom materials and their distribution. Correlation of compressional p-wave velocities and materials in situ strength can provide very useful information for engineering projects such as dredging and foundation design. This approach has proven successful in targeting geotechnical boreholes more effectively over areas where shallow high velocity / high strength material has been identified which can significantly impact dredging operations. Appendix B provides a general correlation of geological material with seismic velocities in the marine environment.

CMSR data was acquired with a Geometrics Geode 24 channel digital enhancement seismograph. Acquisition parameters for the Geode were configured with a sampling interval of 0.00625 milliseconds and a record length of 200ms. Seismic data was time stamped with the navigation log file and backed up on a daily basis on digital medium for post processing. The seismic refraction survey used a 24-channel hydrophone array with sensor intervals of 5m. Seismic energy was provided by a 2800LX Bolt airgun fitted with a 10-cubic inch chamber. The airgun unit and hydrophone array were towed along the sea floor along a single pre-selected alignment with the aid of the on-board DGPS navigation system and tow-body altimeter. The seismic refraction lines were run with a receiver offset of 2m. A gun phone was fitted to the airgun to provide the recording seismograph with an accurate time zero for each shot. Prestart equipment checks were undertaken to ensure accurate time breaks from airgun initiation as well as quality control checks on hydrophone response from the airgun to ensure first arrivals on the seismic records are clear and reliable for post processing. On start up the digital seismograph performs internal tests and calibrations of A-D converters.

3.5 Camera Drops

A waterproof, high-definition 360 degree digital video camera was lowered to the seafloor at each target location. Video was recorded for approximately 1 minutes at each site with the camera positioned close to the seabed. Positions of camera drops were recorded in the log file along with a time stamp.

3.6 Onshore Seismic Refraction Survey

This geophysical method provides an assessment of the bedrock level and the associated seismic velocities and enables an assessment of the weathering and/or strength of the bedrock. The seismic refraction method is based on the critical refraction of seismic waves at interfaces across which the seismic velocity increases. It is the standard method for shallow bedrock mapping and excavatability assessment and has the advantage that seismic velocity information is also obtained in addition to the location of the interfaces.

Seismic refraction data was acquired with a Geometrics Geode 24- channel digital enhancement seismograph. Acquisition parameters for the Geode were set at a sampling interval of 0.00625 milliseconds with a record length of 1.5 seconds. Seismic data was backed up daily and stored on digital medium for post processing.

A geophone interval of 4m was used for all seismic lines completed. Geospace GS11D, 7.55Hz geophones were rigidly coupled with the ground with 75mm tapered spikes on the geophone base that were pressed firmly into the sand. For each 24-channel seismic spread, a 12m shot spacing was used with a minimum of three offsets. Seismic energy was provided by striking a sledgehammer on an aluminium plate successively until a clear first break arrival was observable on the seismic record. In accordance with accepted practice reversed coverage seismic data was obtained using source - receiver offsets up to three times the shot spacing.

4 DATA PROCESSING AND INTERPRETATION PROCEDURES

4.1 Multi-Phase Echo Sounder Data

The MPES data was processed with the QPS Qimera software package using the following workflow routines:

- Load logged DB files;
- Convert raw Range/Theta data to a geospatially corrected (XYZ) solution resulting in the creation of QPD files;
- Generate a Dynamic Surface with CUBE modelling using the standard Shallow Water settings;
- Apply preliminary sonar bias values for Roll/Pitch/Yaw as derive from Pambula Lake Patch Test;
- Adjust Roll bias for the particular days' worth of data and regenerate QPD files and Dynamic Surface;
- Validate the CUBE surface such that it captures all relevant features across the survey area;
- Filter soundings relative to the validated CUBE surface with a threshold set to an IHO Order 1 level;
- Check Shallow and Deep Surfaces for any remaining anomalous soundings;
- Grid data at 2m and 5m bin sizes using a Weighted Moving Average algorithm with a Weight Diameter of 3.

The reduced MPES data has been referenced to Australian height datum (AHD) and is presented as a contour plan on Figure 2.

4.2 Side Scan Sonar Data

The MPES backscatter data was converted to XTF format for processing in Chesapeake software. The data was checked for correct positioning and bottom tracking before being processed. The backscatter intensity for each line was corrected for distance from the sonar head and seabed incident angle using SonarWiz's Empirical Gain Normalisation function. Lines were trimmed to remove line turns and any sections of data with rapid changes in heading. The data range was adjusted for each line to display the best data from the middle of each swath while still ensuring full overlap data coverage (i.e. 200% seabed ensonification)

Data mosaics were produced using the overlap methods. The overlap method produces the highest level of detail and includes acoustic shadows which are useful to discern features with relief such as sediment ripples. A 0.1m resolution GeoTIFF mosaic is provided electronically and presented on Figure 3.

4.3 Sub-Bottom Profiling Survey

Prior to interpretation post processing involved replaying the digital seismic data (SEG-Y format) using Chesapeake software, and applying layback corrections, band pass filters and time variable gains to the seismic data to optimise the detection of reflectors from subsurface layers. The SEG-Y data was then imported to HIS Kingdom software for interpretation and developing a geological model.

An interpretation of the SBP records has been undertaken to map sub-surface reflectors related to geology and this involved replaying the records to identify and digitise coherent laterally continuous reflectors. The digitised reflector information contains the position and two-way travel time of the reflector. The position is corrected for layback behind the DGPS antenna and the two-way travel time is converted to depth with an assigned velocity. The interval seismic velocity assigned for time conversion to depth for R1 is 1550m/s, 1750m/s for R2 and 1800m/s for R3. This velocity was assigned after analysis of the refraction data. If the actual seismic velocity of sub bottom material is lower than this value, the depth calculation to reflector/s would be overestimated and vice versa for a higher actual seismic velocity. The fact that the velocity profile may vary laterally along the alignment will also affect the calculated distance from the sea floor to reflectors when assigning an average near surface velocity, especially if the investigation area is large and comprises long lines. It must be borne in mind that the interpretation of seismic reflection data is subjective. Alternative assessments of the presence, location and nature of seismic reflectors are possible, and could produce interpretations different to those presented here. This subjectivity may be increased where data quality varies on adjacent survey lines and crosslines as a result of sea conditions. The expected accuracy of the interpreted seismic reflector levels is in the order of +/- 5% of sub-surface depth. There are potential errors associated with the determination of strata thickness due to the inherent, relatively long wavelength of the boomer seismic signal (up to several metres) rendering it very difficult to detect accurately layers shallower than 1.0 to 1.5m.

The SBP vessel trackplots have been presented on Figure 4 with contour plans of interpreted reflectors presented on Figures 5 to 7.

4.4 Marine Magnetometer Survey

The magnetometer data has been cleaned and processed to produce Total Magnetic Intensity (TMI) and magnetic gradient grids. The data was manually inspected and edited to remove outlier points and excessive noise typically associated with vessel turns. Only data from the north-south orientated main lines has been used to calculate the TMI grid. East-west orientated cross lines have been used to correct the main lines for diurnal variation and intensity variations between data collected three weeks apart due to weather delays.

The magnetometer data was corrected for layback and offset from the DGPS antenna of the survey vessel during acquisition using BOB software. The total magnetic intensity has been gridded in Surfer and is presented on Figure 8.

4.5 Continuous Marine Seismic Refraction Survey

The digital seismic data has been archived in Marine & Earth Sciences seismic database. The digital seismic records were examined on computer, and the first arrival times were determined using Rayfract, an engineering seismic refraction software package. Generally, the seismic data was considered of good quality and adequate for interpretation. Shot points, receivers and associated first breaks were assigned an X, Y position based on the layback of the source and receivers from the vessel DGPS antenna. These locations were converted to seismic chainage using the GPS position of the designated start location of each seismic line.

The seismic refraction data along each line was merged to construct a combined travel time plot using the elevations as determined by the bathymetric data provided to MES. This merged travel time plot was imported to Rayfract software and processed with the Wavepath Eikonal Travel-time (WET) tomography algorithm. This technique has the ability to resolve strong lateral and vertical velocity gradients with relatively complex topography and efficiently handle large seismic refraction data sets. As with all seismic methods, seismic refraction has inherent limitations and problems in effectively accurately representing subsurface conditions in all geological environments. These limitations are discussed in Appendix A.

The CMSR line location has been presented on Figure 9 with the interpreted marine seismic refraction section presented on Figure 10.

4.6 Camera Drops

Digital videos obtained from the camera drops were played back and stills captured, showing the general seafloor characteristic at each site. This imagery was used to ground truth the side scan sonar imagery interpretation and achieve a good appreciation of ground conditions over the study area for future general reference for design and planning purposes. The camera drop locations are presented on Figure 3 with the still images attached in Appendix D. Electronic copies of the videos are available on request.

4.7 Onshore Seismic Refraction Survey

The digital seismic records were examined on computer, and the first arrival times were determined using Fbpick software. These measured first arrival travel times were analysed using the interpretation program REFRACT based on the intercept time and reciprocal method and refined with Rayfract software based on the Wavepath Eikonal Travel-time tomography (WET) algorithm. This technique can resolve strong lateral and vertical velocity gradients with relatively complex topography. In general, the seismic data was of good quality and adequate for interpretation. As with all seismic methods, seismic refraction has inherent limitations and problems in effectively accurately representing subsurface conditions in all geological environments. These limitations are discussed in Appendix A.

The onshore seismic refraction line locations and sections are presented on Figures 11 to 12.

5 RESULTS

5.1 Multi-Phase Echo Sounder

Bathymetry data was collected from approximately 4.2km offshore to as close as practicable to the shoreline and extending beyond the survey area boundaries. The shallowest depth is -5.2m AHD at the closest point to the shoreline and deepens to -16.7 m AHD offshore, with seabed contours typically parallel to the shoreline and generally flat and featureless with no evidence of surface geological expression. The reduced bathymetry data has been contoured and presented on Figure 2.

5.2 Side Scan Sonar

Seabed features and sediment classification have been interpreted based on the bathymetry data and the side scan sonar mosaic which is presented on Figure 3. Sonar reflectivity is generally proportional to grain size for unconsolidated sediments and roughness or bathymetric relief for rock, reef, or cemented material. Generally fine-grained sands produce the lowest intensity (darker imagery on the mosaic) while coarser sands produce the higher intensity (lighter imagery on the mosaic).

Three sonar characteristics have been mapped over the site and are summarised below in Table 1:

Table 1 - Seabed Sonar Classification

Sonar Characteristic	Interpretation
Very low sonar reflectivity	Mobile, fine grained sands, smooth and rippled. This sonar characteristic is predominantly limited to the offshore zone.
Very low to low sonar reflectivity	Mobile, fine to medium grained sands, smooth and rippled. This sonar characteristic is predominantly limited to the inshore zone.
Low sonar reflectivity with high reflective irregular shapes.	Fine grained sands with high reflective responses typical of benthic plant structures. This sonar characteristic is limited between the -9m and -12m seabed contour intervals.

Figures A to D present examples of the side scan sonar records for the range of sonar characteristics identified.

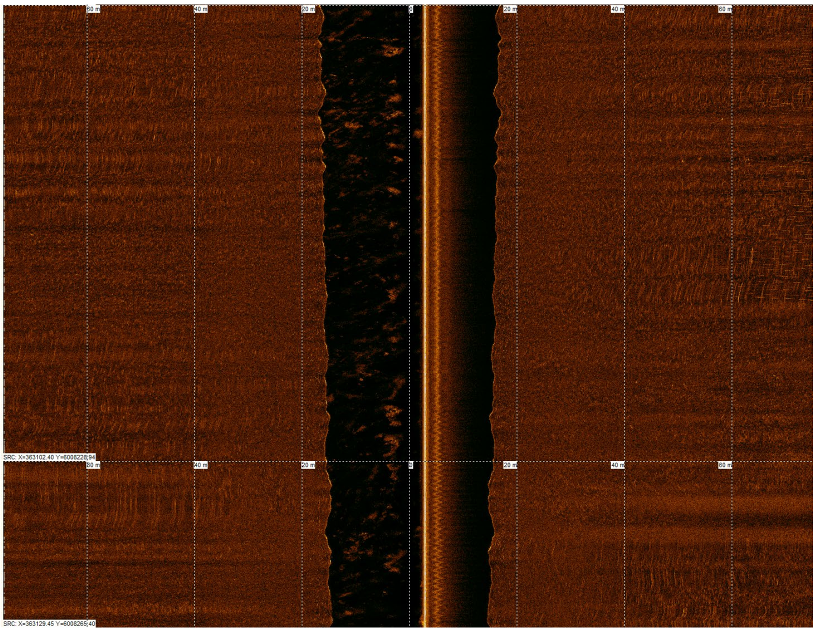


Figure A - Offshore Area Sonar Example

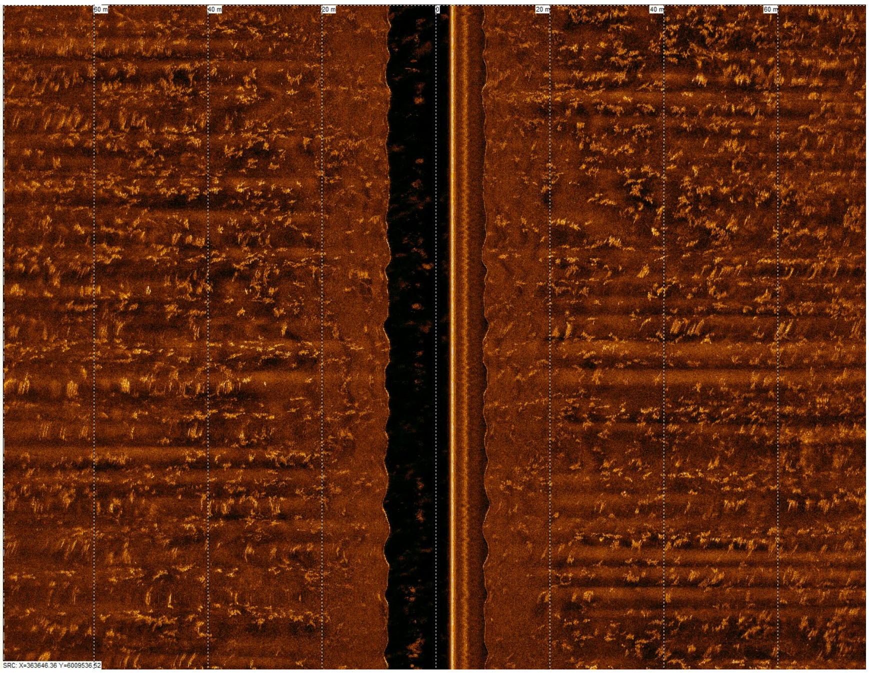


Figure B - Dense Benthic Plant Sonar Example

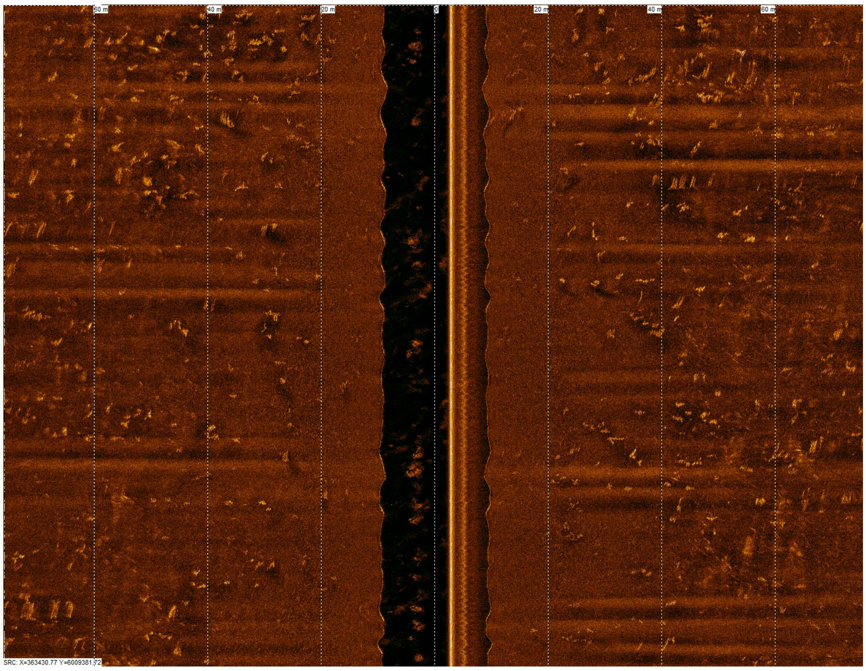


Figure C - Sparse Benthic Plant Sonar Example

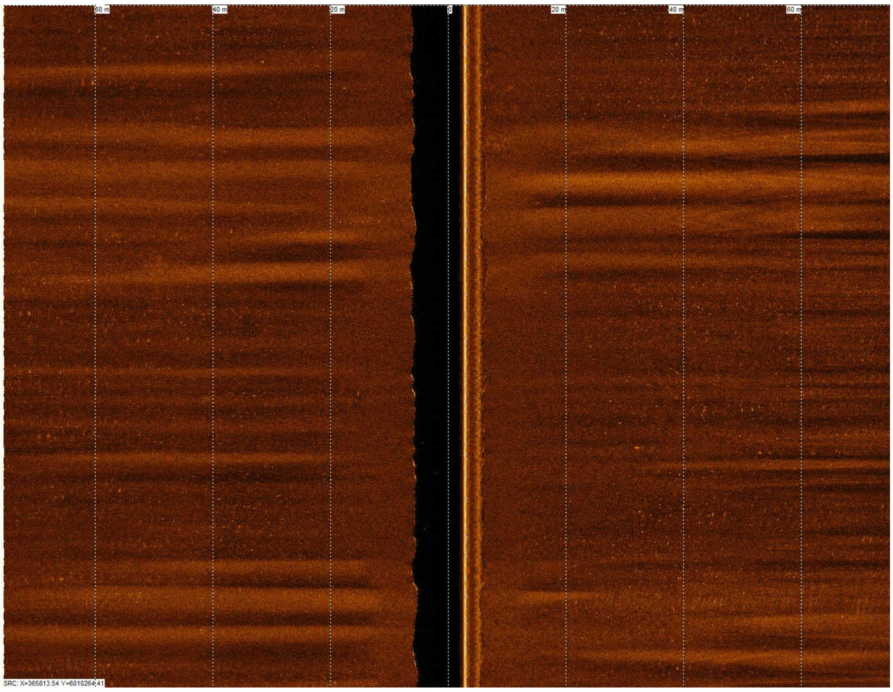


Figure D - Nearshore Area Sonar Example

5.3 Sub-Bottom Profiling

The boomer sub-bottom profiler data has achieved depths of investigation to greater than 40 meters below the seabed. At present there is no offshore geotechnical information available for calibration and verification of the sub-bottom profiler data. The interpretation presented is based on the onshore geology, seismic data characteristic and comparison with the other geophysical data. An example of a sub-bottom profiling record is presented in Figure E. These are time-based records and are provided to give a general indication of data quality and interpreted reflector character and nature.

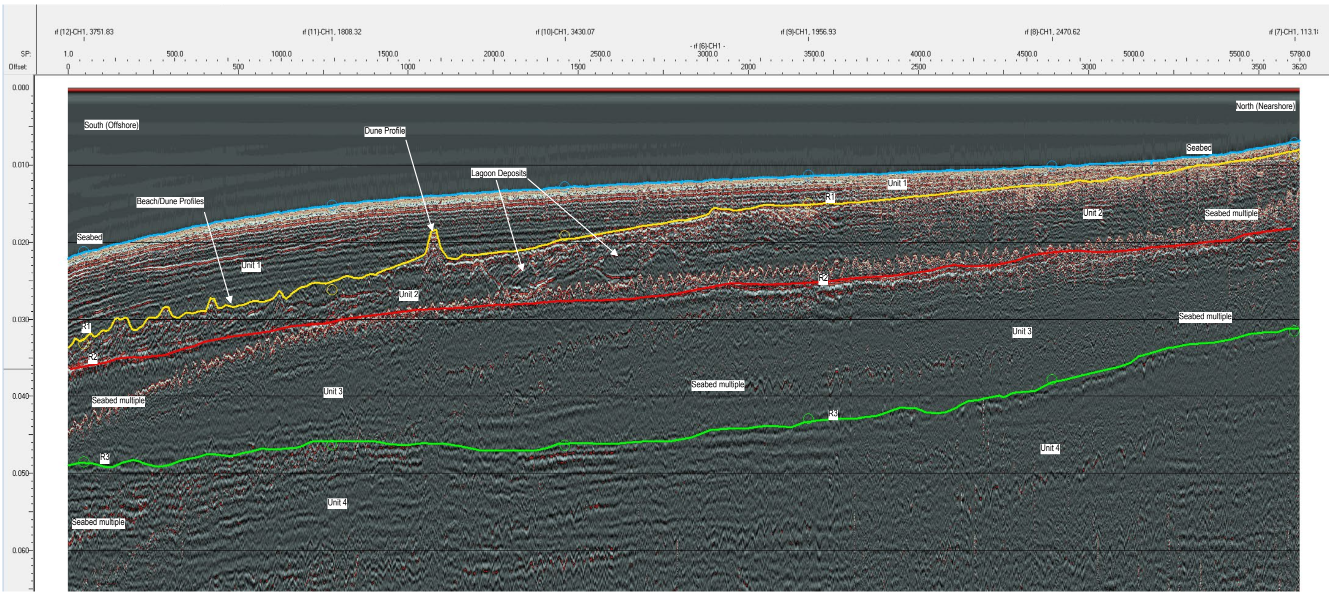


Figure E - Sub-Bottom Profiling Record Example

Three main continuous reflectors have been identified across the survey area with four geological units interpreted. These reflectors and units are summarised below:

Seabed Reflector

Unit 1 - Represent marine Holocene deposits predominantly sandy material. This layer is thin within the near shore zone and thickens to 9m offshore. Internal sub-horizontal reflectors are observed within the unit with minor depositional features observed.

R1 – Reflector 1 – Variable in character with both strong and diffuse characteristics

Unit 2 - Relic beach / dune profiles, some strong dipping reflectors which could be related to cemented / indurated layers. Includes lagoon deposits typical of back beach environments. Complex internal reflectors are observed on the record with fine grained lagoon deposits as well as strong discontinuous reflectors which could represent cemented/indurated layers within this unit.

R2 – Reflector 2 - Moderately strong reflector

Unit 3 - Erosional surface, Pleistocene layer interpreted as a relic soil profile. Limited internal reflectors are observed within this unit.

R3 – Reflector 3 - Continuous reflector, weak in places.

Unit 4 - Bedrock, weak internal sub-horizontal reflectors below the top of this unit are present and display parallelism indicating sedimentary origin.

The interpreted reflectors R1, R2 and R3 have been reduced to AHD and presented as contour plans in Figures 5, 6 and 7.

5.4 Marine Magnetometer

The processed magnetometer data has been contoured from the individual survey lines (50m spacing) and presented as a Total Magnetic Intensity (TMI) image in Figure 8. The measured magnetic field over the site is limited in range (59600nT to 59700nT) with no localised magnetic anomalies identified characteristic of shipwrecks or other large ferrous debris. The main feature observed on the contour data set is a magnetic low within the north-west edges of the site. This could be related to a deeper granitic intrusion body.

5.5 Continuous Marine Seismic Refraction

The interpreted seismic refraction data has identified material with compressional p-wave seismic velocities ranging from 1500m/s to greater than 3,000m/s which correlate with saturated loose sediments to fresh, high strength rock.

The main velocity structures observed on the cross section are as follows:

- Near surface very low velocity layer with seismic velocities ranging from 1500m/s to 1700m/s. The thickness of Unit 1 from the interpreted sub-bottom profiling model generally agrees well with this low velocity layer where unconsolidated sandy deposits are interpreted.
- Velocity inversion layer whereby a high velocity layer is sandwiched within two lower velocity layers. This layer overlies the near surface very low layer with laterally variable velocities. The velocities within a range of 1800-2000m/s within this layer is interpreted to be represented by cemented / indurated sand layers. The top of R1 reflector from the interpreted sub-bottom profiling model generally agrees with the top of this layer.
- Low velocity layer underlying the velocity inversion layer which is laterally variable. A very low velocity interval is mapped between CH1150m and CH2400m. with looser/softer materials expected within this zone. Between CH0m and 1150m/s the seismic velocities within this layer are an order higher with velocities up 2050m/s and could be

represented by residual soils or cemented indurated layers. This layer correlates well with Unit 3 on the interpreted sub-bottom profiling model.
- High velocity basement layer which correlates generally well with R3 (bedrock surface) from the sub-bottom profiling model. The seismic velocity gradient sharpens at around the 1900-2000m/s contour interval indicative of a significant density contrast.

The marine seismic refraction line location is provided in Figure 9. The interpreted seismic refraction section is provided in Figure 10 with the interpreted reflectors from the sub-bottom profiling model been projected onto this cross section.

5.6 Camera Drops

A seabed description from each camera drop image is provided in Table 2 below, with the camera drop images provided in Appendix D.

Table 2 – Camera Drop Image Description

Camera Drop ID	Comments
CD 1	Fine to medium grained sands forming small linear ripples (less than 10cm in height). Sands are very mobile as dense sand clouds were observed moving across the seabed.
CD 2	High turbidity at this location prevented a clear image of the seabed being obtained
CD 3	Fine to medium grained sands forming small linear ripples (less than 10cm in height). Sands are very mobile as dense sand clouds were observed moving across the seabed.

5.7 Onshore Seismic Refraction Survey

The onshore seismic results for each site are summarised below:

Western Onshore Site – The interpreted seismic refraction data at this site has identified material with compressional p-wave seismic velocities ranging from 400m/s to greater than 2400m/s which correlate with very loose soils to cemented/indurated sands and moderately weathered rock. The seismic refraction cross sections display a sharp velocity gradient at the 1500m/s contour interval which is planar refractor and likely related to the water table increasing the seismic velocities within the unconsolidated dune sands. A deeper sharp velocity gradient is observed at the 1900m/s-2000m/s contour interval and indicative of a sharp density contrast and is interpreted as the top of weathered bedrock or cemented / indurated sand layer. Velocity inversions have been identified between the 1500m/s and 2000m/s contour interval and could be related to thin cemented / indurated sand layers. The line location plan and interpreted seismic refraction sections are presented on Figure 11.

Eastern Onshore Site – The interpreted seismic refraction data at this site has identified material with compressional p-wave seismic velocities ranging from 400m/s to greater than 3500m/s which correlate with loose soils to fresh, high strength rock. The seismic refraction cross sections display a sharp velocity gradient at the 1500m/s contour interval which is planar refractor and likely related to the water table increasing the seismic velocities within the unconsolidated dune sands. A deeper sharp velocity gradient is observed at the 1900m/s-2000m/s contour interval and indicative of a sharp density contrast and is interpreted as the top of bedrock. The line location plan and interpreted seismic refraction sections are presented on Figure 12

6 DISCUSSION

The geophysical investigations offshore and onshore at Coorong have successfully mapped the seabed levels and features as well as subsurface conditions over the study area. The seabed is generally flat and featureless with a benthic plant band lying within the -9m and -12m seabed contour interval.

The sub-bottom profiling interpretation has identified a continuous bedrock profile (Unit 4) over the site with this layer interpreted as a sedimentary unit given the internal sub-horizontal and parallel internal reflectors. The material overlying the bedrock is interpreted to be near surface Holocene sandy deposit (Unit 1), a relic beach and dune profile with lagoon deposits which has been preserved since sea level rise (Unit 2) and a Pleistocene soil profile (Unit 3).

The contoured magnetometer data has identified a broad weak anomaly in the north-west edge of the site which is likely related to effects of a deeper geological unit such as a granitic intrusion which are not uncommon in the region.

The marine seismic refraction has identified a complex seismic velocity profile which generally correlates well with the sub-bottom profiling model where distinct reflector boundaries and interpreted units relate well to expected velocity ranges. The seismic velocity profiles for the two onshore seismic refraction lines differ with a considerably higher velocity basement material interpreted on the western line which adjoins the marine seismic refraction line. The velocity profile at the shoreline end of the land-based line is comparable with the nearshore end of the marine seismic line with 2000m/s contour interval dipping offshore at ~1.1 degrees. Both these lines display an inversion layer overlying the interpreted bedrock which is expected to be related to a cemented/indurated sand layer. Figure F presents the seismic refraction results within the nearshore and shoreline zone for comparison.

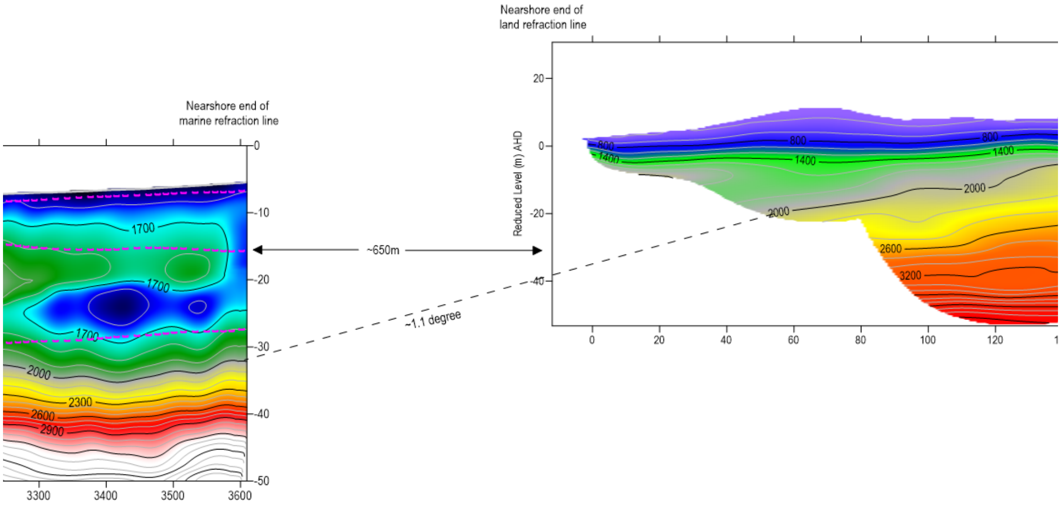


Figure F - Land and Marine Refraction Comparison

7 KEY GEOPHYSICAL MODEL FINDINGS THAT COULD IMPACT TUNNELING DESIGN

- Potential blowout of drilling fluids and hole stability during tunnelling operations if the very low velocity zone is intersected between CH1150m and CH2400m.
- Tunnelling may intersect harder indurated layers within Unit 2 and 3 offshore.
- Effects on benthic plants within the area

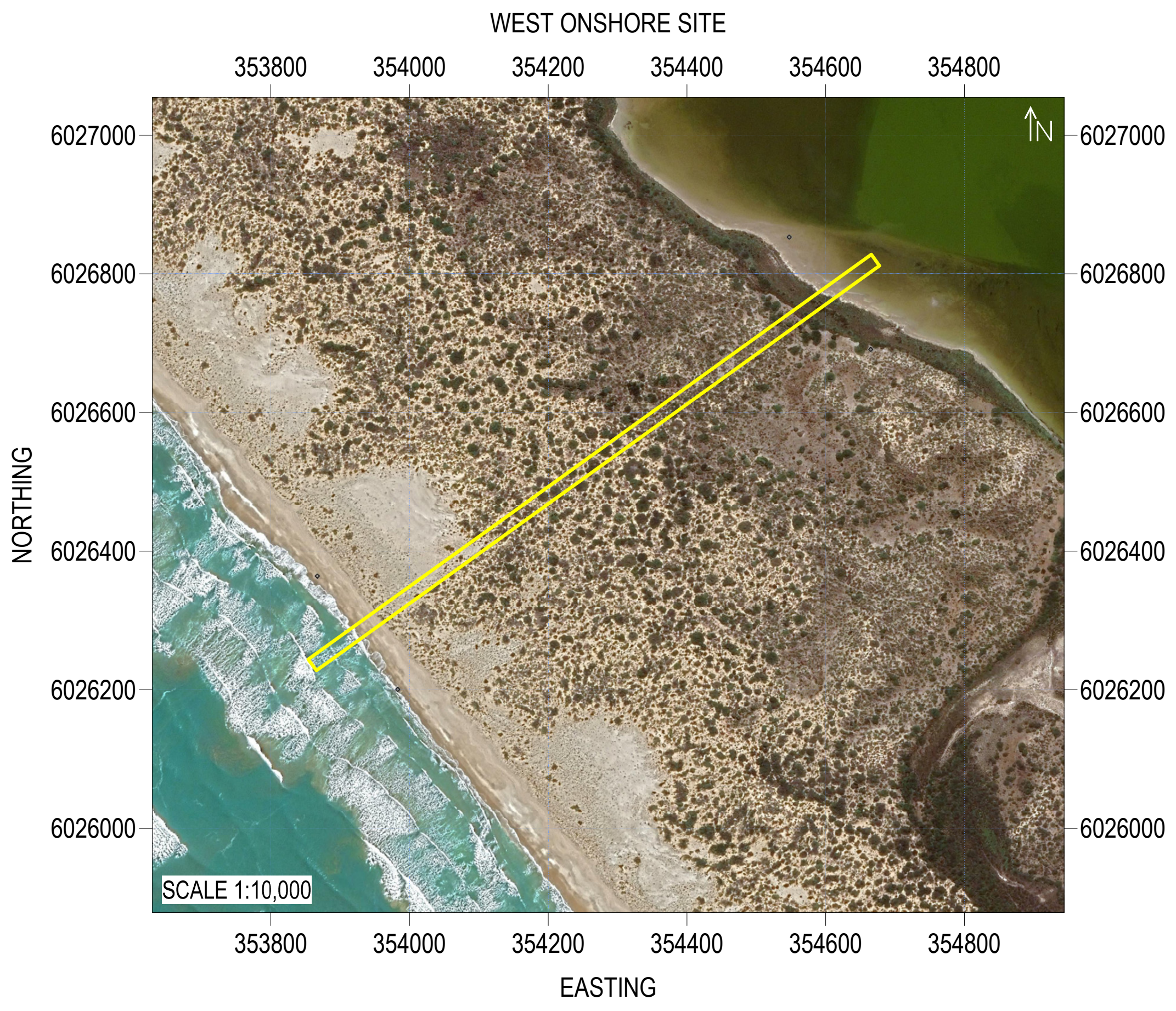
Should you have any questions or queries regarding this report please contact the undersigned.

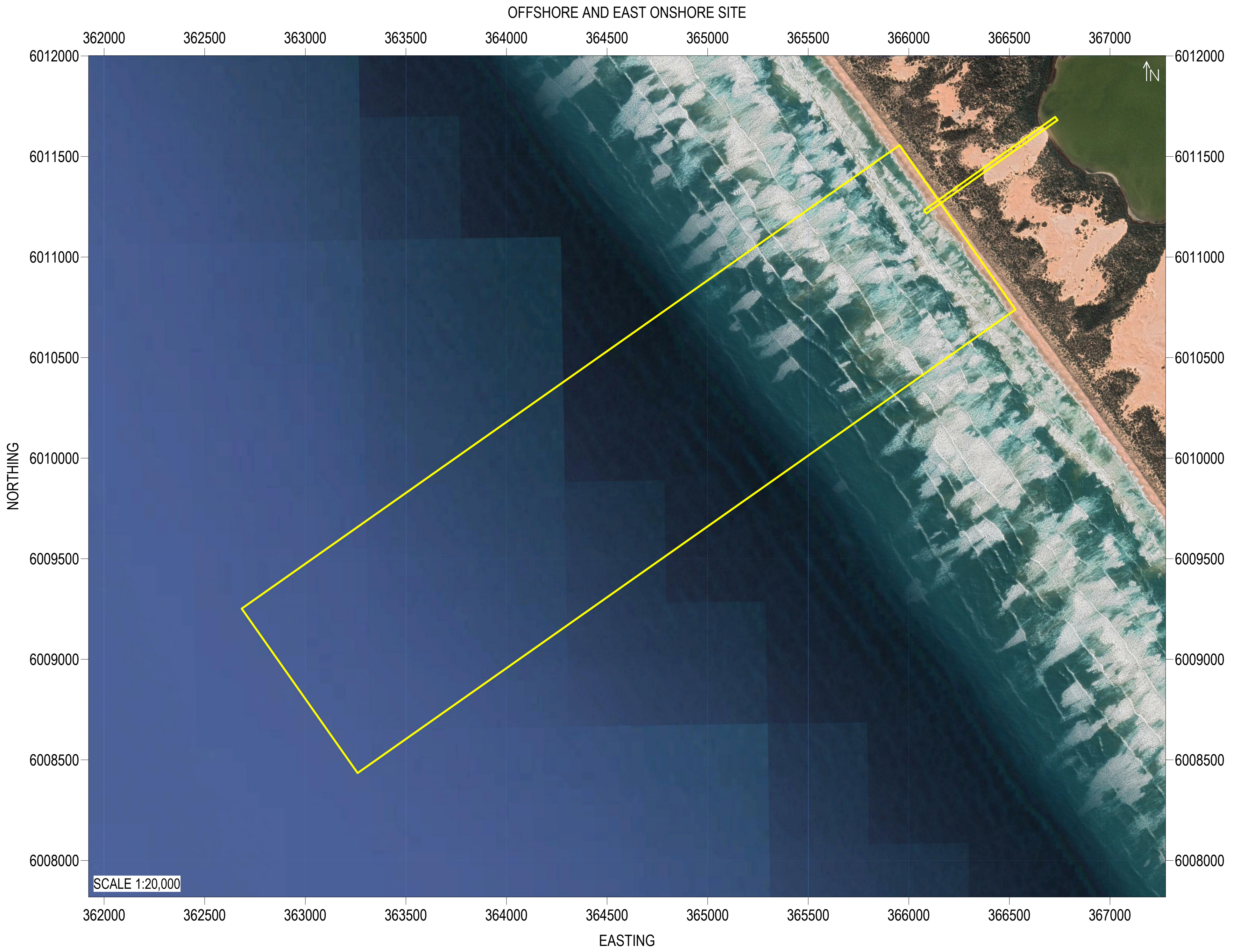
For and on behalf of

MARINE & EARTH SCIENCES PTY LTD

David King

Principal Geophysicist





LEGEND
— Survey Limits

CLIENT	KBR
PROJECT	Healthy Coorong Basin Infrastructure Feasibility Investigations
SURVEY DATE	October-November 2021

SITE LOCATION PLANS

LOCATION MAP

GEODETIC INFORMATION	
Horizontal Datum	GDA2020 MGA Zone 54S
Vertical Datum	Australian Height Datum (AHD) (m)

N SCALE As Shown (A1)

Project Ref: **MES_908** Figure No. **1**

NOTES

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Issue No.	Date	Description	Surv.	Interp.	Drawn	Appr.
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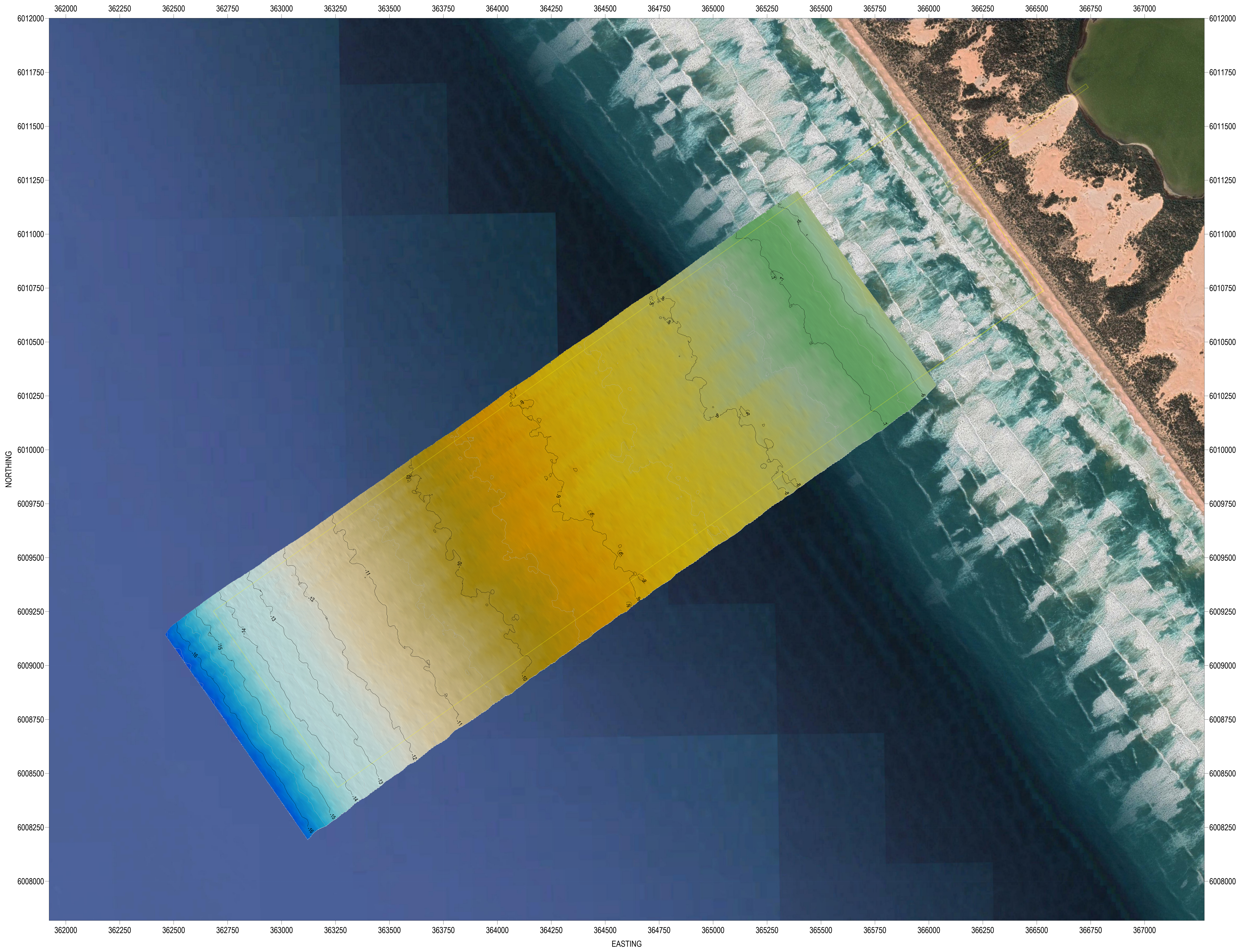

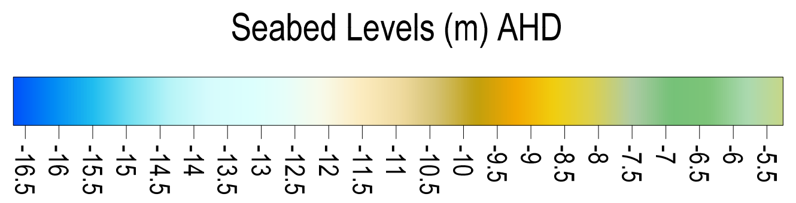

LEGEND

— Survey Limits

CLIENT	KBR
PROJECT	Healthy Coorong Basin Infrastructure Feasibility Investigations
SURVEY DATE	October-November 2021

MULTI-BEAM ECHO SOUNDER SURVEY
SEABED CONTOUR PLAN

LOCATION MAP

GEODETIC INFORMATION

Horizontal Datum	GDA2020 MGA Zone 54S
Vertical Datum	Australian Height Datum (m) AHD

↑N SCALE 1:10,000 (A1)

Project Ref: **MES_908** Figure No. **2**

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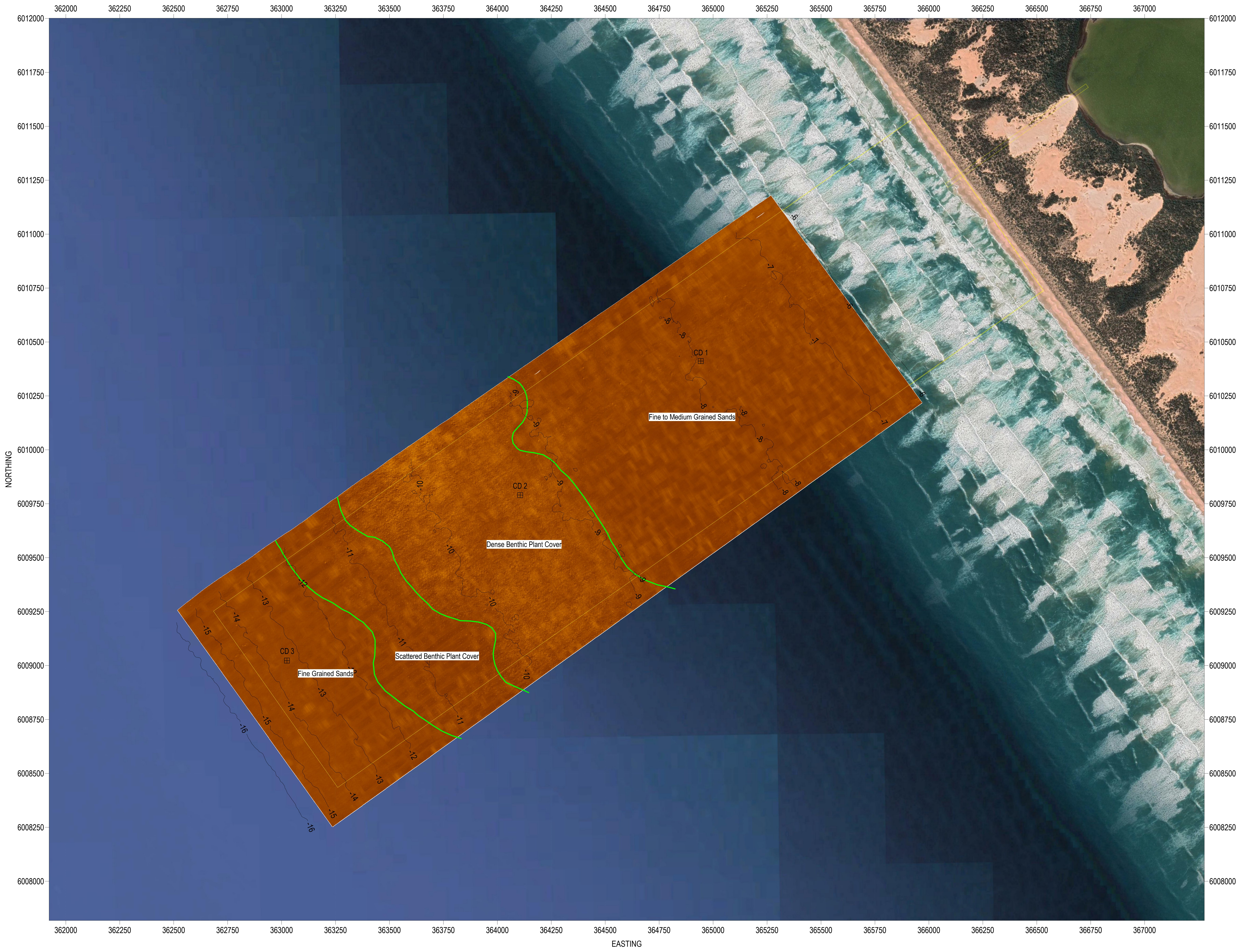

LEGEND
Survey Limits

CLIENT	KBR
PROJECT	Healthy Coorong Basin Infrastructure Feasibility Investigations
SURVEY DATE	October-November 2021

SIDE-SCAN SONAR SURVEY
SONAR MOSAIC AND SEAFLOOR FEATURE MAP

LOCATION MAP

GEODETIC INFORMATION

Horizontal Datum	GDA2020 MGA Zone 54S
Vertical Datum	Australian Height Datum (m) AHD

N SCALE 1:10,000 (A1)

