APPENDIX U

BORR Southern Section Overarching Acid Sulfate Soil and Dewatering Management Plan

1.3 Proposal location

The Proposal is located approximately 200 km south of Perth, mainly within the Shire of Capel including the localities of Gelorup, North Boyanup and Statham with some overlap into neighbouring localities (College Grove, Usher and Dalyellup). A small part of the Proposal occurs in the City of Bunbury. The Proposal Area is approximately 200 ha.

The northeast end of the Proposal area is located approximately eight km southeast of Bunbury Central Business District. The northwest end of the Proposal (regional distributor) at Bussell Highway is approximately seven km south of Bunbury and the southernmost point of the Proposal Area (on Bussell Highway adjacent Capel Golf Course), is approximately 15 km south of Bunbury CBD (Figure 1; Appendix A).

Soil sample locations relevant to the BORR Southern Section have been shown in Figure 2 (Appendix A).

1.3.1 Investigation area

The investigation area includes the BORR Southern Section referral boundary (Figure 1; Appendix A) and commences from south-west of the BORR/ South Western Highway (south) intersection (approximate Ch 100,900) to Bussell Highway Ch 109,100 (Figure 3).

Some areas of the investigation area were not accessible during the site investigation due to the access constraints. These constraints are summarised in Table 1-1. Some investigation locations were also located a significant distance from proposed bridge support locations due to the access constraints summarised in Table 1-1.

Table 1-1 Summary of access constraints

APPROXIMATE BORR DESIGN CHAINAGES	COMMENTS
Ch 105,200 - Ch 108,890	Due to restrictions on clearing native vegetation, investigations were limited to Ground Penetration Radar scanning along existing tracks and grassed areas clear of native vegetation at the following proposed sites: Bussell Highway – BORR Interchange, Yalinda Drive over BORR bridge and the cutting between approximately Ch 107,100 and Ch 107,400.
Ch 108,890 - Ch 109,100	The CPTs and geotechnical borehole were located approximately 30 m to 100 m from the proposed Bridges 1859 and 1860 abutment locations due to the presence of native vegetation and a clearing permit not being granted for this Proposal.

Note: Chainage (Ch) has been used for the purpose of this report as Straight Line Kilometres (SLKs) have not yet been established.

1.4 Scope of works

The scope of works include:

- Review of the concept design and proposed alignment in relation to the potential for ASS disturbance during and/ or after construction
- Review and utilisation of ASS desktop assessment information in terms of topography, geology, hydrology and sensitive receptors
- Review of historical data and concept design information available at time of writing

- Completion of an ASS investigation and groundwater quality assessment in consultation with the DER ASS Guideline: *Identification and investigation of acid sulfate soils and acidic landscapes* (DER, 2015a)
- Preparation of an interpretative report and preparation of an ASS and Dewatering Management Plan (ASSDMP) (this report).

1.5 Limitations

This report: has been prepared by BORR IPT for Main Roads Western Australia (Main Roads) and may only be used and relied on by Main Roads for the purpose agreed between BORR IPT and Main Roads as set out in section 1.2 of this report.

BORR IPT otherwise disclaims responsibility to any person other than Main Roads arising in connection with this report. BORR IPT also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by BORR IPT in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. BORR IPT has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by BORR IPT described in this report. BORR IPT disclaims liability arising from any of the assumptions being incorrect.

BORR IPT has prepared this report on the basis of information provided by Main Roads and others who provided information to BORR IPT (including Government authorities)], which BORR IPT has not independently verified or checked beyond the agreed scope of work. BORR IPT does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

The opinions, conclusions and any recommendations in this report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Investigations undertaken in respect of this report are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.

Site conditions (including the presence of hazardous substances and/or site contamination) may change after the date of this Report. BORR IPT does not accept responsibility arising from, or in connection with, any change to the site conditions. BORR IPT is also not responsible for updating this report if the site conditions change.

2 ACID SULFATE SOIL OVERVIEW

2.1 Background

ASS materials are distinguished from other soil or sediment materials due to properties and/ or behaviour that either have been affected considerably by the oxidation of Reduced Inorganic Sulfur (RIS) or have the capacity to be considerably affected by the oxidation of RIS constituents. Within Western Australia, Acid Sulfate Soils are generally referred to soils or sediments with a RIS content greater than 18.0 mol H+/tonne. However, variations from this general rule include Bassendean Sand, which are required to be considered on a more conservative basis during significant disturbances (DER, 2015a).

ASS materials generally occur in Quaternary marine or estuarine sediments, predominantly confined to coastal lowlands (elevations generally below 5 metres Australian Height Datum [m AHD]) and saline inland areas. Within these sediments, the majority of soils that present an environmental risk are generally confined to recent Holocene aged material (i.e. less than 10 000 years) (DER, 2015a).

ASS materials have been identified in other soil types such as alluvial sediments, leached sands and silts. Accordingly, for areas where no data is available, the extent of ASS materials should be established through desktop assessment and field investigation programs.