Project Ref: **MES_908** Figure No. **3**

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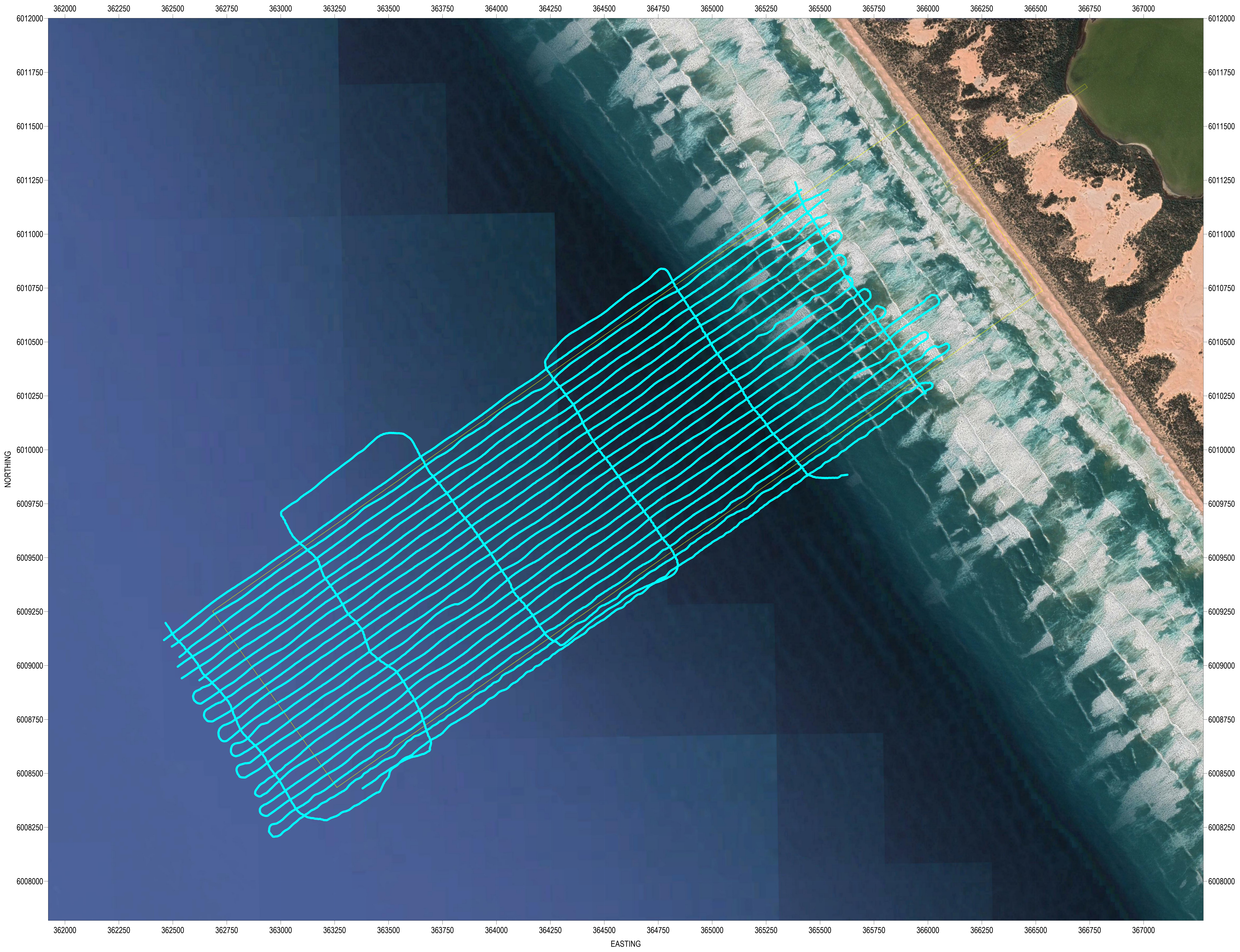

LEGEND

—	Survey Limits
—	SBP Vessel Trackplots

CLIENT	KBR
PROJECT	Healthy Coorong Basin Infrastructure Feasibility Investigations
SURVEY DATE	October-November 2021

SUB-BOTTOM PROFILING SURVEY
VESSEL TRACKPLOTS

LOCATION MAP

GEODETIC INFORMATION

Horizontal Datum	GDA2020 MGA Zone 54S
Vertical Datum	Australian Height Datum (m) AHD

N

SCALE 1:10,000 (A1)

Project Ref: **MES_908**

Figure No. **4**

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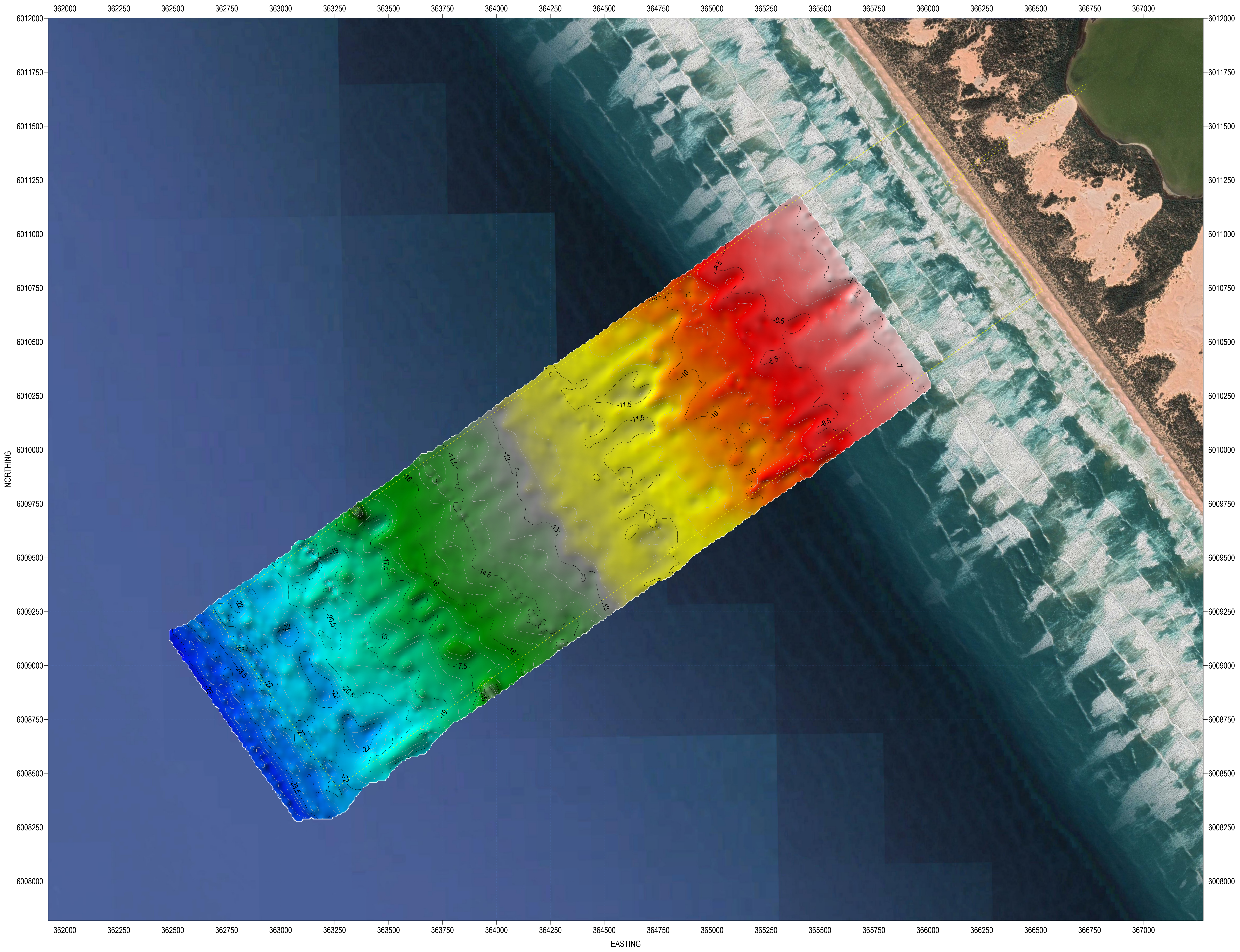

LEGEND
Reduced Level (m) AHD
-25 -24 -23 -22 -21 -20 -19 -18 -17 -16 -15 -14 -13 -12 -11 -10 -9 -8 -7

CLIENT	KBR
PROJECT	Healthy Coorong Basin Infrastructure Feasibility Investigations
SURVEY DATE	October-November 2021

SUB-BOTTOM PROFILING SURVEY
REDUCED INTERPRETED R1 CONTOUR PLAN

LOCATION MAP

GEODETIC INFORMATION	
Horizontal Datum	GDA2020 MGA Zone 54S
Vertical Datum	Australian Height Datum (m) AHD
N	SCALE 1:10,000 (A1)
Project Ref: **MES_908**	Figure No. **5**

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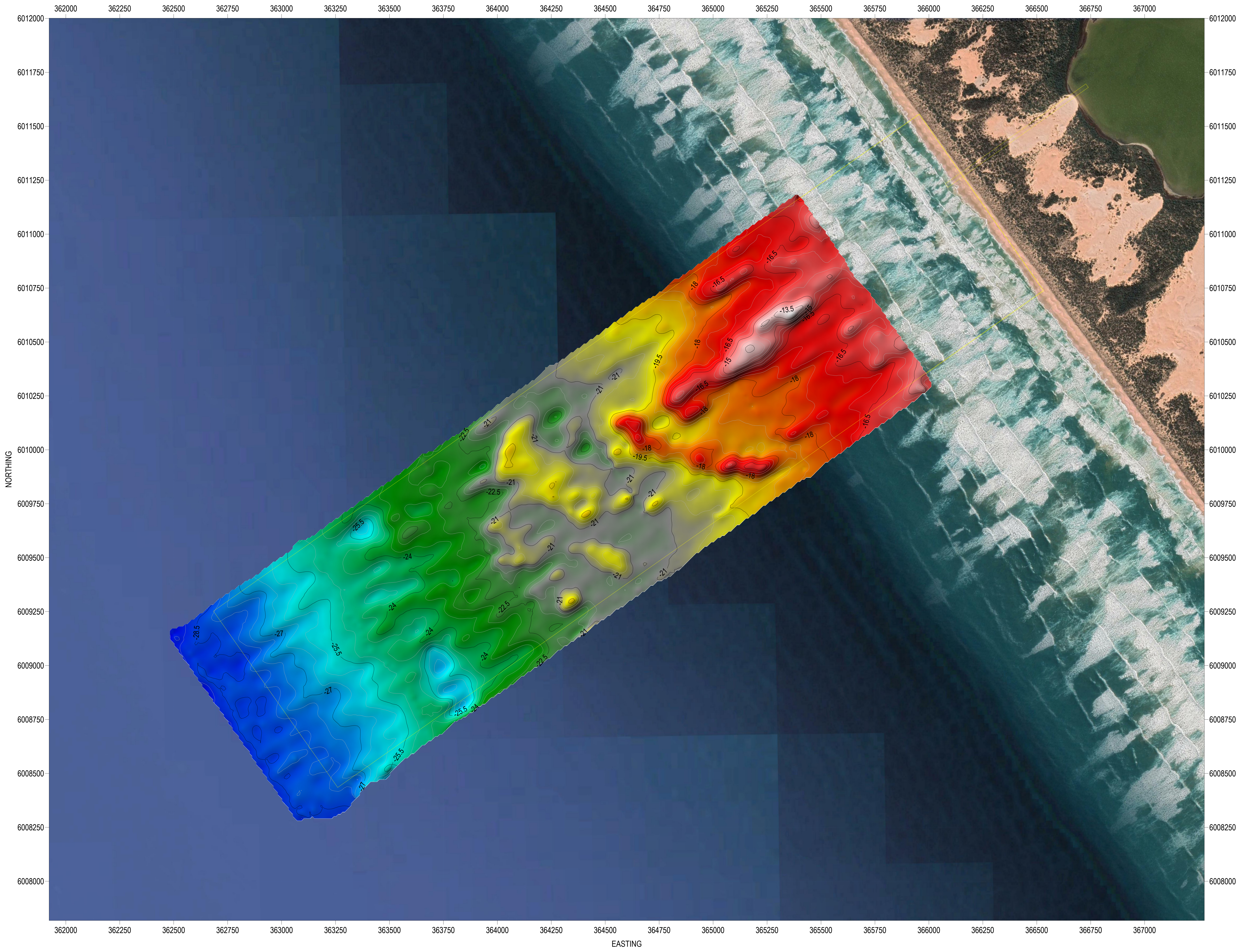
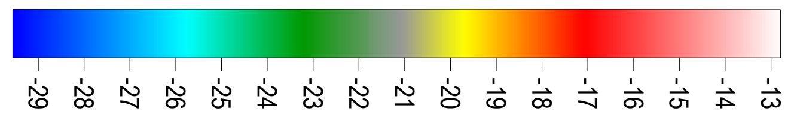
2						
3						



LEGEND

Reduced Level (m) AHD



CLIENT	KBR
PROJECT	Healthy Coorong Basin Infrastructure Feasibility Investigations
SURVEY DATE	October-November 2021

SUB-BOTTOM PROFILING SURVEY
REDUCED INTERPRETED R2 CONTOUR PLAN

LOCATION MAP

GEODETIC INFORMATION

Horizontal Datum	GDA2020 MGA Zone 54S
Vertical Datum	Australian Height Datum (m) AHD

N

SCALE 1:10,000 (A1)

Project Ref: **MES_908**

Figure No. **6**

NOTES

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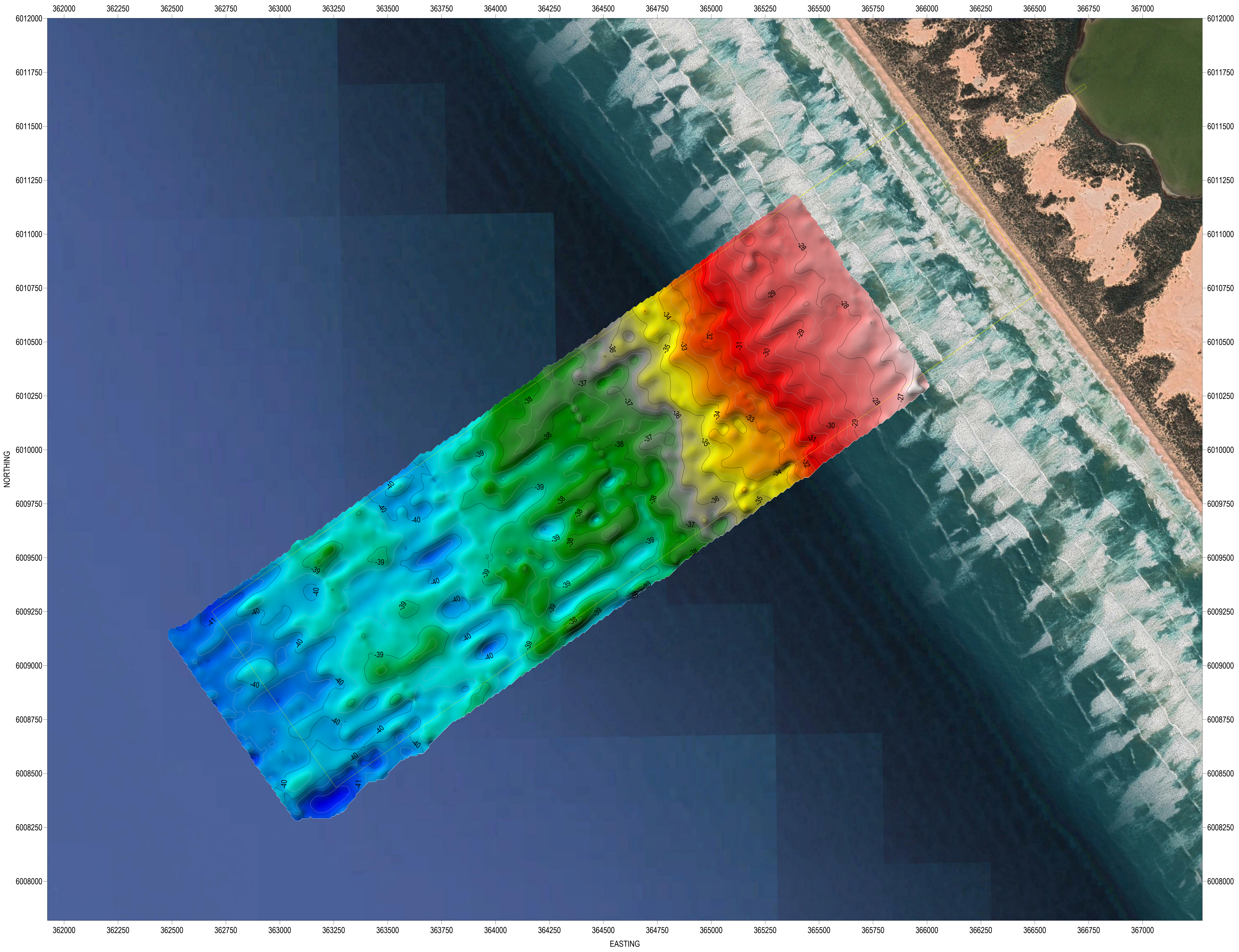
MARINE&EARTH SCIENCES

email: info@marineandearth.com web: marineandearth.com phone: +61 7 3899 1156

Issue No.	Date	Description	Surv.	Interp.	Drawn	Appr.
1	18/11/21	SBP Sed Preliminary				
2						
3						



LEGEND

Reduced Level (m) AHD

-41 -40 -39 -38 -37 -36 -35 -34 -33 -32 -31 -30 -29 -28 -27 -26

CLIENT	KBR
PROJECT	Healthy Coorong Basin Infrastructure Feasibility Investigations
SURVEY DATE	October-November 2021

SUB-BOTTOM PROFILING SURVEY
REDUCED INTERPRETED R3 CONTOUR PLAN

LOCATION MAP

GEODETIC INFORMATION

Horizontal Datum	GDA2020 MGA Zone 54S
Vertical Datum	Australian Height Datum (m) AHD

N

SCALE 1:10,000 (A1)

Project Ref: **MES_908**

Figure No. **7**

NOTES

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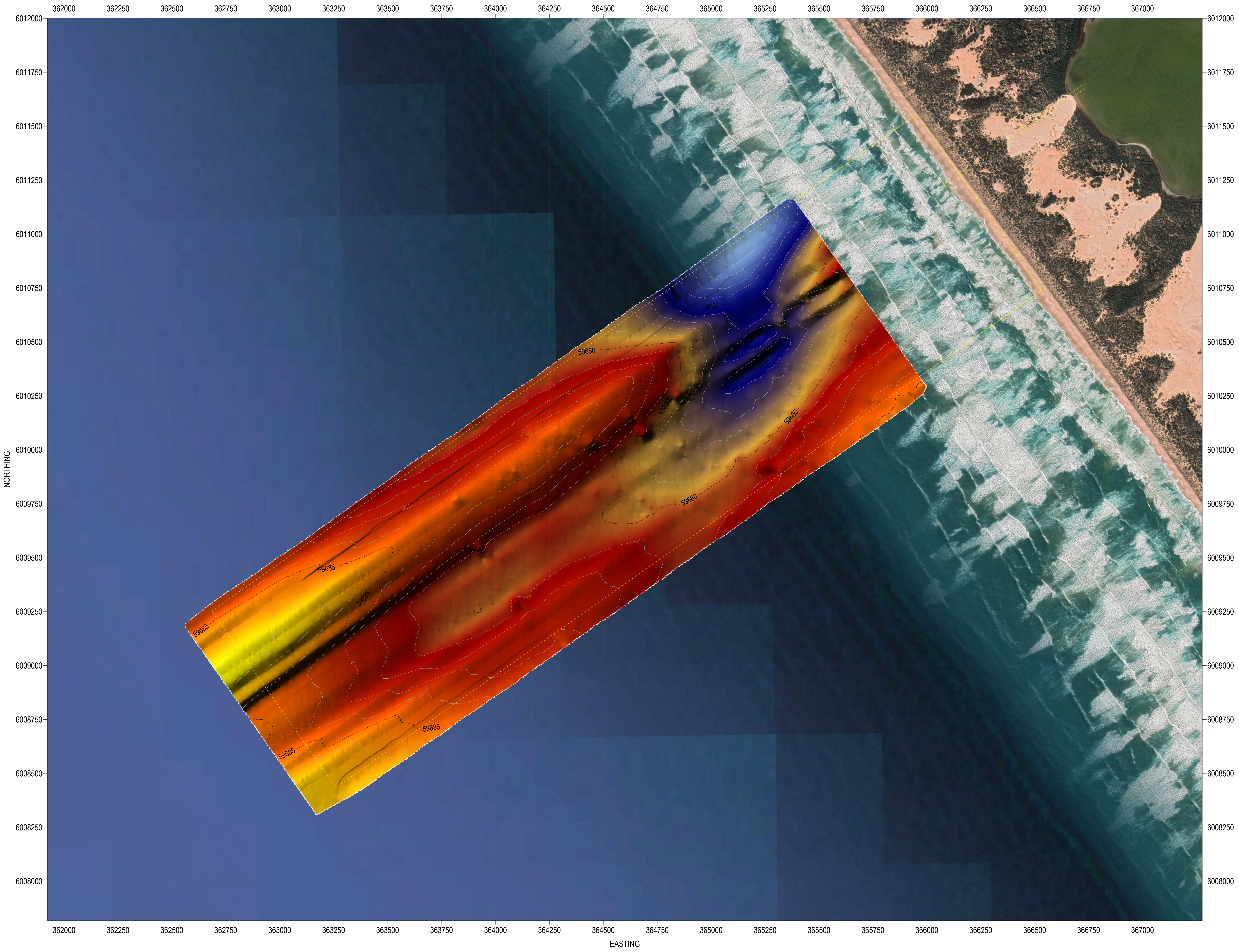
Issue No.	Date	Description	Surv.	Interp.	Drawn	Appr.
1	18/11/21	SBP Sed Preliminary				
2						
3						



LEGEND

▬ Survey Limits

Total Magnetic Intensity (nT)

59615 59620 59625 59630 59635 59640 59645 59650 59655 59660 59665 59670 59675 59680 59685 59690 59695 59700

CLIENT	KBR
PROJECT	Healthy Coorong Basin Infrastructure Feasibility Investigations
SURVEY DATE	October-November 2021

MARINE MAGNETOMETER SURVEY
TOTAL MAGNETIC INTENSITY CONTOUR PLAN

LOCATION MAP

GEODETIC INFORMATION

Horizontal Datum	GDA2020 MGA Zone 54S
Vertical Datum	Australian Height Datum (m) AHD

N SCALE 1:10,000 (A1)

Project Ref: **MES_908** Figure No. **8**

NOTES

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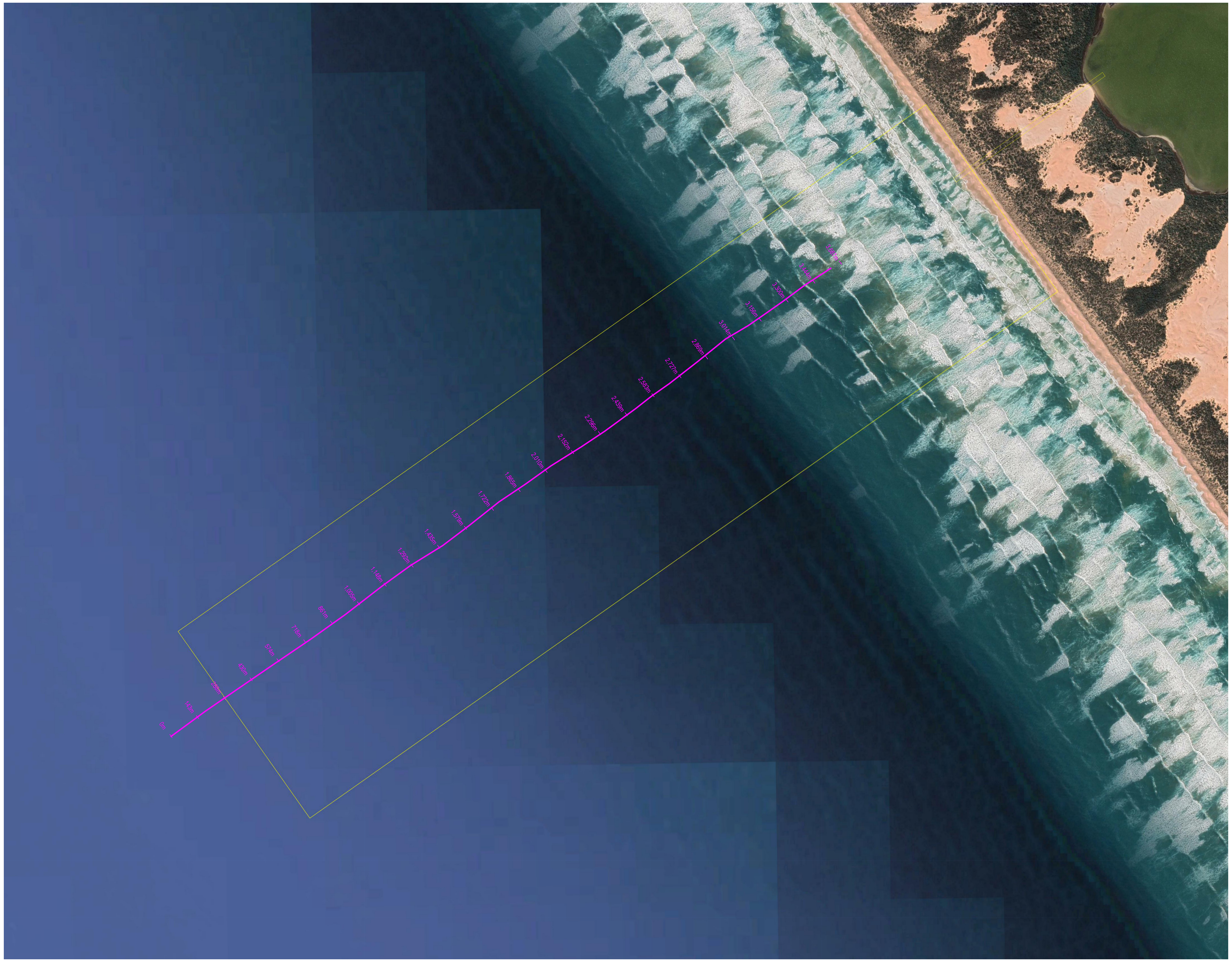
Issue No.	Date	Description	Surv.	Interp.	Drawn	Appr.
1	12/11/21	MAG Preliminary				
2						
3						



LEGEND

- Survey Limits
- CMSR Line Location

CLIENT	KBR
PROJECT	Healthy Coorong Basin Infrastructure Feasibility Investigations
SURVEY DATE	October-November 2021

CONTINUOUS MARINE SEISMIC REFFRACTION SURVEY
SEISMIC LINE LOCATION PLAN

LOCATION MAP

GEODETIC INFORMATION

Horizontal Datum	GDA2020 MGA Zone 54S
Vertical Datum	Australian Height Datum (m) AHD

N

SCALE 1:10,000 (A1)

Project Ref: **MES_908** Figure No. **9**

NOTES

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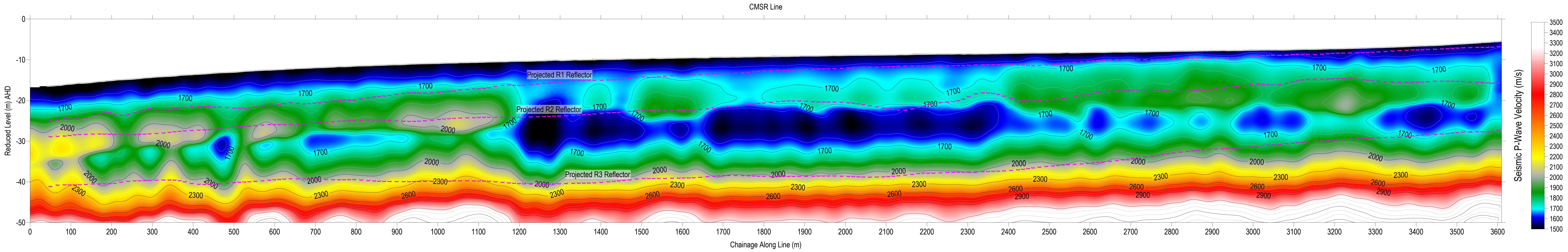
Issue No.	Date	Description	Surv.	Interp.	Drawn	Appr.
1	18/11/21	CMSR LP Preliminary				
2						
3						



LEGEND

CLIENT	KBR
PROJECT	Healthy Coorong Basin Infrastructure Feasibility Investigations
SURVEY DATE	October-November 2021

CONTINUOUS MARINE SEISMIC REFFRACTION SURVEY
INTERPRETED SEISMIC REFRACTION SECTION

LOCATION MAP

GEODETIC INFORMATION

Horizontal Datum	GDA2020 MGA Zone 54S
Vertical Datum	Australian Height Datum (m) AHD

SCALE (A1) H1:5,000
V1:500

Project Ref: **MES_908** Figure No. **10**

NOTES

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MES | MARINE&EARTH SCIENCES

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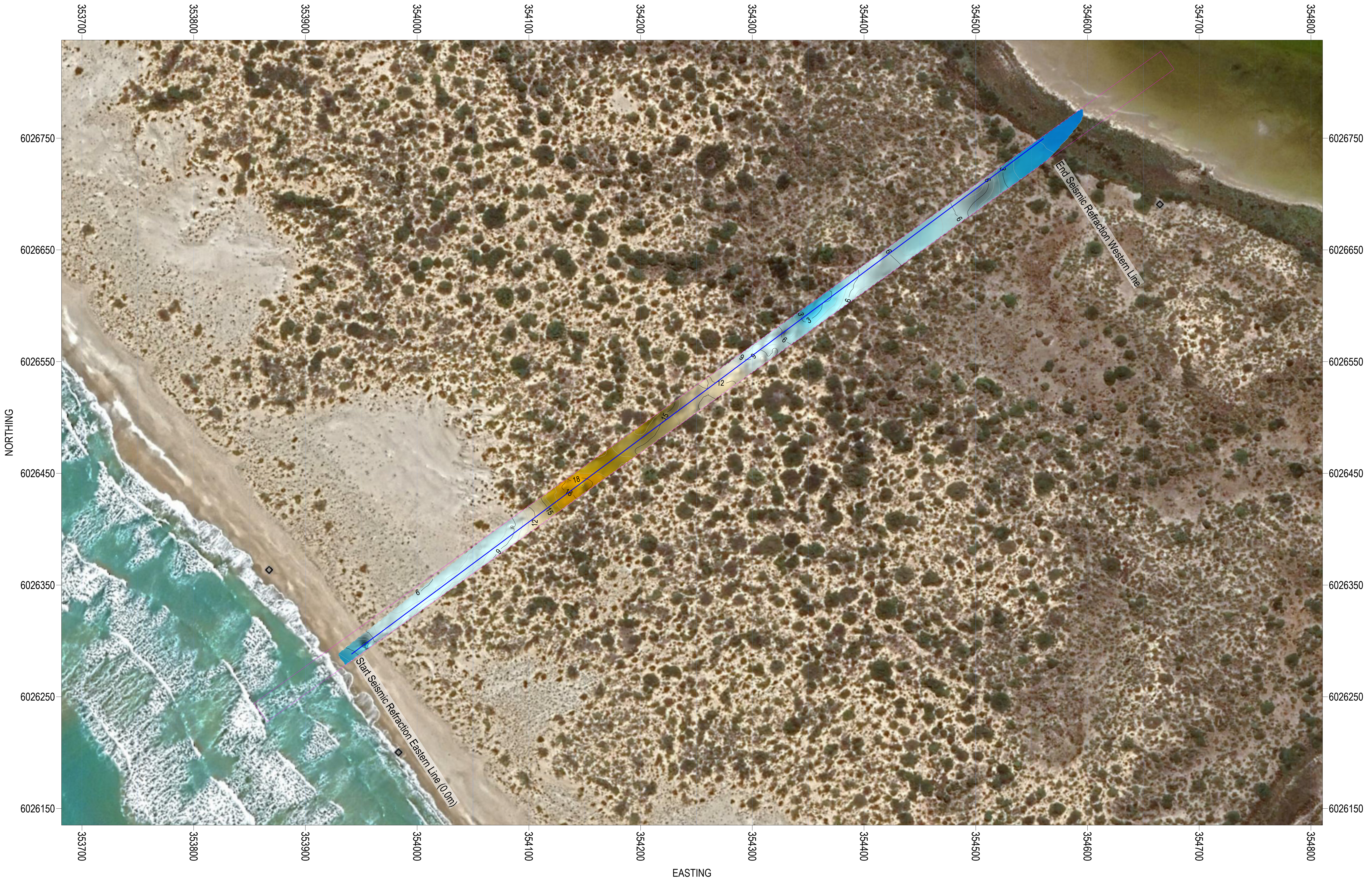
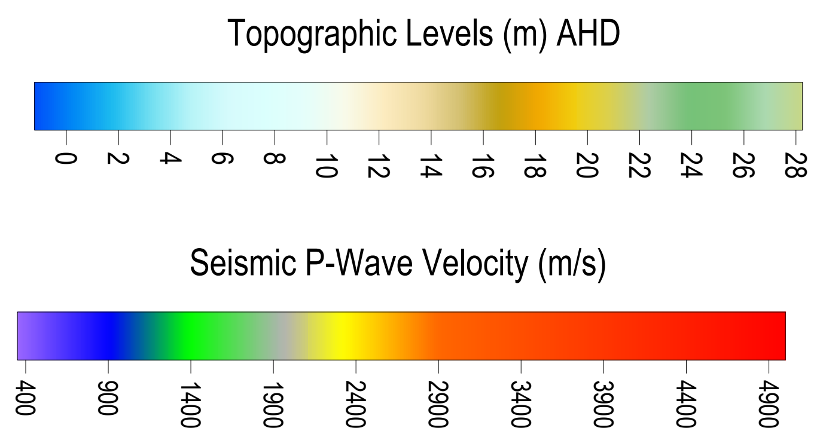
Issue No.	Date	Description	Surv.	Interp.	Drawn	Appr.
1	18/11/21	CMSR ISS Preliminary				
2						
3						





LEGEND

Survey Line Location

CLIENT	KBR
PROJECT	Healthy Coorong Basin Infrastructure Feasibility Investigations
SURVEY DATE	October-November 2021

DUNE SEISMIC REFRACTION
WESTERN SITE LOCATION PLAN AND
INTERPRETED SEISMIC SECTION

LOCATION MAP

GEODETIC INFORMATION

Horizontal Datum	GDA2020 MGA Zone 54S
Vertical Datum	Australian Height Datum (AHD) (m)

N

SCALE (A1) LP 1 : 2,500
Section 1 : 1,000

Project Ref: **MES_908** Figure No. **11**

NOTES

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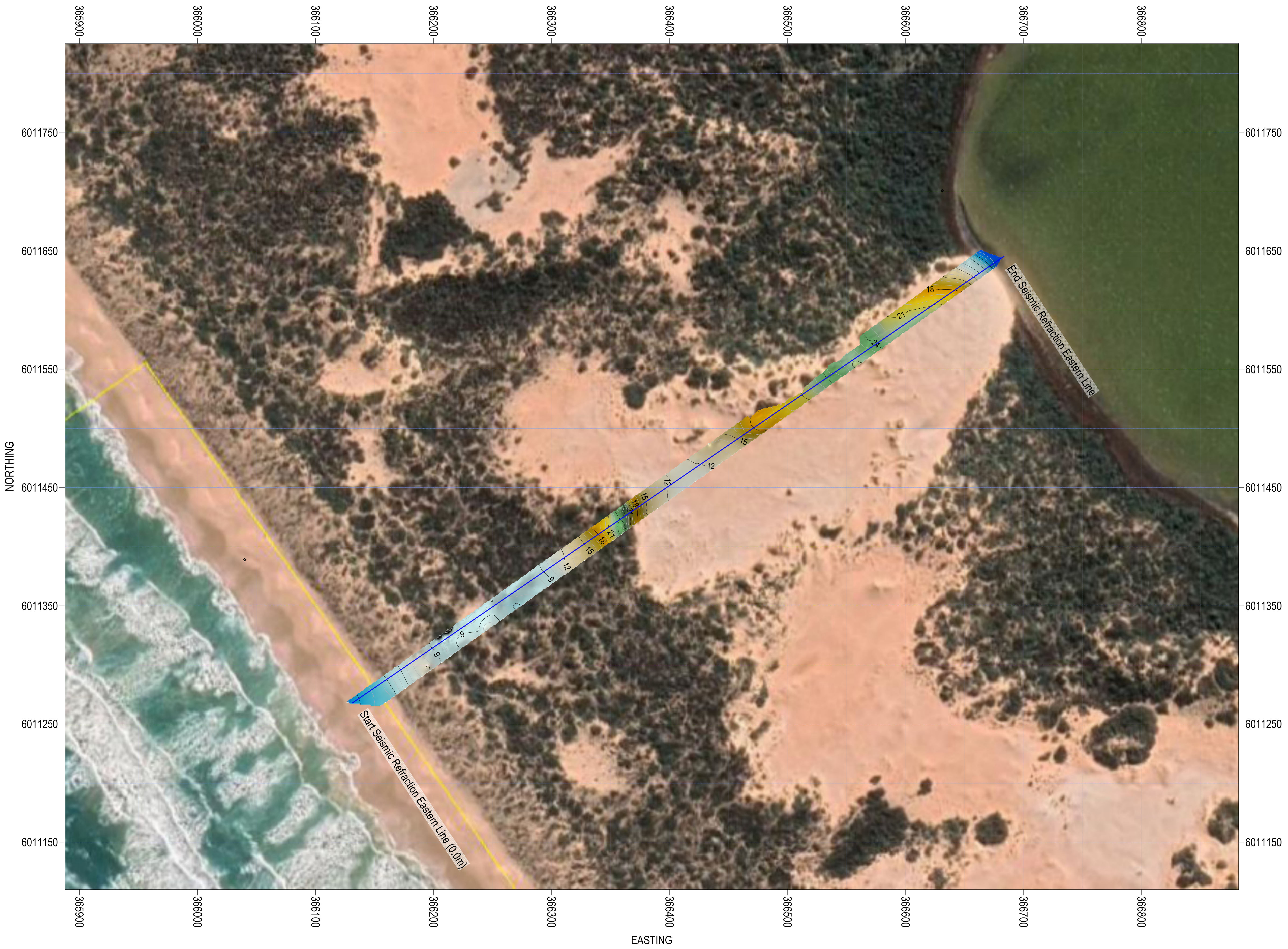
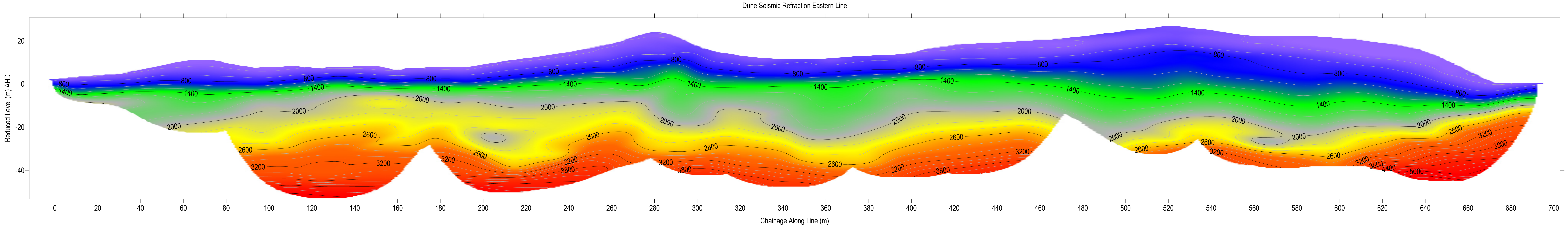
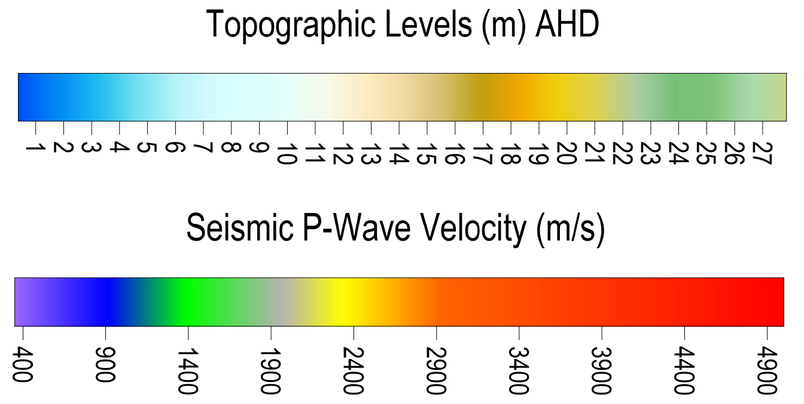
MARINE&EARTH SCIENCES

email: info@marineandearth.com web: marineandearth.com phone: +61 7 3899 1156

Issue No.	Date	Description	Surv.	Interp.	Drawn	Appr.
1	24/11/21	SR West Preliminary				
2						
3						







LEGEND

Survey Line Location

CLIENT	KBR
PROJECT	Healthy Coorong Basin Infrastructure Feasibility Investigations
SURVEY DATE	October-November 2021

DUNE SEISMIC REFRACTION
EASTERN SITE LOCATION PLAN AND
INTERPRETED SEISMIC SECTION

LOCATION MAP

GEODETIC INFORMATION

Horizontal Datum	GDA2020 MGA Zone 54S
Vertical Datum	Australian Height Datum (AHD) (m)

N

SCALE (A1) LP 1 : 2,500
Section 1 : 1,000

Project Ref: **MES_908**

Figure No. **12**

NOTES

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MARINE&EARTH SCIENCES

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Issue No.	Date	Description	Surv.	Interp.	Drawn	Appr.
1	18/11/21	SR East Preliminary				
2						
3						

APPENDIX A – APPENDIX A – LIMITATIONS AND ASSUMPTIONS OF THE SEISMIC REFRACTION METHOD

1. INTRODUCTION

The interpreted seismic refraction sections are presented as profiles immediately beneath the seismic traverse. These sections present a two-dimensional distribution of seismic velocities with depth which have been interpreted from the first arrival travel time data. The following summarises the methods of interpretation as well as the limitations and assumptions.

2. METHODS OF INTERPRETATION

First arrival travel times determined from the digital seismic traces are picked manually and plotted against distance from the seismic source, as travel time curves. Quantitative seismic interpretation is carried out using the intercept time and reciprocal methods (Hawkins 1961). These methods of interpretation provide a simplified seismic profile of the subsurface and rely on a number of assumptions. The main assumptions are:

- The subsurface consists of a series of discrete homogeneous layers
- The boundaries between these layers are distinct
- Seismic velocity increases with depth
- Each layer is sufficient thickness to critically refract energy to produce a refracted wave arrival at the surface

Each of these assumptions demonstrates a requirement of the interpretation procedure for an ideal condition which is unlikely to be fully reflected in all geological conditions. The extent at which each assumption is valid may vary greatly from site to site and within a site. However, at all sites the interpreted seismic sections are a simplification of the actual subsurface velocity distribution. The degree of simplification is related to the interpretation methods employed and the amount of data available for the analysis.

Because such violations may be undetectable, and the interpretation process is in any case partly subjective, other interpretations of the data are possible and may differ considerably from that presented in this report.

The effects of violations of the assumptions are discussed in Section 4 below. Other effects which may be relevant to the understanding of the seismic sections are discussed in Section 5.

It should be noted that at a given site these effects can occur in any combination and that as a result even highly complex geology may give rise to relatively simplified seismic sections.

3. PRECISION AND ACCURACY OF RESULTS

Interpreted seismic velocities are not regarded as being accurate to better than +/- 10% as a measure of actual field velocities, without independent calibration from drilling or excavation.

Calculated layer thicknesses are subject to the same degree of error. This has a cumulative effect on interpreted velocities for subsequent deeper layers.

These errors are inherent in the procedure and must be taken into account in any use which is made of the seismic sections e.g. estimating the volume of material represented by each layer in a proposed excavation.

4. EFFECTS OF VIOLATION OF ASSUMPTIONS

4.1 Assumption of Discrete Homogeneous Layers

The most common violations are:

- Continuous increase in seismic velocity with depth
- In-homogeneity below the scale of resolution of the survey

The first of these occur in many geological settings. It can be allowed for in a number of ways but contributes to the uncertainty in depth calculations. It also means that further interpretation based on the calculated seismic velocities may give erroneous results.

The second violation under ideal conditions of a refraction survey is that resolution of localised features as small as 1.5 to 2 times the geophone spacing is possible. In general, however, the limit of resolution is considered about 2 to 3 times the geophone spacing.

4.2 Assumption of Distinct Boundaries

Real geological boundaries are often gradational and or irregular. The seismic method inevitably disguises gradation and smooths irregularities. The importance of this varies from site to site but it is common for interpreted seismic boundaries to appear at an intermediate level somewhere between the limits of gradation.

4.3 Assumption of Increasing Velocity with Depth

This assumption may be violated for a number of different reasons and such violations (velocity inversion) often cannot be detected from the travel time data alone. It may be possible to infer them from the geological setting or from borehole data.

In general, it is not possible to allow for a velocity inversion in the interpretation unless there is an independent means of estimating both the thickness and the velocity of the layer. If an undetected velocity inversion occurs all calculated depths below the reversal will be greatly in error and be significantly overestimated.

4.4 Assumption of Detectability

Two main types of violation occur:

- Layer is too thin to transmit seismic wave
- Effect of a layer transmitting a wave yet is not detected due to waves from a deeper, higher velocity layer reaching the surface earlier

The first type of violation may occur in many geological settings and is due to the presence of thin high velocity layers within lower velocity material. Thin in this context is defined in terms of seismic detectability and can imply a thickness in the order of 1.0 to 1.5m. The effect cannot be detected from the seismic data alone but may be inferred from borehole information or surface mapping. If such a layer were thick enough to be detected it would be represented as a velocity inversion.

5. OTHER FACTORS

There a number of other factors that can lead to differences between the seismic section and actual geological conditions. These effects are:

- Three Dimensional Effects
- Effects of Water
- Anisotropy

5.1 Three Dimensional Effects

The interpreted seismic sections are two-dimensional representations and only apply to a narrow zone below the line of traverse. However, the actual subsurface is three dimensional and as a result significant lateral variation can occur without being detected, even within short distances to the side of the traverse. If this occurs features may be projected below the traverse and be displaced from the actual position.

5.2 Effects of Water

The presence of water can greatly increase the field velocity of materials which have low velocities when dry. This effect is most prominent in unconsolidated material such as sands where seismic velocities may be ~400 m/s when dry and increase to ~1600 m/s when saturated. It is also possible for water saturation to cause a decrease in seismic velocity where highly expansive clay minerals are present and the material is unconfined. Velocity changes due to the presence of a water table cannot be distinguished from the seismic data alone and may be inferred from geological setting and or borehole information.

5.3 Anisotropy

Field velocities may vary with the direction of the seismic traverse. This is most common in steeply dipping sediments or metasediments but can occur in other settings. When measured across strike the velocity is averaged form the different materials present. Along strike the higher velocity materials or fresher more competent materials will be measured. This effect may be detectable form cross spreads which show markedly higher or lower velocities than longitudinal traverses.

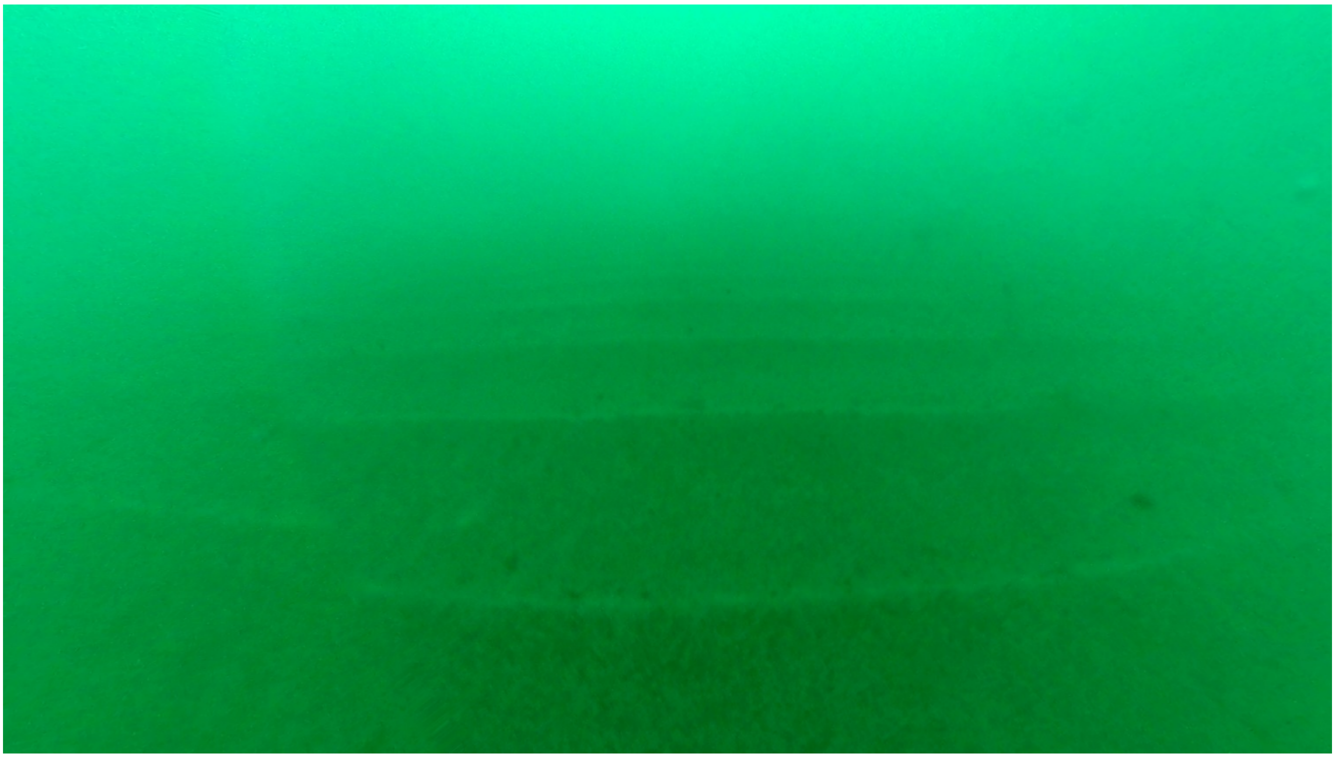
APPENDIX B - GENERAL CORRELATION OF GEOLOGICAL MATERIAL WITH SEISMIC VELOCITIES IN THE MARINE ENVIRONMENT

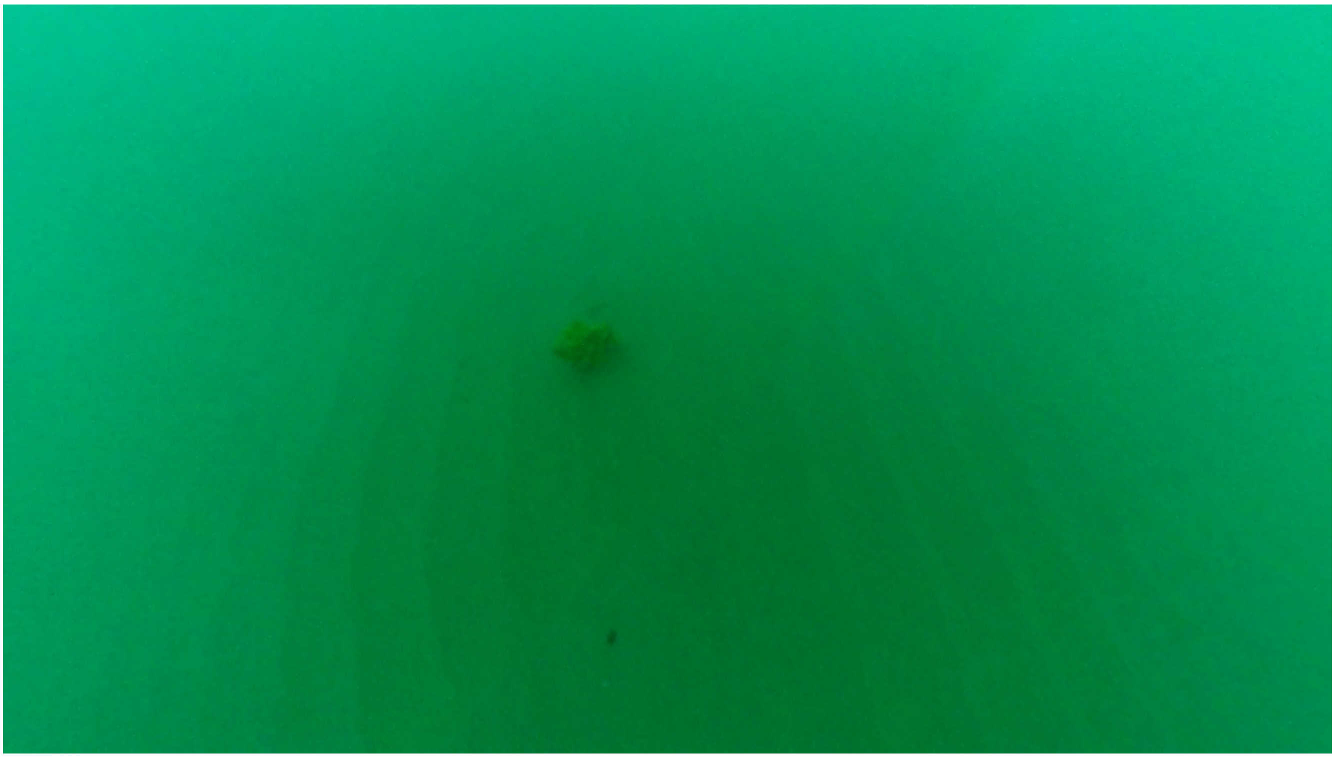
Material Description	**Seismic Velocity Range (m/s)**
Gas-filled fine sediments	800-1400
Silts and soft clays very loose sands	1500-1600
Stiff clays	1700-1900
Loose to dense sands	1600-1800
Cemented sands / Coffee Rock	1900-2400
Loose gravels, cemented gravels	1800-2400
Younger limestone (reef)	2200-3500
Older limestone (reef)	2500-6000
Calcarenite, siliceous calcarenite	2000-3700
Boulders/loose rock in sand	1800-2500
Weathered sandstone/shale	1900-2500
Fresh sandstone/shale	2700-4300
Fractured / Weathered Tuff	1850-2400
Fresh Tuff	2800-4500
Fresh Granite	4300-5800
Fresh Basalt	3000-6500
Fresh Metamorphic	3000-7000

APPENDIX C – ELECTRONIC DELIVERABLES SUMMARY

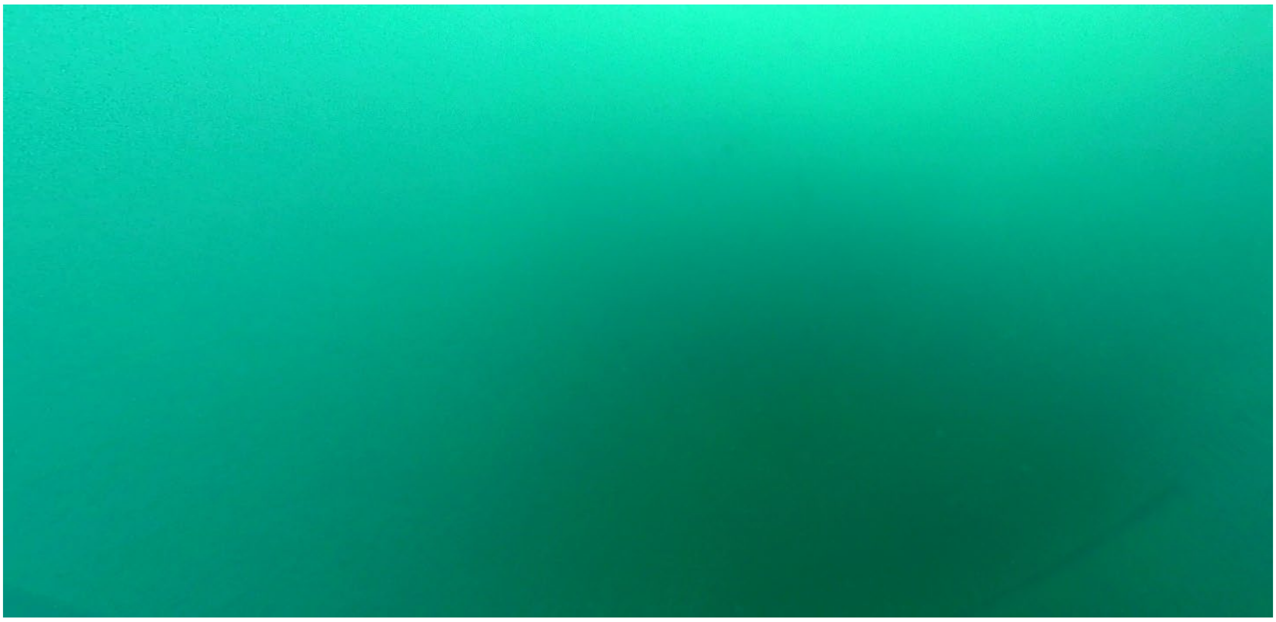
APPENDIX D – CAMERA DROP IMAGE STILLS

Camera Drop Location 1 – 364943E, 6010411N (GDA2020 MGA 54)

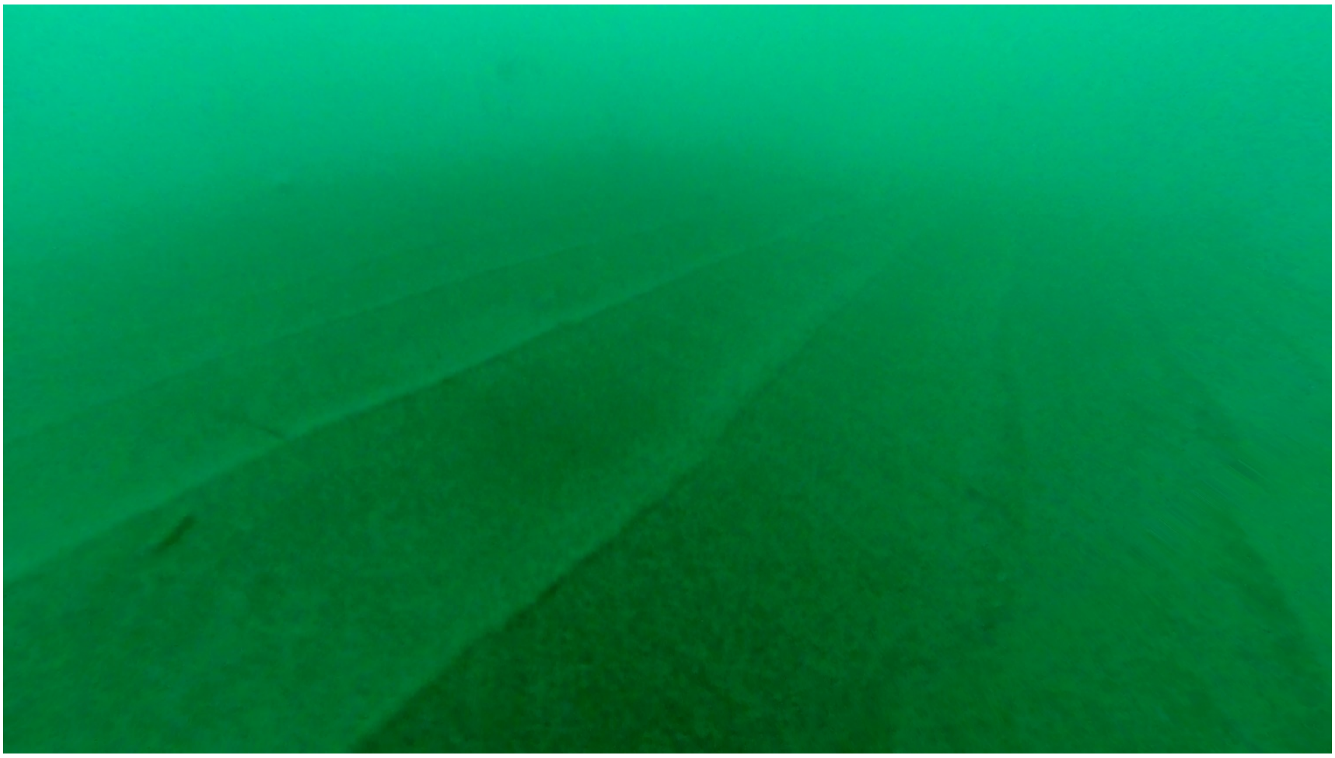


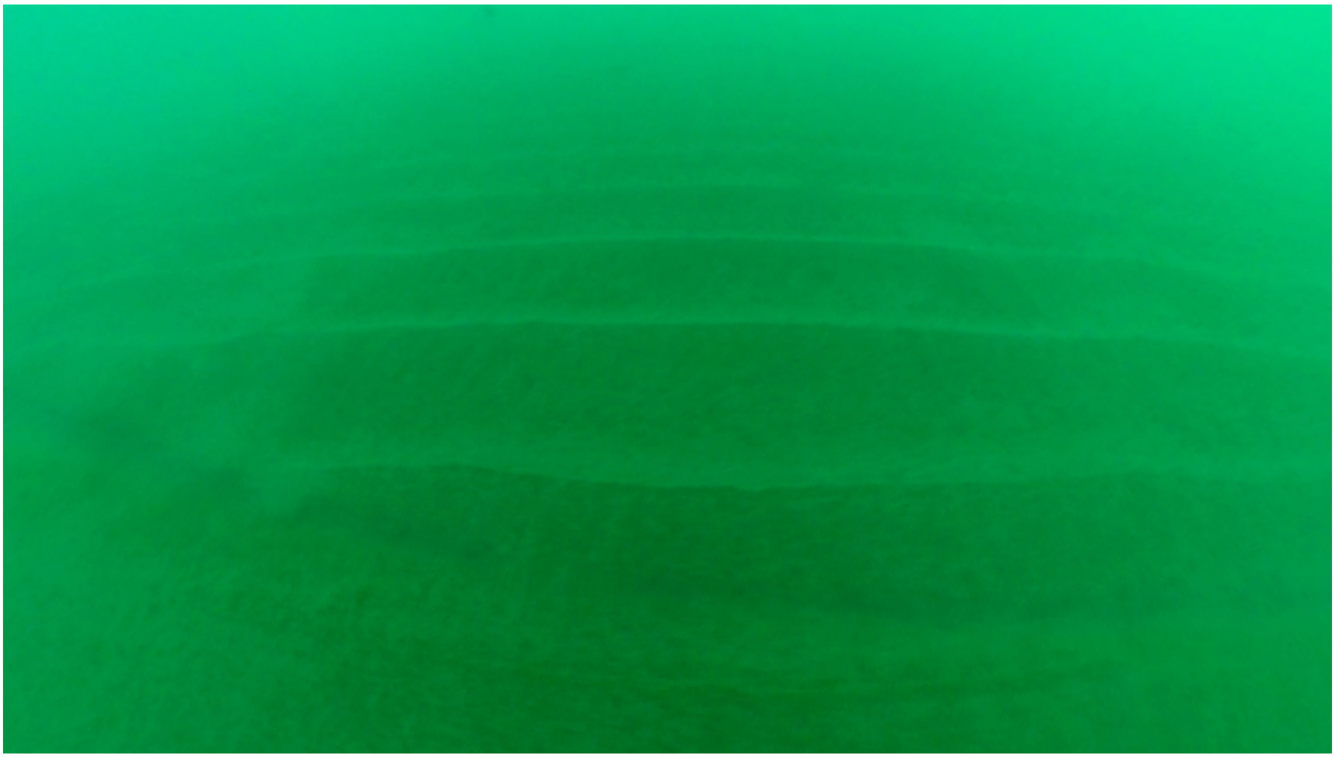


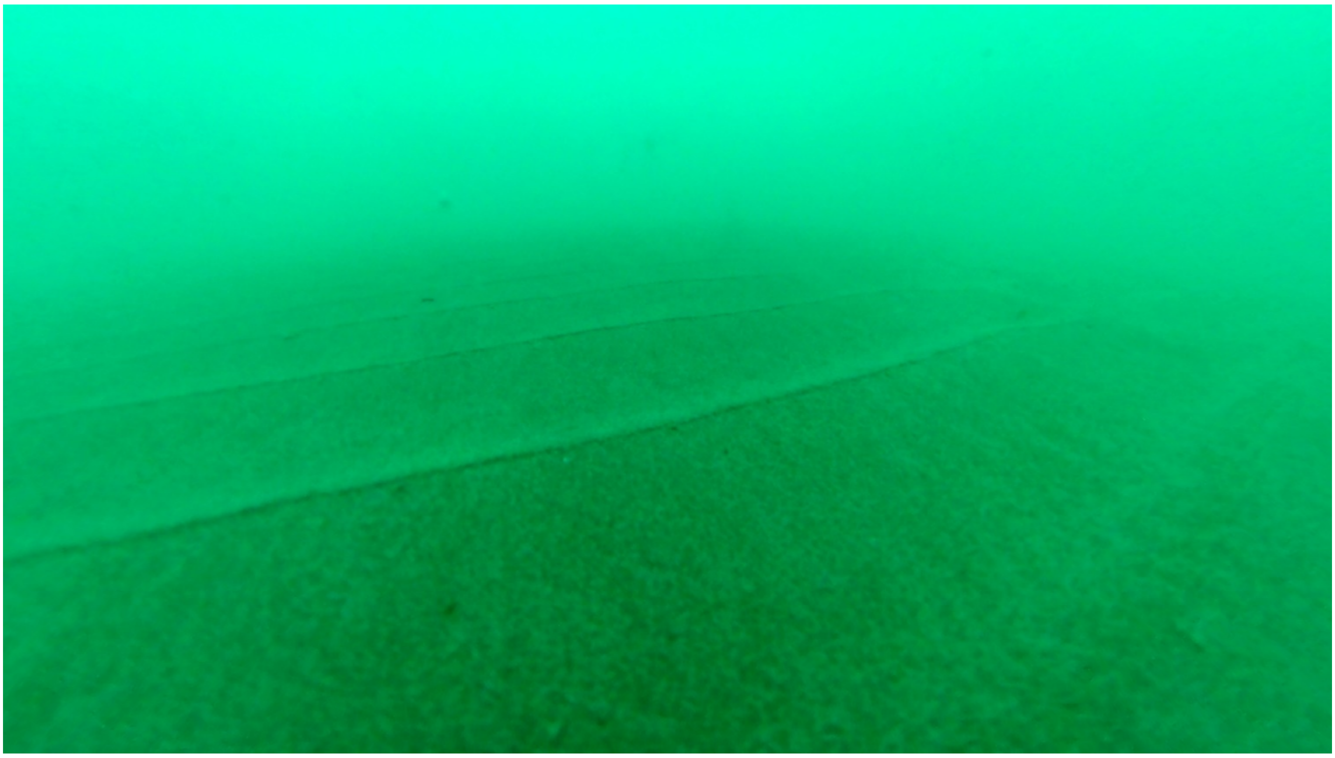
Camera Drop Location 2 – 364106E, 6009790N (GDA2020 MGA 54) – High turbidity at this location prevented a clear camera image to be captured



Camera Drop Location 3 – 363025E, 6009023N (GDA2020 MGA 54)







Appendix I

Particle size distribution test results

14 December 2021 Document Ref. ADL2021-0001AF Rev0

Kellogg Brown & Root
186 B26
Parkside SA 5063

Attention: Phil Staniford

RE: PARTICLE SIZE DISTRIBUTIONS – COORONG INFRASTRUCTURE FEASABILITY ASSESSMENT

Dear Phil,

1 INTRODUCTION

CMW Geosciences was engaged by Kellogg Brown & Root (KBR) to perform Particle Size Distributions (PSDs) on subaqueous soil samples that were retrieved from various locations in the Coorong by CMW Geosciences on 12 August 2021.

2 BACKGROUND

CMW Geosciences have had a considerable involvement in the Coorong Infrastructure Feasibility Assessment. To date, CMW have been responsible for the following output:

- Coorong Infrastructure Feasibility Assessment: Infrastructure Option 1 – Lake Albert to Coorong Connector: Geotechnical Desktop Study (Ref: ADL2021-0001AB Rev 0).
- Coorong Infrastructure Feasibility Assessment: Infrastructure Option 2 – Coorong Lagoon Dredging: Geotechnical Desktop Study (Ref: ADL2021-0001AC Rev 0).
- Coorong Infrastructure Feasibility Assessment: Lake Albert to Coorong Connector: Geotechnical Investigation Report (Ref: ADL2021-0001AD Rev 0).
- Coorong Infrastructure Feasibility Assessment: Coorong Lagoon Dredging Geotechnical Investigation Report (Ref: ADL2021-0001AE Rev 0).

CMW Geosciences understand that additional PSDs are required to further facilitate the feasibility assessment of dredging in the Coorong Lagoon.

3 SCOPE OF WORK

A soil sampler used to retrieve subaqueous soil samples was used to retrieve 17 soil samples at selected locations along the Coorong Lagoon (See Appendix A). Retrieved samples were firstly used to perform acid sulphate and contamination testing.

Samples that were retrieved from each location were typically less than 500g and therefore to facilitate PSD testing in accordance with AS1289, samples were combined to generate sufficient composite samples.

In total, three PSDs were generated from a combination of soil samples as follows:

- Composite 1 – Soil samples received from DCP01, DCP02, DCP03, DCP04 & DCP05
- Composite 2 – Soil samples retrieved from DCP07, DCP09, DCP11, DCP12 & DCP13
- Composite 3 – Soil samples retrieved from DCP13, DCP14, DCP16 & DCP17

All soil samples were retrieved at depths of 0 to 0.15m below ground surface. Each of the composites represent the subaqueous soil in different locations of the Coorong Lagoon (See Appendix A).

4 RESULTS

Results of the PSD for each of the composite materials is detailed in Table 1. Lab certificates are attached in Appendix B.

Table 1: Sieve Analysis Results

ID	Depth (mbgl)	Sieve size (mm)										
		19	**13.2**	**9.5**	**4.75**	**2.36**	**1.18**	**0.600**	**0.425**	**0.300**	**0.150**	**0.075**
Composite 1	0 – 0.15	100	97	95	95	94	92	86	79	67	22	8
Composite 2	0 – 0.15	100	100	100	99	98	95	90	88	84	51	13
Composite 3	0 – 0.15	100	100	100	100	99	98	96	94	89	40	8

The sieve analysis concludes that each composite can be classified as a poorly graded sand with accordance AS1726. Each of the composites may be classified as SP under the Unified Soil Classification System (USCS). Lab results confirm that each composite predominately fine grained with minor fractions of medium and coarse-grained sand.

5 CLOSURE

The findings contained within this report are the result of limited discrete investigations conducted in accordance with normal practices and standards. To the best of our knowledge, they represent a reasonable interpretation of the general condition of the site. Under no circumstances, can it be considered that these findings represent the actual state of the ground conditions away from our investigation locations.

This report has been prepared for use by KBR in relation to the Coorong Infrastructure Feasibility Assessment Project in accordance with generally accepted consulting practice. No other warranty, expressed or implied, is made as to the professional advice included in this report. Use of this report by parties other than KBR and their respective consultants and contractors is at their risk as it may not contain sufficient information for any other purposes.

6 CLOSURE

We trust this is sufficient for your needs but do not hesitate to contact the undersigned with any queries

For and on behalf of
CMW Geosciences Pty Ltd

Prepared by: Reviewed and authorised by:

Nick Barnett John Slade

Geotechnical Engineer **Principal Geotechnical Engineer, CPEng**

Distribution: 1 copy to KBR (electronic)
Original held by CMW Geosciences Pty Ltd

Distribution: 1 copy to Client (electronic) Original held by CMW Geosciences Pty Ltd

Appendix A
Site Plan

LEGEND:

● DCP01 APPROXIMATE DCP LOCATION

NOTES:

1. AERIAL FROM BING MAPS

CMW Geosciences

CLIENT: **KBR**

PROJECT: **COORONG INFRASTRUCTURE FEASIBILITY ASSESSMENT**

TITLE: **SITE INVESTIGATION PLAN - SHEET 2**

DRAWN:	DE	PROJECT:	ADL2021-0001
CHECKED:	AR	DRAWING:	02
REVISION:	A	SCALE:	1:60,000
DATE:	16.08.21	SHEET:	A3 L

Appendix B
Laboratory Certificates

.

Certificate of Analysis

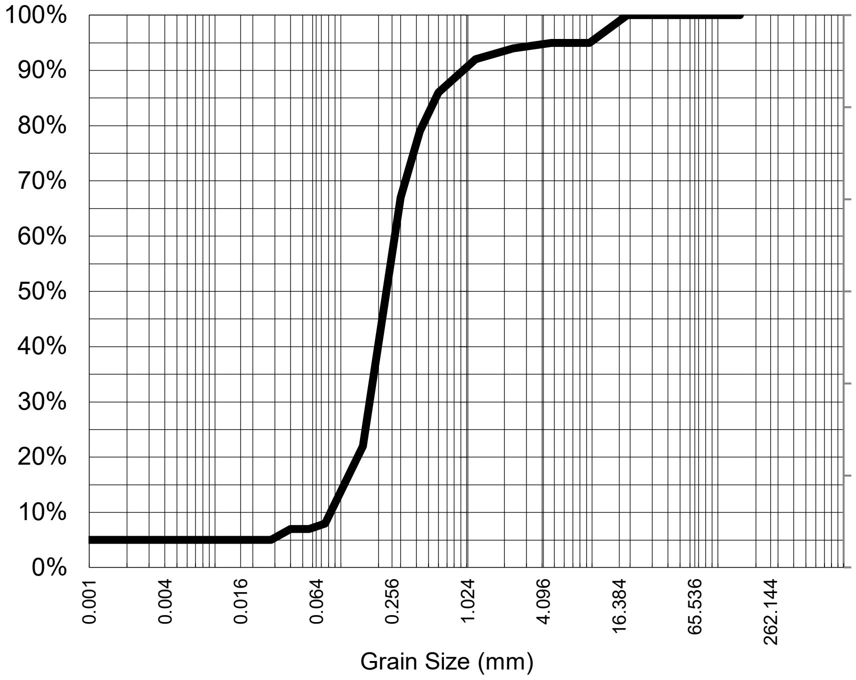
ALS Laboratory Group Pty Ltd
2 Byth Street
Stafford, QLD 4053
pH 07 3243 7222
samples.brisbane@alsenviro.com

ALS Environmental

Brisbane QLD

CLIENT:	STUART TWISS	**DATE REPORTED:**	29-Nov-2021
COMPANY:	FYFE PTY LTD	**DATE RECEIVED:**	18-Nov-2021
ADDRESS:	Level 1, 124 South Terrace Adelaide South Australia	**REPORT NO:**	EB2133290-001 / PSD
PROJECT:	80963-1	**SAMPLE ID:**	Composite 1

Particle Size Distribution



Particle Size (mm)	% Passing
19.0	100%
9.50	95%
4.75	95%
2.36	94%
1.18	92%
0.600	86%
0.425	79%
0.300	67%
0.150	22%
0.075	8%
Particle Size (microns)	
56	7%
40	7%
28	5%
20	5%
15	5%
10	5%
7	5%
5	5%
1	5%

Analysis Notes

Samples analysed as received.

Median Particle Size (mm)*	0.243

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments: AS1289.3.6.3 states that hydrometer analysis is not applicable for samples containing <10% fines (<75um). Results should be assessed accordingly

Analysed: 23-Nov-21

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description:

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) 2.72

NATA Accreditation: 825 Site: Brisbane
This document is issued in accordance with NATA's accreditation requirements. Accredited for compliance with ISO/IEC 17025. This document shall not be reproduced, except in full.

Satish Trivedi
Soil Senior Chemist
Authorised Signatory

Certificate of Analysis

ALS Laboratory Group Pty Ltd
2 Byth Street
Stafford, QLD 4053
pH 07 3243 7222
samples.brisbane@alsenviro.com

ALS Environmental

Brisbane QLD

CLIENT: STUART TWISS

DATE REPORTED: 29-Nov-2021

COMPANY: FYFE PTY LTD

DATE RECEIVED: 18-Nov-2021

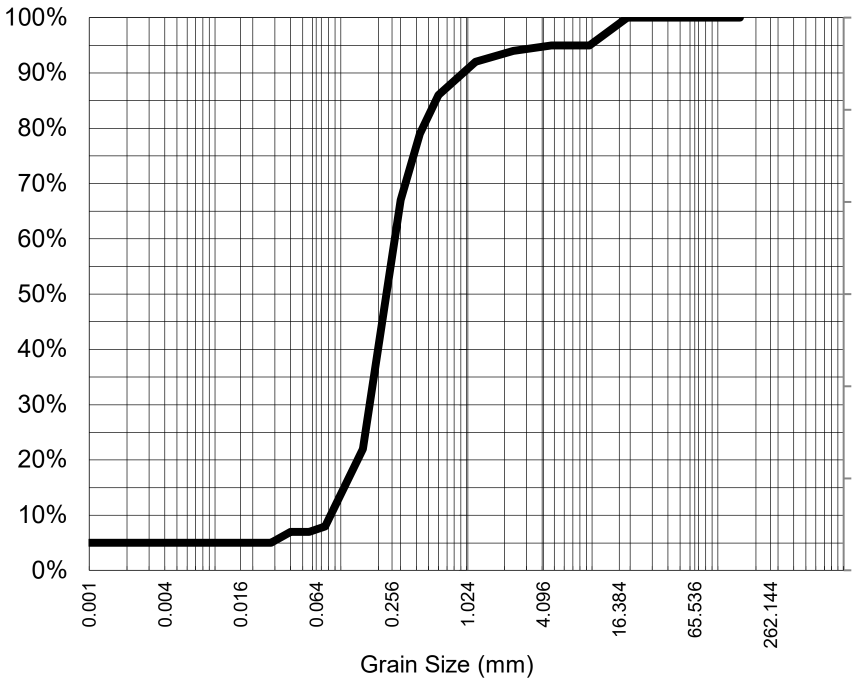
ADDRESS: Level 1, 124 South Terrace
Adelaide
South Australia

REPORT NO: EB2133290-001DUP / PSD

PROJECT: 80963-1

SAMPLE ID: Composite 1

Particle Size Distribution



Particle Size (mm)	% Passing
19.0	100%
9.50	95%
4.75	95%
2.36	94%
1.18	92%
0.600	86%
0.425	79%
0.300	67%
0.150	22%
0.075	8%
Particle Size (microns)	
56	7%
40	7%
28	5%
20	5%
15	5%
10	5%
7	5%
5	5%
1	5%

Analysis Notes

Samples analysed as received.

Median Particle Size (mm)*	0.243

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments: AS1289.3.6.3 states that hydrometer analysis is not applicable for samples containing <10% fines (<75um). Results should be assessed accordingly

Analysed: 23-Nov-21

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description:

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) 2.72

NATA Accreditation: 825 Site: Brisbane
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NATA
WORLD RECOGNISED ACCREDITATION

Satish Trivedi
Soil Senior Chemist
Authorised Signatory

Certificate of Analysis

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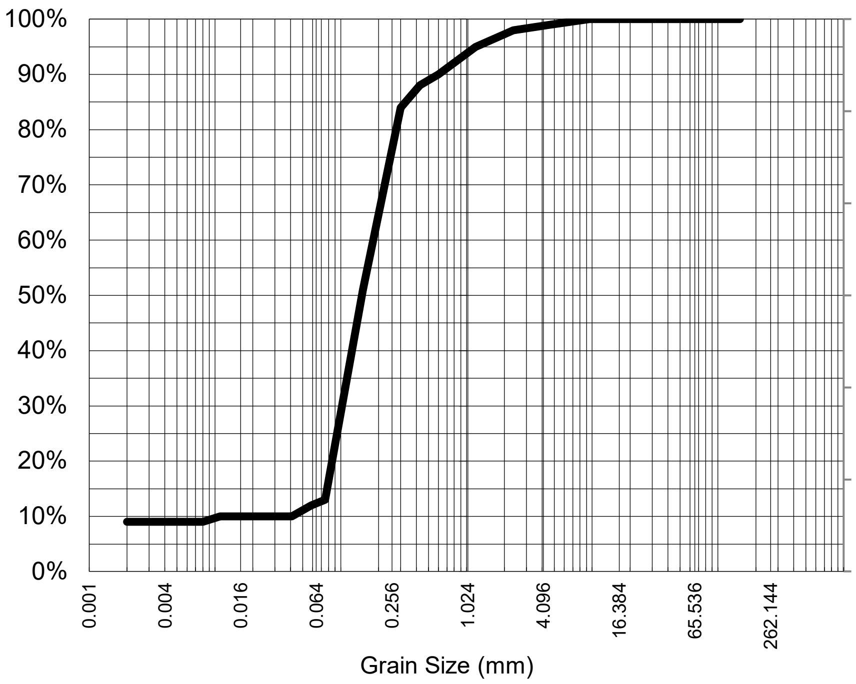
ALS Environmental

Brisbane QLD

CLIENT:	STUART TWISS	**DATE REPORTED:**	29-Nov-2021
COMPANY:	FYFE PTY LTD	**DATE RECEIVED:**	18-Nov-2021
ADDRESS:	Level 1, 124 South Terrace Adelaide South Australia	**REPORT NO:**	EB2133290-002 / PSD
PROJECT:	80963-1	**SAMPLE ID:**	Composite 2

Particle Size Distribution



Particle Size (mm)	% Passing
9.50	100%
4.75	99%
2.36	98%
1.18	95%
0.600	90%
0.425	88%
0.300	84%
0.150	51%
0.075	13%
Particle Size (microns)	
58	12%
41	10%
29	10%
21	10%
15	10%
11	10%
8	9%
5	9%
2	9%

Analysis Notes

Samples analysed as received.

Median Particle Size (mm)*	0.148

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Analysed: 23-Nov-21

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description:

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) 2.62

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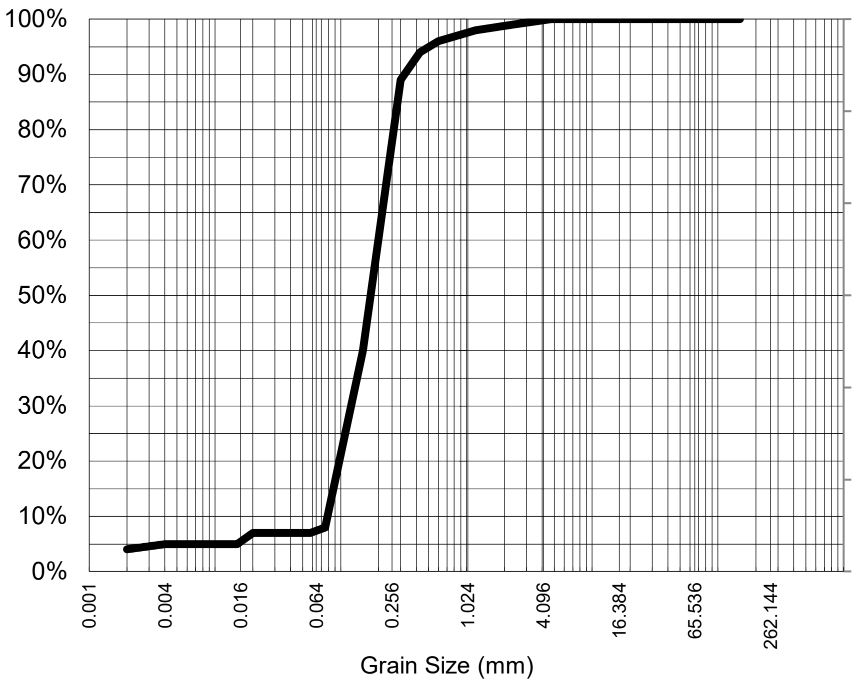
Brisbane QLD

CLIENT:	STUART TWISS	**DATE REPORTED:**	29-Nov-2021
COMPANY:	FYFE PTY LTD	**DATE RECEIVED:**	18-Nov-2021
ADDRESS:	Level 1, 124 South Terrace Adelaide South Australia	**REPORT NO:**	EB2133290-003 / PSD
PROJECT:	80963-1	**SAMPLE ID:**	Composite 3

Particle Size Distribution



Particle Size (mm)	% Passing
4.75	100%
2.36	99%
1.18	98%
0.600	96%
0.425	94%
0.300	89%
0.150	40%
0.075	8%
Particle Size (microns)	
57	7%
41	7%
29	7%
20	7%
15	5%
10	5%
7	5%
5	5%
2	4%

Analysis Notes

Samples analysed as received.

Median Particle Size (mm)*	0.181

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments: AS1289.3.6.3 states that hydrometer analysis is not applicable for samples containing <10% fines (<75um). Results should be assessed accordingly

Analysed: 23-Nov-21

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description:

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) 2.68

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ACCREDITATION

Satish Trivedi
Soil Senior Chemist
Authorised Signatory

Appendix J

Concept dredge methodology and equipment requirements

MARITIME
CONSTRUCTIONS

Coorong Infrastructure Investigation Project Engineering Services

Concept Dredge Methodology & Equipment Requirements

Safety is our first priority

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1 PROJECT BACKGROUND AND OBJECTIVES

1.1 Project Background and Location

The Coorong, Lower Lakes and Murray Mouth (CLLMM) form the delta of Australia's largest river system reaching the ocean, the Murray-Darling.

The Lower Lakes (Lake Alexandrina and Lake Albert) are separated from the Coorong by five barrages (Goolwa, Mundoo, Boundary Creek, Ewe Island and Tauwitchere) built in the 1930-40s. Lake Albert is a terminal lake connected to Lake Alexandrina by a narrow channel (the Narrung Narrows). The Coorong is connected to the Southern Ocean (Encounter Bay) through the Murray Mouth.

The CLLMM is listed as a Ramsar Wetland of International Importance, and as such the Australian Government has international obligations to maintain the ecological character of the site.

Fig. 01; Overview Study Area

Drought and over allocation of the River Murray has led to the ecological decline of the Coorong and Lower Lakes region. With reduced flows from the river, dredging is required to maintain an open Murray mouth and reduced frequency of high flow events leads to increased salinity and sedimentation in the Coorong.

1.2 Coorong Infrastructure Investigations

Healthy Coorong, Healthy basin is a $70 million commitment to restore a healthy Coorong, which was announced by the Australian and South Australian governments in December 2018.

As part of this commitment, KBR was contracted to carry out engineering design services for conceptual design and a range of field investigations for five infrastructure options within or adjacent to the Coorong in South Australia.

The scope of the Coorong Investigations Infrastructure Project (CIIP) is to investigate the feasibility of long-term infrastructure options for improving the ecological health of the Coorong. A short list of potential management options was developed through options analysis and community consultation. Options identified for further investigation include:

1. A connection between the Coorong South Lagoon and Southern Ocean;
2. Coorong Lagoon dredging to improve connectivity;
3. Lake Albert to Coorong Connector;
4. Further augmentation of South East Flows to the Coorong; and
5. Additional automated barrage gates.

1.3 Modelled Options - Dredging

Dredging will remove sediments in the Coorong at targeted locations to improve connectivity between the north and south lagoon and remove constrictions to flow, allowing lower salinity marine water to more readily circulate through the Coorong.

Four options for dredging, have been identified in the various scenario modelling:

1. Dredging along an 18.5km length of the Parnka narrows. The dredge extent is 200m wide along the entire length, with a bed elevation of -1.2m AHD.
2. Dredging along a 2.5km length of narrow channel near Pelican Point. Similarly, this dredge extent is 200 m wide along the entire length, but with a lower bed elevation of -1.5m AHD.
3. An extreme case of dredging along the entire length of the centerline of the Coorong (102 km), to a width of 300 m, and depth of -2.0m AHD.

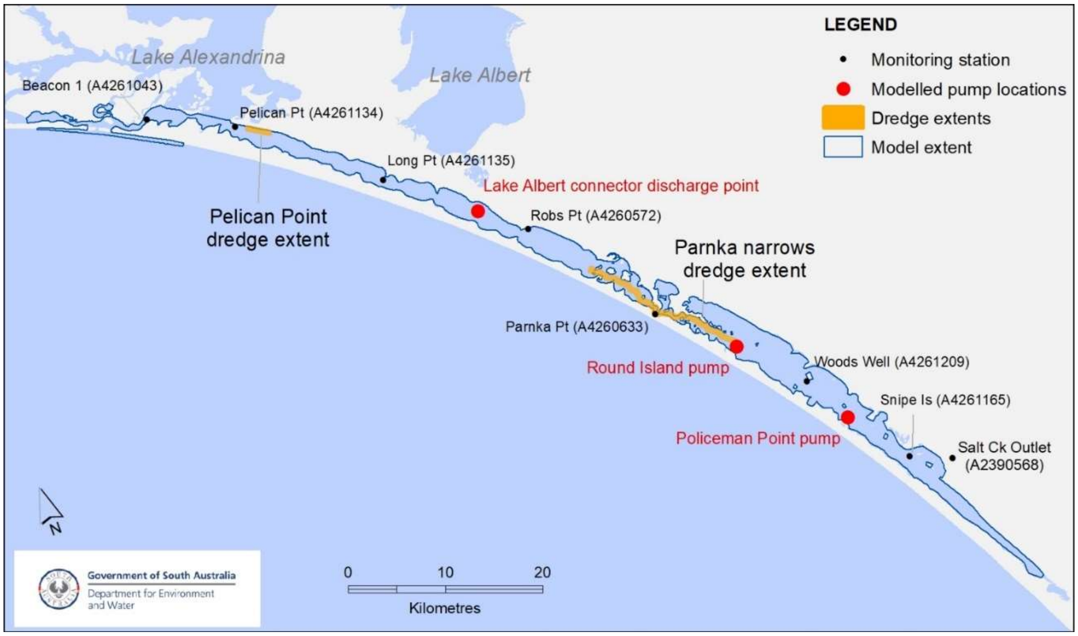


Fig. 02; Overview potential dredge locations

1.4 Scope of Works

For the purpose of this document, MCDP has made a desk-top review of the following items:

- Review of Dredging Methodology and Recommendation of suitable Equipment;
- Desktop assessment of potential dredge disposal locations;
- Desktop review of channel design in light of the chosen equipment;
- Indicative rate of progress for dredging operations;

2 CHOICE OF DREDGING METHODOLOGY

2.1 Traditional Dredging Equipment

In order to come to a balanced approach to what type of equipment is the right equipment for these works; this section will provide an overview of traditional and proven technologies.

Dredging equipment can be divided in Mechanical Dredgers and Hydraulic Dredgers. The difference between these two types is the way that the soil is excavated.

Mechanical Dredges	Hydraulic Dredges
Bucket Ladder Dredge	Suction Dredge
Grab or Clamshell Dredge	Cutter Suction Dredge
Backhoe Dredge	Trailer Suction Dredge

All dredgers except the Trailer Suction Hopper Dredge are stationary dredgers, which mean that they work from an anchored position (either by means of anchor wires and/or spud poles).

The Bucket Ladder Dredge is no longer used in the Australia waters and the plain Suction Dredge is mainly used for mining applications, while the Grab Dredge is in most cases being replaced by the backhoe Dredge. Therefore, only the Backhoe Dredge, the Cutter Suction Dredge and the Trailer Suction Hopper Dredge will be briefly discussed in the sections below as well as the advantages and disadvantages of working with each for the purpose of dredging in the Coorong.

2.1.1 Backhoe Dredge

A Backhoe Dredge (BHD) is a stationary dredge, equipped with a hydraulic excavator on a pontoon, which excavates the soil by means of its bucket or clamshell and discharges the excavated material into a barge for onwards transport and disposal.

The dredge pontoon is usually fixed in position by three spud poles rather than with an anchoring system. Two spuds fix the front of the pontoon and one the rear. This rear spud is usually in the centreline of the pontoon and is a “travelling spud”. At the front of the pontoon (in front of the two forward spuds) a standard hydraulic excavator is placed. Bucket sizes vary from less than 1m^3 to over 20m^3.

During dredging the pontoon is lifted several centimetres at the forward spud poles. Part of the weight of the dredge is now transferred via the spuds to the seabed or riverbed resulting in enough anchoring to deliver the required reaction to the digging forces.

Dredge spread	• Backhoe dredge; • Minimal two hopper barges; • Minimal one tugboat for manoeuvring of dredge
Positioning	• With 3 spuds
Dredging depth	• Depending on the size of excavator, but usually between 3m and 18m of water;
Dredged Materials	• Clay, Sand, Medium Rock, Gravel
Main use	• Capital dredging • Maintenance dredging for difficult to reach areas;

	• Remedial dredging along quay walls and jetties;
Disposal area	• Offshore at a designated dredge disposal location • Onshore (with barge unloading facility and onshore logistics)

2.1.2 Trailer Suction Hopper Dredger

A Trailing Suction Hopper Dredger (TSHD) is a self-propelled sea-going vessel equipped with a hold, called hopper, and a dredging installation by which it can fill and/or empty the hopper. The size of a TSHD is expressed in the hopper capacity and varies between a few hundred m^3 up to more than $45,000m^3$.

During dredging, a mixture of soil and water is pumped into the hopper. When dredging “settling” slurries, dredging continues after the mixture has reached the top of the overflow. Most of the soil will settle in the hopper, while the fine particles together with the water will leave the hopper via the overflow. When dredging “non-settling” slurries (i.e. silts) dredging is stopped when the mixture reaches the overflow, as the quantity of materials lost through the overflow will be similar to the quantity dredged.

When the hopper is filled, dredging is stopped, and the vessel sails to the unloading area. The dredge can be unloaded either by opening the bottom doors or pump the load via pump-ashore equipment to a designated on-shore disposal area.

The THSD is a free sailing vessel and does not hinder other shipping during dredging and is therefore ideal for dredging in harbours and shipping channels. The seagoing vessels are very suitable for borrowing/mining sand under offshore conditions (wind and waves) and large sailing distances.

THSD are used for the dredging of soft clays, silt sand and gravel. Firm and stiff clays are possible to be dredged but can give either blocking problem in the drag head and/or track forming in the clay. In that case the drag head slips into foregoing tracks, resulting in a very irregular clay surface. Dredging rock with a TSHD is in most cases not suitable. It requires very heavy drag heads with special ripper teeth.

Dredge spread	• Trailer Suction Hopper Dredge
Positioning	• N/A
Dredging depth	• Between 3 and 30m;
Dredged Materials	• Silt, Clay, Sand, Gravel; soft Rock
Main use	• Capital dredging • Maintenance dredging
Disposal area	• Offshore (bottom dumping) • On-shore (pump ashore)

2.1.3 Cutter Suction Dredge

The Cutter Suction Dredge (CSD) is a stationary dredge equipped with a cutting device (cutter head) which excavates the soil before it is sucked up by the flow of the dredge pump(s). This type of dredge is capable to dredge all kind of material. The spoil is hydraulically transported via a pipeline. Cutter power ranges from 50 kW up to 5000 kW, depending on the type of soil to be cut. The more powerful dredges are capable to dredge rock.

During the dredging process, the rotating cutter cuts the soil while the pontoon moves in a semi-circular movement by means of the side winches. The thickness of the layer which can be cut in one swing depends on both the soil conditions and the size of the cutter head. At the end of the swing either the ladder will be lowered, and the dredge is swung in the opposite direction, or the dredge will make a “step” forward.

CSD’s are used for capital and maintenance dredging projects and have proven to be a very versatile dredge. The transport distance of the dredged mixture is dependent on the pumping capacity but can be unlimited by adding additional booster stations. The dredged spoil can also be discharged into barges via a barge loading facility.