2.2 Potential risks of Acid Sulfate Soil

The classification of ASS materials include Potential ASS (PASS or sulfidic soil materials) and Actual ASS (AASS or sulfuric soil materials). These ASS materials are often not found in isolation and may co-exist within the same soil profile. Sulfidic soil materials contain RIS (e.g. Pyrite) have the potential to generate acidity. These soil materials are typically located within saturated conditions (depleted of oxygen) and likely to consist of peat, clay, loams, sand and silts and often darker in colour. When PASS are disturbed, either by excavation or lowering of the water table below natural seasonal levels, sulfides present are exposed to air allowing oxidisation and consequently, the formation of sulfuric acid (H_2SO_4) (DER, 2015a).

Sulfuric soil materials typically contain RIS, which has oxidised either in situ (natural state) or during disturbance such as excavation or lowering of the water table below natural seasonal levels.

As a result of the presence of AASS or the oxidation of PASS, the surrounding land (soil) and nearby waterways may become acidic (pH<6.5). Under acidic conditions, metals such as aluminium (generally at pH<4.5) and iron, as well as trace heavy metals (including arsenic), become more mobile in the environment and can be taken up by infiltrating waters (DER, 2015a).

2.3 Potential effects of dewatering groundwater

2.3.1 Water quality

Dissolved metals including iron and aluminium may cause environmental issues, if the dewatering effluent is discharged prior to retention. Discharge without retention may cause iron hydroxides to precipitate out where effluent is discharged into water bodies (particularly surface water). These chemical reactions may release large quantities of acid and consume oxygen causing de-oxygenation of the water column in nearby ecosystems (smother flora and potentially damage aquatic populations) or the local groundwater system and decreasing local acid buffering capacity (alkalinity), where available.

In cases where alkalinity can no longer buffer acidity, acidification of the groundwater may occur.

Acidic conditions generated by ASS can also corrode concrete and steel (pipes, bridge abutments, underground services, and other infrastructure) and can result in the rapid deterioration of asphalt surfaces

where they overlie AASS or PASS. Acidic groundwater plumes can impact on vegetation health of deep rooted vegetation, and affect the water quality of any downstream groundwater receptors including surface water bodies and domestic and industrial water supply bores (DER, 2015a).

2.3.2 Water level

Groundwater dependant ecosystems rely on groundwater to provide some or all of their water requirements. Groundwater dependant ecosystems may include (but are not limited to) terrestrial vegetation and/or fauna, wetlands, and rivers with groundwater base flow.

Draw down of standing groundwater level in superficial / unconfined aquifers caused by dewatering may impact groundwater quality and ultimately groundwater dependant ecosystems within the cone of depression, by reducing or removing their water supply for the duration of dewatering.

Reduced groundwater level may also impact human groundwater users, by reducing water level and flow rate in groundwater bores (for example, backyard bores used to irrigate gardens). Dewatering may also potentially draw in groundwater of differing water quality to that usually found in the dewatering area, potentially affecting the water quality of any downstream groundwater receptors including surface water bodies and domestic and industrial water supply bores.

2.4 Guidelines and legislative requirements in Western Australia

2.4.1 *Environmental Protection Act 1986*

The *Environmental Protection Act 1986* (EP Act) provides for the prevention, control and abatement of pollution and environmental harm, for the conservation, preservation, protection, enhancement and management of the environment and for matters incidental to or connected with the foregoing.

To prevent environmental harm, the act established under Section 50A, states that, A person who –

(a) causes serious environmental harm; or

(b) allows serious environmental harm to be caused, commits an offence.

In the event that ASS is not managed appropriately and environmental harm is caused, as defined in the EP Act. Areas of ASS that have been disturbed and where the disturbance has resulted in concentrations of contaminants in soils, sediments and/or waters that are above background concentrations, or have the potential to present a risk of harm to human health, the environment or any environmental value, may be classified under provisions of the *Contaminated Sites Act 2003*.

The risk and impacts present should be mitigated or remediated, wherever possible.

2.4.2 *Rights in Water Irrigation Act 1914*

The Proposal footprint is located within the Dardanup sub-area of the Bunbury Groundwater Area, proclaimed under the *Rights in Water and Irrigation Act 1914* (RIWI Act). Dewatering for the construction of BORR will require dewatering operations to be undertaken in accordance with the Dewatering Exemption Order 2010 (details provided in Section 13.4) or a formal 5C Licence to Abstract Groundwater in accordance with the RIWI Act obtained from the Department of Water and Environment Regulation (DWER).

2.4.3 Guidance documents

The scope of work is proposed to be undertaken in consultation with DWER and in accordance (where applicable) with the following guidelines.