Dredge spread	• Cutter Suction dredge; • Pipeline (floating / shore based); • Minimal one anchor handling vessel for manoeuvring of dredge and relocation of anchors
Positioning	• 3- point mooring system; • Spud system with 2-point mooring;
Dredging depth	• Between 3 and 30m;
Dredged Materials	• Silt, Clay, Sand, Gravel, Rock
Main use	• Capital dredging • Maintenance dredging
Disposal area	• Onshore into either a dredge pond or reclamation area; • Offshore via a spray pontoon or via barges

2.2 Equipment Selection for the Coorong

2.2.1 Advantages vs Disadvantages of a Backhoe Dredge

Backhoe Dredges work most effectively working backwards (the minimum depth of water required to operate is thus the draft of the pontoon). Likewise, the barges for material transport (the hopper barges) must carry the payload and they do this via displacement – this requires sufficient water depth.

Hoppers can be self-propelled or towed by tug, either way, much thrust is required to move each load of material – tens of thousands of return voyagers will be required to transport the material. This will be very detrimental to the environment (propwash/ groundings etc).

The barges need adequate water to approach the shoreline for unloading – this will require at least one additional dredged channel and temporary sheet piled wharf and causeways to be constructed for unloading and subsequent on land transport/disposal logistics.

The transport of the material in a confined channel will be wind dependant and works may need to cease due to unsafe sailing conditions. Also, barges will not be able to navigate the Mouth, which dictates that disposal of all dredged materials will be restricted to land side disposal combined with trucking operations.

Only a small backhoe and small transport barges could operate at the Coorong – given the significant volume of dredging required this would require an unreasonable and inefficient timeline to complete the dredging.

For these reasons, MCDP is of the opinion that a backhoe dredge is not suitable for the dredging operations within the Coorong.

2.2.2 Advantages vs Disadvantages of a Trailer Suction Hopper Dredge

The advantage of working with TSHDs is oftentimes that dredged materials can be transported of long distances without the aid of additional infrastructure. However, TSHDs have the same or similar disadvantages of working with hopper barges as discussed in the previous section.

Considering the shallowness of the Coorong and the dredged channel, the difficulty of manouvring through the Mouth (for offshore disposal) and the large environmental footprint due to overflow and propwash, MCDP does not recommend the use of a TSHD for these works.

2.2.3 Advantages vs Disadvantages of a Trailer Suction Hopper Dredge

CSDs are stationary vessel and work forward, progressing through its dredged trench/channel. The advantage of working with a CSD is thus that a CSD can work in very shallow waters as it can dredge itself ‘free’.

CSDs agitate material near its suction mouth and pump the material through a closed pipeline and pump system hereby causing minimum disturbance to the environment it operates in.

Pumping distances without the aid of additional booster pumps are in general anywhere between 900m and 1500m. With the aid of (floating or shore based) booster station, the transport distance can be increased and is only limited by the number of booster pumps available.

Disposal of dredged materials can be onshore, nearshore or offshore whereby the discharge pipeline is extended directly to the designated disposal location.

For these and other reasons, MCDP recommends the use of a Cutter Suction Dredge for the works in the Coorong.

3 CONCEPT METHODOLOGY DEVELOPMENT

3.1 Disposal Options

The concept of methodology is strongly dependent in the way the materials are disposed of. Disposal of dredged materials can be done in several manners:

- Offshore disposal;
- Onshore disposal; and
- Nearshore disposal

Offshore disposal of dredged materials is usually done while dredging with BHD’s or TSHD’s due to the flexibility when working with self-propelled barges. Therefore, the offshore disposal will not be discussed as our chosen methodology doesn’t adopt barge transport of dredged materials.

3.1.1 Onshore Disposal

Onshore disposal of hydraulically deposited dredged materials requires a significant infrastructure to contain all volumes. The total volume to be discharged is in the order of 3.5Mm^3, which, if placed at one location at a height of 2m above ground, would occupy an area of about 1000m x 1750m.

This area does not consider the bulking of the material when moved from an in-situ underwater location to a disturbed above water disposal area. Bulking of the materials can be between 5% and 25% depending on the type of material.

Also, and depending on the quantum of fines within the dredged materials, the process water required to transport the dredged materials in slurry form, will need to be returned to the Coorong without fines. To remove fines requires large settlement and sedimentation ponds, the size and length depending on the settlement velocity of the fines.

Also, the presence of PASS within the dredged materials will add additional, and potential long-term management requirement.

Although onshore disposal is certainly an option, considering the above and for the purpose of this document, this will not further be looked into.

3.1.2 Nearshore Disposal

Nearshore disposal of dredged materials is a disposal method whereby the dredged materials are hydraulically placed within the surf zone along the beach. The actions of tides, waves and currents ensures that all dredged materials are equally distributed along the coast.

The dredging of the Murray Mouth as carried out continuously by MCDP since 2015, has been carried out by two small CSDs with disposal of approximately 1.3Mm3 per annum at an elevation below the high tide line (see also the photos in figure 3 below.

Fig. 03; Discharge at High Tide line, Goolwa Beach

MCDP developed an engineered solution for a beach discharge as part of an earlier investigation for the Coorong South Lagoon Pumping Project back in 2010. This design allows for a lower beach discharge in stead of an upper beach discharge which has the following ecological, social and economic benefits.

(a) No impact on natural beach profile as sand is not trapped on the beach profile but rather placed nearer the active zone where it can be mobilised by the natural littoral drift processes;
(b) There is no requirement to manage stockpile heights and the formation of unstable sand cliffs;
(c) There is no risk of flanking failures or dune erosion;
(d) There is no risk of beach scour and associated remedies or hazards;
(e) Any PASS soils are discharged direct into the actve wave zone, hereby eliminating the need for further treatment;
(f) It removes all mechanical machines from the beach; less environmental impact
(g) It removes the soft sand hazard across the beach profile

A concept 3D rendering of such structure is provided in figure 4 below.

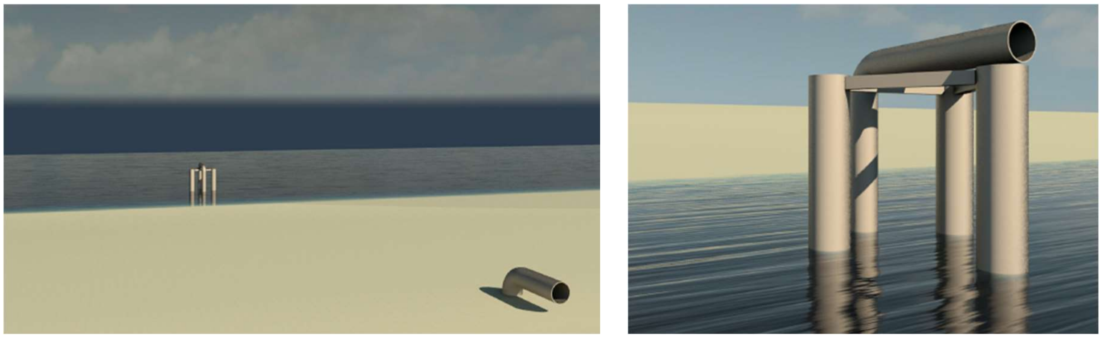


Fig. 04; Concept discharge structure in active wave zone

The structure consists of a (semi) fixed piled structure below the low water line with a discharge pipe. The connection with the dredge discharge pipe can be via buried pipeline in a trenched section of the beach, which allows vehicular access and thus does not obstruct the use of the beach.

3.2 Channel Design and Volumes

Although there are three identified options for dredging (see paragraph 2.3 above), each option makes use of the same design with as only difference the length of the channel.

Maritime Constructions carried out a bathymetric survey covering the potential channel area at Parnka Point (see figure 5 below).

Fig.05; Overview of bathymetric survey carried out by MC

This survey indicated that the bed level of throughout the surveyed area is ranges from 0.0m AHD to about -0.9m AHD. Considering the low flows within the Coorong, it is assumed that the bed level at policeman point will be similar.

The design depth of the new channel is -1.2m AHD (Parnka Point) or -1.5m AHD (Policeman Point). With an existing bed level of approximately -0.3m AHD, the average layer to be removed is in the order of 0.9m to 1.2m. Based on a channel width of 200m, the volume per meter of channel to be removed is in the order of 180m^3 to 240m^3, with a total volume to be removed in the order of 3.5Mm^3. To enable dredging such large quantities of material, MCDP suggests the use of a medium sized CSD.

3.3 Minimum Dredge Width

A general layout of a medium sized CSD, with an installed cutter power of 180kw and a discharge pipe diameter of 500mm is given in figure 06 below.

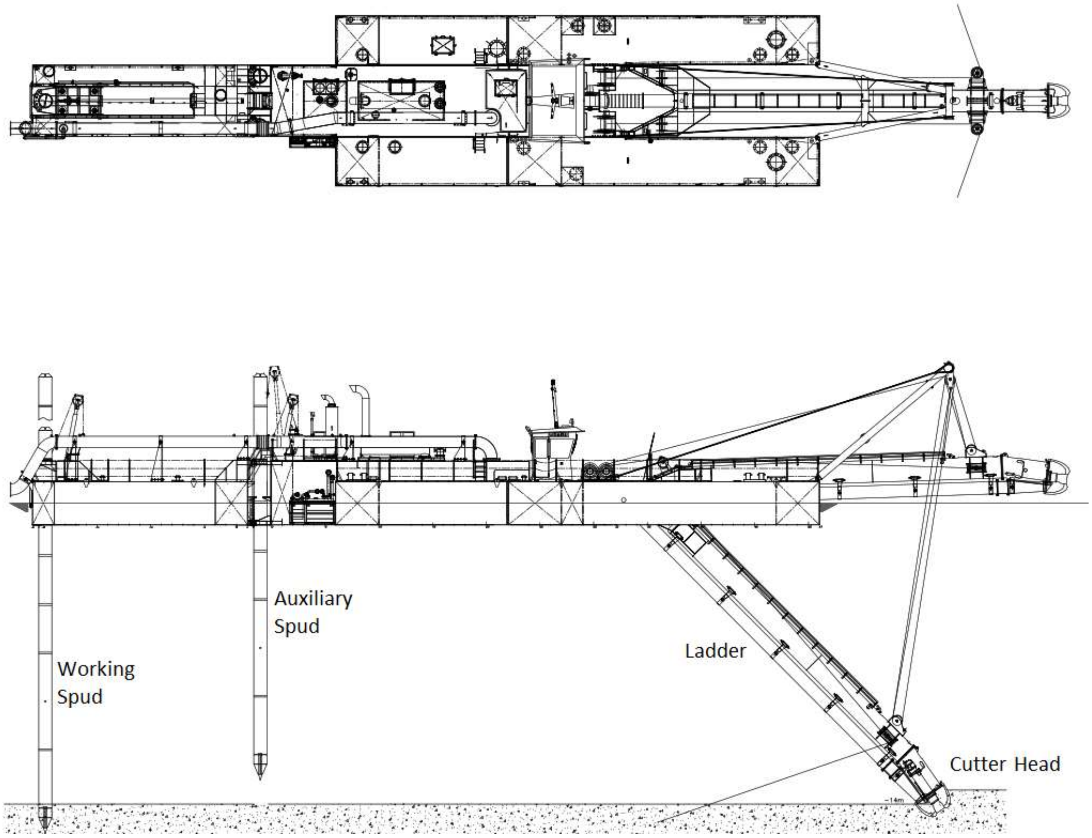


Fig.06; Overview of medium sized CSD

The minimum dredge depth of this dredge is governed by the required draft of the pontoon. For this type of dredge, the working draft is in the order of 1.2m of water. To ensure that the dredge is not restricted by channel width (whereby the pontoon gets grounded before the profile is fully dredged), the minimum working width of this dredge is in the order of **35m**.

3.4 Estimated rates of Production and Progress

For the purpose of estimating rates of production, we have made some brought assumptions:

- The average layer thickness to be removed is in the order of 0.8m-1.0m;

- To achieve an actual design depth, a certain over-dredge volume is to be accounted for. The design dredge depth for a CSD is to be in the order of 0.3m-0.5m below the required depth to be achieved, as not all materials which are cut, will be able to be removed;
- The dredge width is taken as 45m in one swing. This enables dredging at all tides and allows sufficient water for support vessels (like re-fuelling and anchoring);
- Pumping of dredged materials is carried out with the aid of one onshore booster pump, placed approximately at 1.2km pumping distance along the length of the dredged channel;
- A nearshore disposal structure will need to be constructed in line with the onshore booster; such disposal structure is thus required about every 2.4km. In case an additional floating booster is used, the onshore booster pump is only required at approximately 2.7km from the dredge, with nearshore disposal structures once every 5.4km or so.

Taking the above in mind, a total volume of about 40,000m^3 can be removed each week with the aid of two booster stations and some 4-5 nearshore disposal structures.

Appendix K

Energy supply workshop memorandum

TECHNICAL MEMORANDUM

Date	1 November 2021
To	David Hudson, Department for Environment & Water (DEW)
From	Phil Staniford
Copy	Angus MacGregor, Roger Ebsary, Glenn Shimmin, Tom Campbell, Andrew Klos (all DEW), Greg Beaumont (KBR), Andrew Kovacs (KBR)
Project	Coorong Infrastructure Feasibility Investigations
Subject	AEG155-C1-S00046 – Energy Supply Workshop Memorandum

Introduction

The Coorong Infrastructure Investigations Project (CIIP) forms part of the Healthy Coorong, Healthy Basin (HCHB) program. As part of the CIIP, Kellogg Brown & Root Pty Ltd (KBR) has been engaged by Department for Environment & Water (DEW) to investigate the engineering feasibility of long term infrastructure and management solutions to improve the health of the Coorong, provide the opportunity for habitat restoration and to sustain the ecosystem for many years to come.

The CIIP Engineering Services engagement will allow engineering assessment of shortlisted infrastructure solutions to determine potential suites of infrastructure that will achieve the objectives set by the HCHB program providing confidence in the expected outcomes of the solutions to be implemented.

As part of the CIIP Engineering Services engagement, KBR facilitated a workshop on 22 October 2021 to assess and analyse potential energy supply options for the proposed infrastructure. The objective of the workshop was to "*Identify and rank top values to inform energy supply arrangements for pumping infrastructure to improve the ecological health of the Coorong South Lagoon.*"

This memorandum provides a summary of the workshop, discussion and outputs resulting. The intent is for this technical memorandum to be a reference for future discussion regarding design options and selections made.

Limitations and context

The following limitations and context are important to note when reading this memorandum:

- This workshop occurred prior to selection of a preferred design solution. At the time of the workshop there were seven different design solutions with different energy demand profiles ranging from minor (passive solution, no pumping) to significant electrical load with continuous pumping.
- The workshop assessed the seven different energy supply options identified in the Concept Design Report (KBR reference: AEG155-01-TD-WR-REP-0001 Rev. A, 8 October 2021). An additional two energy supply options were included for the workshop. These were labelled P1A and P1B and were both variants on the grid connection option P1.
- A third additional energy supply option was included after discussion at the workshop. This was labelled P1C and was another variant on P1 of potential interest to DEW.

- The workshop did not consider the embodied energy associated with certain materials or products and instead focused on electricity to operate required mechanical elements.

Workshop participants

The following KBR and DEW staff attended the workshop, either in person at KBR or virtually (via Teams).

Table 1 Workshop participants

Participant	Role and Organisation
Heath Newberry	Program Leader, DEW
Andrew Klos	Principal Policy Advisor, Climate Change Unit, DEW
David Hudson	Senior Project Officer – Healthy Coorong, Healthy Basin, DEW
Glenn Shimmin	Manager Water Program Oversight & Delivery, DEW
Tom Campbell	Program Leader, Operations and Maintenance, DEW
Roger Ebsary	Senior Engineer – Healthy Coorong, Healthy Basin, DEW
Greg Beaumont	Principal Electrical Engineer, KBR
Phil Staniford	Project Manager, KBR
Andrew Kovacs	Planning and Sustainability Discipline Manager, KBR

Apologies to the workshop were received from Angus MacGregor (Manager, Healthy Basin, Healthy Coorong) and Louisa Perrin (both DEW).

Workshop Process and Documentation

The following section describes the content, process and discussion that occurred in the workshop. Please also refer to the attached PowerPoint slides.

Introduction

- Andrew Kovacs provided an introduction and context for the workshop.
- Phil Staniford provided a project update and context for this workshop, including a summary of Working Group feedback to date.
- Andrew Klos provided a summary and context regarding current DEW Climate Policy and notable considerations from his experience including:
  - The SA electricity grid is decarbonising rapidly and expected to be approaching zero carbon by 2030.
  - There is an option for the project to participate in the wholesale market including demand management and negative pricing events.
  - Under the existing DEW electricity supply contract from ZEN Energy, low cost offset Certificates are available.
  - There is a general trend of electrification across infrastructure to maximise emissions reduction and reduce cost rather than development of standalone renewable energy supply infrastructure.
  - There is an option to assess commercial arrangements beyond the existing supply contracts.
- Andrew Kovacs introduced the workshop discussion process noting the range of designs still under consideration and the vastly different energy and land requirement profiles for their associated energy supply.

Summary and review of each energy supply option

A summary of all supply options was reviewed using qualitative descriptions (high to low) for key metrics of:

- Land requirements
- Development and planning risk
- Maintenance
- Electricity supply reliability

- Emissions
- Capital expenditure (CAPEX)
- Operating expenditure (OPEX)

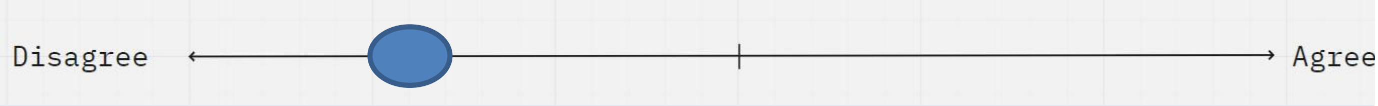
Each energy supply option was discussed in detail with clarifications made to enable more detailed assessment in the workshop tasks. The options are listed below in Table 2.

Task 1. Identify key project values

This task was designed to identify key project values that will influence, eliminate or prioritise different energy supply options under consideration.

Participants were asked the following questions with discussion and debate before settling on a level of agreement and reflecting this on the provided scale.

Table 1. Summary of responses to values questions.

Comments and results for each values question
Question: Capital cost is the key driver (to DEW). Comments: · Not ‘the’ key driver for State Government. · Value for money is a more appropriate interpretation. · Capital cost is unlikely to be key driver of final solution. · Whole of life costing is the key consideration, rather than capital cost. Result: 

Comments and results for each values question

Question: Operational cost is the key driver.

Comments:

- DEW will need to seek additional funding from State Government for operation of the ultimate infrastructure.
- Any long term reductions in OPEX are favourable.
- Consistent operating costs are key to funding, stability is favourable ensuring predictability with annual OPEX.
- Variable costs represent risk for project during operation. Management of DEW's relationship with Department of Treasury and Finance (DTF) is a consideration also.
- Wholesale market participation may add variability to operational costs and is a more intensive process to be active in the market likely requiring external support.
- Both OPEX & CAPEX will remain critical to project receiving requested funding and proceeding.

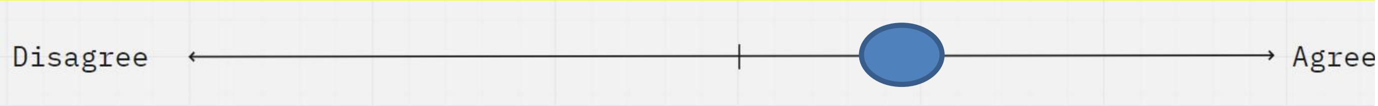
Result:

Question: The lowest emission solution is important.

Comments:

- All options are fairly 'low' emissions with the exception of the diesel generation back-up energy supply.
- Communication is key should a grid connection be selected to convey to stakeholders that grid emissions are reducing.
    - Similarly – if a 'visible' or 'token' investment in renewables locally occurs it must be conveyed with overall intent and outcome.
    - It is noted that this 'visible' or 'token' investment may actually negatively impact stakeholder perceptions or acceptance.
- Low emissions are important but this doesn't necessarily drive the lowest emission scenario when considering other factors.
- Commercial options to be considered should include increasing CAPEX linked costs to reduce OPEX, including power purchase agreements (PPAs) compared to Certificates and other arrangements.

Result:



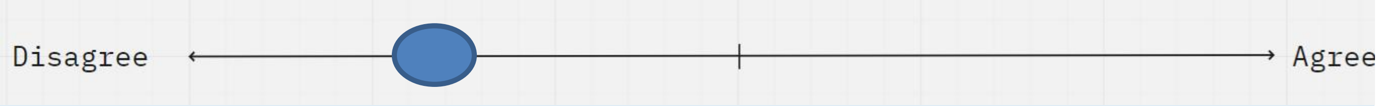
Comments and results for each values question

Question: DEW is comfortable procuring and operating renewable energy sites.

Comments:

- DEW isn't currently managing any sites of significant scale. Some rooftop solar has been deployed, but not at scale.
- Risks of operating renewable generation sites and maintenance was highlighted (i.e. DEW is not experienced or setup to manage this currently and it would likely be outsourced to a specialist service provider).

Result:



Question: DEW should maximise emissions reduction tCO_2e / $ irrespective of how it occurs.

Comments:

- Yes, it is preferred; however, the overall cost / benefit needs to be considered (i.e. it can't be at any cost).

Result:

Question: Planning and environmental approval processes of up to five years in duration is acceptable.

Comments:

- No, it isn't acceptable, considering when construction and commencement of operation of the infrastructure is targeted.
- Supply risk can't be tolerated (i.e. investment in engineering infrastructure without certainty of energy supply arrangements is not acceptable).
- Ecological outcomes are driving the broader project, indicating commencement of operations as soon as possible is preferred.

Result:

Comments and results for each values question

Question: Local investment in renewable energy is important.

Comments:

- Renewable energy is important, but installation of a local 'visible' facility isn't essential.
- Workforce associated with installation of any renewable energy facility is likely to be non-local in any scenario.
- Approvals for local facility increase implementation risk associated with broader project.

Result:

Question: DEW is interested in participation in wholesale electricity market including demand management (and variable pricing).

Comments:

- Yes – if there is benefit for DEW.
- Multiple commercial structures would need to be analysed for benefit and risk before a decision is made.
- Potential for social benefit in reducing load at peak demand and able to convey to public.
- Risk around managing period of non-pumping due to demand management (i.e. can this lost capacity be caught up via a higher pumping rate or can it be tolerated for some infrastructure options).

Result:

Question: DEW is happy to support a fossil fuel based supply solution.

Comments:

- No, based on policy and initial community consultation feedback.
- It locks in costs and emissions – not desirable.
- It could lead to stranded assets in the DEW portfolio (e.g. diesel generation cannot be operated considering social licence, cost, risks, etc.).

Result:

Task 2. Top project values

In the second task related to values, participants were asked to rank their ‘Top three’ values for the project from the below list. While similar to the questions above the intent was to check for alignment and inherent assumptions that had not been expressed.

The values list presented for discussion included the following eight values:

- OPEX.
- CAPEX.
- Planning and approval risk reduction.
- Emissions level.
- Visible, local renewable energy.
- Supply reliability.
- Land required.
- Operational management risk reduction (maintenance, spills).

After discussion through the workshop to reach a consensus, the participants selected the top three values as:

- OPEX – as it is critical for ongoing viability of the project into the operational and life support phase.
- Planning and approvals risk – as it isn’t tolerable if supply or feasibility of project is at placed risk owing to additional and potentially conflicting planning and approvals processes.
- Emissions – important, though most options appear to have favourable (low) emissions.

Supply reliability was identified as a fourth value of some importance but was not considered within the top three values. This was based on acceptance that supply reliability for any of the options should be comparable (i.e. a primary source and a back up source and that a grid connection is considered to have a high reliability). As such, it wasn’t deemed necessary to include as one of the top three values.

Evaluate energy supply options using key values

After identifying the key values, the energy supply options were evaluated. Multiple options were assessed as misaligned with the agreed values and noted for removal from consideration, these removed options are noted in red shading.

Table 2. Supply options and outcomes

Power Supply Option	Primary Supply	Secondary Supply	Description	Potential issues with Development Approval	Greenhouse Gas Emissions	OPEX	Comment
P1	Grid	N/A	Grid connection	Low	Medium	Medium (up to $5M per annum)	Supply cost updated to $5M. This is the base case to compare to. OPEX assumed comparable to P1A, P1C and P2.
P1A	Grid	N/A	Grid connection with PPA for external renewable source (location and size TBC).	Low	Low	Medium (TBC)	This option would help expand renewables in SA. Another potential benefit is that a new grid supply transition line triggers additional (external) renewable development in area.
P1B	Grid	Solar	Grid connection with DEW local solar farm connected – size of solar farm TBD.	Medium	Medium (TBC)	Medium	Small solar farm unlikely to be worth environmental and planning approval process and may be at odds with community perceptions / expectations. Operational risk for DEW if asset is not adequately managed and maintained.
P1C	Grid	NA	Grid connection using wholesale market price trading and demand management used to minimise OPEX. Option added during workshop discussion.	Low	Medium	TBC	Management and operation of wholesale market price trading to be further investigated. Note this market trading could be contracted to SA Water or another private operator for operational activities. Opportunity to draw from SA Water's knowledge with partnership on the project. Demand management measures need to ensure achievement of ecological outcomes will not be impacted.

Power Supply Option	Primary Supply	Secondary Supply	Description	Potential issues with Development Approval	Greenhouse Gas Emissions	OPEX	Comment
P2	Solar	Grid	Solar array sized to supply electrical maximum demand during winter's day. Grid connection utilised during times of low irradiance levels.	Medium	Low	Medium	Operating off grid 75% of the time. Relative emissions to be considered. CAPEX to be considered ($5M to $29M for solar farm). Requirement for 2-22 ha. Purchase of land not included. A potential location would along 55 km power line from Tintinara, in less ecologically or commercially valuable land. Appetite of DEW to manage and procure solar farm remains to be confirmed.
P3	Solar	Diesel Genset	Solar array sized to supply electrical maximum demand during winter's day. Generator sized to supply entire site demand during times of low irradiance levels.	Medium	High	High	Doesn't align with key values, OPEX, emissions, community expectation.
P4	Solar	Battery	Solar array sized to supply electrical maximum demand & charge batteries during winter's day. Batteries sized to supply pumps during night & rely on sufficient irradiance levels for the solar array to recharge batteries.	Medium	Very low	High	OPEX changed to high due to battery refurbishment. Doesn't align with key values. Battery cost poor value compared to others.
P5	Wind	Grid	Wind turbines sized to supply electrical maximum demand at a nominal wind speed. Grid connection utilised during times of low wind speed.	High	Very Low	Medium / Low – scale and procurement dependent	Planning risk associated with wind is not tolerable for business case, (social, political and planning risk).

Power Supply Option	Primary Supply	Secondary Supply	Description	Potential issues with Development Approval	Greenhouse Gas Emissions	OPEX	Comment
P6	Wind	Diesel Genset	Wind turbines sized to supply electrical maximum demand at a nominal wind speed. Generator sized to supply entire site demand during times of low wind speed.	High	High	High	Doesn't align with key values, OPEX, emissions, community expectation.
P7	Wind	Battery	Wind turbines sized to supply electrical maximum demand & charge batteries during nominal wind speeds. Batteries sized to supply pumps during low wind conditions – maximum of 12 hours.	High	Very low	High	OPEX changed to high due to battery refurbishment. Doesn't align with key values.

Note:

- Hydrogen storage was discussed as an energy supply option. It was noted that with current levels of commercial readiness, it is not an appropriate energy storage technology or a suitable supply solution for the project. Other existing forms of energy are currently more cost effective and are unlikely to be overtaken by hydrogen storage in the next 5-10 years as this infrastructure is implemented.
- Natural gas was discussed as a potential cleaner energy source to diesel generation if a fossil fuel based generation source was required. This wasn't progressed though considering proximity of the site to a natural gas supply, maintenance requirements for natural gas engines and acceptance of the grid connection as n improving energy supply source.

Conclusion

The workshop ranked key values to help guide potential energy supply options. The key values were then used to evaluate potential options and remove misaligned supply options. The top options selected for continued investigation and assessment were:

- P1 – Grid connection.
- P1A – Grid connection and PPA or similar arrangement to reduce emissions.
- P1C – Grid connection using wholesale market price trading and demand management used to minimise OPEX.
- P2 – Large solar farm constructed in vicinity of project with grid connection.

KBR will now use this technical memorandum to inform further project decision-making processes including the upcoming multi-criteria analysis assessments and capital and operating cost estimates current in development for the overall infrastructure option selected for the project. The conclusions reached in this workshop can also be reflected in subsequent design development and preparation of the project's feasibility assessment report.

Yours sincerely

Phil Staniford
Project Manager

Appendix L

Construction methodology statements

Construction Methodology

1. PROJECT DETAILS

Client	· Kellogg Brown & Root Pty Ltd
Location	· Coorong South Australia
Scope of Works	· Constructability of current Options 1A,1B

2. OPTION 1A

Project Planning	· Cultural heritage survey to be completed prior to construction activities (upon final alignment selection) · Land acquisition will be required · Council consultation required for temporary road diversion/road closure · Access trail from Seven Mile Road leading to Boundary Bluff and Dodd Peninsula will be permanently closed · Landowners will be consulted for use of property adjacent the construction corridor and footprint agreed · Detailed survey of corridor and extent of the above areas · Environmental assessment to be conducted · Livestock (and native fauna) to be excluded from construction site
Site Establishment	· The eastern side of Narrung Road to be the main site compound and laydown · Grubbing of the site will be required and windrowed around the perimeter for later remediation of the compound · Temporary power connection for site to be taken from Narrung Road overhead power lines · Access from both North and South along Narrung Road · Hard stand built for structure deliveries within the compound · Speed restrictions on Narrung Road during construction works
Inlet Regulating Structure	· Temporary public road to be constructed on the western side of Narrung Road, but ideally a full road closure · Existing Telstra service to be directionally drilled below design level · Existing reticulation water to be directionally drilled below design level · Overhead power poles on eastern side of Narrung Road to be temporarily braced or removed · Excavation to be completed via a 23t excavator · Spoil to be short hauled and stockpiled for testing in compound then transported off site (or reincorporated in works / spread locally) · Sheet piles to be driven with excavator with EMV attachment · Rock protection supplied from Murray Bridge · Steel reinforcement supplied from Adelaide · In situ concrete supplied from Murray Bridge, will be extremely tight on batch to discharge times (plant over an hour away)

	· Cranage supplied from Adelaide · Crane pads to be constructed on the western side of Narrung Road, with all major precast elements to be completed prior to channel works starting (crane pad could be retained for operational purposes) · Power to be supplied from overhead power lines on Narrung Road. SAPN connection point will be required. · Stock grid on Narrung Road may cause problems for local livestock owners, with an open channel blocking access for moving stock, Narrung Road would be the only North/South option (to be investigated in detailed design)
Open Channel Construction	· Machine control to be developed in 3D model showing the full extent of property boundaries along with design profile · Topsoil to be removed via scrapers and stockpiled adjacent for reuse and remediation when channel is complete · The footprint of channel to be cut with the scrapers · Imported fill required to construct haul road suitable for road going trucks using a grader (or suitable site won material) · Channel construction to start at the western end · 36t excavators with conventional tilt buckets will be used for the channel construction along with bulldozer, grader, watercarts and compaction rollers to maintain access and complete the channel profile · All spoil will need to be transported off site (or could be reincorporated in works (e.g. dredge ponds) / windrowed to avoid off-site haulage costs) · A lined channel is suggested (pending further geotechnical assessment – Emerson Class testing)

3. OPTION 1B

Site Establishment	· The southern side of Narrung Road would be the main site compound and laydown · Grubbing of the site will be required and windrowed around the perimeter for later remediation of the compound · Temporary power connection for site to be taken from Narrung Road overhead power lines · Access from both East and West along Narrung Road · Hard stand built for structure deliveries within the compound · Speed restrictions on Narrung Road during construction works
Inlet Regulating Structure	· Temporary public road to be constructed on the southern side of Narrung Road · Existing Telstra service to be directionally drilled below design level · Existing reticulation water to be directionally drilled below design level · Overhead power poles on northern side of Narrung Road to be temporarily braced or removed

	· Excavation to be completed via a 23t excavator · Spoil to be short hauled and stockpiled for testing in compound then transported off site (or reincorporated in works / spread locally) · Sheet piles to be driven with excavator with EMV attachment · Rock protection supplied from Murray Bridge · Steel reinforcement supplied from Adelaide · In situ concrete supplied from Murray Bridge, will be extremely tight on batch to discharge times (plant over an hour away) · Cranage supplied from Adelaide · Crane pads to be constructed on the southern side of Narrung Road, with all major precast elements to be completed prior to channel works starting (crane pad could be retained for operational purposes) · Power to be supplied from overhead power lines on Narrung road. SAPN connection point will be required
Pipe Jack CH 2125-1250 (if deemed commercially economical – otherwise conventional open trench pipe laying)	· Temporary road diversion on Seven Mile Road to enable public access around construction site · Send pit will be excavated at pipe bend at CH 2125 enabling pipework to be delivered to the site compound and craned to the rig · Receive pit will be at CH 1250 and a temporary road will need to constructed around the excavation · Phase 1 will be the install of two pipes and complete reinstatement · Phase 2 another two pipes and complete reinstatement · Phase 3 remaining pipe · Construction of discharge concrete headwall structure (cofferdam required)
Conventional open trench pipe laying	· A temporary road will need to be built from CH 1250 – 800 outside of the current road easement · Two pipes will be laid in a similar sequence to the pipe jacking method · Intention would be to batter/bench the open trench · All excess spoil to be removed from site via road going trucks (or reincorporated in works (e.g. dredge ponds) / spread locally) · A crawler crane would be required for lifting and laying pipework in the tight corridor · 36t excavators will be used on this section of work

4. STAGING / SEQUENCE OF WORKS

Option 1A:	1) Site mobilisation 2) Access roads through farm land 3) Site clearing 4) Inlet regulator construction 5) Open channel excavation and lining 6) Fence installation 7) Dredging Lake Albert and Coorong open channel

	8) Commissioning 9) Site demobilisation
Option 1B:	1) Site mobilisation 2) Temporary access roads 3) Site clearing 4) Inlet regulator construction 5) Pipe jacking 6) Pipe discharge concrete headwall 7) Dredging Lake Albert and Coorong open channel 8) Commissioning 9) Site demobilisation

Construction Methodology

1. PROJECT DETAILS

Client	· Kellogg Brown & Root Pty Ltd
Location	· Coorong South Australia
Scope of Works	· Constructability of current Options 3A, 3B, 3C, 3D

2. OPTIONS 3A, 3B, 3C, 3D

Project Planning	· Cultural heritage survey to be completed prior to construction activities (upon final alignment selection) · Private property (may be) required for laydown/compound/barge point · Land acquisition (may) be required · Detailed survey of construction corridor · Environmental assessment to be conducted · Livestock (and native fauna) to be excluded from construction site
Site Establishment	· A large laydown (may) need to be constructed on private property on the eastern side of the Princess highway south of Woods Well/Culburra Road (or on western side at nominate barge point) · Main site amenities will be at this site · The laydown will need to be big enough to store pipework, mechanical fittings, quarry products structural elements and mobile concrete batching plant · Quarry material to be transported from Murray Bridge
Access Roads/ Barge Access (east)	· Access road to be constructed on the western side of the Princess Highway with vehicle holding bay · A temporary earth platform/ramp to be built into the southern lagoon to enable access to the water (barge point) · Two independent barge platforms for ferrying heavy plant and materials across the Coorong to Younghusband Peninsula · Dredging the travel path may be required for barge access · A personnel boat will be required for quick transportation of workers and support staff
Access Roads/Barge Access (west)	· A similar access road and platform (barge point) will need to be constructed on the western side for access to the peninsula with imported material ferried from the main compound · A 45t excavator would be used to place the material from the barge
Site Clearing/Set Up	· Grubbing of the construction footprint will be required · Temporary Dura-Base matting will be placed at the barge landing site to enable 40t dump trucks access to the peninsula · Green waste to be removed from site and transported to the main compound for disposal

	· Imported quarry material will need to be placed to construct a small amenities compound on the peninsula (and permanent access tracks / hardstands) · Access to the western side of the peninsula would be using Dura-Base matting to limit the amount if imported fill to be removed at project end (temporary works only)
Pipe Jacking land Based Pipe (if deemed commercially economical – otherwise conventional open trench pipe laying)	· Launch shaft to be constructed on the eastern side of the peninsula from a hydraulically braced sheet pile system · Dewatering spear system will be required around the shaft for any ground water ingress · Excavation will be via a 45t excavator and dump truck · Spoil to be to be removed from the construction site, stockpiled nearby and later reused at project end · Concrete floor and brace wall will need to be formed and poured in the launch shaft via a mobile batch plant in the main compound on the mainland · A 100t crawler crane will be required for the setup and de-mob of the rig · Pipe work suggested to be 3m lengths to minimise the size of the launch shaft · Pipework to be transported from the main compound on conventional road going semi-trailers · Conventional pipe laying techniques to be used from end of pipe jack to structures (or where pipe jacking is not deemed commercially economical)
Floating Pontoon, Pipework, Pumps	· Construction will be from the barge · Crawler crane will be stationed on the barge · Pipework and pumps will come from the main compound on road going trucks · Power supply would need to be an undersea cable from the mainland

3. STAGING / SEQUENCE OF WORKS

Option 3A:	1) Site mobilisation 2) Access roads / barge access 3) Site clearing 4) Jetty outfall structure construction 5) Pipe jacking through sand dunes (or conventional pipe laying) 6) Pipe install and connection on jetty 7) Floating walkway install 8) Pontoon and pump install 9) Pipe install on walkway and connections 10) Commissioning 11) Site demobilisation
Option 3B:	1) Site mobilisation 2) Access roads / barge access 3) Site clearing

	4) Pipe jacking through sand dunes (or conventional pipe laying) 5) Concrete apron outfall structure 6) Flexmat install 7) Floating walkway install 8) Pontoon and pump install 9) Pipe install on walkway and connections 10) Commissioning 11) Site demobilisation
Option 3C:	1) As per Option 3A
Option 3D:	1) As per Option 3B

Construction Methodology

1. PROJECT DETAILS

Client	· Kellogg Brown & Root Pty Ltd
Location	· Coorong South Australia
Scope of Works	· Constructability of current Options 4A, 4B

2. OPTIONS 4A, 4B

Project Planning	· Cultural heritage survey to be completed prior to construction activities (upon final alignment selection) · Private property (may be) required for laydown/compound/barge point · Land acquisition (may) be required · Detailed survey of construction corridor · Environmental assessment to be conducted · Livestock (and native fauna) to be excluded from construction site
Site Establishment	· A large laydown (may) need to be constructed on private property on the eastern side of the Princess highway south of Woods Well/Culburra Road (or on western side at nominated barge point) · Main site amenities will be at this site · The laydown will need to be big enough to store pipework, mechanical fittings, quarry products structural elements and mobile concrete batching plant · Quarry material to be transported from Murray Bridge
Access Roads/ Barge Access (east)	· Access road to be constructed on the western side of the Princess Highway with vehicle holding bay · A temporary earth platform/ramp to be built into the southern lagoon to enable access to the water (barge point) · Two independent barge platforms for ferrying heavy plant and materials across the Coorong to Younghusband Peninsula · Dredging the travel path may be required for barge access · A personnel boat will be required for quick transportation of workers and support staff
Access Roads/Barge Access (west)	· A similar access road and platform (barge point) will need to be constructed on the western side for access to the peninsula with imported material ferried from the main compound · A 45t excavator would be used to place the material from the barge
Site Clearing/Set Up	· Grubbing of the construction footprint will be required · Temporary Dura-Base matting will be placed at the barge landing site to enable 40t dump trucks access to the peninsula · Green waste to be removed from site and transported to the main compound for disposal

	· Imported quarry material will need to be placed to construct a small amenities compound on the peninsula (and permanent access tracks / hardstands) · Access to the western side of the peninsula would be using Dura-Base matting to limit the amount of imported fill to be removed at project end (temporary works only)
Pipe Jacking land Based Pipe (if deemed commercially economical – otherwise conventional open trench pipe laying)	· Launch shaft to be constructed on the eastern side of the peninsula from a hydraulically braced sheet pile system · De watering spear system will be required around the shaft for any ground water ingress · Excavation will be via a 45t excavator and dump truck · Spoil to be to be removed from the construction site, stockpiled nearby and later reused at project end · Concrete floor and brace wall will need to be formed and poured in the launch shaft via a mobile batch plant in the main compound on the mainland · A 100t crawler crane will be required for the setup and de-mob of the rig · Pipe work suggested to be 3m lengths to minimise the size of the launch shaft · Pipework to be transported from the main compound on conventional road going semi-trailers · Conventional pipe laying techniques to be used from end of pipe jack to structures (or where pipe jacking is not deemed commercially economical)
Floating Pontoon, Pipework, Pumps (Option 4A)	· Construction will be from a barge · Crawler crane will be stationed on the barge · Pipework and pumps will come from the main compound on road going trucks · Power supply would need to be a undersea cable from the mainland
Concrete Bi-Directional Pump Station (Option 4B)	· The site will need to be cut level and imported quarry material placed for crane pads and concrete pumping · Access road to be built suitable for road going trucks (and retained for permanent access) · A 100t crawler crane will be required to drive the sheet piles and stay on site for all construction activities · A concrete boom pump is required for this option and multiple agitators running from the main compound batch plant · Concrete will have to be poured sequentially in small sections creating multiple joins. Access will not allow for multiple pumps. · External pipe work needs to be installed prior to concrete works · Scaffold will be required along with EWPs and scissor lifts · All temporary work equipment, formwork, pipe spools, valves, switchboards etc. will need to be transported via trucks to the location of the crane

	· Power supply would be via undersea cable from the mainland
Rock Armour Breakwater/Pedestrian Walkway (Option 4B)	· Rock to be delivered to the main compound from Murray Bridge · The material will be loaded onto 40t dump trucks and ferried to the peninsula · Two Barges needed to get enough material to site to be as productive as possible (or alternately hauled up Ocean Beach from Tea Tree Crossing or 42 Mile Crossing) · Two 45t excavators will work in tandem placing the rock into the Southern Ocean using GPS · Final layer of rock will be placed to the design level in readiness for concrete · Prior to pipe install a coffer dam would be built to allow pumping out of the water (behind breakwater) · Sheets piles to be driven with the excavators (similar for Coorong pipework) · Rock armour may need to be placed on the inside of the sheet piles to stabilise · Outlet pipe to be installed conventionally using excavators · Sheet piles to be removed · Concrete placed on breakwater structure using a line pump · Pours would be sequential taking into account volumes and production rates from previous pours
Conventional open trench pipe laying	· Conventional pipe laying methods to be used from end of pipe jacking · Cofferdams constructed with driven sheet piles from excavators on barges · Pipe laid into breakwater structure and precast concrete support base installed

3. STAGING / SEQUENCE OF WORKS

Option 4A:	1) Site mobilisation 2) Access roads / barge access 3) Site clearing 4) Jetty structure construction 5) Pipe jacking through sand dunes (or conventional pipe laying) 6) Pipe install and connection on jetty 7) Floating walkway install 8) Pontoon and pump install 9) Pipe install on walkway and connections 10) Commissioning 11) Site demobilisation
Option 4B:	1) Site mobilisation 2) Access roads / barge access 3) Site clearing 4) Breakwater structure construction

5) Concrete pump station construction (and pump install)
6) Pipe jacking through sand dunes (or conventional pipe laying)
7) Cofferdam installation into breakwater
8) Pipe install into breakwater
9) Coffer dam installation into Coorong
10) Pipe install into Coorong
11) Commissioning
12) Site demobilisation

Construction Methodology

1. PROJECT DETAILS

Client	· Kellogg Brown & Root Pty Ltd
Location	· Coorong South Australia
Scope of Works	· Constructability of current Options 5A, 5B

2. OPTIONS 5A, 5B

Project Planning	· Cultural heritage survey to be completed prior to construction activities (upon final alignment selection) · Private property (may) be required for laydown/compound/barge point · Land acquisition (may) be required · Detailed survey of construction corridor · Environmental assessment to be conducted · Livestock (and native fauna) to be excluded from construction site
Site Establishment	· Laydown / site compound to be constructed on cleared land at Parnka Point of similar size and method as the previous options · A temporary bridge to be constructed from over size shot rock across from Parnka Point to the peninsula (or piled suspended deck structure) · Grubbing of temporary access roads on the peninsula required and to be transported from site for disposal · Import quarry material from Murray Bridge for temporary access to the Southern Ocean and Coorong · Minimal amenities will be required at the pump out construction site · A large laydown (may) need to be constructed on private property on the eastern side of the Princess highway south of Woods Well/Culburra Road at the pump in location (or on western side of nominated barge point) · Main site amenities will be at this site · The laydown will need to be big enough to store pipework, mechanical fittings, quarry products structural elements and mobile concrete batching plant
Access Roads/ Barge Access (east)	· Access road to be constructed on the western side of the Princess Highway with vehicle holding bay · A temporary earth platform/ramp to be built into the southern lagoon to enable access to the water (barge point) · Two independent barge platforms for ferrying heavy plant and materials across the Coorong to Younghusband Peninsula · Dredging the travel path may be required for barge access · A personnel boat will be required for quick transportation of workers and support staff

Access Roads/Barge Access (west)	· A similar access road and platform (barge point) will need to be constructed on the western side for access to the peninsula with imported material ferried from the main compound · A 45t excavator would be used to place the material from the barge
Site Clearing/Set Up	· Grubbing of the construction footprint will be required · Temporary Dura-Base matting will be placed at the barge landing site to enable 40t dump trucks access to the peninsula · Green waste to be removed from site and transported to the main compound for disposal · Imported quarry material will need to be placed to construct a small amenities compound on the peninsula (and permanent access tracks / hardstands) · Access to the western side of the peninsula would be using Dura-Base matting to limit the amount of imported fill to be removed at project end (temporary works only)
Pipe Jacking land Based Pipe (if deemed commercially economical – otherwise conventional open trench pipe laying)	· Launch shaft to be constructed on the eastern side of the peninsula from a hydraulically braced sheet pile system · Dewatering spear system will be required around the shaft for any ground water ingress · Excavation will be via a 45t excavator and dump truck · Spoil to be to be removed from the construction site, stockpiled nearby and later reused at project end · Concrete floor and brace wall will need to be formed and poured in the launch shaft via a mobile batch plant in the main compound on the mainland · A 100t crawler crane will be required for the setup and de-mob of the rig · Pipe work suggested to be 3m lengths to minimise the size of the launch shaft · Pipework to be transported from the main compound on conventional road going semi-trailers · Exit shaft will be set up the same as the launch shaft · Conventional pipe laying techniques to be used from end of pipe jack to structures (or where pipe jacking is not deemed commercially viable)
Floating Pontoon, Pipework, Pumps	· Construction will be from a barge · Crawler crane will be stationed on the barge · Pipework and pumps will come from the main compound on road going trucks · Power supply would need to be a undersea cable from the mainland

3. STAGING / SEQUENCE OF WORKS

Option 5A:	1) Site mobilisation 2) Access roads / barge access

	3) Site clearing 4) Jetty structure construction 5) Pipe jacking through sand dunes (or conventional pipe laying) 6) Pipe install and connection on jetty 7) Floating walkway install 8) Pontoon and pump install 9) Pipe install on walkway and connections 10) Commissioning 11) Site demobilisation
Option 5B:	1) Site mobilisation 2) Access roads / barge access 3) Site clearing 4) Jetty structure construction 5) Pipe jacking through sand dunes (or conventional pipe laying) 6) Concrete apron outfall structure construction 7) Flexmat installation 8) Pipe install and connection on jetty 9) Floating walkway install 10) Pontoon and pump install 11) Pipe install on walkway and connections 12) Commissioning 13) Site demobilisation

Construction Methodology

1. PROJECT DETAILS

Client	· Kellogg Brown & Root Pty Ltd
Location	· Coorong South Australia
Scope of Works	· Constructability of current Option 6

2. OPTION 6

Project Planning	· Cultural heritage survey to be completed prior to construction activities (upon final alignment selection) · Private property (may be) required for laydown/compound · Land acquisition (may) be required · Detailed survey of construction corridor · Environmental assessment to be conducted · Livestock (and native fauna) to be excluded from construction site
Site Establishment	· A large laydown will need to be constructed on private property on the eastern side of the Princess highway south of Woods Well/Culburra Road · Main site amenities will be at this site · The laydown will need to be big enough to store pipework, mechanical fittings, quarry products structural elements and mobile concrete batching plant · Quarry material to be transported from Murray Bridge
Access Roads/ Barge Access (east)	· Access road to be constructed on the western side of the Princess Highway with vehicle holding bay · A temporary earth platform/ramp to be built into the southern lagoon to enable access to the water (barge point) · Two independent barge platforms for ferrying heavy plant and materials across the Coorong to the Younghusband Peninsula · Dredging the travel path may be required for barge access · A personnel boat will be required for quick transportation of workers and support staff
Access Roads/Barge Access (west)	· A similar access road and platform (barge point) will need to be constructed on the western side for access to the peninsula with imported material ferried from the main compound · A 45t excavator would be used to place the material from the barge
Site Clearing/Set Up	· Grubbing of the construction footprint will be required · Temporary Dura-Base matting will be placed at the barge landing site to enable 40t dump trucks access to the peninsula · Green waste to be removed from site and transported to the main compound for disposal · Imported quarry material will need to be placed to construct a

	small amenities compound on the peninsula (and permanent access tracks / hardstands) · Access to the western side of the peninsula would be using Dura-Base matting to limit the amount of imported fill to be removed at project end (temporary works only)
Pipe Jacking land Based Pipe (if deemed commercially economical – otherwise conventional open trench pipe laying)	· Launch shaft to be constructed on the eastern side of the peninsula from a hydraulically braced sheet pile system · De watering spear system will be required around the shaft for any ground water ingress · Excavation will be via a 45t excavator and dump truck · Spoil to be to be removed from the construction site, stockpiled nearby and later reused at project end · Concrete floor and brace wall will need to be formed and poured in the launch shaft via a mobile batch plant in the main compound on the mainland · A 100t crawler crane will be required for the setup and de-mob of the rig · Pipe work suggested to be 3m lengths to minimise the size of the launch shaft · Pipework to be transported from the main compound on conventional road going semi-trailers · Exit shaft will be set up the same as launch shaft · Pipes to have enough separation to allow pipe jacking of consecutive pipes alongside
Rock Armour Breakwater/Pedestrian Walkway	· Rock delivered to the main compound from Murray Bridge · The material will be loaded onto 40t dump trucks and ferried to the peninsula · Two Barges needed to get enough material to site to be as productive as possible (or alternately hauled up Ocean Beach from Tea Tree Crossing or 42 Mile Crossing) · Two 45t excavators will work in tandem placing the rock into the southern ocean using GPS · Final layer of rock will be placed to the design level in readiness for concrete · Prior to concrete a coffer dam would be built to allow pumping out of the water (behind breakwater) · Sheets piles to be driven with the excavators (similar for Coorong pipework) · Rock armour may need to be placed on the inside of the sheet piles to stabilise · Outlet pipe and precast concrete base to be installed conventionally using the excavators · Sheet piles to be removed · Concrete placed on breakwater structure using a line pump · Pours would be sequential taking into account volumes and production rates from previous pours

Conventional open trench pipe laying	· Conventional pipe laying methods to be used from end of pipe jacking · Butterfly valves installed on pipe · Cofferdams constructed with driven sheet piles from excavators on barges · Pipe laid into breakwater structure and precast concrete support base installed
Risks / problems	· The volume of spoil removal from this option would be extremely difficult to manage · Limited room on the peninsula to stock pile · Environmental footprint would be significant · Ground water would be difficult to manage · Similar to open cut method, pipe jacking the volumes of surplus spoil would be difficult to manage · Pipes go a long way into Coorong and breakwater resulting in large amounts of cofferdam to be constructed

3. STAGING / SEQUENCE OF WORKS

Option 6:	1) Site mobilisation 2) Access roads / barge access 3) Site clearing 4) Breakwater structure construction 5) Pipe jacking through sand dunes (or conventional pipe laying) 6) Butterfly valve installation 7) Cofferdam installation into breakwater 8) Pipe install into breakwater 9) Cofferdam installation into Coorong 10) Pipe install into Coorong 11) Commissioning 12) Site demobilisation

Appendix M

Environmental Protection and Biodiversity Conservation Act protected matters search tool report

Australian Government

Department of Agriculture,
Water and the Environment

EPBC Act Protected Matters Report

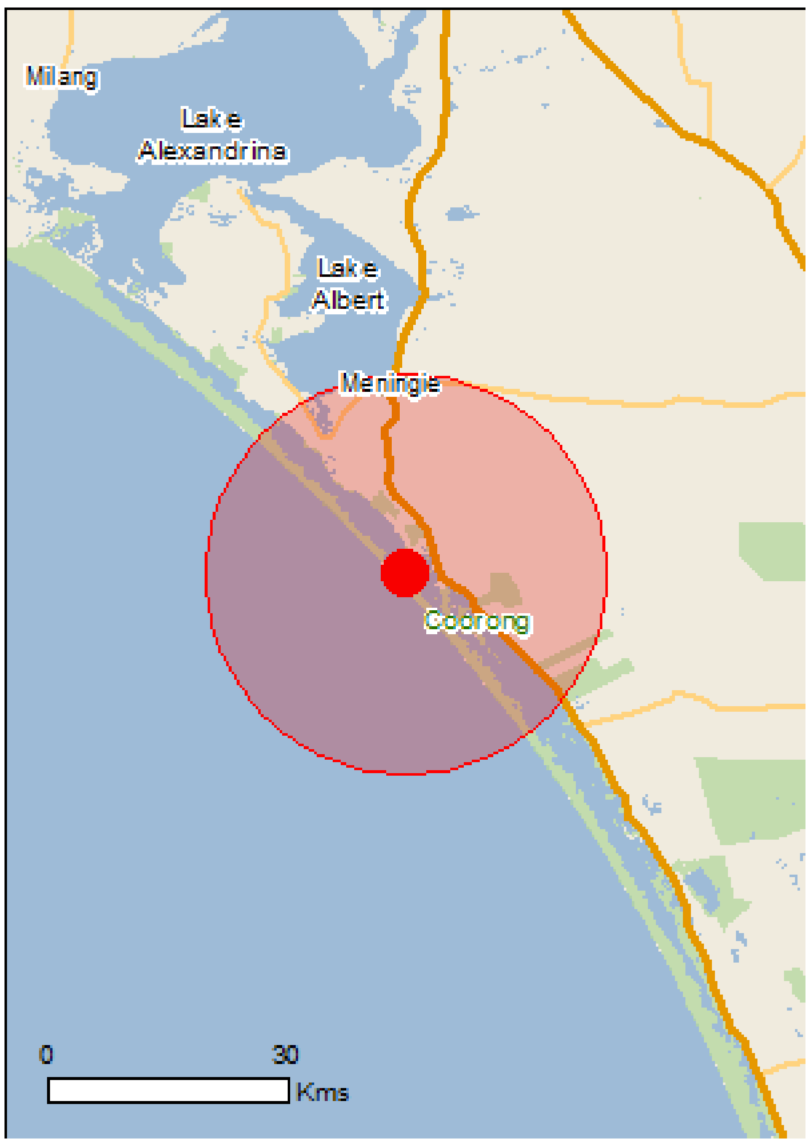
This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

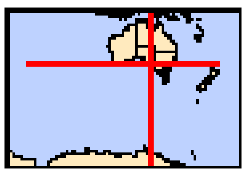
Report created: 01/09/21 12:21:26

- Summary
- Details
  - Matters of NES
  - Other Matters Protected by the EPBC Act
  - Extra Information
- Caveat
- Acknowledgements



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2015

Coordinates
Buffer: 25.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	4
Listed Threatened Species:	55
Listed Migratory Species:	63

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	100
Whales and Other Cetaceans:	14
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	1

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	8
Regional Forest Agreements:	None
Invasive Species:	24
Nationally Important Wetlands:	1
Key Ecological Features (Marine)	1

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar) [Resource Information]

Name	Proximity
The coorong, and lakes alexandrina and albert wetland	Within Ramsar site

Commonwealth Marine Area [Resource Information]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside the Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

Name
EEZ and Territorial Sea

Marine Regions [Resource Information]

If you are planning to undertake action in an area in or close to the Commonwealth Marine Area, and a marine bioregional plan has been prepared for the Commonwealth Marine Area in that area, the marine bioregional plan may inform your decision as to whether to refer your proposed action under the EPBC Act.

Name
South-east

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions	Endangered	Community may occur within area
Plains mallee box woodlands of the Murray Darling Depression, Riverina and Naracoorte Coastal Plain Bioregions	Critically Endangered	Community may occur within area
River Murray and associated wetlands, floodplains and groundwater systems, from the junction with the Darling River to the sea	Approval Disallowed	Community likely to occur within area
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat likely to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Foraging, feeding or related behaviour known to occur within area

Name	Status	Type of Presence
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Foraging, feeding or related behaviour known to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat known to occur within area
Limosa lapponica baueri Nunivak Bar-tailed Godwit, Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Neophema chrysogaster Orange-bellied Parrot [747]	Critically Endangered	Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat likely to occur within area
Pedionomus torquatus Plains-wanderer [906]	Critically Endangered	Species or species habitat may occur within area
Pezoporus occidentalis Night Parrot [59350]	Endangered	Extinct within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur

Name	Status	Type of Presence
		within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Species or species habitat known to occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thinornis cucullatus cucullatus Eastern Hooded Plover, Eastern Hooded Plover [90381]	Vulnerable	Species or species habitat known to occur within area
Fish		
Craterocephalus fluviatilis Murray Hardyhead [56791]	Endangered	Species or species habitat may occur within area
Galaxias rostratus Flathead Galaxias, Beaked Minnow, Flat-headed Galaxias, Flat-headed Jollytail, Flat-headed Minnow [84745]	Critically Endangered	Species or species habitat may occur within area
Maccullochella peelii Murray Cod [66633]	Vulnerable	Species or species habitat known to occur within area
Nannoperca australis Murray-Darling Basin lineage Southern Pygmy Perch (Murray-Darling Basin lineage) [91711]	Vulnerable	Species or species habitat known to occur within area
Frogs		
Litoria raniformis Growling Grass Frog, Southern Bell Frog, Green and Golden Frog, Warty Swamp Frog, Golden Bell Frog [1828]	Vulnerable	Species or species habitat likely to occur within area
Mammals		
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Neophoca cinerea Australian Sea-lion, Australian Sea Lion [22]	Endangered	Species or species habitat likely to occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Plants		
Acacia pinguifolia Fat-leaved Wattle, Fat-leaf Wattle [5319]	Endangered	Species or species habitat may occur within area
Caladenia colorata Coloured Spider-orchid, Small Western Spider-orchid, Painted Spider-orchid [54999]	Endangered	Species or species habitat likely to occur within area
Caladenia conferta Coast Spider-orchid [55000]	Endangered	Species or species habitat may occur within area
Caladenia tensa Greencomb Spider-orchid, Rigid Spider-orchid [24390]	Endangered	Species or species habitat likely to occur within area
Caladenia versicolor Candy Spider-orchid [24392]	Vulnerable	Species or species habitat may occur within area
Dodonaea procumbens Trailing Hop-bush [12149]	Vulnerable	Species or species habitat may occur within area
Pterostylis arenicola Sandhill Greenhood Orchid [17919]	Vulnerable	Species or species habitat known to occur within area
Senecio macrocarpus Large-fruit Fireweed, Large-fruit Groundsel [16333]	Vulnerable	Species or species habitat likely to occur within area
Thelymitra epipactoides Metallic Sun-orchid [11896]	Endangered	Species or species habitat known to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Sharks		
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species

Name	Threatened	Type of Presence
		habitat likely to occur within area
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area
Ardenna grisea Sooty Shearwater [82651]		Species or species habitat may occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Hydroprogne caspia Caspian Tern [808]		Foraging, feeding or related behaviour known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area
Sternula albifrons Little Tern [82849]		Species or species habitat may occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Migratory Marine Species		
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	Species or species habitat known to occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or

Name	Threatened	Type of Presence
		related behaviour known to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour likely to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat likely to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Arenaria interpres Ruddy Turnstone [872]		Foraging, feeding or related behaviour known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Foraging, feeding or related behaviour known to occur within area
Calidris alba Sanderling [875]		Foraging, feeding or related behaviour known

Name	Threatened	Type of Presence
		to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Calidris ruficollis Red-necked Stint [860]		Foraging, feeding or related behaviour known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Foraging, feeding or related behaviour known to occur within area
Charadrius bicinctus Double-banded Plover [895]		Foraging, feeding or related behaviour known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Foraging, feeding or related behaviour known to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Foraging, feeding or related behaviour known to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat known to occur within area
Gallinago megala Swinhoe's Snipe [864]		Foraging, feeding or related behaviour likely to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Foraging, feeding or related behaviour likely to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Foraging, feeding or related behaviour known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Foraging, feeding or related behaviour likely to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area
Phalaropus lobatus Red-necked Phalarope [838]		Foraging, feeding or related behaviour known to occur within area
Philomachus pugnax Ruff (Reeve) [850]		Foraging, feeding or related behaviour known to occur within area

Name	Threatened	Type of Presence
Pluvialis fulva Pacific Golden Plover [25545]		Foraging, feeding or related behaviour known to occur within area
Pluvialis squatarola Grey Plover [865]		Foraging, feeding or related behaviour known to occur within area
Thalasseus bergii Greater Crested Tern [83000]		Breeding known to occur within area
Tringa glareola Wood Sandpiper [829]		Foraging, feeding or related behaviour known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Foraging, feeding or related behaviour known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Foraging, feeding or related behaviour known to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land -

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Arenaria interpres Ruddy Turnstone [872]		Foraging, feeding or related behaviour known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Foraging, feeding or related behaviour known to occur within area
Calidris alba Sanderling [875]		Foraging, feeding or related behaviour known

Name	Threatened	Type of Presence
		to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Calidris ruficollis Red-necked Stint [860]		Foraging, feeding or related behaviour known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Foraging, feeding or related behaviour known to occur within area
Catharacta skua Great Skua [59472]		Species or species habitat may occur within area
Charadrius bicinctus Double-banded Plover [895]		Foraging, feeding or related behaviour known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Foraging, feeding or related behaviour known to occur within area
Charadrius ruficapillus Red-capped Plover [881]		Foraging, feeding or related behaviour known to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Foraging, feeding or related behaviour known to occur within area
Chrysococcyx osculans Black-eared Cuckoo [705]		Species or species habitat known to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat known to occur within area
Gallinago megala Swinhoe's Snipe [864]		Foraging, feeding or related behaviour likely to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Foraging, feeding or related behaviour likely to occur within area

Name	Threatened	Type of Presence
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Himantopus himantopus Pied Stilt, Black-winged Stilt [870]		Foraging, feeding or related behaviour known to occur within area
Larus novaehollandiae Silver Gull [810]		Breeding known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Foraging, feeding or related behaviour known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Neophema chrysogaster Orange-bellied Parrot [747]	Critically Endangered	Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Foraging, feeding or related behaviour likely to occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat likely to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area
Phalacrocorax fuscescens Black-faced Cormorant [59660]		Foraging, feeding or related behaviour likely to occur within area
Phalaropus lobatus Red-necked Phalarope [838]		Foraging, feeding or related behaviour known to occur within area
Philomachus pugnax Ruff (Reeve) [850]		Foraging, feeding or

Name	Threatened	Type of Presence
		related behaviour known to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Foraging, feeding or related behaviour known to occur within area
Pluvialis squatarola Grey Plover [865]		Foraging, feeding or related behaviour known to occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Foraging, feeding or related behaviour likely to occur within area
Puffinus griseus Sooty Shearwater [1024]		Species or species habitat may occur within area
Recurvirostra novaehollandiae Red-necked Avocet [871]		Foraging, feeding or related behaviour known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Sterna albifrons Little Tern [813]		Species or species habitat may occur within area
Sterna bergii Crested Tern [816]		Breeding known to occur within area
Sterna caspia Caspian Tern [59467]		Foraging, feeding or related behaviour known to occur within area
Sterna fuscata Sooty Tern [794]		Breeding known to occur within area
Sterna nereis Fairy Tern [796]		Breeding known to occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thinornis rubricollis Hooded Plover [59510]		Species or species

Name	Threatened	Type of Presence
		habitat known to occur within area
Thinornis rubricollis rubricollis Hooded Plover (eastern) [66726]	Vulnerable*	Species or species habitat known to occur within area
Tringa glareola Wood Sandpiper [829]		Foraging, feeding or related behaviour known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Foraging, feeding or related behaviour known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Foraging, feeding or related behaviour known to occur within area
Fish		
Acentronura australe Southern Pygmy Pipehorse [66185]		Species or species habitat may occur within area
Campichthys tryoni Tryon's Pipefish [66193]		Species or species habitat may occur within area
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area
Hippocampus abdominalis Big-belly Seahorse, Eastern Potbelly Seahorse, New Zealand Potbelly Seahorse [66233]		Species or species habitat may occur within area
Hippocampus breviceps Short-head Seahorse, Short-snouted Seahorse [66235]		Species or species habitat may occur within area
Histiogamphelus cristatus Rhino Pipefish, Macleay's Crested Pipefish, Ring-back Pipefish [66243]		Species or species habitat may occur within area
Hypselognathus rostratus Knifesnout Pipefish, Knife-snouted Pipefish [66245]		Species or species habitat may occur within area
Kaupus costatus Deepbody Pipefish, Deep-bodied Pipefish [66246]		Species or species habitat may occur within area
Leptoichthys fistularius Brushtail Pipefish [66248]		Species or species habitat may occur within area
Lissocampus caudalis Australian Smooth Pipefish, Smooth Pipefish [66249]		Species or species habitat may occur within area
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area
Notiocampus ruber Red Pipefish [66265]		Species or species

Name	Threatened	Type of Presence
		habitat may occur within area
Phycodurus eques Leafy Seadragon [66267]		Species or species habitat may occur within area
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area
Pugnaso curtirostris Pugnose Pipefish, Pug-nosed Pipefish [66269]		Species or species habitat may occur within area
Solegnathus robustus Robust Pipehorse, Robust Spiny Pipehorse [66274]		Species or species habitat may occur within area
Solegnathus spinosissimus Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Stipecampus cristatus Ringback Pipefish, Ring-backed Pipefish [66278]		Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Vanacampus phillipi Port Phillip Pipefish [66284]		Species or species habitat may occur within area
Vanacampus poecilolaemus Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area
Vanacampus vercoi Verco's Pipefish [66286]		Species or species habitat may occur within area
Mammals		
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
Arctocephalus pusillus Australian Fur-seal, Australo-African Fur-seal [21]		Species or species habitat may occur within area
Neophoca cinerea Australian Sea-lion, Australian Sea Lion [22]	Endangered	Species or species habitat likely to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species

Name	Threatened	Type of Presence
		habitat may occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area

Whales and other Cetaceans [Resource Information]

Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour likely to occur within area
Delphinus delphis Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat likely to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Australian Marine Parks [Resource Information]

Name	Label

Name	Label
Murray	Multiple Use Zone (IUCN VI)

Extra Information

State and Territory Reserves [Resource Information]

Name	State
Coorong	SA
Unnamed (No.HA1051)	SA
Unnamed (No.HA1061)	SA
Unnamed (No.HA1298)	SA
Unnamed (No.HA352)	SA
Unnamed (No.HA501)	SA
Unnamed (No.HA570)	SA
Unnamed (No.HA577)	SA

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Alauda arvensis Skylark [656]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		Species or species habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Olea europaea Olive, Common Olive [9160]		Species or species habitat may occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Solanum elaeagnifolium Silver Nightshade, Silver-leaved Nightshade, White Horse Nettle, Silver-leaf Nightshade, Tomato Weed, White Nightshade, Bull-nettle, Prairie-berry, Satansbos, Silver-leaf Bitter-apple, Silverleaf-nettle, Trompillo [12323]		Species or species habitat likely to occur within area

Nationally Important Wetlands

[Resource Information]

Name	State
The Coorong, Lake Alexandrina & Lake Albert	SA

Key Ecological Features (Marine) [Resource Information]

Key Ecological Features are the parts of the marine ecosystem that are considered to be important for the biodiversity or ecosystem functioning and integrity of the Commonwealth Marine Area.

Name	Region
Bonney Coast Upwelling	South-east

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-35.8605 139.356

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

Appendix N

Preliminary environmental risk review - construction and operation

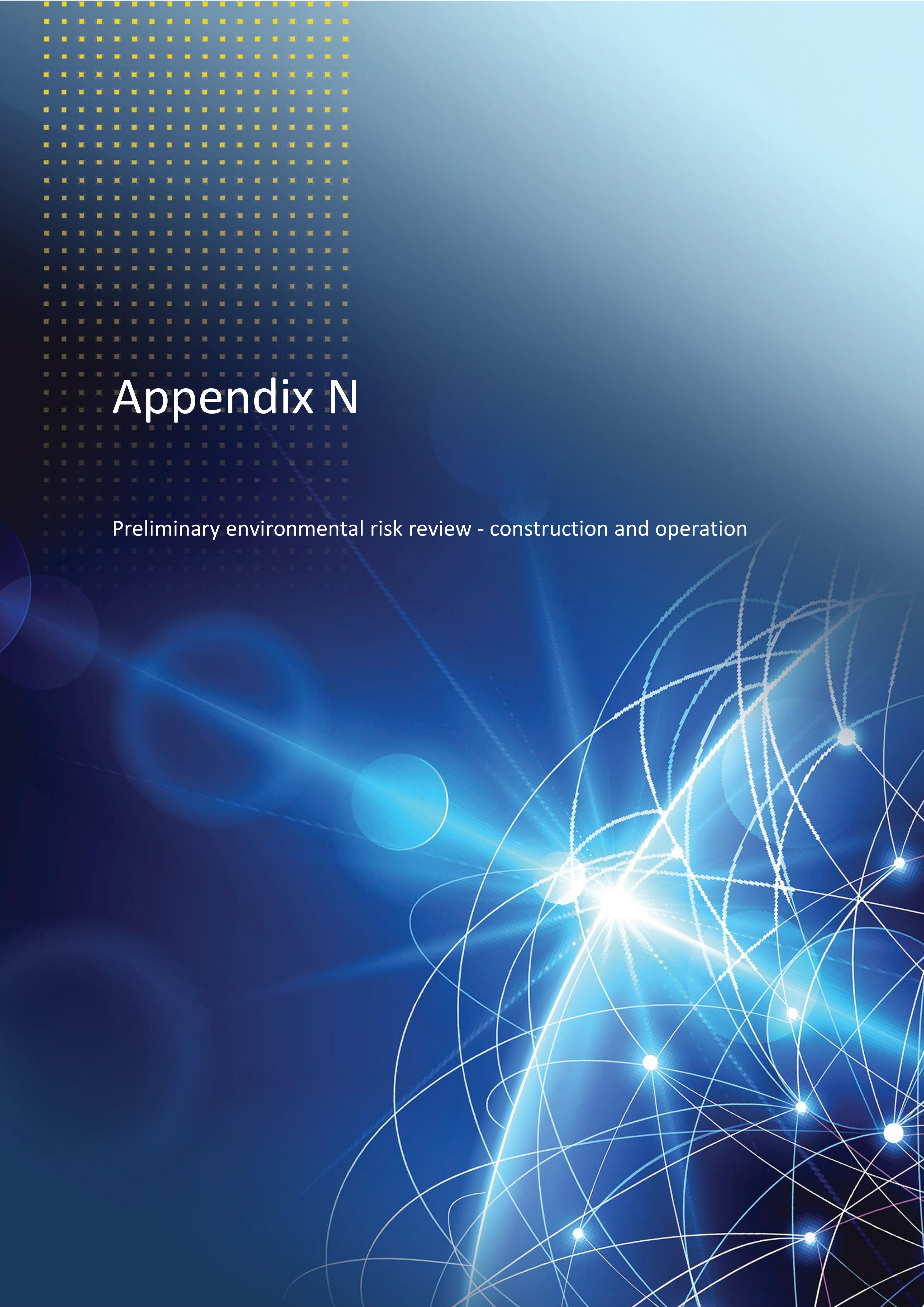


Table 1 Option 1A – Passive open channel connection between Lake Albert and Coorong North Lagoon: 1,000 ML/d with regulator structure

Environmental Aspect	Potential impacts	Description	Consequence	Likelihood	Risk	Mitigation measures	Residual Risk
CONSTRUCTION							
Coastal / Lake processes (Currents, tides, wind & wave conditions)	Staged alteration to flows within Lake Albert and Coorong North Lagoon as construction activities progress	Alteration of flows between Lake Albert and Coorong North Lagoon has the potential to adversely affect the ecological health of the wetland if not designed appropriately.	Moderate	Possible	Medium	• Design consideration – Include water/flow management during construction in design and construction documents. Manage during construction.	Low
Marine processes (Currents, tides, wind & wave conditions)	N/A	N/A - No construction activities are proposed to take place within the open marine environment	N/A	N/A	N/A	• N/A	N/A
Sediment characteristics	Mobilisation of sediment/erosion and sedimentation	Significant earthworks required for earthen channel construction. Potential to transport sediment via runoff into the adjacent waterways, increasing turbidity levels / sediment resuspension and adversely affecting the aquatic environment.	Major	Almost Certain	Very High	• Minimise footprint of works as far as practicable. • Stage earthworks such that runoff from disturbed areas will be captured and treated by the sediment control measures. • Progressive stabilisation of disturbed areas as soon as practicable. Channel to be stable before opening. • Develop and implement an Erosion and Sediment Control Plan.	High
	Disturbance of acid sulphate soils (ASS)	Significant earthworks may disturb ASS, which would require appropriate assessment, management, treatment, and disposal. These processes require space and controls to ensure runoff and sediment transport are managed appropriately. If released to adjacent waterways, ASS may adversely affect the terrestrial and aquatic environments including vegetation, fauna species (i.e. fish) and benthic habitat communities. Groundwater drawdown may affect ASS.	Moderate	Likely	High	• All materials to be excavated to be assessed and managed as per ASS guidelines. • Excavated spoil should not be within 50 m of the top of bank of the lake or the Coorong. • Conduct treatment validation and monitoring for ASS indicators.	Medium
Water quality	Increased suspended sediment concentrations and nutrients in the water column	Construction of channel connections will involve direct disturbance of the Ramsar wetland within Lake Albert and the Coorong. This has the potential to adversely affect water quality (i.e. increased turbidity, sedimentation, nutrient levels). Surface water runoff also has the potential to transport sediment or other pollutants/nutrients into the adjacent coastal/lake environments which could result in algal blooms.	Major	Almost Certain	Very High	• Minimise footprint of works as far as practicable. • Implement an Erosion and Sediment Control Plan. • Site runoff or accumulated seepage or groundwater captured in excavations should be appropriately captured and treated before release.	High
	Alteration of groundwater levels	Changes to groundwater levels may alter the ecological character of the wetland.	Moderate	Likely	High	• Design consideration – Minimise impacts on groundwater levels through design. Manage dewatering during construction.	Medium
	Fuels, chemicals, spills, and leaks	Potential for spills and leaks from machinery and vehicles to adversely affect water quality and the aquatic environment.	Minor	Unlikely	Low	• Ensure safe and effective fuel, oil and chemical storage and handling. • Implement spill and leak prevention and control techniques. • Ensure appropriate spill kits are available and provide training on kit use.	Low
Flora	Direct disturbance to native vegetation communities	Vegetation clearing (Ag. Land – little to no native vegetation) would be in the order of approximately 40 ha depending on construction methodologies employed. Clearing of vegetation will increase the potential for erosion and sedimentation issues.	Moderate	Likely	High	• Design consideration – Confirm presence/absence of threatened ecological communities/State/National listed species by conducting an ecological survey. • Minimise footprint of works as far as practicable and avoid high value areas. • Minimise machinery access along dune system (designate access tracks/paths for vehicle and machinery movements). • Rehabilitate disturbed areas.	Medium
	Disturbance to agricultural land	Clearing of agricultural land which has previously been disturbed by farming practices.	Minor	Almost Certain	Medium	• Minimise footprint of works as far as practicable. • Minimise machinery access.	Low
	Introduction of pest species	Potential for people, vehicles and machinery to introduce pest species which could adversely affect the ecological character of the wetland.	Minor	Unlikely	Low	• Ensure all people, vehicles and machinery are clean and free of weeds.	Low
	Fuels, chemicals, spills, and leaks	Potential for spills and leaks from machinery and vehicles to adversely affect sediment quality and in turn adversely affect terrestrial vegetation.	Minor	Unlikely	Low	• Ensure safe and effective fuel, oil and chemical storage and handling. • Implement spill and leak prevention and control techniques. • Ensure appropriate spill kits are available and provide training on kit use.	Low

Table 1 – Option 1A continued

Environmental Aspect	Potential impacts	Description	Consequence	Likelihood	Risk	Mitigation measures	Residual Risk
Fauna	Disturbance/displacement to waterfowl and shorebird species	Construction activities (i.e. movements, noise) may temporarily displace shorebird species/waterfowl that utilise the site (State and Commonwealth EPBC threatened and migratory species such as Sanderlings, Sandpipers, Plovers).	Moderate	Likely	High	• Carry out ecological assessment to identify and clearly delineate 'no go' zones. • Take care to prevent injury to native fauna as a result of vehicle movements and construction activities. • Time works to avoid key migratory shorebird periods (Spring/Summer) if practical.	Medium
	Fuels, chemicals, spills, and leaks	Potential for spills and leaks from machinery and vehicles to adversely affect terrestrial and aquatic fauna species.	Minor	Unlikely	Low	• Ensure safe and effective fuel, oil and chemical storage and handling. • Implement spill and leak prevention and control techniques. • Ensure appropriate spill kits are available and provide training on kit use.	Low
Noise	Increased noise levels associated with vehicle and machinery movements, earthworks, and site access.	Increased noise levels are likely to temporarily effect terrestrial fauna species, particularly shorebirds and waterfowls which frequent the area.	Moderate	Likely	High	• Take all practical measures to minimise any noise generation at the site. • Limit all construction activities to within agreed works hours. • Turn noisy plant/machinery off when not in use.	Medium
Visual amenity	Significant earthworks and impact of construction machinery on the natural visual amenity of the area	Construction of an open earthen channel will alter the visual amenity of this part of the Coorong. All equipment including vehicle and machinery will be visually present for the duration of works which will have an adverse impact on the visual amenity of the area.	Insignificant	Unlikely	Low	• Vehicle access limited to designated access points and paths. • Screen and maintain lay down areas. • Rehabilitation of exposed surfaces.	Low
Energy emissions	Emissions associated with typical construction activities	Temporary emissions from vehicle and machinery movements for the duration of construction activities.	Insignificant	Unlikely	Low	• Vehicle access limited to designated access points and path. • All machinery is to be well maintained and operated in accordance with manufacturer's specifications.	Low
OPERATION							
Coastal / Lake processes (Currents, tides, wind & wave conditions)	Permanent alteration to flows within Lake Albert and Coorong North Lagoon (risk of adverse effect rather than intended benefit).	Alteration of flows between Lake Albert and Coorong North Lagoon has the potential to adversely affect the ecological health of the wetland if not designed appropriately.	Major	Possible	High	• Design consideration – Increased flows are to provide improved flushing and mixing in the Coorong with no adverse impact to flows within Lake Albert or the ecological health of the system due to flow alterations.	Low
Marine processes (Currents, tides, wind & wave conditions)	N/A	N/A – No construction activities are proposed to take place within the open marine environment	N/A	N/A	N/A	• N/A	N/A
Sediment characteristics	Exposure of in-situ ASS material within constructed earthen channel	Exposure and release of ASS to adjacent waterways, may adversely affect the aquatic environment including vegetation, fauna species (i.e. fish) and benthic habitat communities.	Moderate	Possible	Medium	• Regularly inspect and monitor condition of open channel. • Monitor water quality conditions between Lake Albert and the Coorong.	Medium
Water quality	Stratification in Coorong North Lagoon	Without appropriate mixing, the input of freshwater to the hypersaline environment of the Coorong may result in stratification which would impact the ecological character of the waterway (i.e. reduce dissolved oxygen levels, fish kills etc.)	Moderate	Likely	High	• Design consideration – Modelling to confirm appropriate mixing of freshwater and saline water.	Medium
	Scouring of earthen channel during operation resulting in a reduction in water quality	Flow velocities have the potential to scour the channel, adversely affecting water quality conditions due to increased turbidity and sediment resuspension., with settled sediment affecting benthic habitats.	Moderate	Possible	Medium	• Regularly inspect and monitor condition of open channel. • Monitor water quality conditions between Lake Albert and the Coorong.	Medium
	Maintaining baseflows during operation of the open channel	Potential for the channel to be left in a dry state, which could exacerbate erosion and sedimentation issues, or potential for ponding to occur which could affect water quality conditions.	Moderate	Possible	Medium	• Address in design process. Regularly inspect and monitor condition of open channel.	Medium
	Increased nutrient levels in Coorong potentially causing algal growth	Erosion of earthen channel may result in the disturbance of sediments and nutrients within the water column could trigger algal growth in the Coorong leading to the depletion of available oxygen in the water column for aquatic and marine life.	Moderate	Possible	Medium	• Design consideration – Ability to manage flows. • Monitor water quality conditions between Lake Albert and the Coorong.	Medium
Flora	Potential damage to native vegetation when accessing open channel for maintenance purposes	Terrestrial vegetation may be impacted by infrequent and temporary vehicle and machinery access for routine maintenance activities of the open channel (i.e. reshaping, removal of accumulated material)	Insignificant	Unlikely	Low	• Vehicle access limited to designated access points and path.	Low
Fauna	Alteration to fish movements between Lake Albert and North Coorong Lagoon	Distribution and movements of fish species may be altered due to increased connectivity between the two waterbodies.	Moderate	Possible	Medium	• Design consideration – Assess implications of fish movement between Lake Albert and Coorong North Lagoon. • Monitor efficiency of channel and regulated structure.	Low
	Impairment of species movement in channel if baseflows are not maintained	Fauna species, including terrestrial fauna and fish, may become stranded in the open channel if flows and/or water quality are not maintained resulting in injury or death.	Moderate	Likely	High	• Design consideration – Appropriate batter slopes for terrestrial fauna movement and inclusion of fish management. • Regularly inspect and monitor open channel for fauna species.	Medium

Table 1 – Option 1A continued

Environmental Aspect	Potential impacts	Description	Consequence	Likelihood	Risk	Mitigation measures	Residual Risk
Noise	Increased noise associated with vehicle and machinery movements.	Infrequent, temporary, and intermittent noise sources associated with routine vehicle and machinery movements accessing the site for routine maintenance activities which may disturb shorebirds/waterfowl that frequent the area.	Insignificant	Unlikely	Low	• Ensure all machinery is well maintained and effectively muffled. • Time maintenance works to avoid key migratory shorebird periods (Spring/Summer) if practicable.	Low
Visual amenity	Permanent change to topography of the land and introduction of man-made structure (i.e. regulating structure)	Permanent change to topography, however an open earthen channel is largely consistent with surrounding landscape character and does not involve substantial man-made structures with the exception of a regulated structure incorporated in the earthen channel.	Major	Likely	High	• Minimise footprint of works as far as practicable. • Maintain open channel, revegetation spoil areas.	High
Energy, emissions	Emissions associated with routine maintenance activities (vehicle and machinery movements)	No requirement for utility / service connections. Infrequent, temporary, and intermittent emissions associated with routine vehicle and machinery movements accessing the site (i.e. reshaping, removal of accumulated material).	Insignificant	Unlikely	Low	• Vehicle access limited to designated access points and path. • All machinery is to be well maintained and operated in accordance with manufacturer's specifications.	Low

Table 2 Option 1B – Passive piped connection between Lake Albert and Coorong North Lagoon: 1,000 ML/d with regulator structure

Environmental Aspect	Potential impacts	Description	Consequence	Likelihood	Risk	Mitigation measures	Residual Risk
CONSTRUCTION							
Coastal / Lake processes (Currents, tides, wind & wave conditions)	Staged alteration to flows within Lake Albert and Coorong North Lagoon as construction activities progress	Alteration of flows between Lake Albert and Coorong North Lagoon has the potential to adversely affect the ecological health of the wetland if not designed appropriately. No mechanism capable of altering the tidal regime, wind, and wave conditions.	Moderate	Possible	Medium	• Design consideration – Modelling to confirm whether increased flows provide improved flushing and mixing in the Coorong with no adverse impact to flows within Lake Albert or the ecological health of the system due to flow alterations.	Low
Marine processes (Currents, tides, wind & wave conditions)	N/A	N/A - No construction activities are proposed to take place within the open marine environment	N/A	N/A	N/A	N/A	N/A
Sediment characteristics	Mobilisation of sediment / erosion and sedimentation	Significant earthworks associated with trench and fill for pipe installation. Potential to transport sediment via runoff into the adjacent waterways, increasing turbidity levels / sediment resuspension and adversely affecting the aquatic environment.	Major	Almost Certain	Very High	• Minimise footprint of works as far as practicable. • Divert surface runoff away from disturbed areas and install temporary erosion controls. • Stage earthworks such that runoff from disturbed areas will be captured and treated by the sediment control measures. • Progressive stabilisation of disturbed areas as soon as practicable. • Develop and implement an Erosion and Sediment Control Plan.	High
	Disturbance of acid sulphate soils (ASS)	Significant earthworks may disturb ASS, which would require appropriate assessment, management, treatment, and disposal. These processes require space and controls to ensure runoff and sediment transport are managed appropriately. If released to adjacent waterways, ASS may adversely affect the terrestrial and aquatic environments including vegetation, fauna species (i.e. fish) and benthic habitat communities.	Moderate	Likely	High	• All materials to be excavated to be assessed and managed as per ASS guidelines. • Excavated spoil should not be within 50 m of the top of bank of the lake or the Coorong. • Conduct treatment validation and monitoring for ASS indicators.	Medium
Water quality	Increased suspended sediment concentrations and nutrients in the water column	Pipe installation will involve direct disturbance of the Ramsar wetland within Lake Albert and the Coorong. This has the potential to adversely affect water quality (i.e. increased turbidity, sedimentation, nutrient levels). Surface water runoff has the potential to transport sediment or other pollutants/nutrients into the adjacent coastal/lake environments which could result in algal blooms.	Major	Almost Certain	Very High	• Minimise footprint of works as far as practicable. • Site runoff or accumulated seepage or groundwater captured in excavations should be appropriately captured and treated before release. • Implement an Erosion and Sediment Control Plan.	High
	Fuels, chemicals, spills, and leaks	Potential for spills and leaks from machinery and vehicles to adversely affect water quality and the aquatic environment.	Minor	Unlikely	Low	• Ensure safe and effective fuel, oil and chemical storage and handling. • Implement spill and leak prevention and control techniques. • Ensure appropriate spill kits are available/provide training on kit use.	Low
Flora	Direct disturbance to native vegetation communities	Vegetation clearing (AG. Land – little to no native vegetation) would be in the order of approximately 26 ha depending on construction methodologies employed. Clearing of vegetation will increase the potential for erosion and sedimentation issues.	Moderate	Likely	High	• Design consideration – Confirm presence/absence of threatened ecological communities/State/National listed species by conducting an ecological survey. • Minimise footprint of works as far as practicable. Avoid high value areas where possible. • Minimise machinery access along dune system (designate access tracks/paths for vehicle and machinery movements). • Rehabilitate disturbed areas.	Medium
	Disturbance to agricultural land	Clearing of agricultural land which has previously been disturbed by farming practices.	Minor	Almost Certain	Medium	• Minimise footprint of works as far as practicable. • Minimise machinery access.	Low
	Introduction of pest species	Potential for people, vehicles and machinery to introduce pest species which could adversely affect the ecological character of the wetland.	Minor	Unlikely	Low	• Ensure all people, vehicles and machinery are clean and free of weeds.	Low
	Fuels, chemicals, spills, and leaks	Potential for spills and leaks from machinery and vehicles to adversely affect sediment quality and in turn adversely affect terrestrial vegetation.	Minor	Unlikely	Low	• Ensure safe and effective fuel, oil and chemical storage and handling. • Implement spill and leak prevention and control techniques. • Ensure appropriate spill kits are available and provide training on kit use.	Low

Table 2 – Option 1B continued

Environmental Aspect	Potential impacts	Description	Consequence	Likelihood	Risk	Mitigation measures	Residual Risk
Fauna	Disturbance/displacement to waterfowl and shorebird species	Construction activities (i.e. movements, noise) may temporarily displace shorebird species/waterfowl that utilise the site (State and Commonwealth EPBC threatened and migratory species such as Sanderlings, Sandpipers, Plovers).	Moderate	Likely	High	• Carry out ecological assessment to identify and clearly delineate 'no go' zones. • Take care to prevent injury to native fauna as a result of vehicle movements and construction activities. • Time works to avoid key migratory shorebird periods (Spring/Summer) if practicable.	Medium
	Fuels, chemicals, spills, and leaks	Potential for spills and leaks from machinery and vehicles to adversely affect terrestrial and aquatic fauna species.	Minor	Unlikely	Low	• Ensure safe and effective fuel, oil and chemical storage and handling. • Implement spill and leak prevention and control techniques. • Ensure appropriate spill kits are available and provide training on kit use.	Low
Noise	Increased ambient noise levels associated with vehicle and machinery movements, earthworks, and site access.	Increased noise levels are likely to temporarily effect terrestrial fauna species, particularly shorebirds and waterfowls which frequent the area.	Moderate	Likely	High	• Ensure all machinery is well maintained and effectively muffled. • Minimise the number of haul loads required to transport material. • Time works to avoid key migratory shorebird periods if practicable	Medium
Visual amenity	Significant earthworks and impact of construction machinery on the natural visual amenity of the area	Construction of the passive pipe connection will largely be buried but construction activities will occur over a wider footprint and may temporarily impact the natural visual amenity of the Lake Albert/Coorong environment.	Moderate	Unlikely	Low	• Minimise footprint of works as far as practicable. • Vehicle access limited to designated access points and paths. • Screen and maintain lay down areas. • Rehabilitation of exposed surfaces.	Low
Energy emissions	Emissions associated with typical construction activities (vehicle and machinery movements)	Temporary emissions for the duration of construction activities.	Insignificant	Unlikely	Low	• Vehicle access limited to designated access points and path. • All machinery is to be well maintained and operated in accordance with manufacturer's specifications.	Low
OPERATION							
Coastal / Lake processes (Currents, tides, wind & wave conditions)	Permanent alteration to flows within Lake Albert and Coorong North Lagoon (risk o adverse effect rather than intended benefit)	Alteration of flows between Lake Albert and Coorong North Lagoon has the potential to adversely affect the ecological health of the wetland if not designed appropriately. No mechanism capable of altering the tidal regime, wind, and wave conditions.	Major	Possible	High	• Design consideration – Increased flows are to provide improved flushing and mixing in the Coorong with no adverse impact to flows within Lake Albert or the ecological health of the system due to flow alterations.	Low
Marine processes (Currents, tides, wind & wave conditions)	N/A	N/A – No construction activities are proposed to take place within the open marine environment	N/A	N/A	N/A	• N/A	N/A
Sediment characteristics	N/A	N/A – No mechanism for the operation of the passive pipe connection to alter or adversely affect sediment characteristics.	N/A	N/A	N/A	• N/A	N/A
Water quality	Stratification in Coorong North Lagoon	Without appropriate mixing, the input of freshwater to the hypersaline environment of the Coorong may result in stratification which would impact the ecological character of the waterway (i.e. reduce dissolved oxygen levels, fish kills etc.)	Moderate	Likely	High	• Design consideration – Address mixing of freshwater and saline water.	Medium
	Increased suspended sediment and turbidity levels in the Coorong. Water quality problems from low/no flow periods through pipes.	Potential for flows to transport increased suspended sediment to the Coorong. Poor water quality from periods of no flow in pipes.	Moderate	Possible	Medium	• Design consideration – Ability to manage flows to limit transport of sediment from Lake Albert to the Coorong and deal with low flow/no flow effects in pipes.	Medium
	Increased nutrient levels in Coorong potentially causing algal growth	Algal growth in the Coorong may lead to the depletion of available oxygen in the water column for aquatic and marine life.	Moderate	Possible	Medium	• Design consideration – Ability to reduce/manage flows. • Regularly monitor water quality conditions between Lake Albert and the Coorong.	Low
Flora	N/A	No mechanism for the operation of the passive pipe connection to alter or adversely affect terrestrial vegetation.	N/A	N/A	N/A	• N/A	N/A
Fauna	Alteration to fish movements between Lake Albert and North Coorong Lagoon	Distribution and movements of fish species may be altered due to increased connectivity between the two waterbodies.	Moderate	Possible	Medium	• Design consideration – Assess implications of fish movement between Lake Albert and Coorong North Lagoon. • Monitor efficiency of channel and regulated structure.	Low
Noise	Increased noise associated with vehicle and machinery movements.	Infrequent, temporary, and intermittent noise sources associated with routine vehicle and machinery movements accessing the site for routine maintenance activities.	Insignificant	Unlikely	Low	• Ensure all machinery is well maintained and effectively muffled. • Minimise the number of haul loads required to transport materials. • Time maintenance works to avoid key migratory shorebird periods (Spring/Summer) if practicable.	Low
Visual amenity	Alteration to the visual amenity values of the Coorong and Lake Albert environment.	The pipelines will be buried with ground levels restored to their pre-existing condition. No permanent change to topography and no substantial exposed man-made structures with the exception of a regulated structure.	Insignificant	Unlikely	Low	• Minimise footprint of works as far as practicable. • Restore natural surface levels.	Low

Table 2 – Option 1B continued

Environmental Aspect	Potential impacts	Description	Consequence	Likelihood	Risk	Mitigation measures	Residual Risk
Energy, emissions	Emissions associated with routine maintenance activities (vehicle and machinery movements)	No requirement for utility/service connections Infrequent, temporary, and intermittent emissions associated with routine vehicle and machinery movements accessing the site (i.e. reshaping, removal of accumulated material).	Insignificant	Unlikely	Low	• Vehicle access limited to designated access points and paths. • All machinery is to be well maintained and operated in accordance with manufacturer's specifications.	Low

Table 3 Option 2 – Dredge Parnka Point: 18.5 km long to between -1.2 mAHD and -1.4 mAHD centred around Parnka Point

Environmental Aspect	Potential impacts	Description	Consequence	Likelihood	Risk	Mitigation measures	Residual Risk
CONSTRUCTION							
Coastal / Lake processes (Currents, tides, wind & wave conditions)	Alteration to Coorong bathymetry	Dredging will result in changes to the bathymetry of the Coorong which may affect the tidal prism. Based on the proposed design profile and modelling results, changes will be negligible. Dredging will not directly impact on wind and wave conditions within the Coorong.	Minor	Unlikely	Low	• Ensure dredging is undertaken in line with the proposed design profile.	Low
	Alteration to currents within the Coorong	Dredging will result in changes to tidal currents which has the potential to affect bed shear stress and deposition and erosion regimes of sediment. Based on the proposed design profile and modelling results, changes to currents will be negligible.	Minor	Unlikely	Low	• Ensure dredging is undertaken in line with the proposed design profile.	Low
Marine processes (Currents, tides, wind & wave conditions)	Potential alterations to seabed bathymetry due to ocean disposal of material	Disposal of dredged material is to occur within the near shore, high energy ocean environment, which will encourage the rapid dispersal of dredged sediment. Approximately 2.8 million m^3 is proposed to be dredged and disposal at sea, however this process will be slow and will occur over a long duration. Dredged material disposal will not directly impact on wind and wave conditions within the open ocean.	Moderate	Possible	Medium	• Design consideration – Assess dredge material dispersion at discharge location. • Monitor location of dredged material pipeline and discharge location.	Low
Sediment characteristics	Direct disturbance of potentially contaminated sediment (to be determined)	Potential for dredged material quality to be considered unsuitable for sea disposal as per the National Assessment Guidelines for Dredging 2009 (NAGD) and Sea Dumping Act based on the physical and chemical characteristics of the sediment (i.e. presence of contaminants). This has the potential to impact water quality, sediment characteristics and benthic habitat communities at both the dredge and dredged material discharge location.	Major	Possible	High	• Design consideration - Undertake further sediment sampling and analysis to inform sediment suitability for offshore disposal. (Preliminary sampling indicates some instances of elevated arsenic – may be naturally occurring constituent).	Medium
	Direct disturbance of dune system, coastal foreshore and near shore coastal zone for pipeline establishment	Pipeline installation will directly disturb sandy habitats associated with the dunal and coastal foreshore system. The pipeline will likely be placed over the dunal system at multiple locations (along existing disturbed paths where possible), with a portion of the alignment buried to cross the beach zone to the near shore zone. Disturbances from these activities may result in increased suspended sediment levels in the near shore coastal waters and the waters of Coorong.	Minor	Almost Certain	Medium	• Minimise footprint of works as far as practicable. • Restore disturbed areas. • Carefully select pipeline alignments.	Low
Water quality	Suspension of fine sediment in the water column	Dredging and dredged material disposal activities will result in a temporary localised increase in turbidity and suspended sediment levels present in the water column in those areas within the immediate vicinity of the dredge area and disposal location and potentially nearby sensitive receptors (i.e. Ramsar wetland, marine park). However material is to be disposed of in the active near shore zone and will disperse. Large volume will affect beach morphology (locally) and longshore sediment transport.	Moderate	Almost Certain	High	• Manage efficiency of dredge and ensure all machinery is in working order. • Ensure all dredge machinery and vessel movements are operating in the correct locations. • Conduct plume and beach morphology monitoring. • Within the practicalities of the vessel, minimise the generation of plumes.	Medium
	Potential for blanketing effects associated with suspended sediment settling out of the plume which could smother benthic organisms or change the nature of bottom substrates.	The nearest seagrass communities are located near Victor Harbor in the North, and towards the southern end of the Coorong near Kingston. There are no known seagrass communities within proximity to the discharge location. Material is to be disposed of in the active near shore coastal zone and will disperse quickly with limited ability to result in any substantial blanketing or smothering effects.	Moderate	Possible	Medium	• Conduct plume monitoring. • Within the practicalities of the vessel, minimise the generation of plumes by control of operation.	Low
	Potential release of nutrients (nitrogen, phosphorous and/or ammonia) from disturbed sediment in a form which is readily available for photosynthesis.	Dredging and dredge material disposal may increase nutrient concentrations in the water column which can stimulate algal blooms and plant growth, reducing the overall water quality of the system.	Moderate	Possible	Medium	• Conduct monitoring. • Within the practicalities of the vessel, minimise the generation of plumes by control of operation.	Low
	Waste generated during construction may enter the waterways	A variety of wastes are likely to be generated including general waste, construction materials, sewage waste, and hazardous wastes. If these were to be released to the Coorong or open ocean it would impact water quality and the marine/aquatic habitats they support.	Minor	Unlikely	Low	• All waste materials are to be appropriately contained, collected, and disposed of, without entering the waterway. • Any associated waste waters are to be appropriately contained and treated prior to any discharge.	Low
	Fuels, chemicals, spills, and leaks	Potential for spills and leaks from machinery and vehicles to adversely affect water quality and the aquatic environment.	Minor	Unlikely	Low	• Ensure safe and effective fuel, oil and chemical storage and handling. • Implement spill and leak prevention and control techniques. • Ensure appropriate spill kits are available and provide training on kit use.	Low
	Potential spread of marine pests	Potential for vessels to introduce pest species which could adversely affect the marine environment. The main mechanisms for marine pest introduction or spread include the translocation of pest species attached to vessel hulls or in niche areas of a vessel. The risk of this occurring is limited to those vessels which come from areas affected by marine pests, such as vessels from overseas countries.	Minor	Unlikely	Low	• Ensure all vessels are clean and sourced from within Australia.	Low

Table 3 – Option 2 Continued

Environmental Aspect	Potential impacts	Description	Consequence	Likelihood	Risk	Mitigation measures	Residual Risk
Flora	Disturbance of dunal vegetation during installation and removal of dredge pipeline	Installation and demobilisation of the dredge material delivery pipeline will minimise disturbance of dunal vegetation approximately 20 ha. The pipeline will likely be placed on top of and over the dunal system. Existing vegetation may be damaged during this process however impacts would be temporary and the dunal vegetation would be expected to regenerate after removal of the pipeline. No threatened ecological communities or EPBC listed species are likely to occur (to be confirmed by ecological survey)	Minor	Almost Certain	Medium	• Minimise footprint of works as far as practicable. • Minimise machinery access. • Rehabilitate disturbed areas.	Low
	Disturbance to seagrass communities as a result of dredge material disposal activities	The nearest seagrass communities are located near Victor Harbor in the North, and towards the southern end of the Coorong near Kingston. Disposal of dredged material is to occur within the active near shore zone away from these sensitive receptors.	Moderate	Possible	Medium	• Maintain and monitor discharge location. • Undertake monitoring.	Low
	Introduction of pest species	Potential for people, vehicles, machinery, and vessels to introduce pest species which could adversely affect the ecological character of the wetland.	Minor	Unlikely	Low	• Ensure all people, vehicles and machinery are clean and free of weeds/pests.	Low
	Fuels, chemicals, spills, and leaks	Potential for spills and leaks from machinery and vehicles to adversely affect sediment quality and in turn adversely affect terrestrial vegetation.	Minor	Unlikely	Low	• Ensure safe and effective fuel, oil and chemical storage and handling. • Implement spill and leak prevention and control techniques. • Ensure appropriate spill kits are available and provide training on kit use.	Low
Fauna	Blanketing / smothering benthic habitats and communities during dredging and disposal	Short-term impacts to local ecological communities within the vicinity of the dredge area may occur due to the smothering effects of remobilised sediment and deposition, however benthic communities would be expected to recover quickly due to their ability to recolonise after disturbances.	Moderate	Possible	Medium	• Ensure dredging and dredge material disposal activities remain within the boundaries of the defined dredge area and discharge location.	Low
	Potential dredged material disposal impacts on recreational and commercial fisheries	Disposal and the subsequent resuspension and transport of sediment may potentially impact recreational and commercial fisheries, including those associated with the Goolwa Cockle and fish species such as the mulloway, sharks, salmon, mullet, flathead and snapper and fisheries resources associated with adjacent marine park areas.	Moderate	Likely	High	• Ensure dredging and dredge material disposal activities remain within the boundaries of the defined dredge area and discharge location.	Medium
	Disturbance/displacement to waterfowl and shorebird species	Vehicle and machinery movements and re-positioning of pipelines on the dune system and coastal foreshore has the potential to disturb / displace shorebird species/waterfowl that utilise the site (State and Commonwealth EPBC threatened and migratory species such as Sanderlings, Sandpipers, Plovers). The beach and foreshore area are within a Ramsar wetland, support breeding habitat for Hooded Plovers and other shorebirds and is highly frequented by a range of migratory species. Disturbances would occur for the duration of dredging.	Moderate	Likely	High	• Carry out ecological assessment to identify and clearly delineate 'no go' zones. • Take care to prevent injury to native fauna as a result of vehicle movements and construction activities. • Time works to avoid key migratory shorebird periods (Spring/Summer) if practicable.	Medium
	Vessel interaction with marine fauna species	Potential boat strike associated with vessel movements in the open ocean marine environment and the waters of Coorong as dredge operations progress and pipeline segments are installed.	Moderate	Possible	Medium	• Impose vessel speed limits. • Vessels are to keep careful forward lookout for marine mammals that may be in the path to minimise risk of collision.	Low
	Introduction of pest species	Potential for people, vehicles, machinery, and vessels to introduce pest species which could adversely affect the ecological character of the wetland.	Minor	Unlikely	Low	• Ensure all people, vehicles and machinery are clean and free of weeds/pests.	Low
Noise	Increased ambient noise levels during dredging and disposal	Increased noise levels associated with dredging and dredged material pipeline installation/movement which will affect shorebirds and waterfowls which rely on the Coorong and coastal foreshore areas (i.e. Sanderling, Hooded Plover etc.).	Moderate	Likely	High	• Ensure all machinery is well maintained and effectively muffled as per the manufacturer's specification. • Time works to avoid key migratory shorebird periods (Spring/Summer) if practicable.	Medium
Visual amenity	Impact of construction machinery on the natural visual amenity of the area	Dredging and dredged material disposal activities will be temporary but are likely to occur over a substantial timeframe. All equipment including the dredge, support vessels, pipeline, vehicles, and machinery will be visually present for the entire duration of works.	Insignificant	Likely	Low	• Regularly inform the public of progress and changes at the site, particularly with regard to safety and access issues.	Low
Energy, emissions	Emissions associated with dredging and dredged material disposal, and typical construction activities	Temporary emissions for the duration of dredging and dredged material disposal (including vessel, vehicle, and other related machinery emissions).	Minor	Likely	Medium	• Vehicle access limited to designated access points and path. • All machinery is to be well maintained and operated in accordance with manufacturer's specifications.	Low

Table 3 – Option 2 Continued

Environmental Aspect	Potential impacts	Description	Consequence	Likelihood	Risk	Mitigation measures	Residual Risk
OPERATION							
Coastal / Lake processes (Currents, tides, wind & wave conditions)	N/A	N/A – No mechanism to impact coastal/lake processes post dredging and dredged material disposal activities.	N/A	N/A	N/A	N/A	N/A
Marine processes (Currents, tides, wind & wave conditions)	N/A	N/A – No mechanism to impact marine processes post dredging and dredged material disposal activities.	N/A	N/A	N/A	N/A	N/A
Sediment characteristics	N/A	N/A – No mechanism to impact sediment characteristics post dredging and dredged material disposal activities.	N/A	N/A	N/A	N/A	N/A
Water quality	N/A	N/A – No mechanism to impact water quality post dredging and dredged material disposal activities.	N/A	N/A	N/A	N/A	N/A
Flora	N/A	N/A – No mechanism to impact marine or terrestrial flora post dredging and dredged material disposal activities.	N/A	N/A	N/A	N/A	N/A
Fauna	N/A	N/A – No mechanism to impact marine or terrestrial fauna post dredging and dredged material disposal activities.	N/A	N/A	N/A	N/A	N/A
Noise	N/A	N/A - No noise generating operations or activities upon completion of dredging and dredged material disposal.	N/A	N/A	N/A	N/A	N/A
Visual amenity	N/A	N/A - No impacts to visual amenity upon completion of dredging	N/A	N/A	N/A	N/A	N/A
Energy, emissions	N/A	N/A – No energy emissions post dredging and dredged material disposal activities.	N/A	N/A	N/A	N/A	N/A

Table 4 Option 3A – Intermittent pumped connection out of Coorong South Lagoon – near shore discharge structure: 1,000 ML/d via pumps on a pontoon structure adjacent Younghusband Peninsula to a near shore discharge structure (within Southern Ocean)

Environmental Aspect	Potential impacts	Description	Consequence	Likelihood	Risk	Mitigation measure	Residual Risk
CONSTRUCTION							
Coastal / Lake processes (Currents, tides, wind & wave conditions)	N/A	N/A – No mechanism for construction activities to adversely alter coastal/lake processes of the Coorong.	N/A	N/A	N/A	N/A	N/A
Marine processes (Currents, tides, wind & wave conditions)	Alteration of sediment transport mechanisms	Works associated with construction of a near shore discharge structure may alter currents and sediment transport processes and exacerbate erosion/accretion of foreshore and beach area.	Moderate	Possible	Medium	• Minimise footprint of works as far as practicable. • Minimise duration of works within the beach / near shore zone.	Low
Sediment characteristics	Mobilisation of sediment / erosion and sedimentation during pontoon and pipeline construction within the Coorong	Pontoon construction is likely to disturb intertidal sediments along the Coorong shoreline. There is the potential for this sediment to impact the waterway, resulting in a localised increased in turbidity/sediment resuspension with the potential to affect the aquatic habitats and Ramsar Wetland.	Moderate	Possible	Medium	• Minimise footprint of works as far as practicable. • Divert surface runoff away from disturbed areas and install temporary erosion controls. • Stage earthworks such that runoff from disturbed areas will be captured and treated by the sediment control measures. • Progressive stabilisation of disturbed areas as soon as practicable. • Develop and implement an Erosion and Sediment Control Plan.	Low
	Direct disturbance of dune system and beach sediments for pipeline installation	Significant earthworks associated with pipeline installation through the dune system (Ramsar wetland), which is predominantly sand (extent of disturbance is dependent on construction methodology to be employed). Material will need to be excavated, stockpiled, reused where possible with any excess removed from site. These disturbances have the potential to transport sediment into the adjacent waterways, increasing turbidity levels/sediment resuspension and adversely affecting the aquatic and marine environments.	Major	Almost Certain	Very High	• Minimise footprint of works as far as practicable. • Install temporary erosion controls. • Stage earthworks such that runoff from disturbed areas will be captured and treated by the sediment control measures. • Management of material stockpiles. • Progressive stabilisation of disturbed dune system as soon as practicable. • Develop and implement an Erosion and Sediment Control Plan.	High
	Direct disturbance of seabed for pipeline installation	Disturbance of the seabed will result in the resuspension of sediments which have the potential to adversely affect water quality and benthic communities within and surrounding the works area.	Major	Almost Certain	Very High	• Minimise footprint of works as far as practicable. • Minimise duration of works within the coastal zone.	High
	Disturbance of acid sulphate soils (ASS)	Earthworks within the dune system (Ramsar Wetland) may disturb ASS, which would require appropriate assessment and management. If released to adjacent waterways, ASS oxidation by products may adversely affect the terrestrial and aquatic environments including vegetation, fauna species (i.e. fish) and benthic habitat communities. Based on the sediment characteristics of the dune (i.e. sand) there is a low likelihood of encountering ASS.	Moderate	Unlikely	Medium	• Assess and manage ASS in accordance with ASS guidelines. • Ensure all fill materials brought to site are clean and free of any ASS.	Low
Water quality	Suspension of fine sediment in the water column	Construction of pontoon and near shore discharge structure will result in a temporary localised increase in turbidity and suspended sediment levels. This can result in the formation of a suspended sediment plume and reduce sunlight penetration of the water column; however, works will be temporary with limited ability to reduce sunlight penetration as sediments predominantly consist of sand which settle out quickly within the water column.	Moderate	Possible	Medium	• Minimise disturbances and footprint of works as far as practicable. • Ensure all machinery and vessel movements are operating in the correct locations. • Conduct visual monitoring	Low
	Potential for increased nutrients within the water column during construction activities.	Construction of pontoon and near shore discharge structure will result in the disturbance of sediments which may increase nutrient concentrations in the water column stimulating algal blooms and reducing the overall water quality of the system.	Moderate	Possible	Medium	• Minimise disturbances and footprint of works as far as practicable. • Conduct visual monitoring.	Low
	Waste generated during construction.	A variety of wastes are likely to be generated including general waste, construction materials, and hazardous wastes. If these were to be released to the Coorong or open ocean it would impact water quality and the marine/aquatic habitats they support.	Minor	Unlikely	Low	• All waste materials are to be appropriately contained, collected, and disposed of, without entering the waterway. • Any associated waste waters are to be appropriately contained and treated prior to any discharge.	Low
	Fuels, chemicals, spills, and leaks	Potential for spills and leaks from machinery and vehicles to adversely affect water quality and the aquatic environment.	Minor	Unlikely	Low	• Ensure safe and effective fuel, oil and chemical storage and handling. • Implement spill and leak prevention and control techniques. • Ensure appropriate spill kits are available and provide training on kit use.	Low
	Potential spread of marine pests	Potential for vessels to introduce pest species which could adversely affect the marine environment. The main mechanisms for marine pest introduction or spread include the translocation of pest species attached to vessel hulls or in niche areas of a vessel. The risk of this occurring is limited to those vessels which come from areas affected by marine pests, such as vessels from overseas countries.	Minor	Unlikely	Low	• Ensure all vessels are clean and sourced from within Australia.	Low

Table 4 – Option 3A Continued

Environmental Aspect	Potential impacts	Description	Consequence	Likelihood	Risk	Mitigation measure	Residual Risk
Flora	Disturbance to coastal saltmarsh communities during pipe installation within Coorong	Construction activities associated with the pipeline installation will directly impact coastal saltmarsh communities (e.g. intertidal / estuarine sedges, samphire etc.) within the Coorong system.	Moderate	Almost Certain	High	• Minimise footprint of works as far as practicable. • Minimise machinery access. • Restore disturbed bed levels to pre-existing conditions.	Medium
	Disturbance of dunal vegetation during pipe installation	Direct disturbance of approximately 11 ha of dunal vegetation is likely to occur depending on construction methodologies employed. The dunal vegetation to be disturbed is widely represented along the coastline and will have the opportunity to regenerate.	Major	Almost Certain	Very High	• Design consideration – Confirm presence/absence of threatened ecological communities/State/National listed species by conducting an ecological survey. • Minimise footprint of works as far as practicable. Refine design to avoid high value areas. • Minimise machinery access along dune system (designate access tracks/paths for vehicle and machinery movements). • Rehabilitate disturbed areas. Reuse surface layer of sand/soil to retain seed bank. • Stabilise finished surface such that accelerated erosion does not occur.	High
	Potential impact on marine flora species within the near shore coastal zone	The nearest seagrass communities are located near Victor Harbor in the North, and towards the southern end of the Coorong near Kingston. Construction of a near shore discharge within the high energy coastal zone will not occur within the vicinity of these sensitive receptors.	Minor	Unlikely	Low	• Minimise footprint of works as far as practicable.	Low
	Introduction of pest species	Potential for people, vehicles, machinery, and vessels to introduce pest species which could adversely affect the ecological character of the wetland.	Minor	Unlikely	Low	• Ensure all vessels and machinery are clean and free of weeds/pests.	Low
	Fuels, chemicals, spills, and leaks	Potential for spills and leaks from machinery and vehicles to adversely affect sediment quality and in turn adversely affect terrestrial vegetation.	Minor	Unlikely	Low	• Ensure safe and effective fuel, oil and chemical storage and handling. • Implement spill and leak prevention and control techniques. • Ensure appropriate spill kits are available and provide training on kit use.	Low
Fauna	Disturbance / displacement to waterfowl and shorebird species	Construction activities (i.e. movements, noise) may temporarily displace shorebird species/waterfowl that utilise the site (State and Commonwealth EPBC threatened and migratory species such as Sanderlings, Sandpipers, Plovers, and waterfowl)	Moderate	Likely	High	• Carry out ecological assessment to identify and clearly delineate 'no go' zones. • Minimise machinery access along the coastal foreshore/beach area where possible. • Take care to prevent injury to native fauna as a result of vehicle movements and construction activities. • Time works to avoid key migratory shorebird periods (Spring/Summer) if practicable.	Medium
	Introduction of pest species	Potential for people, vehicles, machinery, and vessels to introduce pest species which could adversely affect the ecological character of the wetland.	Minor	Unlikely	Low	• Ensure all people, vehicles and machinery are clean and free of weeds/pests.	Low
	Fuels, chemicals, spills, and leaks	Potential for spills and leaks from vehicles and machinery to adversely affect terrestrial, aquatic, and marine fauna species.	Minor	Unlikely	Low	• Ensure safe and effective fuel, oil and chemical storage and handling. • Implement spill and leak prevention and control techniques. • Ensure appropriate spill kits are available and provide training on kit use.	Low
Noise	Increased ambient noise levels associated with vehicle and machinery movements, earthworks, and site access.	Increased noise levels are likely to temporarily effect terrestrial fauna species, particularly shorebirds and waterfowls which frequent the area.	Moderate	Likely	High	• Take all practical measures to minimise any noise generation at the site. • Limit all construction activities to within agreed works hours. • Turn noisy plant/machinery off when not in use.	Medium
Visual amenity	Impact of construction machinery on the natural visual amenity of the area	All equipment including vehicles, machinery, infrastructure (pontoon, pipeline etc.) will be visually present for the entire duration of works which will have an adverse impact on the visual amenity of the area.	Insignificant	Unlikely	Low	• Vehicle access limited to designated access points and paths. • All machinery is to be well maintained and operated in accordance with manufacturer's specifications.	Low
Energy, emissions	Emissions associated with typical construction activities (vehicle and machinery movements)	Temporary emissions for the duration of construction activities.	Insignificant	Likely	Low	• Vehicle access limited to designated access points and path. • All machinery is to be well maintained and operated in accordance with manufacturer's specifications.	Low
OPERATION							
Coastal / Lake processes (Currents, tides, wind & wave conditions)	Potential alteration to currents within the Coorong	Discharge of hypersaline waters from the Coorong may increase flows from the north and marginally change the magnitude of currents experienced within the Coorong South Lagoon.	Minor	Possible	Medium	• Design consideration – Assess the potential for changes to flow velocities in the Coorong South Lagoon.	Low

Table 4 – Option 3A Continued

Environmental Aspect	Potential impacts	Description	Consequence	Likelihood	Risk	Mitigation measure	Residual Risk
Marine processes (Currents, tides, wind & wave conditions)	Alteration to marine processes	The near shore Jetty structure will have some potential affect to currents and longshore sediment transport processes which may affect erosion / accretion of the beach zone.	Moderate	Likely	High	• Minimise footprint of works as far as practicable. • Consider coastal processes in Jetty design.	Medium
Sediment characteristics	N/A	N/A – No mechanism to impact sediment characteristics during operation.	N/A	N/A	N/A	• N/A	N/A
Water quality	Potential alteration to water quality in Coorong	Pumping out hypersaline waters to the marine environment may adversely affect water levels and quality in the Coorong South Lagoon if not appropriately managed.	Major	Possible	High	• Design consideration - Undertake modelling to confirm the near shore environment intended water quality outcomes in Coorong. • Monitor water quality in the Coorong. • Implement effective management of pump in and pump out processes.	Medium
	Hypersaline discharge to ocean waters	Without appropriate mixing, the input of hypersaline waters to the marine environment may result in stratification which would impact the ecological character of the marine environment (i.e. impacts on water quality, fish, seagrass, algae etc.)	Major	Possible	High	• Design consideration – Undertake modelling to confirm sufficient mixing of hypersaline discharge occurs within the near shore environment.	Medium
Flora	Alteration to seagrass communities	Discharge of hypersaline waters within the vicinity of the outfall location may alter the physiology of seagrass. However the nearest seagrass communities are located near Victor Harbor in the North, and towards the southern end of the Coorong near Kingston SE and there are no known seagrass communities within proximity to the near shore discharge location.	Minor	Unlikely	Low	• Confirm Seagrass communities not present in area of influence.	Low
Fauna	Disturbance / displacement to waterfowl and shorebird species	Pumps will operate on an as required basis (not continual) which will intermittently increase ambient noise levels and potentially affect shorebird/waterfowl species which frequent the area. The permanent near shore discharge structure may also disturb and displace those shorebirds and waterfowls which frequent the area (State and Commonwealth EPBC threatened and migratory species such as Sanderlings, Sandpipers, Plovers).	Major	Almost Certain	Very High	• Ensure all machinery and pumps are well maintained and effectively muffled. • Undertake regular maintenance of pumps.	High
	Impact of passive pipeline intake on fish species within the Coorong	Potential for entrapment or impingement of fish species at intake.	Moderate	Unlikely	Medium	• Design consideration – Installation of fish screens to minimise impacts on fish species.	Low
	Potential impacts on marine species at the near shore discharge location	Discharge of hypersaline waters have the potential to impact recreational and commercial fisheries (i.e. mulloway, sharks, salmon, mullet, flathead, snapper, and the Goolwa Cockle) and benthic communities through alterations to water quality within the marine environment.	Major	Almost Certain	Very High	• Design consideration – Undertake modelling to confirm sufficient mixing of hypersaline discharge occurs within the near shore environment.	Medium
Noise	Increased noise associated with pumps and vehicle and machinery movements.	Infrequent, temporary, and intermittent noise sources associated with routine vehicle and machinery movements accessing the site for routine maintenance activities.	Minor	Almost Certain	Medium	• Ensure all machinery and vehicles are well maintained and effectively muffled. • Schedule/carry out maintenance visits so as to minimise disturbance.	Low
Visual amenity	Alteration to the visual amenity values of the Coorong (pontoon structure) and the marine/beach environment	Permanent structures, including the Jetty, pontoon and segments of the pipeline will be visible and will alter the natural amenity of the area.	Moderate	Likely	High	• Minimise footprint of works as far as practicable.	High
Energy, emissions	Operation of pumps and supply of energy source	Pumps will operate on an as required basis during operation of the pipeline (not continual). Suitable energy sources will be needed to operate the pump stations with installation of sub-sea cables and disturbance/clearing along existing corridors to either connect with the existing network, or the potential: • Development of a wind farm (varying between 7.5 ha and 240 ha depending on power demand) – potential impacts include clearing vegetation, noise, and adverse effects on wildlife and habitat, and visual amenity. • Development of a solar farm (varying between 0.6 ha and 20 ha depending on power demand) – potential impacts include clearing vegetation, adverse effects on wildlife and habitat, water consumption, visual amenity, and glare.	Major	Almost Certain	Very High	• Design consideration – Undertake further assessment of energy requirements and potential sources.	High

Table 5 Option 3B – Intermittent pumped connection out of Coorong South Lagoon – low visual impact discharge structure: 1,000 ML/d via pumps on a pontoon structure adjacent Younghusband Peninsula to a beach discharge structure (likely within tidal zone)

Environmental Aspect	Potential impacts	Description	Consequence	Likelihood	Risk	Mitigation measure	Residual Risk
CONSTRUCTION							
Coastal / Lake processes (Currents, tides, wind & wave conditions)	N/A	N/A – No mechanism for construction activities to adversely alter coastal/lake processes of the Coorong	N/A	N/A	N/A	N/A	N/A
Marine processes (Currents, tides, wind & wave conditions)	Alteration of sediment transport mechanisms	Works associated with construction of beach discharge structure may alter sediment transport processes and exacerbate erosion/accretion of foreshore and beach area.	Moderate	Possible	Medium	• Minimise footprint of works as far as practicable. • Minimise duration of works within the beach / near shore zone.	Low
Sediment characteristics	Mobilisation of sediment / erosion and sedimentation during pontoon and pipeline construction within the Coorong	Pontoon construction is likely to disturb intertidal sediments along the Coorong shoreline. There is the potential for this sediment to impact the waterway, resulting in a localised increased in turbidity/sediment resuspension with the potential to affect the aquatic habitats and Ramsar Wetland.	Moderate	Possible	Medium	• Minimise footprint of works as far as practicable. • Divert surface runoff away from disturbed areas and install temporary erosion controls. • Stage earthworks such that runoff from disturbed areas will be captured and treated by the sediment control measures. • Progressive stabilisation of disturbed areas as soon as practicable. • Develop and implement an Erosion and Sediment Control Plan.	Low
	Direct disturbance of dune system and beach sediments for pipeline installation	Significant earthworks associated with pipeline installation through the dune system (Ramsar wetland), which is predominantly sand (extent of disturbance is dependent on construction methodology to be employed). Material will need to be excavated, stockpiled, reused where possible with any excess removed from site. These disturbances have the potential to transport sediment into the adjacent waterways, increasing turbidity levels/sediment resuspension and adversely affecting the aquatic and marine environments.	Major	Almost Certain	Very High	• Minimise footprint of works as far as practicable. • Install temporary erosion controls. • Stage earthworks such that runoff from disturbed areas will be captured and treated by the sediment control measures. • Management of material stockpiles. • Progressive stabilisation of disturbed dune system as soon as practicable. • Develop and implement an Erosion and Sediment Control Plan.	High
	Disturbance of acid sulphate soils (ASS)	Earthworks within the dune system (Ramsar Wetland) may disturb ASS, which would require appropriate assessment and management. If released to adjacent waterways, ASS oxidation by products may adversely affect the terrestrial and aquatic environments including vegetation, fauna species (i.e. fish) and benthic habitat communities. Based on the sediment characteristics of the dune (i.e. sand) there is a low likelihood of encountering ASS.	Moderate	Unlikely	Medium	• Assess and manage ASS in accordance with ASS guidelines. • Ensure all fill materials brought to site are clean and free of any ASS.	Low
Water quality	Suspension of fine sediment in the water column	Construction of pontoon structure and beach discharge structure will result in a temporary localised increase in turbidity and suspended sediment levels. This can result in the formation of a suspended sediment plume and reduce sunlight penetration of the water column; however, works will be temporary with limited ability to reduce sunlight penetration as sediments predominantly consist of sand which settle out quickly within the water column.	Moderate	Possible	Medium	• Minimise disturbances and footprint of works as far as practicable. • Ensure all machinery and vessel movements are operating in the correct locations. • Conduct visual monitoring	Low
	Potential for increased nutrients within the water column during construction activities.	Construction of pontoon and beach discharge structure will result in the disturbance of sediments which may increase nutrient concentrations in the water column stimulating algal blooms and reducing the overall water quality of the system.	Moderate	Possible	Medium	• Minimise disturbances and footprint of works as far as practicable. • Conduct visual monitoring.	Low
	Waste generated during construction.	A variety of wastes are likely to be generated including general waste, construction materials, and hazardous wastes. If these were to be released to the Coorong or open ocean it would impact water quality and the marine/aquatic habitats they support.	Minor	Unlikely	Low	• All waste materials are to be appropriately contained, collected, and disposed of, without entering the waterway. • Any associated waste waters are to be appropriately contained and treated prior to any discharge.	Low
	Fuels, chemicals, spills, and leaks	Potential for spills and leaks from machinery and vehicles to adversely affect water quality and the aquatic environment.	Minor	Unlikely	Low	• Ensure safe and effective fuel, oil and chemical storage and handling. • Implement spill and leak prevention and control techniques. • Ensure appropriate spill kits are available and provide training on kit use.	Low
	Potential spread of marine pests	Potential for vessels to introduce pest species which could adversely affect the marine environment. The main mechanisms for marine pest introduction or spread include the translocation of pest species attached to vessel hulls or in niche areas of a vessel. The risk of this occurring is limited to those vessels which come from areas affected by marine pests, such as vessels from overseas countries.	Minor	Unlikely	Low	• Ensure all vessels are clean and sourced from within Australia.	Low

Table 5 – Option 3B Continued

Environmental Aspect	Potential impacts	Description	Consequence	Likelihood	Risk	Mitigation measure	Residual Risk
Flora	Disturbance to coastal saltmarsh communities during pipe installation within Coorong	Construction activities associated with the pipeline installation will directly impact coastal saltmarsh communities (e.g. intertidal / estuarine sedges, samphire etc.) within the Coorong system.	Moderate	Almost Certain	High	• Minimise footprint of works as far as practicable. • Minimise machinery access. • Restore disturbed bed levels to pre-existing conditions.	Medium
	Disturbance of dunal vegetation during pipe installation	Direct disturbance of approximately 10 ha of dunal vegetation is likely to occur depending on construction methodologies employed. The dunal vegetation to be disturbed is widely represented along the coastline and will have the opportunity to regenerate.	Major	Almost Certain	Very High	• Design consideration – Confirm presence/absence of threatened ecological communities/State/National listed species by conducting an ecological survey. • Minimise footprint of works as far as practicable. • Minimise machinery access along dune system (designate access tracks/paths for vehicle and machinery movements). • Rehabilitate disturbed areas.	High
	Potential impact on marine flora species within the near shore coastal zone	The nearest seagrass communities are located near Victor Harbor in the North, and towards the southern end of the Coorong near Kingston. Construction of a beach discharge location will not occur within the vicinity of these sensitive receptors.	Minor	Unlikely	Low	• Minimise footprint of works as far as practicable.	Low
	Introduction of pest species	Potential for people, vehicles, machinery, and vessels to introduce pest species which could adversely affect the ecological character of the wetland.	Minor	Unlikely	Low	• Ensure all people, vehicles and machinery are clean and free of weeds/pests.	Low
	Fuels, chemicals, spills, and leaks	Potential for spills and leaks from machinery and vehicles to adversely affect sediment quality and in turn adversely affect terrestrial vegetation.	Minor	Unlikely	Low	• Ensure safe and effective fuel, oil and chemical storage and handling. • Implement spill and leak prevention/control techniques. • Ensure appropriate spill kits are available and provide training on kit use.	Low
Fauna	Disturbance / displacement to waterfowl and shorebird species	Construction activities (i.e. movements, noise) may temporarily displace shorebird species/waterfowl that utilise the site (State and Commonwealth EPBC threatened and migratory species such as Sanderlings, Sandpipers, Plovers, and waterfowl).	Moderate	Likely	High	• Carry out ecological assessment to identify and clearly delineate 'no go' zones. • Minimise machinery access along the coastal foreshore/beach area where possible. • Take care to prevent injury to native fauna as a result of vehicle movements and construction activities. • Time works to avoid key migratory shorebird periods if practicable.	Medium
	Introduction of pest species	Potential for people, vehicles and machinery to introduce pest species which could adversely affect the ecological character of the wetland.	Minor	Unlikely	Low	• Ensure all people, vehicles and machinery are clean and free of weeds/pests.	Low
	Fuels, chemicals, spills, and leaks	Potential for spills and leaks from vehicles and machinery to adversely affect terrestrial, aquatic, and marine fauna species.	Minor	Unlikely	Low	• Ensure safe and effective fuel, oil and chemical storage and handling. • Implement spill and leak prevention/control techniques. • Ensure appropriate spill kits are available and provide training on kit use.	Low
Noise	Increased ambient noise levels associated with vehicle and machinery movements, earthworks, and site access.	Increased noise levels are likely to temporarily effect terrestrial fauna species, particularly shorebirds and waterfowls which frequent the area.	Moderate	Likely	High	• Take all practical measures to minimise any noise generation at the site. • Limit all construction activities to within agreed works hours. • Turn noisy plant/machinery off when not in use.	Medium
Visual amenity	Impact of construction machinery on the natural visual amenity of the area	All equipment including vehicles, machinery, infrastructure (pontoon, pipeline etc.) will be visually present for the entire duration of works which will have an adverse impact on the visual amenity of the area.	Insignificant	Unlikely	Low	• Vehicle access limited to designated access points and paths. • All machinery is to be well maintained and operated in accordance with manufacturer's specifications.	Low
Energy, emissions	Emissions associated with typical construction activities (vehicle and machinery movements)	Temporary emissions for the duration of construction activities.	Insignificant	Likely	Low	• Vehicle access limited to designated access points and path. • All machinery is to be well maintained and operated in accordance with manufacturer's specifications.	Low
OPERATION							
Coastal / Lake processes (Currents, tides, wind & wave conditions)	Potential alteration to currents within the Coorong	Discharge of hypersaline waters from the Coorong may increase flows from the north and marginally change the magnitude of currents experienced within the Coorong South Lagoon.	Minor	Possible	Medium	• Design consideration – Assess the potential for changes to flow velocities in the Coorong South Lagoon.	Low
Marine processes (Currents, tides, wind & wave conditions)	Alteration to marine processes	The pipeline and beach discharge structure may permanently alter sediment transport processes which may exacerbate erosion / accretion of the beach area.	Major	Likely	High	• Minimise footprint of works as far as practicable. • Maintain beach protection structure and alternate vehicle access.	Medium

Table 5 – Option 3B Continued

Environmental Aspect	Potential impacts	Description	Consequence	Likelihood	Risk	Mitigation measure	Residual Risk
Sediment characteristics	N/A	N/A – No mechanism to impact sediment characteristics during operation.	N/A	N/A	N/A	• N/A	N/A
Water quality	Potential alteration to water quality in Coorong	Pumping out hypersaline waters to the marine environment may adversely affect water levels and quality in the Coorong South Lagoon if not appropriately managed.	Major	Possible	High	• Design consideration - Undertake modelling to confirm intended water quality outcomes in the Coorong. • Monitor water quality in the Coorong. • Implement effective management of pump in and pump out processes.	Medium
	Hypersaline discharge to ocean waters	Without appropriate mixing, the input of hypersaline waters to the marine environment may result in water quality effects which could impact the ecological character of the near shore marine environment (i.e. impacts on water quality, fish, seagrass, algae etc.)	Major	Possible	High	• Design consideration – Undertake modelling to confirm sufficient mixing of hypersaline discharge occurs within the near shore zone.	Medium
Flora	Alteration to seagrass communities	Discharge of hypersaline waters within the vicinity of the beach discharge location may alter the physiology of seagrass within the near shore zone. However the nearest seagrass communities are located near Victor Harbor in the North, and towards the southern end of the Coorong near Kingston SE and there are no known seagrass communities within proximity to the beach discharge location.	Minor	Unlikely	Low	• Confirm Seagrass communities not present in area of influence.	Low
Fauna	Disturbance / displacement to waterfowl and shorebird species	Pumps will operate on an as required basis (not continual) which will intermittently increase ambient noise levels and potentially affect shorebird/waterfowl species which frequent the area. The permanent beach discharge structure will also disturb and displace those shorebird species which utilise the beach and foreshore area (State and Commonwealth EPBC threatened and migratory species such as Sanderlings, Sandpipers, Plovers).	Major	Almost Certain	Very High	• Ensure all machinery and pumps are well maintained and effectively muffled. • Undertake regular maintenance of structures and pumps.	High
	Impact of pipeline intake on fish species within the Coorong	Potential for entrapment or impingement of fish species at intake.	Moderate	Unlikely	Medium	• Design consideration – Installation of fish screens to minimise impacts on fish species.	Low
	Potential impacts on marine species at the near shore discharge location	Discharge of hypersaline waters have the potential to impact recreational and commercial fisheries (i.e. mulloway, sharks, salmon, mullet, flathead, snapper, and the Goolwa Cockle) and benthic communities through alterations to water quality within the marine environment.	Major	Almost Certain	Very High	• Design consideration – Undertake modelling to confirm sufficient mixing of hypersaline discharge occurs within the near shore environment.	High
Noise	Increased noise associated with pumps and vehicle and machinery movements.	Infrequent, temporary, and intermittent noise sources associated with routine vehicle and machinery movements accessing the site for routine maintenance activities.	Minor	Almost Certain	Medium	• Ensure all machinery and vehicles are well maintained and effectively muffled. • Schedule/carry out maintenance works so as to minimise disturbance.	Low
Visual amenity	Alteration to the visual amenity values of the Coorong (pontoon structure) and the marine/beach environment	Permanent structures, including the beach discharge structure, pontoon and segments of the pipeline will be visible and will alter the natural amenity of the area.	Major	Almost Certain	High	• Minimise footprint of works as far as practicable.	Medium
Energy, emissions	Operation of pumps and supply of energy source	Pumps will operate on an as required basis during operation of the pipeline (not continual). Suitable energy sources will be needed to operate the pump stations with installation of sub-sea cables and disturbance/clearing along existing corridors to either connect with the existing network, or the potential: • Development of a wind farm (varying between 7.5 ha and 240 ha depending on power demand) – potential impacts include clearing vegetation, noise, and adverse effects on wildlife and habitat, and visual amenity. • Development of a solar farm (varying between 0.6 ha and 20 ha depending on power demand) – potential impacts include clearing vegetation, adverse effects on wildlife and habitat, water consumption, visual amenity, and glare.	Major	Almost Certain	Very High	• Design consideration – Undertake further assessment of energy requirements and potential sources.	High

Table 6 Option 3C – Intermittent pumped connection out of Coorong South Lagoon – near shore discharge structure: 250 ML/d via pumps on a pontoon structure adjacent Younghusband Peninsula to a near shore discharge structure (within Southern Ocean)

Environmental Aspect	Potential impacts	Description	Consequence	Likelihood	Risk	Mitigation measure	Residual Risk
CONSTRUCTION							
Coastal / Lake processes (Currents, tides, wind & wave conditions)	N/A	N/A – No mechanism for construction activities to adversely alter coastal/lake processes of the Coorong	N/A	N/A	N/A	N/A	N/A
Marine processes (Currents, tides, wind & wave conditions)	Alteration of sediment transport mechanisms	Works associated with construction of a near shore discharge structure may alter currents and sediment transport processes and exacerbate erosion/accretion of foreshore and beach area.	Moderate	Possible	Medium	• Minimise footprint of works as far as practicable. • Minimise duration of works within the beach / near shore zone.	Low
Sediment characteristics	Mobilisation of sediment / erosion and sedimentation during pontoon and pipeline construction within the Coorong	Pontoon construction is likely to disturb intertidal sediments along the Coorong shoreline. There is the potential for this sediment to impact the waterway, resulting in a localised increased in turbidity/sediment resuspension with the potential to affect the aquatic habitats and Ramsar Wetland.	Moderate	Possible	Medium	• Minimise footprint of works as far as practicable. • Divert surface runoff away from disturbed areas and install temporary erosion controls. • Stage earthworks such that runoff from disturbed areas will be captured and treated by the sediment control measures. • Progressive stabilisation of disturbed areas as soon as practicable. • Develop and implement an Erosion and Sediment Control Plan.	Low
	Direct disturbance of dune system and beach sediments for pipeline installation	Significant earthworks associated with pipeline installation through the dune system (Ramsar wetland), which is predominantly sand (extent of disturbance is dependent on construction methodology to be employed). Material will need to be excavated, stockpiled, reused where possible with any excess removed from site. These disturbances have the potential to transport sediment into the adjacent waterways, increasing turbidity levels/sediment resuspension and adversely affecting the aquatic and marine environments.	Major	Almost Certain	Very High	• Minimise footprint of works as far as practicable. • Install temporary erosion controls. • Stage earthworks such that runoff from disturbed areas will be captured and treated by the sediment control measures. • Management of material stockpiles. • Progressive stabilisation of disturbed dune system as soon as practicable. • Develop and implement an Erosion and Sediment Control Plan.	High
	Direct disturbance of seabed for pipeline installation	Disturbance of the seabed will result in the resuspension of sediments which have the potential to adversely affect water quality and benthic communities within and surrounding the works area.	Major	Almost Certain	Very High	• Minimise footprint of works as far as practicable. • Minimise duration of works within the coastal zone.	High
	Disturbance of acid sulphate soils (ASS)	Earthworks within the dune system (Ramsar Wetland) may disturb ASS, which would require appropriate assessment and management. If released to adjacent waterways, ASS oxidation by products may adversely affect the terrestrial and aquatic environments including vegetation, fauna species (i.e. fish) and benthic habitat communities. Based on the sediment characteristics of the dune (i.e. sand) there is a low likelihood of encountering ASS.	Moderate	Unlikely	Medium	• Assess and manage ASS in accordance with ASS guidelines. • Ensure all fill materials brought to site are clean and free of any ASS.	Low
Water quality	Suspension of fine sediment in the water column	Construction of pontoon and near shore discharge structure will result in a temporary localised increase in turbidity and suspended sediment levels. This can result in the formation of a suspended sediment plume and reduce sunlight penetration of the water column; however, works will be temporary with limited ability to reduce sunlight penetration as sediments predominantly consist of sand which settle out quickly within the water column.	Moderate	Possible	Medium	• Minimise disturbances and footprint of works as far as practicable. • Ensure all machinery and vessel movements are operating in the correct locations. • Conduct visual monitoring	Low
	Potential for increased nutrients within the water column during construction activities.	Construction of pontoon and near shore discharge structure will result in the disturbance of sediments which may increase nutrient concentrations in the water column stimulating algal blooms and reducing the overall water quality of the system.	Moderate	Possible	Medium	• Minimise disturbances and footprint of works as far as practicable. • Conduct visual monitoring.	Low
	Waste generated during construction.	A variety of wastes are likely to be generated including general waste, construction materials, and hazardous wastes. If these were to be released to the Coorong or open ocean it would impact water quality and the marine/aquatic habitats they support.	Minor	Unlikely	Low	• All waste materials are to be appropriately contained, collected, and disposed of, without entering the waterway. • Any associated waste waters are to be appropriately contained and treated prior to any discharge.	Low
	Fuels, chemicals, spills, and leaks	Potential for spills and leaks from machinery and vehicles to adversely affect water quality and the aquatic environment.	Minor	Unlikely	Low	• Ensure safe and effective fuel, oil and chemical storage and handling. • Implement spill and leak prevention and control techniques. • Ensure appropriate spill kits are available and provide training on kit use.	Low
	Potential spread of marine pests	Potential for vessels to introduce pest species which could adversely affect the marine environment. The main mechanisms for marine pest introduction or spread include the translocation of pest species attached to vessel hulls or in niche areas of a vessel. The risk of this occurring is limited to those vessels which come from areas affected by marine pests, such as vessels from overseas countries.	Minor	Unlikely	Low	• Ensure all vessels are clean and sourced from within Australia.	Low

Table 6 – Option 3C Continued

Environmental Aspect	Potential impacts	Description	Consequence	Likelihood	Risk	Mitigation measure	Residual Risk
Flora	Disturbance to coastal saltmarsh communities during pipe installation within Coorong	Construction activities associated with the pipeline installation will directly impact coastal saltmarsh communities (e.g. intertidal/estuarine sedges, samphire etc.) within the Coorong system.	Moderate	Almost Certain	High	• Minimise footprint of works as far as practicable. • Minimise machinery access. • Restore disturbed bed levels to pre-existing conditions.	Medium
	Disturbance of dunal vegetation during pipe installation	Direct disturbance of approximately 11 ha of dunal vegetation is likely to occur depending on construction methodologies employed. The dunal vegetation to be disturbed is Widely represented along the coastline and will have the opportunity to regenerate.	Major	Almost Certain	Very High	• Design consideration – Confirm presence/absence of threatened ecological communities/State/National listed species by conducting an ecological survey. • Minimise footprint of works as far as practicable. Refine design to avoid high value areas. • Minimise machinery access along dune system (designate access tracks/paths for vehicle and machinery movements). • Rehabilitate disturbed areas. Reuse surface/layer of sand/soil to retain seed bank. • Stabilise finished surface such that accelerated erosion does not occur.	High
	Potential impact on marine flora species within the near shore coastal zone	The nearest seagrass communities are located near Victor Harbor in the North, and towards the southern end of the Coorong near Kingston. Construction of a near shore discharge within the high energy coastal zone will not occur within the vicinity of these sensitive receptors.	Minor	Unlikely	Low	• Minimise footprint of works as far as practicable.	Low
	Introduction of pest species	Potential for people, vehicles, machinery, and vessels to introduce pest species which could adversely affect the ecological character of the wetland.	Minor	Unlikely	Low	• Ensure all people, vessels and machinery are clean and free of weeds/pests.	Low
	Fuels, chemicals, spills, and leaks	Potential for spills and leaks from machinery and vehicles to adversely affect sediment quality and in turn adversely affect terrestrial vegetation.	Minor	Unlikely	Low	• Ensure safe and effective fuel, oil and chemical storage and handling. • Implement spill and leak prevention and control techniques. • Ensure appropriate spill kits are available and provide training on kit use.	Low
Fauna	Disturbance / displacement to waterfowl and shorebird species	Construction activities (i.e. movements, noise) may temporarily displace shorebird species/waterfowl that utilise the site (State and Commonwealth EPBC threatened and migratory species such as Sanderlings, Sandpipers, Plovers, and waterfowl)	Moderate	Likely	High	• Carry out ecological assessment to identify and clearly delineate 'no go' zones. • Minimise machinery access along the coastal foreshore/beach area where possible. • Take care to prevent injury to native fauna as a result of vehicle movements and construction activities. • Time works to avoid key migratory shorebird periods (Spring/Summer) if practicable.	Medium
	Introduction of pest species	Potential for people, vehicles, machinery, and vessels to introduce pest species which could adversely affect the ecological character of the wetland.	Minor	Unlikely	Low	• Ensure all people, vehicles and machinery are clean and free of weeds/pests.	Low
	Fuels, chemicals, spills, and leaks	Potential for spills and leaks from vehicles and machinery to adversely affect terrestrial, aquatic, and marine fauna species.	Minor	Unlikely	Low	• Ensure safe and effective fuel, oil and chemical storage and handling. • Implement spill and leak prevention and control techniques. • Ensure appropriate spill kits are available and provide training on kit use.	Low
Noise	Increased ambient noise levels associated with vehicle and machinery movements, earthworks, and site access.	Increased noise levels are likely to temporarily effect terrestrial fauna species, particularly shorebirds and waterfowls which frequent the area.	Moderate	Likely	High	• Take all practical measures to minimise any noise generation at the site. • Limit all construction activities to within agreed works hours. • Turn noisy plant/machinery off when not in use.	Medium
Visual amenity	Impact of construction machinery on the natural visual amenity of the area	All equipment including vehicles, machinery, infostructure (pontoon, pipeline etc.) will be visually present for the entire duration of works which will have an adverse impact on the visual amenity of the area.	Insignificant	Unlikely	Low	• Vehicle access limited to designated access points and paths. • All machinery is to be well maintained and operated in accordance with manufacturer's specifications.	Low
Energy, emissions	Emissions associated with typical construction activities (vehicle and machinery movements)	Temporary emissions for the duration of construction activities.	Insignificant	Likely	Low	• Vehicle access limited to designated access points and path. • All machinery is to be well maintained and operated in accordance with manufacturer's specifications.	Low
OPERATION							
Coastal / Lake processes (Currents, tides, wind & wave conditions)	Potential alteration to currents within the Coorong	Discharge of hypersaline waters from the Coorong may increase flows from the north and marginally change the magnitude of currents experienced within the Coorong South Lagoon.	Minor	Possible	Medium	• Design consideration –Assess the potential for changes to flow velocities in the Coorong South Lagoon.	Low
Marine processes (Currents, tides, wind & wave conditions)	Alteration to marine processes	The near shore Jetty structure will have some potential to affect currents and longshore sediment transport processes which may affect erosion / accretion of the beach zone with potential long term erosion of the coastline and dunal system.	Moderate	Likely	High	• Minimise footprint of works as far as practicable. • Consider coastal processes in Jetty design	Medium

Table 6 – Option 3C Continued

Environmental Aspect	Potential impacts	Description	Consequence	Likelihood	Risk	Mitigation measure	Residual Risk
Sediment characteristics	N/A	N/A – No mechanism to impact sediment characteristics during operation.	N/A	N/A	N/A	• N/A	N/A
Water quality	Potential alteration to water quality in Coorong	Pumping out hypersaline waters to the marine environment may adversely affect water levels and quality in the Coorong South Lagoon if not appropriately managed.	Major	Possible	High	• Design consideration - Undertake modelling to confirm the near shore environment intended water quality outcomes in Coorong. • Monitor water quality in the Coorong. • Implement effective management of pump in and pump out processes.	Medium
	Hypersaline discharge to ocean waters	Without appropriate mixing, the input of hypersaline waters to the marine environment may result in stratification which would impact the ecological character of the marine environment (i.e. impacts on water quality, fish, seagrass, algae etc.)	Major	Possible	High	• Design consideration – Undertake modelling to confirm sufficient mixing of hypersaline discharge occurs within the near shore environment.	Medium
Flora	Alteration to seagrass communities	Discharge of hypersaline waters within the vicinity of the outfall location may alter the physiology of seagrass. However the nearest seagrass communities are located near Victor Harbor in the North, and towards the southern end of the Coorong near Kingston and there are no known seagrass communities within proximity to the discharge location.	Minor	Unlikely	Low	• Design consideration – Undertake modelling to confirm sufficient mixing of hypersaline discharge occurs within the near shore environment. • Confirm seagrass communities not present in the area of influence.	Low
Fauna	Disturbance / displacement to waterfowl and shorebird species	Continual operation of pumps will result in an overall increase in ambient noise levels which will impact terrestrial fauna species, particularly shorebirds and waterfowls which frequent the area (State and Commonwealth EPBC threatened and migratory species such as Sanderlings, Sandpipers, Plovers). The permanent near shore discharge structure may also disturb and displace those shorebirds and waterfowls which frequent the area (State and Commonwealth EPBC threatened and migratory species such as Sanderlings, Sandpipers, Plovers).	Major	Almost Certain	Very High	• Ensure all machinery and pumps are well maintained and effectively muffled. • Undertake regular maintenance of pumps.	High
	Impact of passive pipeline intake on fish species within the Coorong	Potential for entrapment or impingement of fish species at intake.	Moderate	Unlikely	Medium	• Design consideration – Installation of fish screens to minimise impacts on fish species.	Low
	Potential impacts on marine species at the near shore discharge location	Discharge of hypersaline waters have the potential to impact recreational and commercial fisheries (i.e. mulloway, sharks, salmon, mullet, flathead, snapper, and the Goolwa Cockle) and benthic communities through alterations to water quality within the marine environment.	Major	Almost Certain	Very High	• Design consideration – Undertake modelling to confirm sufficient mixing of hypersaline discharge occurs within the near shore environment.	Medium
Noise	Increased noise associated with pumps and vehicle and machinery movements.	Continual operation of pumps will result in an overall increase in ambient noise levels which will impact shorebird/waterfowl species which frequent the area. In addition, infrequent, temporary, and intermittent noise sources associated with routine vehicle and machinery movements accessing the site will also occur during routine maintenance activities.	Minor	Almost Certain	Medium	• Ensure all machinery and vehicles are well maintained and effectively muffled. • Schedule/carry out maintenance visits so as to minimise disturbance.	Low
Visual amenity	Alteration to the visual amenity values of the Coorong (pontoon structure) and the marine/beach environment	Permanent structures, including the jetty, pontoon and segments of the pipeline will be visible and will alter the natural amenity of the area.	Moderate	Likely	High	• Minimise footprint of works as far as practicable.	High
Energy, emissions	Operation of pumps and supply of energy source	Continual operation of pumps will be required. Suitable energy sources will be needed to operate the pump stations with installation of sub-sea cables and disturbance/clearing along existing corridors to either connect with the existing network, or the potential: • Development of a wind farm (varying between 7.5 ha and 240 ha depending on power demand) – potential impacts include clearing vegetation, noise, and adverse effects on wildlife and habitat, and visual amenity. • Development of a solar farm (varying between 0.6 ha and 20 ha depending on power demand) – potential impacts include clearing vegetation, adverse effects on wildlife and habitat, water consumption, visual amenity, and glare.	Major	Almost Certain	Very High	• Design consideration – Undertake further assessment of energy requirements and potential sources.	High

Table 7 Option 3D –Pumped connection out of Coorong South Lagoon – low visual impact discharge structure: 250 ML/d via pumps on a pontoon structure adjacent Younghusband Peninsula to a beach discharge structure (likely within tidal zone)

Environmental Aspect	Potential impacts	Description	Consequence	Likelihood	Risk	Mitigation measure	Residual Risk
CONSTRUCTION							
Coastal / Lake processes (Currents, tides, wind & wave conditions)	N/A	N/A – No mechanism for construction activities to adversely alter coastal/lake processes of the Coorong	N/A	N/A	N/A	N/A	N/A
Marine processes (Currents, tides, wind & wave conditions)	Alteration of sediment transport mechanisms	Works associated with construction of beach discharge structure may alter sediment transport processes and exacerbate erosion/accretion of foreshore and beach area.	Moderate	Possible	Medium	• Minimise footprint of works as far as practicable. • Minimise duration of works within the beach / near shore zone.	Low
Sediment characteristics	Mobilisation of sediment/erosion and sedimentation during pontoon and pipeline construction within the Coorong	Pontoon construction is likely to disturb intertidal sediments along the Coorong shoreline. There is the potential for this sediment to impact the waterway, resulting in a localised increased in turbidity / sediment resuspension with the potential to affect the aquatic habitats and Ramsar Wetland.	Moderate	Possible	Medium	• Minimise footprint of works as far as practicable. • Divert surface runoff away from disturbed areas and install temporary erosion controls. • Stage earthworks such that runoff from disturbed areas will be captured and treated by the sediment control measures. • Progressive stabilisation of disturbed areas as soon as practicable. • Develop and implement an Erosion and Sediment Control Plan.	Low
	Direct disturbance of dune system and beach sediments for pipeline installation	Significant earthworks associated with pipeline installation through the dune system (Ramsar wetland), which is predominantly sand (extent of disturbance is dependent on construction methodology to be employed). Material will need to be excavated, stockpiled, reused where possible with any excess removed from site. These disturbances have the potential to transport sediment into the adjacent waterways, increasing turbidity levels / sediment resuspension and adversely affecting the aquatic and marine environments.	Major	Almost Certain	Very High	• Minimise footprint of works as far as practicable. • Install temporary erosion controls. • Stage earthworks such that runoff from disturbed areas will be captured and treated by the sediment control measures. • Management of material stockpiles. • Progressive stabilisation of disturbed dune system as soon as practicable. • Develop and implement an Erosion and Sediment Control Plan.	High
	Disturbance of acid sulphate soils (ASS)	Earthworks within the dune system (Ramsar Wetland) may disturb ASS, which would require appropriate assessment and management. If released to adjacent waterways, ASS oxidisation by products may adversely affect the terrestrial and aquatic environments including vegetation, fauna species (i.e. fish) and benthic habitat communities. Based on the sediment characteristics of the dune (i.e. sand) there is a low likelihood of encountering ASS.	Moderate	Unlikely	Medium	• Assess and manage ASS in accordance with ASS guidelines. • Ensure all fill materials brought to site are clean and free of any ASS.	Low
Water quality	Suspension of fine sediment in the water column	Construction of pontoon structure and beach discharge structure will result in a temporary localised increase in turbidity and suspended sediment levels. This can result in the formation of a suspended sediment plume and reduce sunlight penetration of the water column; however, works will be temporary with limited ability to reduce sunlight penetration as sediments predominantly consist of sand which settle out quickly within the water column.	Moderate	Possible	Medium	• Minimise disturbances and footprint of works as far as practicable. • Ensure all machinery and vessel movements are operating in the correct locations. • Conduct visual monitoring	Low
	Potential for increased nutrients within the water column during construction activities.	Construction of pontoon and beach discharge structure will result in the disturbance of sediments which may increase nutrient concentrations in the water column stimulating algal blooms and reducing the overall water quality of the system.	Moderate	Possible	Medium	• Minimise disturbances and footprint of works as far as practicable. • Conduct visual monitoring.	Low
	Waste generated during construction.	A variety of wastes are likely to be generated including general waste, construction materials, and hazardous wastes. If these were to be released to the Coorong or open ocean it would impact water quality and the marine/aquatic habitats they support.	Minor	Unlikely	Low	• All waste materials are to be appropriately contained, collected, and disposed of, without entering the waterway. • Any associated waste waters are to be appropriately contained and treated prior to any discharge.	Low
	Fuels, chemicals, spills, and leaks	Potential for spills and leaks from machinery and vehicles to adversely affect water quality and the aquatic environment.	Minor	Unlikely	Low	• Ensure safe and effective fuel, oil and chemical storage and handling. • Implement spill and leak prevention and control techniques. • Ensure appropriate spill kits are available and provide training on kit use.	Low
	Potential spread of marine pests	Potential for vessels to introduce pest species which could adversely affect the marine environment. The main mechanisms for marine pest introduction or spread include the translocation of pest species attached to vessel hulls or in niche areas of a vessel. The risk of this occurring is limited to those vessels which come from areas affected by marine pests, such as vessels from overseas countries.	Minor	Unlikely	Low	• Ensure all vessels are clean and sourced from within Australia.	Low

Table 7 – Option 3D Continued

Environmental Aspect	Potential impacts	Description	Consequence	Likelihood	Risk	Mitigation measure	Residual Risk
Flora	Disturbance to coastal saltmarsh communities during pipe installation within Coorong	Construction activities associated with the pipeline installation will directly impact coastal saltmarsh communities (e.g. intertidal / estuarine sedges, samphire etc.) within the Coorong system.	Moderate	Almost Certain	High	• Minimise footprint of works as far as practicable. • Minimise machinery access. • Restore disturbed bed levels to pre-existing conditions.	Medium
	Disturbance of dunal vegetation during pipe installation	Direct disturbance of approximately 10 ha of dunal vegetation is likely to occur depending on construction methodologies employed. The dunal vegetation to be disturbed is widely represented along the coastline and will have the opportunity to regenerate.	Major	Almost Certain	Very High	• Design consideration – Confirm presence/absence of threatened ecological communities/State/National listed species by conducting an ecological survey. • Minimise footprint of works as far as practicable. • Minimise machinery access along dune system (designate access tracks/paths for vehicle and machinery movements). • Rehabilitate disturbed areas.	High
	Potential impact on marine flora species within the near shore coastal zone	The nearest seagrass communities are located near Victor Harbor in the North, and towards the southern end of the Coorong near Kingston. Construction of a beach discharge location will not occur within the vicinity of these sensitive receptors.	Minor	Unlikely	Low	• Minimise footprint of works as far as practicable.	Low
	Introduction of pest species	Potential for people, vehicles, machinery, and vessels to introduce pest species which could adversely affect the ecological character of the wetland.	Minor	Unlikely	Low	• Ensure all people, vehicles and machinery are clean and free of weeds/pests.	Low
	Fuels, chemicals, spills, and leaks	Potential for spills and leaks from machinery and vehicles to adversely affect sediment quality and in turn adversely affect terrestrial vegetation.	Minor	Unlikely	Low	• Ensure safe and effective fuel, oil and chemical storage and handling. • Implement spill and leak prevention and control techniques. • Ensure appropriate spill kits are available and provide training on kit use.	Low
Fauna	Disturbance / displacement to waterfowl and shorebird species	Construction activities (i.e. movements, noise) may temporarily displace shorebird species/waterfowl that utilise the site (State and Commonwealth EPBC threatened and migratory species such as Sanderlings, Sandpipers, Plovers, and waterfowl)	Moderate	Likely	High	• Carry out ecological assessment to identify and clearly delineate 'no go' zones. • Minimise machinery access along the coastal foreshore/beach area where possible. • Take care to prevent injury to native fauna as a result of vehicle movements and construction activities. • Time works to avoid key migratory shorebird periods if practicable.	Medium
	Introduction of pest species	Potential for people, vehicles and machinery to introduce pest species which could adversely affect the ecological character of the wetland.	Minor	Unlikely	Low	• Ensure all people, vehicles and machinery are clean and free of weeds/pests.	Low
	Fuels, chemicals, spills, and leaks	Potential for spills and leaks from vehicles and machinery to adversely affect terrestrial, aquatic, and marine fauna species.	Minor	Unlikely	Low	• Ensure safe and effective fuel, oil and chemical storage and handling. • Implement spill and leak prevention and control techniques. • Ensure appropriate spill kits are available and provide training on kit use.	Low
Noise	Increased ambient noise levels associated with vehicle and machinery movements, earthworks, and site access.	Increased noise levels are likely to temporarily effect terrestrial fauna species, particularly shorebirds and waterfowls which frequent the area.	Moderate	Likely	High	• Take all practical measures to minimise any noise generation at the site. • Limit all construction activities to within agreed works hours. • Turn noisy plant/machinery off when not in use.	Medium
Visual amenity	Impact of construction machinery on the natural visual amenity of the area	All equipment including vehicles, machinery, infostructure (pontoon, pipeline etc.) will be visually present for the entire duration of works which will have an adverse impact on the visual amenity of the area.	Insignificant	Unlikely	Low	• Vehicle access limited to designated access points and paths. • All machinery is to be well maintained and operated in accordance with manufacturer's specifications.	Low
Energy, emissions	Emissions associated with typical construction activities (vehicle and machinery movements)	Temporary emissions for the duration of construction activities.	Insignificant	Likely	Low	• Vehicle access limited to designated access points and path. • All machinery is to be well maintained and operated in accordance with manufacturer's specifications.	Low
OPERATION							
Coastal / Lake processes (Currents, tides, wind & wave conditions)	Potential alteration to currents within the Coorong	Discharge of hypersaline waters from the Coorong may increase flows from the north and marginally change the magnitude of currents experienced within the Coorong South Lagoon.	Minor	Possible	Medium	• Design consideration – Assess the potential changes to flow velocities in the Coorong South Lagoon.	Low
Marine processes (Currents, tides, wind & wave conditions)	Alteration to marine processes	The pipeline and beach discharge structure may permanently alter sediment transport processes which may exacerbate erosion / accretion of the beach area.	Major	Likely	High	• Minimise footprint of works as far as practicable. • Maintain beach protection structure and alternate vehicle access.	Medium
Sediment characteristics	N/A	N/A – No mechanism to impact sediment characteristics during operation.	N/A	N/A	N/A	• N/A	N/A

Table 7 – Option 3D Continued

Environmental Aspect	Potential impacts	Description	Consequence	Likelihood	Risk	Mitigation measure	Residual Risk
Water quality	Potential alteration to water quality in Coorong	Pumping out hypersaline waters to the marine environment may adversely affect water levels and quality in the Coorong South Lagoon if not appropriately managed.	Major	Possible	High	• Design consideration - Undertake modelling to confirm intended water quality outcomes in the Coorong. • Monitor water quality in the Coorong. • Implement effective management of pump in and pump out processes.	Medium
	Hypersaline discharge to ocean waters	Without appropriate mixing, the input of hypersaline waters to the marine environment may result in water quality affects which could impact the ecological character of the near shore marine environment (i.e. impacts on water quality, fish, seagrass, algae etc.).	Major	Possible	High	• Design consideration – Undertake modelling to confirm sufficient mixing of hypersaline discharge occurs within the near shore zone.	Medium
Flora	Alteration to seagrass communities	Discharge of hypersaline waters within the vicinity of the beach discharge location may alter the physiology of seagrass within the near shore zone. However the nearest seagrass communities are located near Victor Harbor in the North, and towards the southern end of the Coorong near Kingston and there are no known seagrass communities within proximity to the discharge location.	Minor	Unlikely	Low	• Confirm seagrass communities not present in area of influence.	Low
Fauna	Disturbance / displacement to waterfowl and shorebird species	Continual operation of pumps will result in an overall increase in ambient noise levels which will impact terrestrial fauna species, particularly shorebirds and waterfowls which frequent the area (State and Commonwealth EPBC threatened and migratory species such as Sanderlings, Sandpipers, Plovers). The permanent beach discharge structure will also disturb and displace those shorebird species which utilise the beach and foreshore area (State and Commonwealth EPBC threatened and migratory species such as Sanderlings, Sandpipers, Plovers).	Major	Almost Certain	Very High	• Ensure all machinery and pumps are well maintained and effectively muffled. • Undertake regular maintenance of structures and pumps.	High
	Impact of pipeline intake on fish species within the Coorong	Potential for entrapment or impingement of fish species at intake.	Moderate	Unlikely	Medium	• Design consideration – Installation of fish screens to minimise impacts on fish species.	Low
	Potential impacts on marine species at the near shore discharge location	Discharge of hypersaline waters have the potential to impact recreational and commercial fisheries (i.e. mulloway, sharks, salmon, mullet, flathead, snapper, and the Goolwa Cockle) and benthic communities through alterations to water quality within the marine environment.	Major	Almost Certain	Very High	• Design consideration – Undertake modelling to confirm sufficient mixing of hypersaline discharge occurs within the near shore environment.	High
Noise	Increased noise associated with pumps and vehicle and machinery movements.	Continual operation of pumps will result in an overall increase in ambient noise levels which will impact terrestrial fauna species, particularly shorebirds and waterfowls which frequent the area (State and Commonwealth EPBC threatened and migratory species such as Sanderlings, Sandpipers, Plovers).	Minor	Almost Certain	Medium	• Ensure all machinery and vehicles are well maintained and effectively muffled. • Schedule/carry out maintenance works so as to minimise disturbance.	Low
Visual amenity	Alteration to the visual amenity values of the Coorong (pontoon structure) and the marine/beach environment	Permanent structures, including the beach discharge structure, pontoon and segments of the pipeline will be visible and will alter the natural amenity of the area.	Major	Almost Certain	High	• Minimise footprint of works as far as practicable.	Medium
Energy, emissions	Operation of pumps and supply of energy source	Continual operation of pumps will be required. Suitable energy sources will be needed to operate the pump stations with installation of sub-sea cables and disturbance / clearing along existing corridors to either connect with the existing network, or the potential: • Development of a wind farm (varying between 7.5 ha and 240 ha depending on power demand) – potential impacts include clearing vegetation, noise, and adverse effects on wildlife and habitat, and visual amenity. • Development of a solar farm (varying between 0.6 ha and 20 ha depending on power demand) – potential impacts include clearing vegetation, adverse effects on wildlife and habitat, water consumption, visual amenity, and glare.	Major	Almost Certain	Very High	• Design consideration – Undertake further assessment of energy requirements and potential sources.	High

Table 8 Option 4A – Bi-directional pumped Southern Ocean connection – one location, separate pumping stations, pump in location with caisson structure: 350 ML/d into and out of Coorong South Lagoon

Environmental Aspect	Potential impacts	Description	Consequence	Likelihood	Risk	Mitigation measure	Residual Risk
CONSTRUCTION							
Coastal / Lake processes (Currents, tides, wind & wave conditions)	N/A	N/A – No mechanism for construction activities to adversely alter coastal/lake processes of the Coorong.	N/A	N/A	N/A	• N/A	N/A
Marine processes (Currents, tides, wind & wave conditions)	Alteration of sediment transport mechanisms	Construction of caisson and jetty structure within the near shore marine environment may alter currents and sediment transport processes and exacerbate erosion/accretion along the coastline.	Moderate	Possible	Medium	• Minimise footprint of works as far as practicable. • Minimise duration of works within the beach / near shore zone.	Low
Sediment characteristics	Mobilisation of sediment / erosion and sedimentation during pontoon and pipeline construction within the Coorong	Pontoon construction is likely to disturb intertidal sediments along the Coorong shoreline. There is the potential for this sediment to impact the waterway, resulting in a localised increased in turbidity / sediment resuspension with the potential to affect the aquatic habitats and Ramsar Wetland.	Moderate	Possible	Medium	• Minimise footprint of works as far as practicable. • Divert surface runoff away from disturbed areas and install temporary erosion controls. • Stage earthworks such that runoff from disturbed areas will be captured and treated by sediment control measures. • Progressive stabilisation of disturbed areas as soon as practicable. • Develop and implement an Erosion and Sediment Control Plan.	Low
	Direct disturbance of dune system and beach sediments for pipeline installation	Significant earthworks associated with pipeline installation through the dune system (Ramsar wetland), which is predominantly sand (extent of disturbance is dependent on construction methodology to be employed). Material will need to be excavated, stockpiled, reused where possible with any excess removed from site. These disturbances have the potential to transport sediment into the adjacent waterways, increasing turbidity levels / sediment resuspension and adversely affecting the aquatic and marine environments.	Major	Almost Certain	Very High	• Minimise footprint of works as far as practicable. • Install temporary erosion controls. • Stage earthworks such that runoff from disturbed areas will be captured and treated by the sediment control measures. • Management of material stockpiles. • Progressive stabilisation of disturbed dune system as soon as practicable. • Develop and implement an Erosion and Sediment Control Plan.	High
	Direct disturbance of seabed for construction of caisson and jetty structure and pipeline installation	Disturbance of the seabed will result in the resuspension of sediments which have the potential to adversely affect water quality and benthic communities within and surrounding the works area.	Major	Almost Certain	Very High	• Minimise footprint of works as far as practicable. • Minimise duration of works within the coastal zone.	High
	Disturbance of acid sulphate soils (ASS)	Earthworks within the dune system (Ramsar Wetland) may disturb ASS, which would require appropriate assessment and management. If released to adjacent waterways, ASS oxidisation by products may adversely affect the terrestrial and aquatic environments including vegetation, fauna species (i.e. fish) and benthic habitat communities. Based on the sediment characteristics of the dune (i.e. sand) there is a low likelihood of encountering ASS.	Moderate	Unlikely	Medium	• Assess and manage ASS in accordance with ASS guidelines. • Ensure all fill materials brought to site are clean and free of any ASS.	Low
Water quality	Suspension of fine sediment in the water column	Installation of the pipeline, supporting infrastructure and caisson will result in a temporary localised increase in turbidity and suspended sediment levels. This can result in the formation of a suspended sediment plume and reduce sunlight penetration of the water column; however, works will be temporary with limited ability to reduce sunlight penetration as sediments predominantly consist of sand which settle out quickly within the water column.	Moderate	Possible	Medium	• Minimise disturbances and footprint of works as far as practicable. • Ensure all machinery and vessel movements are operating in the correct locations. • Conduct monitoring.	Low
	Potential for increased nutrients within the water column during construction activities	Caisson, pontoon, jetty and beach discharge structure will result in the disturbance of sediments which may increase nutrient concentrations in the water column stimulating algal blooms and reducing the overall water quality of the system.	Moderate	Possible	Medium	• Minimise disturbances and footprint of works as far as practicable. • Conduct monitoring.	Low
	Waste generated during construction.	A variety of wastes are likely to be generated including general waste, construction materials, and hazardous wastes. If these were to be released to the Coorong or open ocean it would impact water quality and the marine/aquatic habitats they support.	Minor	Unlikely	Low	• All waste materials are to be appropriately contained, collected, and disposed of, without entering the waterway. • Any associated waste waters are to be appropriately contained and treated prior to any discharge.	Low
	Fuels, chemicals, spills, and leaks	Potential for spills and leaks from machinery and vehicles to adversely impact water quality and the aquatic environment.	Minor	Unlikely	Low	• Ensure safe and effective fuel, oil and chemical storage and handling. • Implement spill and leak prevention and control techniques. • Ensure appropriate spill kits are available and provide training on kit use.	Low
	Potential spread of marine pests	Potential for vessels to introduce pest species which could adversely affect the marine environment. The main mechanisms for marine pest introduction or spread include the translocation of pest species attached to vessel hulls or in niche areas of a vessel. The risk of this occurring is limited to those vessels which come from areas affected by marine pests, such as vessels from overseas countries.	Minor	Unlikely	Low	• Ensure all vessels are clean and sourced from within Australia.	Low

Table 8 – Option 4A Continued

Environmental Aspect	Potential impacts	Description	Consequence	Likelihood	Risk	Mitigation measure	Residual Risk
Flora	Disturbance to coastal saltmarsh communities during pipe installation within Coorong	Construction activities associated with the pipeline installation will directly impact coastal saltmarsh communities (e.g. intertidal / estuarine sedges, samphire etc.) within the Coorong system.	Moderate	Almost Certain	High	• Minimise footprint of works as far as practicable. • Minimise machinery access. Restore disturbed bed levels to pre-existing conditions.	Medium
	Disturbance of dunal vegetation during pipe installation	Direct disturbance of approximately 11 ha of dunal vegetation is likely to occur depending on construction methodologies employed. The dunal vegetation to be disturbed is widely represented along the coastline and will have the opportunity to regenerate.	Major	Almost Certain	Very High	• Design consideration – Confirm presence/absence of threatened ecological communities/State/National listed species by conducting an ecological survey. • Minimise footprint of works as far as practicable. Refine design to avoid high value areas. • Minimise machinery access along dune system (designate access tracks/paths for vehicle and machinery movements). • Rehabilitate disturbed areas. reuse surface layer of sand/soil to retain seed bank. • Stabilise finished surface such that accelerated erosion does not occur.	High
	Potential impact on marine flora species within the near shore coastal zone	The nearest seagrass communities are located near Victor Harbor in the North, and towards the southern end of the Coorong near Kingston. Construction of the pipeline, supporting infrastructure and caisson will not occur within the vicinity of these sensitive receptors.	Minor	Unlikely	Low	• Minimise footprint of works as far as practicable.	Low
	Introduction of pest species	Potential for people, vehicles, machinery, and vessels to introduce pest species which could adversely affect the ecological character of the wetland.	Minor	Unlikely	Low	• Ensure all people, vessels and machinery are clean and free of weeds/pests.	Low
	Fuels, chemicals, spills, and leaks	Potential for spills and leaks from machinery and vehicles to adversely affect sediment quality and in turn adversely affect terrestrial vegetation.	Minor	Unlikely	Low	• Ensure safe and effective fuel, oil and chemical storage and handling. • Implement spill and leak prevention and control techniques. • Ensure appropriate spill kits are available and provide training on kit use.	Low
Fauna	Disturbance / displacement to waterfowl and shorebird species	Construction activities (i.e. movements, noise) may temporarily displace shorebird species/waterfowl that utilise the site (State and Commonwealth EPBC threatened and migratory species such as Sanderlings, Sandpipers, Plovers, and waterfowl).	Moderate	Likely	High	• Carry out ecological assessment to identify and clearly delineate 'no go' zones. • Minimise machinery access along the coastal foreshore/beach area where possible. • Take care to prevent injury to native fauna as a result of vehicle movements and construction activities. • Time works to avoid key migratory shorebird periods (Spring/Summer) if practicable.	Medium
	Disturbance to benthic habitat communities during caisson and jetty construction	Construction of the jetty and caisson will temporarily impact benthic communities; however these would be expected to recover quickly due to their ability to recolonise after disturbances.	Minor	Possible	Medium	• Minimise footprint of works as far as practicable.	Low
	Underwater noise and vibration resulting in the displacement of marine fauna species	Caisson construction and piling activities associated with the jetty structure will result in underwater noise and vibration, which may impact marine fauna species, such as fish, mammals, and other transient species including whales which are known to pass through the area, but not rely on it for breeding/calving purposes. These activities will be temporary and intermittent during construction.	Moderate	Almost Certain	High	• Undertake marine megafauna observations prior to and during pile installation works and caisson construction. • Establish an observation zone around pilling activities. • Gradually ramp up pile driving equipment to allow mobile species to move away from the works area. • Interrupt the impact pile driving activity when a marine species is within close proximity to the piling or caisson works.	Medium
	Vessel interaction with marine fauna species	Potential boat strike associated with vessel movements in the open ocean marine environment and the waters of Coorong as structure are built and pipeline segments are installed.	Moderate	Possible	Medium	• Impose vessel speed limits. • Vessels are to keep careful forward lookout for marine mammals that may be in the path to minimise risk of collision.	Low
	Introduction of pest species	Potential for people, vehicles, machinery, and vessels to introduce pest species which could adversely affect the ecological character of the wetland.	Minor	Unlikely	Low	• Ensure all people, vehicles and machinery are clean and free of weeds/pests.	Low
	Fuels, chemicals, spills, and leaks	Potential for spills and leaks from vehicles and machinery to adversely affect terrestrial, aquatic, and marine fauna species.	Minor	Unlikely	Low	• Ensure safe and effective fuel, oil and chemical storage and handling. • Implement spill and leak prevention and control techniques. • Ensure appropriate spill kits are available and provide training on kit use	Low
Noise	Increased ambient noise levels associated with vehicle and machinery movements, earthworks, and site access.	Increased noise levels are likely to temporarily effect terrestrial fauna species, particularly shorebirds and waterfowls which frequent the area.	Moderate	Likely	High	• Take all practical measures to minimise any noise generation at the site. • Limit all construction activities to within agreed works hours. • Turn noisy plant/machinery off when not in use.	Medium

Table 8 – Option 4A Continued

Environmental Aspect	Potential impacts	Description	Consequence	Likelihood	Risk	Mitigation measure	Residual Risk
Visual amenity	Impact of construction machinery on the natural visual amenity of the area	All equipment including vehicles and machinery will be visually present for the entire duration of works which will have an adverse impact on the visual amenity of the area.	Insignificant	Unlikely	Low	• Vehicle access limited to designated access points and paths. • All machinery is to be well maintained and operated in accordance with manufacturer's specifications.	Low
Energy, emissions	Emissions associated with typical construction activities (vehicle and machinery movements)	Temporary emissions for the duration of construction activities.	Insignificant	Likely	Low	• Vehicle access limited to designated access points and path. • All machinery is to be well maintained and operated in accordance with manufacturer's specifications.	Low
OPERATION							
Coastal / Lake processes (Currents, tides, wind & wave conditions)	Potential alteration to currents within the Coorong	Discharge of hypersaline waters from the Coorong may increase flows from the north and marginally change the magnitude of currents experience within the Coorong South Lagoon.	Minor	Possible	Medium	• Design consideration – Assess the potential for changes to flow velocities in the Coorong South Lagoon.	Low
Marine processes (Currents, tides, wind & wave conditions)	Alteration to marine processes	The caisson and jetty structure will have some potential to affect to currents and longshore sediment transport processes which may affect erosion / accretion of the beach zone.	Moderate	Likely	High	• Minimise footprint of works as far as practicable. • Consider coastal processes in jetty design.	Medium
Sediment characteristics	N/A	N/A – No mechanism to impact sediment characteristics during operation.	N/A	N/A	N/A	• N/A	N/A
Water quality	Potential alteration to water quality in Coorong	Intake of marine water to the Coorong and outfall of hypersaline waters to the marine environment may adversely affect water levels and quality in the Coorong South Lagoon if not appropriately managed.	Major	Possible	High	• Design consideration - Undertake modelling to confirm the near shore environment intended water quality outcomes in Coorong. • Monitor water quality in the Coorong. • Implement effective management of pump in and pump out processes.	Medium
	Hypersaline discharge to ocean waters	Without appropriate mixing, the input of hypersaline waters to the marine environment may result in stratification which would impact the ecological character of the marine environment (i.e. impacts on water quality, fish, seagrass, algae etc.).	Major	Possible	High	• Design consideration – Undertake modelling to confirm sufficient mixing of hypersaline discharge occurs within the near shore environment.	Medium
Flora	Alteration to seagrass communities	Discharge of hypersaline waters within the vicinity of the outfall location may alter the physiology of seagrass. However the nearest seagrass communities are located near Victor Harbor in the North, and towards the southern end of the Coorong near Kingston and there are no known seagrass communities within proximity to the outfall location.	Minor	Unlikely	Low	• Confirm Seagrass communities do not present in area of influence.	Low
Fauna	Disturbance / displacement to waterfowl and shorebird species	Continual operation of pumps will result in an overall increase in ambient noise levels which will impact terrestrial fauna species, particularly shorebirds and waterfowls which frequent the area (State and Commonwealth EPBC threatened and migratory species such as Sanderlings, Sandpipers, Plovers).	Major	Almost Certain	Very High	• Ensure all machinery and pumps are well maintained and effectively muffled. • Undertake regular maintenance of pumps.	High
	Impact of passive pipeline intake on fish species within the Coorong	Potential for entrapment or impingement of fish species at intake.	Moderate	Unlikely	Medium	• Design consideration – Installation of fish screens to minimise impacts on fish species.	Low
	Potential impacts on marine species at the near shore discharge location	Discharge of hypersaline waters have the potential to impact recreational and commercial fisheries (i.e. mulloway, sharks, salmon, mullet, flathead, snapper, and the Goolwa Cockle) and benthic communities through alterations to water quality within the marine environment.	Major	Almost Certain	Very High	• Design consideration – Undertake modelling to confirm sufficient mixing of hypersaline discharge occurs within the near shore environment.	Medium
Noise	Increased noise associated with pumps and vehicle and machinery movements.	Continual operation of pumps will result in an overall increase in ambient noise levels which will impact shorebird/waterfowl species which frequent the area. In addition, infrequent, temporary, and intermittent noise sources associated with routine vehicle and machinery movements accessing the site will also occur during routine maintenance activities.	Minor	Almost Certain	Medium	• Ensure all vehicles and pumps are well maintained and effectively muffled. • Schedule/carry out maintenance visits so as to minimise disturbance.	Low
Visual amenity	Alteration to the visual amenity values of the Coorong (pontoon structure) and the marine/beach environment	Large permanent structures, including the Jetty, pontoon, segments of pipeline, the jetty structure and caisson will be visible and will alter the natural amenity of the coastline.	Major	Almost Certain	Very High	• Minimise footprint of works as far as practicable.	High
Energy, emissions	Operation of pumps and supply of energy source	Continual operation of pumps will be required. Suitable energy sources will be needed to operate the pump stations with installation of sub-sea cables and disturbance/clearing along existing corridors to either connect with the existing network, or the potential: • Development of a wind farm (varying between 7.5 ha and 240 ha depending on power demand) – potential impacts include clearing vegetation, noise, and adverse effects on wildlife and habitat. • Development of a solar farm (varying between 0.6 ha and 20 ha depending on power demand) – potential impacts include clearing vegetation, adverse effects on wildlife and habitat, and water consumption.	Major	Almost Certain	Very High	• Design consideration – Undertake further assessment of energy requirements and potential sources.	High

Table 9 Option 4B – Bi-directional pumped Southern Ocean connection – one location, one common pumping station, near shore discharge / intake protected by breakwater: 350 ML/d into and out of Coorong South Lagoon via a common dry well pumping station within Younghusband Peninsula

Environmental Aspect	Potential impacts	Description	Consequence	Likelihood	Risk	Mitigation measure	Residual Risk
CONSTRUCTION							
Coastal / Lake processes (Currents, tides, wind & wave conditions)	N/A	N/A – No mechanism for construction activities to adversely alter coastal/lake processes of the Coorong.	N/A	N/A	N/A	• N/A	N/A
Marine processes (Currents, tides, wind & wave conditions)	Alteration of sediment transport mechanisms	Construction of the ocean pipeline may alter current and sediment transport processes and exacerbate erosion/accretion along the coastline.	Minor	Possible	Medium	• Minimise footprint of works as far as practicable. • Minimise duration of works within the beach / near shore zone.	Low
Sediment characteristics	Mobilisation of sediment / erosion and sedimentation during pipeline construction within the Coorong	Pipeline installation is likely to disturb intertidal sediments along the Coorong shoreline. There is the potential for this sediment to impact the waterway, resulting in a localised increase in turbidity / sediment resuspension with the potential to affect the aquatic habitats and Ramsar Wetland.	Moderate	Possible	Medium	• Minimise footprint of works as far as practicable. • Divert surface runoff away from disturbed areas and install temporary erosion controls. • Stage earthworks such that runoff from disturbed areas will be captured and treated by sediment control measures. • Progressive stabilisation of disturbed areas as soon as practicable. • Develop and implement an Erosion and Sediment Control Plan.	Low
	Direct disturbance of dune system and beach sediments for pipeline installation and dry well pumping station within Younghusband Peninsula	Significant earthworks associated with pipeline installation and construction and installation of the dry well pumping station through the dune system (Ramsar wetland), which is predominantly sand (extent of disturbance is dependent on construction methodology to be employed). Material will need to be excavated, stockpiled, reused where possible with any excess removed from site. These disturbances have the potential to transport sediment into the adjacent waterways, increasing turbidity levels / sediment resuspension and adversely affecting the aquatic and marine environments.	Major	Almost Certain	Very High	• Minimise footprint of works as far as practicable. • Install temporary erosion controls. • Stage earthworks such that runoff from disturbed areas will be captured and treated by the sediment control measures. • Management of material stockpiles. • Progressive stabilisation of disturbed dune system as soon as practicable. • Develop and implement an Erosion and Sediment Control Plan.	High
	Direct disturbance of seabed for pipeline installation	Disturbance of the seabed will result in the resuspension of sediments which have the potential to adversely affect water quality and benthic communities within and surrounding the works area.	Major	Almost Certain	Very High	• Minimise footprint of works as far as practicable. • All materials are to be clean and free of silt. •	High
	Disturbance of acid sulphate soils (ASS)	Earthworks within the dune system (Ramsar Wetland) may disturb ASS, which would require appropriate assessment and management. If not managed effectively ASS may adversely affect the terrestrial and aquatic environments. Based on the sediment characteristics of the dune (i.e. sand) there is a low likelihood of encountering ASS.	Moderate	Unlikely	Medium	• Assess and manage ASS in accordance with ASS guidelines. • If any material is showing signs of ASS indicators, undertake periodic 'test as you go' sampling and field testing.	Low
Water quality	Suspension of fine sediment in the water column	Installation of the pipeline infrastructure will result in a temporary localised increase in turbidity and suspended sediment levels. This can result in the formation of a suspended sediment plume and reduce sunlight penetration of the water column; however, works will be temporary with limited ability to reduce sunlight penetration as sediments predominantly consist of sand which settle out quickly within the water column.	Moderate	Possible	Medium	• Minimise disturbances and footprint of works as far as practicable. • Ensure all machinery and vessel movements are operating in the correct locations. • Conduct visual monitoring.	Low
	Potential for increased nutrients within the water column during construction activities.	Pipeline installation will result in the disturbance of sediments which may increase nutrient concentrations in the water column stimulating algal blooms and reducing the overall water quality of the system.	Minor	Unlikely	Low	• Minimise disturbances and footprint of works as far as practicable • Conduct visual monitoring.	Low
	Waste generated during construction.	A variety of wastes are likely to be generated including general waste, construction materials, and hazardous wastes. If these were to be released to the Coorong or open ocean it would impact water quality and the marine/aquatic habitats they support.	Minor	Unlikely	Low	• All waste materials are to be appropriately contained, collected, and disposed of, without entering the waterway. • Any associated waste waters are to be appropriately contained and treated prior to any discharge.	Low
	Fuels, chemicals, spills, and leaks	Potential for spills and leaks from machinery and vehicles to adversely affect water quality and the aquatic environment.	Minor	Unlikely	Low	• Ensure safe and effective fuel, oil and chemical storage and handling. • Implement spill and leak prevention and control techniques. • Ensure appropriate spill kits are available and provide training on kit use.	Low
	Potential spread of marine pests	Potential for vessels to introduce pest species which could adversely affect the marine environment. The main mechanisms for marine pest introduction or spread include the translocation of pest species attached to vessel hulls or in niche areas of a vessel. The risk of this occurring is limited to those vessels which come from areas affected by marine pests, such as vessels from overseas countries.	Minor	Unlikely	Low	• Ensure all vessels are clean and sourced from within Australia.	Low

Table 9 – Option 4B Continued

Environmental Aspect	Potential impacts	Description	Consequence	Likelihood	Risk	Mitigation measure	Residual Risk
Flora	Disturbance to coastal saltmarsh communities (e.g. intertidal/estuarine sedges, samphire etc.) during pipe installation within Coorong	Construction activities associated with the pipeline installation will impact coastal saltmarsh communities within the Coorong system.	Moderate	Almost Certain	High	• Minimise footprint of works as far as practicable. • Minimise machinery access. • Restore disturbed bed levels to pre-existing conditions.	Medium
	Disturbance of dunal vegetation during pipe installation	Direct disturbance of approximately 12 ha of dunal vegetation is likely to occur depending on construction methodologies employed. The dunal vegetation to be disturbed is largely represented along the coastline and will have the opportunity to regenerate.	Major	Almost Certain	Very High	• Design consideration – Confirm presence/absence of threatened ecological communities/State/National listed species by conducting an ecological survey. • Minimise footprint of works as far as practicable. • Minimise machinery access along dune system (designate access tracks/paths for vehicle and machinery movements). • Rehabilitate disturbed areas.	High
	Potential impact on marine flora species within the coastal zone	The nearest seagrass communities are located near Victor Harbor in the North, and towards the southern end of the Coorong near Kingston. Construction of the pipeline, supporting infrastructure and breakwater will not occur within the vicinity of these sensitive receptors.	Minor	Unlikely	Low	• Minimise footprint of works as far as practicable.	Low
	Introduction of pest species	Potential for people, vehicles and machinery to introduce weed, pest species which could adversely affect the ecological character of the wetland.	Minor	Unlikely	Low	• Ensure all people, vehicles and machinery are clean and free of weeds/pests.	Low
	Fuels, chemicals, spills, and leaks	Potential for spills and leaks from machinery and vehicles to adversely affect sediment quality and in turn adversely affect terrestrial vegetation.	Minor	Unlikely	Low	• Ensure safe and effective fuel, oil and chemical storage and handling. • Implement spill and leak prevention and control techniques. • Ensure appropriate spill kits are available and provide training on kit use.	Low
Fauna	Disturbance / displacement to waterfowl and shorebird species	Construction activities (i.e. movements, noise) may temporarily displace shorebird species/waterfowl that utilise the site (State and Commonwealth EPBC threatened and migratory species such as Sanderlings, Sandpipers, Plovers, and waterfowl).	Moderate	Likely	High	• Carry out ecological assessment to identify and clearly delineate 'no go' zones. • Minimise machinery access along the coastal foreshore/beach area where possible. • Take care to prevent injury to native fauna as a result of vehicle movements and construction activities. • Time works to avoid key migratory shorebird periods (Spring/Summer) if practicable.	Medium
	Disturbance to benthic habitat communities during pipeline and breakwater installation	Installation of the breakwater and pipeline will impact benthic communities. Areas affected by pipeline works would be expected to recover quickly due to their ability to recolonise after disturbances.	Minor	Possible	Medium	• Minimise footprint of works as far as practicable.	Low
	Vessel interaction with marine fauna species	Potential boat strike associated with vessel movements in the open ocean marine environment and the waters of Coorong as pipeline segments are installed.	Moderate	Possible	Medium	• Impose vessel speed limits. • Vessels are to keep careful forward lookout for marine mammals that may be in the path to minimise risk of collision.	Low
	Introduction of pest species	Potential for people, vehicles, machinery, and vessels to introduce pest species which could adversely affect the ecological character of the wetland.	Minor	Unlikely	Low	• Ensure all people, vehicles and machinery are clean and free of weeds/pests.	Low
Noise	Increased ambient noise levels associated with vehicle and machinery movements, earthworks, and site access.	Increased noise levels are likely to temporarily effect terrestrial fauna species, particularly shorebirds and waterfowls which frequent the area.	Moderate	Likely	High	• Take all practical measures to minimise any noise generation at the site. • Limit all construction activities to within agreed works hours. • Turn noisy plant/machinery off when not in use.	Medium
Visual amenity	Impact of construction machinery on the natural visual amenity of the area	All equipment including vehicles and machinery will be visually present for the duration of works which will have an effect on the visual amenity of the area.	Insignificant	Unlikely	Low	• Vehicle access limited to designated access points and paths. • All machinery is to be well maintained and operated in accordance with manufacturer's specifications.	Low
Energy emissions	Emissions associated with typical construction activities	Temporary emissions from vehicle and machinery movements for the duration of construction activities.	Insignificant	Likely	Low	• Vehicle access limited to designated access points and path. • All machinery is to be well maintained and operated in accordance with manufacturer's specifications.	Low

Table 9 – Option 4B Continued

Environmental Aspect	Potential impacts	Description	Consequence	Likelihood	Risk	Mitigation measure	Residual Risk
OPERATION							
Coastal / Lake processes (Currents, tides, wind & wave conditions)	Potential alteration to currents within the Coorong	Discharge of hypersaline waters from the Coorong may increase flows from the north and marginally change the magnitude of currents experienced within the Coorong South Lagoon.	Minor	Possible	Medium	• Design consideration – Undertake modelling to confirm predicted flow velocities to be experienced in the Coorong South Lagoon.	Low
Marine processes (Currents, tides, wind & wave conditions)	Alteration to marine processes	The breakwater and pipeline in the marine environment may result in alterations to currents and sediment transport processes which may exacerbate erosion / accretion of the foreshore and beach area with potential long term effects on the dunal system.	Major	Likely	High	• Assess the potential for effects on sediment transport in the active beach zone and possible need for mitigation. • Minimise footprint of works as far as practicable.	High
Sediment characteristics	N/A	N/A – No mechanism to impact sediment characteristics during operation.	N/A	N/A	N/A	• N/A	N/A
Water quality	Potential alteration to water quality in Coorong	Intake of marine water to the Coorong and outfall of hypersaline waters to the marine environment may adversely affect water levels and quality in the Coorong South Lagoon if not appropriately managed.	Major	Possible	High	• Design consideration - Undertake modelling to confirm sufficient mixing of hypersaline discharge occurs within the near shore environment and similarly for intake of marine waters to the Coorong. • Monitor water quality in the Coorong. • Implement effective management of pump in and pump out processes.	Medium
	Hypersaline discharge to ocean waters	Without appropriate mixing, the input of hypersaline waters to the marine environment may result in stratification which would impact the ecological character of the marine environment (i.e. impacts on water quality, fish, seagrass, algae etc.).	Major	Almost Certain	Very High	• Design consideration – Undertake modelling to confirm sufficient mixing of hypersaline discharge occurs within the near shore environment.	Medium
Flora	Alteration to seagrass communities	Without appropriate mixing, the input of hypersaline waters to the marine environment may result in stratification which would impact the ecological character of the marine environment (i.e. impacts on water quality, fish, seagrass, algae etc.).	Minor	Possible	Low	• Design consideration – Undertake modelling to confirm sufficient mixing of hypersaline discharge occurs within the near shore environment.	Low
Fauna	Disturbance / displacement to waterfowl and shorebird species	The only noise generating aspect during operation will be the dry well pumping station. The pump station will be buried within the sand dune and therefore increases in noise levels from pump operations will largely be muffled within minimal impact on shorebirds and waterfowl that may frequent the area (State and Commonwealth EPBC threatened and migratory species such as Sanderlings, Sandpipers, Plovers).	Minor	Unlikely	Low	• Ensure all machinery and pumps are well maintained and effectively muffled. • Undertake regular maintenance of pumps.	Low
	Impact of passive pipeline intake on fish species within the Coorong	Potential for entrapment or impingement of fish species at intake.	Moderate	Unlikely	Medium	• Design consideration – Installation of fish screens to minimise impacts on fish species.	Low
	Potential impacts on marine species at the near shore discharge location	Discharge of hypersaline waters have the potential to impact recreational and commercial fisheries (i.e. mulloway, sharks, salmon, mullet, flathead, snapper, and the Goolwa Cockle) and benthic communities through alterations to water quality within the marine environment.	Major	Almost Certain	Very High	• Design consideration – Undertake modelling to confirm sufficient mixing of hypersaline discharge occurs within the near shore environment.	Medium
Noise	Increased noise associated with vehicle and machinery movements.	Infrequent, temporary, and intermittent noise sources associated with routine vehicle and machinery movements accessing the site will occur for routine maintenance activities which may disturb shorebirds/waterfowl that frequent the area.	Insignificant	Unlikely	Low	• Ensure all machinery and vehicles are well maintained and effectively muffled. • Time maintenance works to avoid key migratory shorebird periods (Spring/Summer) if practicable.	Low
Visual amenity	Alteration to the visual amenity values of the Coorong and marine environment	Breakwater very visible which would affect the natural amenity of the area. Pump station may also be visible.	Moderate	Likely	High	• Minimise footprint of works as far as practicable.	High
Energy, emissions	Operation of pumps and supply of energy source	Continual operation of pumps will be required. Suitable energy sources will be needed to operate the pump stations with installation of sub-sea cables and disturbance/clearing along existing corridors to either connect with the existing network, or the potential: • Development of a wind farm (varying between 7.5 ha and 240 ha depending on power demand) – potential impacts include clearing vegetation, noise, and adverse effects on wildlife and habitat, and visual amenity. • Development of a solar farm (varying between 0.6 ha and 20 ha depending on power demand) – potential impacts include clearing vegetation, adverse effects on wildlife and habitat, water consumption, visual amenity, and glare.	Major	Almost Certain	Very High	• Design consideration – Undertake further assessment of energy requirements and potential sources.	High

Table 10 Option 5A – Bi-directional pumped Southern Ocean connection – two locations, separate pumping stations, pump in location with caisson structure and pump out location with a near shore discharge structure: 350 ML/d into and out of Coorong South Lagoon allowing circulation of flows within Coorong South Lagoon

Environmental Aspect	Potential impacts	Description	Consequence	Likelihood	Risk	Mitigation measure	Residual Risk
CONSTRUCTION							
Coastal / Lake processes (Currents, tides, wind & wave conditions)	N/A	N/A – No mechanism for construction activities to adversely alter coastal/lake processes of the Coorong.	N/A	N/A	N/A	• N/A	N/A
Marine processes (Currents, tides, wind & wave conditions)	Alteration of sediment transport mechanisms	Construction of caisson and jetty structure within the near shore marine environment may temporarily alter current and sediment transport processes and affect erosion/accretion near the works.	Moderate	Possible	Medium	• Minimise footprint of works as far as practicable. • Minimise duration of works within the beach / near shore zone.	Low
Sediment characteristics	Mobilisation of sediment / erosion and sedimentation during pontoon and pipeline construction within the Coorong	Pontoon construction is likely to disturb intertidal sediments along the Coorong shoreline. There is the potential for this sediment to impact the waterway, resulting in a localised increased in turbidity / sediment resuspension with the potential to affect the aquatic habitats and Ramsar Wetland.	Moderate	Possible	Medium	• Minimise footprint of works as far as practicable. • Install temporary erosion controls. • Stage earthworks such that runoff from disturbed areas will be captured and treated by sediment control measures. • Progressive stabilisation of disturbed areas as soon as practicable. • Develop and implement an Erosion and Sediment Control Plan.	Low
	Direct disturbance of dune system and beach sediments for pipeline installation	Significant earthworks associated with pipeline installation through the dune system at two separate locations (Ramsar wetland), which is predominantly sand (extent of disturbance is dependent on construction methodology to be employed). Material will need to be excavated, stockpiled, reused where possible with any excess removed from site. These disturbances have the potential to transport sediment into the adjacent waterways, increasing turbidity levels/sediment resuspension and adversely affecting the aquatic and marine environments.	Major	Almost Certain	Very High	• Minimise footprint of works as far as practicable. • Install temporary erosion controls. • Stage earthworks such that runoff from disturbed areas will be captured and treated by the sediment control measures. • Management of material stockpiles. • Progressive stabilisation of disturbed dune system as soon as practicable. • Develop and implement an Erosion and Sediment Control Plan.	High
	Direct disturbance of seabed for construction of caisson and jetty structure and pipeline installation	Disturbance of the seabed will result in the resuspension of sediments which have the potential to adversely affect water quality and benthic communities within and surrounding the works area.	Major	Almost Certain	Very High	• Minimise footprint of works as far as practicable. • Minimise duration of works within the coastal zone.	High
	Disturbance of acid sulphate soils (ASS)	Earthworks within the dune system (Ramsar Wetland) may disturb ASS, which would require appropriate stockpiling, management, treatment, and disposal. If released to adjacent waterways, ASS may adversely affect the terrestrial and aquatic environments including vegetation, fauna species (i.e. fish) and benthic habitat communities. Based on the sediment characteristics of the dune (i.e. sand) there is a low likelihood of encountering ASS.	Moderate	Unlikely	Medium	• Assess and manage ASS in accordance with ASS guidelines. • Carry out validation testing of any treated material and monitor for ASS indication. • Ensure all fill materials brought to site are clean and free of any ASS.	Low
Water quality	Suspension of fine sediment in the water column	Installation of the pipeline, supporting infrastructure and caisson will result in a temporary localised increase in turbidity and suspended sediment levels. This can result in the formation of a suspended sediment plume and reduce sunlight penetration of the water column; however, works will be temporary with limited ability to reduce sunlight penetration as sediments predominantly consist of sand which settle out quickly within the water column.	Moderate	Possible	Medium	• Minimise disturbances and footprint of works as far as practicable. • Ensure all machinery and vessel movements are operating in the correct locations. • Conduct monitoring.	Low
	Potential for increased nutrients within the water column during construction activities.	Caisson, pontoon, jetty and beach discharge structure will result in the disturbance of sediments which may increase nutrient concentrations in the water column stimulating algal blooms and reducing the overall water quality of the system.	Moderate	Possible	Medium	• Minimise disturbances and footprint of works as far as practicable. • Conduct monitoring.	Low
	Waste generated during construction.	A variety of wastes are likely to be generated including general waste, construction materials, sewage waste, and hazardous wastes. If these were to be released to the Coorong or open ocean it would impact water quality and the marine/aquatic habitats they support.	Minor	Unlikely	Low	• All waste materials are to be appropriately contained, collected, and disposed of, without entering the waterway. • Any associated waste waters are to be appropriately contained and treated prior to any discharge.	Low
	Fuels, chemicals, spills, and leaks	Potential for spills and leaks from machinery and vehicles to adversely affect water quality and the aquatic environment.	Minor	Unlikely	Low	• Ensure safe and effective fuel, oil and chemical storage and handling. • Implement spill and leak prevention and control techniques. • Ensure appropriate spill kits are available and provide training on kit use.	Low
	Potential spread of marine pests	Potential for vessels to introduce pest species which could adversely affect the marine environment. The main mechanisms for marine pest introduction or spread include the translocation of pest species attached to vessel hulls or in niche areas of a vessel. The risk of this occurring is limited to those vessels which come from areas affected by marine pests, such as vessels from overseas countries.	Minor	Unlikely	Low	• Ensure all vessels are clean and sourced from within Australia.	Low

Table 10 – Options 5A continued

Environmental Aspect	Potential impacts	Description	Consequence	Likelihood	Risk	Mitigation measure	Residual Risk
Flora	Disturbance to coastal saltmarsh communities during pipe installation within Coorong	Construction activities associated with the pipeline installation will directly impact coastal saltmarsh communities (e.g. intertidal/estuarine sedges, samphire etc.) within the Coorong system.	Moderate	Almost Certain	High	- Minimise footprint of works as far as practicable. - Minimise machinery access. - Restore disturbed bed levels to pre-existing conditions.	Medium
	Disturbance of dunal vegetation during pipe installation	Direct disturbance of approximately 28 ha of dunal vegetation is likely to occur depending on construction methodologies employed. The dunal vegetation to be disturbed is largely represented along the coastline and will have the opportunity to regenerate.	Major	Almost Certain	Very High	- Design consideration – Confirm presence/absence of threatened ecological communities/State/National listed species by conducting an ecological survey. - Minimise footprint of works as far as practicable. - Minimise machinery access along dune system (designate access tracks/paths for vehicle and machinery movements). - Rehabilitate disturbed areas.	High
	Potential impact on marine flora species within the near shore coastal zone	The nearest seagrass communities are located near Victor Harbor in the North, and towards the southern end of the Coorong near Kingston. Construction of the pipeline, supporting infrastructure and caisson will not occur within the vicinity of these sensitive receptors.	Minor	Unlikely	Low	- Minimise footprint of works as far as practicable.	Low
	Introduction of pest species (e.g. weeds)	Potential for people, vehicles, machinery, and vessels to introduce pest species which could adversely affect the ecological character of the wetland.	Minor	Possible	Low	- Ensure all people, vehicles and machinery are clean and free of weeds/pests.	Low
	Fuels, chemicals, spills, and leaks	Potential for spills and leaks from machinery and vehicles to adversely affect sediment quality and in turn adversely affect terrestrial vegetation.	Minor	Possible	Low	- Ensure safe and effective fuel, oil and chemical storage and handling. - Implement spill and leak prevention and control techniques. - Ensure appropriate spill kits are available and provide training on kit use.	Low
Fauna	Disturbance / displacement to waterfowl and shorebird species	Construction activities (i.e. movements, noise) may temporarily displace shorebird species/waterfowl that utilise the site (State and Commonwealth EPBC threatened and migratory species such as Sanderlings, Sandpipers, Plovers, and waterfowl).	Moderate	Likely	High	- Carry out ecological assessment to identify and clearly delineate 'no go' zones. - Minimise machinery access along the coastal foreshore/beach area where possible. - Take care to prevent injury to native fauna as a result of vehicle movements and construction activities. - Time works to avoid key migratory shorebird periods if practicable.	Medium
	Disturbance to benthic habitat communities during caisson and jetty construction	Construction of the jetty and caisson will temporarily impact benthic communities; however these would be expected to recover quickly due to their ability to recolonise after disturbances.	Minor	Possible	Medium	- Minimise footprint of works as far as practicable.	Low
	Underwater noise and vibration resulting in the displacement of marine fauna species	Caisson construction and piling activities associated with the jetty structure will result in underwater noise and vibration, which may impact marine fauna species, such as fish, mammals, and other transient species including whales which are known to pass through the area, but not rely on it for breeding/calving purposes. These activities will be temporary and intermittent during construction.	Moderate	Almost Certain	High	- Undertake marine megafauna observations prior to and during pile installation works and caisson construction. - Establish an observation zone around pilling activities. - Gradually ramp up pile driving equipment to allow mobile species to move away from the works area. - Interrupt the impact pile driving activity when a marine species is within close proximity to the piling or caisson works.	Medium
	Vessel interaction with marine fauna species	Potential boat strike associated with vessel movements in the open ocean marine environment and the waters of Coorong as structures are built and pipeline segments are installed.	Moderate	Possible	Medium	- Impose vessel speed limits. - Vessels are to keep careful forward lookout for marine mammals that may be in the path to minimise risk of collision.	Low
	Introduction of marine pest species	Potential for machinery, and vessels to introduce pest species which could adversely affect the ecological character of the wetland.	Minor	Unlikely	Low	- Ensure all vessels and machinery are clean and free of pests.	Low
Noise	Increased ambient noise levels associated with vehicle and machinery movements, earthworks, and site access.	Increased noise levels may temporarily affect terrestrial fauna species, particularly shorebirds and waterfowls which frequent the area.	Moderate	Likely	High	- Take all practical measures to minimise any noise generation at the site. - Limit all construction activities to within agreed works hours. - Turn noisy plant/machinery off when not in use. - Time works to avoid key migratory shorebird periods if practicable.	Medium
Visual amenity	Impact of construction machinery on the natural visual amenity of the area	Equipment including vehicles, vessels and machinery will be visually present for the duration of works which will have a temporary effect on the visual amenity of the area.	Insignificant	Unlikely	Low	- Vehicle access limited to designated access points and paths. - All machinery is to be well maintained and operated in accordance with manufacturer's specifications.	Low

Table 10 – Option 5A Continued

Environmental Aspect	Potential impacts	Description	Consequence	Likelihood	Risk	Mitigation measure	Residual Risk
Energy, emissions	Emissions associated with typical construction activities (vehicle and machinery movements)	Temporary emissions for the duration of construction activities.	Insignificant	Likely	Low	• Vehicle access limited to designated access points and path. • All machinery is to be well maintained and operated in accordance with manufacturer's specifications.	Low
OPERATION							
Coastal / Lake processes (Currents, tides, wind & wave conditions	Potential alteration to currents within the Coorong	Discharge of hypersaline waters from the Coorong may increase flows from the north and marginally change the magnitude of currents and water levels experienced within the Coorong South Lagoon.	Minor	Possible	Medium	• Design consideration – Assess the potential for changes to flow velocities in the Coorong South Lagoon.	Low
Marine processes (Currents, tides, wind & wave conditions)	Alteration to marine processes	The caisson and jetty structures have some potential to affect currents and sediment transport processes which may affect erosion / accretion of the foreshore and beach zone.	Severe	Likely	High	• Minimise footprint of works as far as practicable. • Consider coastal processes in Jetty design.	Medium
Sediment characteristics	N/A	N/A – No mechanism to impact sediment characteristics during operation.	N/A	N/A	N/A	• N/A	N/A
Water quality	Potential alteration to water quality in Coorong	Intake of marine water to the Coorong and outfall of hypersaline waters to the marine environment may adversely affect water levels and quality in the Coorong South Lagoon if not appropriately managed.	Major	Possible	High	• Design consideration - Undertake modelling to confirm sufficient mixing of hypersaline discharge occurs within the near shore environment and similarly for intake of marine waters to the Coorong. • Monitor water quality in the Coorong. • Implement effective management of pump in and pump out processes.	Medium
	Hypersaline discharge to ocean waters	Without appropriate mixing, the outfall of hypersaline waters to the marine environment may result in stratification which would impact the ecological character of the marine environment (i.e. impacts on water quality, fish, seagrass, algae etc.).	Major	Possible	High	• Design consideration – Undertake modelling to confirm sufficient mixing of hypersaline discharge occurs within the near shore environment.	Medium
Flora	Alteration to seagrass communities	Discharge of hypersaline waters within the vicinity of the outfall location may alter the physiology of seagrass. However, the nearest seagrass communities are located near Victor Harbor in the North, and towards the southern end of the Coorong near Kingston and there are no known seagrass communities within proximity to the near shore discharge location.	Minor	Unlikely	Low	• Design consideration – Undertake modelling to confirm sufficient mixing of hypersaline discharge occurs within the near shore environment.	Low
Fauna	Disturbance / displacement to waterfowl and shorebird species	Continual operation of pumps will result in an overall increase in ambient noise levels which will impact terrestrial fauna species, particularly shorebirds and waterfowls which frequent the area (State and Commonwealth EPBC threatened and migratory species such as Sanderlings, Sandpipers, Plovers).	Major	Almost Certain	Very High	• Ensure all machinery and pumps are well maintained and effectively muffled. • Undertake regular maintenance of pumps.	High
	Impact of passive pipeline intake on fish species within the Coorong	Potential for entrapment or impingement of fish species at passive pipeline intakes.	Moderate	Likely	High	• Design consideration – Installation of fish screens to minimise impacts on fish species.	Medium
	Potential impacts on marine species at the near shore discharge location	Discharge of hypersaline waters have the potential to impact recreational and commercial fisheries (i.e. mulloway, sharks, salmon, mullet, flathead, snapper, and the Goolwa Cockle) and benthic communities through alterations to water quality within the marine environment.	Major	Almost Certain	Very High	• Design consideration – Undertake modelling to confirm sufficient mixing of hypersaline discharge occurs within the near shore environment.	High
Noise	Increased noise associated with vehicle and machinery movements	Infrequent, temporary, and intermittent noise sources associated with routine vehicle and machinery movements accessing the site will occur for routine maintenance activities which may disturb shorebirds/waterfowl that frequent the area.	Minor	Almost Certain	Medium	• Ensure all machinery and pumps are well maintained and effectively muffled. • Time maintenance works to avoid key migratory shorebird periods (Spring/Summer) if practicable.	Low
Visual amenity	Alteration to the visual amenity values of the Coorong and marine environment	Large permanent structures, including the pontoon, segments of pipeline, the jetty structures and caisson will be visible and will alter the natural amenity of the coastline.	Major	Almost Certain	Very High	• Minimise footprint of works as far as practicable.	Very High
Energy, emissions	Emissions associated with routine maintenance activities	Continual operation of pumps will be required. Suitable energy sources will be needed to operate the pump stations with installation of sub-sea cables and disturbance/clearing along existing corridors/road access/laydown areas to either connect with the existing network, or the potential: • Development of a wind farm (varying between 7.5 ha and 240 ha depending on power demand) – additional impacts may include clearing vegetation, noise, adverse effects on wildlife and habitat, and visual amenity. • Development of a solar farm varying between 0.6 ha and 20 ha depending on power demand) – additional impacts may include clearing vegetation, adverse effects on wildlife and habitat, water consumption, visual amenity, and glare.	Major	Almost Certain	Very High	• Design consideration – Undertake further assessment of energy requirements and potential sources.	High

Table 11 Option 5B – Bi-directional pumped Southern Ocean connection – two locations, separate pumping stations, pump in location with caisson structure and pump out location with a low visual impact discharge structure: 350 ML/d into and out of Coorong South Lagoon allowing circulation of flows within Coorong South Lagoon

Environmental Aspect	Potential impacts	Description	Consequence	Likelihood	Risk	Mitigation measure	Residual Risk
CONSTRUCTION							
Coastal / Lake processes (Currents, tides, wind & wave conditions)	N/A	N/A – No mechanism for construction activities to adversely alter coastal/lake processes of the Coorong.	N/A	N/A	N/A	• N/A	N/A
Marine processes (Currents, tides, wind & wave conditions)	Alteration of sediment transport mechanisms	Construction of caisson and jetty structure within the near shore marine environment may temporarily alter current and sediment transport processes and affect erosion/accretion near the works. Works associated with construction of beach discharge structure may alter sediment transport processes and exacerbate erosion/accretion of foreshore and beach area.	Moderate	Possible	Medium	• Minimise footprint of works as far as practicable. • Minimise duration of works within the beach / near shore zone.	Low
Sediment characteristics	Mobilisation of sediment / erosion and sedimentation during pontoon and pipeline construction within the Coorong	Pontoon construction is likely to disturb intertidal sediments along the Coorong shoreline. There is the potential for this sediment to impact the waterway, resulting in a localised increased in turbidity / sediment resuspension with the potential to affect the aquatic habitats and Ramsar Wetland.	Moderate	Possible	Medium	• Minimise footprint of works as far as practicable. • Install temporary erosion controls. • Stage earthworks such that runoff from disturbed areas will be captured and treated by sediment control measures. • Progressive stabilisation of disturbed areas as soon as practicable. • Develop and implement an Erosion and Sediment Control Plan.	Low
	Direct disturbance of dune system and beach sediments for pipeline installation	Significant earthworks associated with pipeline installation through the dune system at two separate locations (Ramsar wetland), which is predominantly sand (extent of disturbance is dependent on construction methodology to be employed). Material will need to be excavated, stockpiled, reused where possible with any excess removed from site. These disturbances have the potential to transport sediment into the adjacent waterways, increasing turbidity levels / sediment resuspension and adversely affecting the aquatic and marine environments.	Major	Almost Certain	Very High	• Minimise footprint of works as far as practicable. • Install temporary erosion controls. • Stage earthworks such that runoff from disturbed areas will be captured and treated by the sediment control measures. • Management of material stockpiles. • Progressive stabilisation of disturbed dune system as soon as practicable. • Develop and implement an Erosion and Sediment Control Plan.	High
	Direct disturbance of seabed for construction of caisson and jetty structure and pipeline installation	Disturbance of the seabed will result in the resuspension of sediments which have the potential to adversely affect water quality and benthic communities within and surrounding the works area.	Major	Almost Certain	Very High	• Minimise footprint of works as far as practicable. • Minimise duration of works within the coastal zone.	High
	Disturbance of acid sulphate soils (ASS)	Earthworks within the dune system (Ramsar Wetland) may disturb ASS, which would require appropriate stockpiling, management, treatment, and disposal. If released to adjacent waterways, ASS may adversely affect the terrestrial and aquatic environments including vegetation, fauna species (i.e. fish) and benthic habitat communities. Based on the sediment characteristics of the dune (i.e. sand) there is a low likelihood of encountering ASS.	Moderate	Unlikely	Medium	• Assess and manage ASS in accordance with ASS guidelines. • Carry out validation testing of any treated material and monitor for ASS indications. • Ensure all fill materials brought to site are clean and free of any ASS.	Low
Water quality	Suspension of fine sediment in the water column	Installation of the pipeline, supporting infrastructure and caisson will result in a temporary localised increase in turbidity and suspended sediment levels. This can result in the formation of a suspended sediment plume and reduce sunlight penetration of the water column; however, works will be temporary with limited ability to reduce sunlight penetration as sediments predominantly consist of sand which settle out quickly within the water column.	Moderate	Possible	Medium	• Minimise disturbances and footprint of works as far as practicable. • Ensure all machinery and vessel movements are operating in the correct locations. • Conduct monitoring.	Low
	Potential for increased nutrients within the water column during construction activities.	Caisson, pontoon, jetty and beach discharge structure will result in the disturbance of sediments which may increase nutrient concentrations in the water column stimulating algal blooms and reducing the overall water quality of the system.	Moderate	Possible	Medium	• Minimise disturbances and footprint of works as far as practicable. • Conduct monitoring.	Low
	Waste generated during construction.	A variety of wastes are likely to be generated including general waste, construction materials, sewage waste, and hazardous wastes. If these were to be released to the Coorong or open ocean it would impact water quality and the marine/aquatic habitats they support.	Minor	Unlikely	Low	• All waste materials are to be appropriately contained, collected, and disposed of, without entering the waterway. • Any associated waste waters are to be appropriately contained and treated prior to any discharge.	Low
	Fuels, chemicals, spills, and leaks	Potential for spills and leaks from machinery and vehicles to adversely affect water quality and the aquatic environment.	Minor	Unlikely	Low	• Ensure safe and effective fuel, oil and chemical storage and handling. • Implement spill and leak prevention and control techniques. • Ensure appropriate spill kits are available and provide training on kit use.	Low
	Potential spread of marine pests	Potential for vessels to introduce pest species which could adversely affect the marine environment. The main mechanisms for marine pest introduction or spread include the translocation of pest species attached to vessel hulls or in niche areas of a vessel. The risk of this occurring is limited to those vessels which come from areas affected by marine pests, such as vessels from overseas countries.	Minor	Unlikely	Low	• Ensure all vessels are clean and sourced from within Australia.	Low

Table 11 – Options 5B Continued

Environmental Aspect	Potential impacts	Description	Consequence	Likelihood	Risk	Mitigation measure	Residual Risk
Flora	Disturbance to coastal saltmarsh communities during pipe installation within Coorong	Construction activities associated with the pipeline installation will directly impact coastal saltmarsh communities (e.g. intertidal / estuarine sedges, samphire etc.) within the Coorong system.	Moderate	Almost Certain	High	• Minimise footprint of works as far as practicable. • Minimise machinery access. • Restore disturbed bed levels to pre-existing conditions.	Medium
	Disturbance of dunal vegetation during pipe installation	Direct disturbance of approximately 27 ha of dunal vegetation is likely to occur depending on construction methodologies employed. The dunal vegetation to be disturbed is largely represented along the coastline and will have the opportunity to regenerate.	Major	Almost Certain	Very High	• Design consideration – Confirm presence/absence of threatened ecological communities/State/National listed species by conducting an ecological survey. • Minimise footprint of works as far as practicable. • Minimise machinery access along dune system (designate access tracks/paths for vehicle and machinery movements). • Rehabilitate disturbed areas.	High
	Potential impact on marine flora species within the near shore coastal zone	The nearest seagrass communities are located near Victor Harbor in the North, and towards the southern end of the Coorong near Kingston. Construction of the pipeline, supporting infrastructure and caisson will not occur within the vicinity of these sensitive receptors.	Minor	Unlikely	Low	• Minimise footprint of works as far as practicable.	Low
	Introduction of pest species (e.g. Weeds)	Potential for people, vehicles, machinery, and vessels to introduce pest species which could adversely affect the ecological character of the wetland.	Minor	Possible	Low	• Ensure all people, vehicles and machinery are clean and free of weeds/pests.	Low
	Fuels, chemicals, spills, and leaks	Potential for spills and leaks from machinery and vehicles to adversely affect sediment quality and in turn adversely affect terrestrial vegetation.	Minor	Possible	Low	• Ensure safe and effective fuel, oil and chemical storage and handling. • Implement spill and leak prevention and control techniques. • Ensure appropriate spill kits are available and provide training on kit use.	Low
Fauna	Disturbance / displacement to waterfowl and shorebird species	Construction activities (i.e. movements, noise) may temporarily displace shorebird species/waterfowl that utilise the site (State and Commonwealth EPBC threatened and migratory species such as Sanderlings, Sandpipers, Plovers, and waterfowl).	Moderate	Likely	High	• Carry out ecological assessment to identify and clearly delineate 'no go' zones. • Minimise machinery access along the coastal foreshore / beach area where possible. • Take care to prevent injury to native fauna as a result of vehicle movements and construction activities. • Time works to avoid key migratory shorebird periods if practicable.	Medium
	Disturbance to benthic habitat communities during caisson and jetty construction	Construction of the jetty and caisson will temporarily impact benthic communities; however these would be expected to recover quickly due to their ability to recolonise after disturbances.	Minor	Possible	Medium	• Minimise footprint of works as far as practicable.	Low
	Underwater noise and vibration resulting in the displacement of marine fauna species	Caisson construction and piling activities associated with the jetty structure will result in underwater noise and vibration, which may impact marine fauna species, such as fish, mammals, and other transient species including whales which are known to pass through the area, but not rely on it for breeding/calving purposes. These activities will be temporary and intermittent during construction.	Moderate	Almost Certain	High	• Undertake marine megafauna observations prior to and during pile installation works and caisson construction. • Establish an observation zone around pilling activities. • Gradually ramp up pile driving equipment to allow mobile species to move away from the works area. • Interrupt the impact pile driving activity when a marine species is within close proximity to the piling or caisson works.	Medium
	Vessel interaction with marine fauna species	Potential boat strike associated with vessel movements in the open ocean marine environment and the waters of Coorong as structures are built and pipeline segments are installed.	Moderate	Possible	Medium	• Impose vessel speed limits. • Vessels are to keep careful forward lookout for marine mammals that may be in the path to minimise risk of collision.	Low
	Introduction of marine pest species	Potential for machinery and vessels to introduce pest species which could adversely affect the ecological character of the wetland.	Minor	Unlikely	Low	• Ensure all vessels and machinery are clean and free of pests.	Low
Noise	Increased ambient noise levels associated with vehicle and machinery movements, earthworks, and site access.	Increased noise levels may temporarily affect terrestrial fauna species, particularly shorebirds and waterfowls which frequent the area.	Moderate	Likely	High	• Take all practical measures to minimise any noise generation at the site. • Limit all construction activities to within agreed works hours. • Turn noisy plant/machinery off when not in use. • Time works to avoid key migratory shorebird periods if practicable.	Medium
Visual amenity	Impact of construction machinery on the natural visual amenity of the area	Equipment including vehicles, vessels and machinery will be visually present for the duration of works which will have a temporary effect on the visual amenity of the area.	Insignificant	Unlikely	Low	• Vehicle access limited to designated access points and paths. • All machinery is to be well maintained and operated in accordance with manufacturer's specifications.	Low

Table 11 – Options 5B Continued

Environmental Aspect	Potential impacts	Description	Consequence	Likelihood	Risk	Mitigation measure	Residual Risk
Energy, emissions	Emissions associated with typical construction activities (vehicle and machinery movements)	Temporary emissions for the duration of construction activities.	Insignificant	Likely	Low	• Vehicle access limited to designated access points and path. • All machinery is to be well maintained and operated in accordance with manufacturer's specifications.	Low
OPERATION							
Coastal / Lake processes (Currents, tides, wind & wave conditions	Potential alteration to currents within the Coorong	Discharge of hypersaline waters from the Coorong may increase flows from the north and marginally change the magnitude of currents and water levels experienced within the Coorong South Lagoon.	Minor	Possible	Medium	• Design consideration – Assess the potential for changes to flow velocities in the Coorong South Lagoon.	Low
Marine processes (Currents, tides, wind & wave conditions)	Alteration to marine processes	The caisson and jetty structures have some potential to affect currents and sediment transport processes which may affect erosion / accretion of the foreshore and beach zone.	Severe	Likely	High	• Minimise footprint of works as far as practicable. • Consider coastal processes in Jetty design.	Medium
Sediment characteristics	N/A	N/A – No mechanism to impact sediment characteristics during operation.	N/A	N/A	N/A	• N/A	N/A
Water quality	Potential alteration to water quality in Coorong	Intake of marine water to the Coorong and outfall of hypersaline waters to the marine environment may adversely affect water levels and quality in the Coorong South Lagoon if not appropriately managed.	Major	Possible	High	• Design consideration - Undertake modelling to confirm sufficient mixing of hypersaline discharge occurs within the near shore environment and similarly for intake of marine waters to the Coorong. • Monitor water quality in the Coorong. • Implement effective management of pump in and pump out processes.	Medium
	Hypersaline discharge to ocean waters	Without appropriate mixing, the outfall of hypersaline waters to the marine environment may result in stratification which would impact the ecological character of the marine environment (i.e. impacts on water quality, fish, seagrass, algae etc.).	Major	Possible	High	• Design consideration – Undertake modelling to confirm sufficient mixing of hypersaline discharge occurs within the near shore environment.	Medium
Flora	Alteration to seagrass communities	Discharge of hypersaline waters within the vicinity of the outfall location may alter the physiology of seagrass. However the nearest seagrass communities are located near Victor Harbor in the North, and towards the southern end of the Coorong near Kingston SE and there are no known seagrass communities within proximity to the beach discharge structure.	Minor	Unlikely	Low	• Design consideration – Undertake modelling to confirm sufficient mixing of hypersaline discharge occurs within the near shore environment.	Low
Fauna	Disturbance / displacement to waterfowl and shorebird species	Continual operation of pumps will result in an overall increase in ambient noise levels which will impact terrestrial fauna species, particularly shorebirds and waterfowls which frequent the area (State and Commonwealth EPBC threatened and migratory species such as Sanderlings, Sandpipers, Plovers). The permanent beach discharge structure will also disturb and displace those shorebird species which utilise the beach and foreshore area (State and Commonwealth EPBC threatened and migratory species such as Sanderlings, Sandpipers, Plovers).	Major	Almost Certain	Very High	• Ensure all machinery and pumps are well maintained and effectively muffled. • Undertake regular maintenance of pumps.	High
	Impact of passive pipeline intake on fish species within the Coorong	Potential for entrapment or impingement of fish species at passive pipeline intakes.	Moderate	Likely	High	• Design consideration – Installation of fish screens to minimise impacts on fish species.	Medium
	Potential impacts on marine species at the near shore discharge location	Discharge of hypersaline waters have the potential to impact recreational and commercial fisheries (i.e. mulloway, sharks, salmon, mullet, flathead, snapper, and the Goolwa Cockle) and benthic communities through alterations to water quality within the marine environment.	Major	Almost Certain	Very High	• Design consideration – Undertake modelling to confirm sufficient mixing of hypersaline discharge occurs within the near shore environment.	High
Noise	Increased noise associated with vehicle and machinery movements	Infrequent, temporary, and intermittent noise sources associated with routine vehicle and machinery movements accessing the site will occur for routine maintenance activities which may disturb shorebirds/waterfowl that frequent the area.	Minor	Almost Certain	Medium	• Ensure all machinery and pumps are well maintained and effectively muffled. • Time maintenance works to avoid key migratory shorebird periods (Spring/Summer) if practicable.	Low
Visual amenity	Alteration to the visual amenity values of the Coorong and marine environment	Large permanent structures, including the pontoon, segments of pipeline, the jetty structures and caisson will be visible and will alter the natural amenity of the coastline. Some reduction of visual prominence by replacement of one Jetty with beach discharge.	Major	Almost Certain	Very High	• Minimise footprint of works as far as practicable.	High
Energy, emissions	Emissions associated with routine maintenance activities	Continual operation of pumps will be required. Suitable energy sources will be needed to operate the pump stations with installation of sub-sea cables and disturbance/clearing along existing corridors/road access/laydown areas to either connect with the existing network, or the potential: • Development of a wind farm (varying between 7.5 ha and 240 ha depending on power demand) – additional impacts may include clearing vegetation, noise, adverse effects on wildlife and habitat, and visual amenity. • Development of a solar farm (varying between 0.6 ha and 20 ha depending on power demand) – additional impacts may include clearing vegetation, adverse effects on wildlife and habitat, water consumption, visual amenity, and glare.	Major	Almost Certain	Very High	• Design consideration – Undertake further assessment of energy requirements and potential sources.	High

Table 12 Option 6 – Bi-directional passive piped connection into and out of Coorong South Lagoon: Varying flow rate driven by differing water levels between Coorong South Lagoon and Southern Ocean to a near shore ocean location protected by breakwater

Environmental Aspect	Potential impacts	Description	Consequence	Likelihood	Risk	Mitigation measure	Residual Risk
CONSTRUCTION							
Coastal / Lake processes (Currents, tides, wind & wave conditions)	N/A	N/A – No mechanism for construction activities to adversely alter coastal/lake processes of the Coorong.	N/A	N/A	N/A	• N/A	N/A
Marine processes (Currents, tides, wind & wave conditions)	Alteration of sediment transport mechanisms	Construction of the near shore ocean pipeline and breakwater may alter current and sediment transport processes and exacerbate erosion/accretion along the coastline.	Minor	Possible	Medium	• Minimise footprint of works as far as practicable. • Minimise duration of works within the beach / near shore zone.	Low
Sediment characteristics	Mobilisation of sediment/erosion and sedimentation during pipeline installation within the Coorong	Pipeline installation is likely to disturb intertidal sediments along the Coorong shoreline. There is the potential for this sediment to impact the waterway, resulting in a localised increase in turbidity / sediment resuspension with the potential to affect the aquatic habitats and Ramsar Wetland.	Moderate	Possible	Medium	• Minimise footprint of works as far as practicable. • Install temporary erosion controls. • Stage earthworks such that runoff from disturbed areas will be captured and treated by sediment control measures. • Progressive stabilisation of disturbed areas as soon as practicable. • Develop and implement an Erosion and Sediment Control Plan.	Low
	Direct disturbance of dune system and beach sediments during pipeline installation	Significant earthworks associated with the installation of 15 deep water ocean pipelines through the dune system (Ramsar wetland), which is predominantly sand (extent of disturbance is dependent on construction methodology to be employed). Material will need to be excavated, stockpiled, reused where possible with any excess removed from site. These disturbances have the potential to transport sediment into the adjacent waterways, increasing turbidity levels / sediment resuspension and adversely affecting the aquatic and marine environments.	Major	Almost Certain	Very High	• Minimise footprint of works as far as practicable. • Install temporary erosion controls. • Stage earthworks such that runoff from disturbed areas will be captured and treated by the sediment control measures. • Management of material stockpiles. • Progressive stabilisation of disturbed dune system as soon as practicable. • Develop and implement an Erosion and Sediment Control Plan.	High
	Direct disturbance of seabed for construction of breakwater and pipeline installation	Disturbance of the seabed will result in the resuspension of sediments which have the potential to adversely affect water quality and benthic communities within and surrounding the works area.	Major	Almost Certain	Very High	• Minimise footprint of works as far as practicable. • Minimise duration of works within the coastal zone.	High
	Disturbance of acid sulphate soils (ASS)	Earthworks within the dune system (Ramsar Wetland) may disturb ASS, which would require appropriate assessment and management. If not managed effectively, ASS may adversely affect the terrestrial and aquatic environments. Based on the sediment characteristics of the dune (i.e. sand) there is a low likelihood of encountering ASS.	Moderate	Unlikely	Medium	• Assess and manage ASS in accordance with ASS guidelines. • If any material is showing signs of ASS indicators, undertake periodic 'test as you go' sampling and field testing.	Low
Water quality	Suspension of fine sediment in the water column	Installation of the pipeline infrastructure and breakwater will result in a temporary localised increase in turbidity and suspended sediment levels. This can result in the formation of a suspended sediment plume and reduce sunlight penetration of the water column; however, works will be temporary with limited ability to reduce sunlight penetration as sediments predominantly consist of sand which settle out quickly within the water column.	Moderate	Possible	Medium	• Minimise disturbances and footprint of works as far as practicable. • Ensure all machinery and vessel movements are operating in the correct locations. • Conduct visual monitoring.	Low
	Potential for increased nutrients within the water column	Breakwater construction and pipeline installation will result in the temporary disturbance of sediments which may increase nutrient concentrations in the water column stimulating algal blooms and reducing the overall water quality of the system.	Moderate	Possible	Medium	• Minimise disturbances and footprint of works as far as practicable. • Conduct visual monitoring.	Low
	Waste generated during construction	A variety of wastes are likely to be generated including general waste, construction materials, and hazardous wastes. If these were to be released to the Coorong or open ocean it would impact water quality and the marine/aquatic habitats they support.	Minor	Unlikely	Low	• All waste materials are to be appropriately contained, collected, and disposed of, without entering the waterway. • Any associated waste waters are to be appropriately contained and treated prior to any discharge.	Low
	Fuels, chemicals, spills, and leaks	Potential for spills and leaks from machinery and vehicles to adversely affect water quality and the aquatic environment.	Minor	Unlikely	Low	• Ensure safe and effective fuel, oil and chemical storage and handling. • Implement spill and leak prevention and control techniques. • Ensure appropriate spill kits are available and provide training on kit use.	Low
	Potential spread of marine pests	Potential for vessels to introduce pest species which could adversely affect the marine environment. The main mechanisms for marine pest introduction or spread include the translocation of pest species attached to vessel hulls or in niche areas of a vessel. The risk of this occurring is limited to those vessels which come from areas affected by marine pests, such as vessels from overseas countries.	Minor	Unlikely	Low	• Ensure all vessels are clean and sourced from within Australian waters.	Low

Table 12 – Option 6 Continued

Environmental Aspect	Potential impacts	Description	Consequence	Likelihood	Risk	Mitigation measure	Residual Risk
Flora	Disturbance to coastal saltmarsh communities during pipe installation within Coorong	Construction activities associated with the pipeline installation will directly impact coastal saltmarsh communities (e.g. intertidal / estuarine sedges, samphire etc.) within the Coorong system.	Moderate	Almost Certain	High	• Minimise footprint of works as far as practicable. • Minimise machinery access. • Restore disturbed bed levels to pre-existing levels. (Survey before/after, replace material by side casting, bed leveling).	Medium
	Disturbance of dunal vegetation during pipe installation	Substantial disturbance of approximately 16 ha of dunal vegetation is likely to occur depending on construction methodologies employed. The dunal vegetation to be disturbed is largely represented along the coastline and will have the opportunity to regenerate.	Major	Almost Certain	Very High	• Design consideration – Confirm presence/absence of threatened ecological communities/State/National listed species by conducting an ecological survey. • Minimise footprint of works as far as practicable. (Refine design to avoid high value areas). • Minimise machinery access along dune system (designate access tracks/paths for vehicle and machinery movements). • Rehabilitate disturbed areas.	High
	Potential impact on marine flora species within the coastal zone	The nearest seagrass communities are located near Victor Harbor in the North, and towards the southern end of the Coorong near Kingston. Construction of the near shore ocean connection pipelines and breakwater will not occur within the vicinity of these sensitive receptors.	Minor	Unlikely	Low	• Minimise footprint of works as far as practicable.	Low
	Introduction of pest species	Potential for people, vehicles, machinery, and vessels to introduce weed/pest species which could adversely affect the ecological character of the wetland.	Minor	Unlikely	Low	• Ensure all people, vehicles and machinery are clean and free of weeds/pests.	Low
	Fuels, chemicals, spills, and leaks	Potential for spills and leaks from machinery and vehicles to adversely affect sediment quality and in turn adversely affect terrestrial vegetation.	Minor	Unlikely	Low	• Ensure safe and effective fuel, oil and chemical storage and handling. • Implement spill and leak prevention and control techniques. • Ensure appropriate spill kits are available and provide training on kit use.	Low
Fauna	Disturbance / displacement to waterfowl and shorebird species	Construction activities (i.e. movements, noise) may temporarily displace shorebird species/waterfowl that utilise the site (State and Commonwealth EPBC threatened and migratory species such as Sanderlings, Sandpipers, Plovers, and waterfowl).	Moderate	Likely	High	• Carry out ecological assessment to identify and clearly delineate 'no go' zones. • Minimise machinery access along the coastal foreshore/beach area where possible. • Take care to prevent injury to native fauna as a result of vehicle movements and construction activities. • Time works to avoid key migratory shorebird periods (Spring/Summer) if practicable.	Medium
	Disturbance to benthic habitat communities during breakwater and pipeline installation	Installation of the deep water ocean pipelines will temporarily impact benthic communities; however these would be expected to recover quickly due to their ability to recolonise after disturbances. Breakwater will result in permanent change.	Minor	Possible	Medium	• Minimise footprint of works as far as practicable. • Minimise machinery movements.	Low
	Vessel interaction with marine fauna species	Potential boat strike associated with vessel movements in the open ocean marine environment and the waters of Coorong as pipeline segments are installed.	Moderate	Possible	Medium	• Impose vessel speed limits. • Vessels are to keep careful forward lookout for marine mammals that may be in the path to minimise risk of collision.	Low
	Introduction of pest species	Potential for people, vehicles, machinery, and vessels to introduce pest species which could adversely affect the ecological character of the wetland.	Minor	Unlikely	Low	• Ensure all people, vehicles and machinery are clean and free of weeds/pests.	Low
Noise	Increased ambient noise levels associated with vehicle and machinery movements, earthworks, and site access	Increased noise levels may temporarily affect terrestrial fauna species, particularly shorebirds and waterfowls which frequent the area.	Moderate	Likely	High	• Take all practical measures to minimise any noise generation at the site. • Limit all construction activities to within agreed works hours. • Turn noisy plant/machinery off when not in use. • Time works to avoid key migratory shorebird periods (Spring/Summer) if practicable.	Medium
Visual amenity	Impact of construction machinery on the natural visual amenity of the area	All equipment including vehicles, vessels and machinery will be visually present for the duration of works which will have an effect on the visual amenity of the area.	Insignificant	Unlikely	Low	• Vehicle access limited to designated access points and paths. • All machinery is to be well maintained and operated in accordance with manufacturer's specifications.	Low
Energy, emissions	Emissions associated with typical construction activities	Temporary emissions from vehicle and machinery movements for the duration of construction activities.	Insignificant	Unlikely	Low	• Vehicle access limited to designated access points and path. • All machinery is to be well maintained and operated in accordance with manufacturer's specifications.	Low
OPERATION							
Coastal / Lake processes (Currents, tides, wind & wave conditions)	Potential alteration to currents within the Coorong	Discharge of hypersaline waters from the Coorong and intake of marine water from the ocean may increase flows and marginally change the magnitude of currents experienced within the Coorong South Lagoon.	Minor	Possible	Medium	• Design consideration – Undertake modelling to confirm predicted flow velocities to be experienced in the Coorong South Lagoon.	Low

Table 12 – Option 6 Continued

Environmental Aspect	Potential impacts	Description	Consequence	Likelihood	Risk	Mitigation measure	Residual Risk
Marine processes (Currents, tides, wind & wave conditions)	Alteration to marine processes	The breakwater structure will result in alterations to currents and sediment transport processes which may exacerbate erosion / accretion of the foreshore and beach area with potential long term erosion/accretion of the coastline and dunal system.	Severe	Likely	High	• Assess potential for effects on coastal processes and possible need for mitigation. • Minimise footprint of works as far as practicable.	High
Sediment characteristics	N/A	N/A – No mechanism to impact sediment characteristics during operation.	N/A	N/A	N/A	• N/A	N/A
Water quality	Potential alteration to water quality in Coorong	Intake of marine water to the Coorong and outfall of hypersaline waters to the marine environment may adversely affect water levels and quality in the Coorong South Lagoon if not appropriately managed.	Major	Possible	High	• Design consideration - Undertake modelling to confirm sufficient mixing of hypersaline discharge occurs within the near shore environment and similarly for intake of marine waters to the Coorong. • Monitor water quality in the Coorong. • Implement effective management of pump in and pump out processes.	Medium
	Hypersaline discharge to ocean waters	Without appropriate mixing, the outfall of hypersaline waters to the marine environment may result in stratification which could impact the ecological character of the marine environment (i.e. impacts on water quality, fish, seagrass, algae etc.).	Major	Possible	High	• Design consideration – Undertake modelling to confirm sufficient mixing of hypersaline discharge occurs within the near shore environment.	Medium
Flora	Alteration to seagrass communities	Discharge of hypersaline waters within the vicinity of the outfall location may alter the physiology of seagrass. However the nearest seagrass communities are located near Victor Harbor in the North, and towards the southern end of the Coorong near Kingston and there are no known seagrass communities within proximity to the outfall location.	Minor	Unlikely	Low	• Design consideration – Undertake modelling to confirm sufficient mixing of hypersaline discharge occurs within the near shore environment.	Low
Fauna	Impact of passive pipeline intake on fish species within the Coorong	Potential for entrapment or impingement of fish species at passive pipeline intakes.	Moderate	Likely	High	• Design consideration – Installation of fish exclusion devices to minimise impacts on fish species.	Medium
	Potential impacts on marine species at the near shore discharge location	Discharge of hypersaline waters have the potential to impact recreational and commercial fisheries (i.e. mulloway, sharks, salmon, mullet, flathead, snapper, and the Goolwa Cockle) and benthic communities through alterations to water quality within the marine environment.	Moderate	Likely	High	• Design consideration – Undertake modelling to confirm sufficient mixing of hypersaline discharge occurs within the near shore environment.	Medium
Noise	Increased noise associated with vehicle and machinery movements	Infrequent, temporary, and intermittent noise sources associated with routine vehicle and machinery movements accessing the site will occur for routine maintenance activities which may disturb shorebirds/waterfowl that frequent the area.	Insignificant	Unlikely	Low	• Ensure all machinery and vehicles are well maintained and effectively muffled. • Time maintenance works to avoid key migratory shorebird periods (Spring/Summer) if practicable.	Low
Visual amenity	Alteration to the visual amenity values of the Coorong and marine environment	Large permanent breakwater in the ocean environment will be visible and will adversely alter the natural amenity of the coastline.	Major	Likely	High	• Minimise footprint of works as far as practicable.	High
Energy, emissions	Emissions associated with routine maintenance activities	No requirement for utility / service connections. Infrequent, temporary, and intermittent emissions associated with routine vehicle and machinery movements accessing the site.	Insignificant	Unlikely	Low	• Vehicle access limited to designated access points and path. • All machinery to be well maintained and operated in accordance with manufacturer's specifications.	Low