- Australian Standard (AS) 1726:2017 Geotechnical Site Investigations (Standards Australia, 2017)

- Australian/ New Zealand Standard (AS/NZS) 5667.1:1998 Water quality – Sampling: Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples (Standards Australia and Standards New Zealand, 1998)
- AS/ NZS 5667.11:1998 Water Quality Sampling - Guidance on sampling of groundwater (Standards Australia and Stanards New Zealand, 1998)
- AS 4482.2:1999 Guide to Sampling and Investigation of Potentially Contaminated Soil Part 2: Volatile Substances (Standards Australia, 1999)
- AS 4482.1:2005 Guide to Sampling and Investigation of Potentially Contaminated Soil Part 2: Non-Volatile compounds (Standards Australia, 2005)
- Water Quality Australia, Australian Government Initiative – National Acid Sulfate Soils Guidance, national acid sulfate soils sampling and identification methods manual (Water Quality Australia, 2018)
- DER, Acid Sulfate Soil Guideline Series - Identification and Investigation of Acid Sulfate Soils and Acidic Landscapes (DER, 2015a)
- DER, Acid Sulfate Soil Guideline Series - Treatment and Management of Soils and Water in Acid Sulfate Soil Landscapes (DER, 2015b)
- Department of Water (DoW), Water Quality Protection Note 13, Dewatering of soils at construction sites (DoW, 2012)
- Western Australian Planning Commission (WAPC), Acid Sulfate Soils, Planning Guidelines (WAPC, 2008)
- DER Assessment and Management of Contaminated Sites Guideline (DER, 2014)
- National Uniform Drillers Licensing Committee (NUDLC) Minimum Construction Requirements for Water Bores in Australia (National Uniform Drillers Licensing Committee , 2012).

3 METHODOLOGY

3.1 Desktop assessment

The desktop assessment was undertaken utilising data and information from publically available information and existing investigation data provided by MRWA. The desktop assessment focuses on the shallow sub-surface anticipated to be disturbed during the construction component of the design and construction phase.

3.1.1 Published information

The following published information was referred to for the production of this report:

- 1:50,000 Urban Geological Series Map, Bunbury - Burekup, (Sheet 2031 III - 2031 II) (GSWA, 1981)
- The Bunbury Shallow-Drilling Groundwater Investigation. Geological Survey of Western Australia, Report 12, 1 January 1984 (Commander, 1984)
- Geology and Groundwater Resources of the Superficial Formations between Pinjarra and Bunbury, Perth Basin Geological Survey of Western Australia, Report 26 (Deeney, 1989).

3.1.2 Existing investigation data

The following five geotechnical (including ASS) investigation reports, supplied by Main Roads, include investigation locations previously carried out within the BORR Proposal area (Northern, Central and Southern Sections):

- Bunbury Port Access Project Stage 2, Report for Geotechnical Investigation (WML, 2011)
- Bunbury Port Access Project – Stage 2, Factual Report for Supplementary Geotechnical Investigation (AECOM, 2012)
- Greater Bunbury Urban Expansion Wanju, WA, Geotechnical Investigation Report (CMW, 2016)
- Golder Associates (14 August 2017). Geotechnical Report on 260 Treendale Road, Roelands (Golder Associates, 2017)
- Bunbury Outer Ring Road Southern Section. South West Highway to Bussell Highway. Geotechnical Report (WML, 2017).

3.1.3 Digital data

The following digital datasets were used in the preparation of this report:

- DWER, Acid Sulfate Soil Risk Map, Swan Coastal Plain (DWER-055) (DWER, 2018)
- Airborne LiDAR Survey (ALS) point cloud captured by McMullen Nolan Group (MNG) in August 2018 (MNG, 2018)
- Department of Mines, Industry Regulation and Safety (DMIRS), 1:50,000 Geological series map – Bunbury-Bureko (2031 III) (DMIRS, 2018)
- Department of Biodiversity, Conservation and Attractions (DBCA), Geomorphic Wetlands, Swan Coastal Plain (DBCA-019) (DBCA, 2020).
- Landgate, Medium Scale Topo Water (Line) (LGATE-018) (Landgate, 2018).

3.1.4 Design drawings

The following design drawing sets were used to assist the fieldwork investigation and enable preparation of this report:

- BORR South Ultimate Design Plan and Profile Rev A drawing set received on 15 July 2019.

The full list of drawings used from the abovementioned drawing sets are summarised in Table B-1, Appendix B

Following completion of the site investigation fieldwork programme, the ultimate design drawings listed in Appendix B have been revised and new drawings added. The revisions have not been incorporated into this report to date.

3.2 Preliminary risk assessment

Following completion of the desktop assessment, the data has been collated to prepare a preliminary risk assessment for the disturbance of ASS and groundwater during construction, which directly informs the preliminary site investigation program.

3.3 Site Investigation

A preliminary soil, groundwater and surface water site investigation was undertaken in accordance with the guidelines and sampling rationale that was informed by the desktop, proposed designs and risk assessment.

4 PROPOSED DEVELOPMENT

The BORR Southern section extends along the BORR design alignment from south-west of the BORR/South Western Highway (south) intersection at Ch 100,900 to Bussell Highway south-southwest of Boyanup Road West at Ch 115,148, as shown on Figure 2.

The major construction elements proposed along BORR Southern Section include:

- Construction of the BORR, which will be a dual carriageway
- Construction of a PSP alongside the BORR
- Modification and realignment (horizontal and vertical) of existing roads and at-grade intersections impacted by the construction of the BORR
- Construction of new side roads, on ramps and off ramps to connect into the BORR
- Construction of interchanges, as follows:
  - Centenary Road Interchange: Dumbbell interchange where Centenary Road and Lillydale Road is proposed to extend over BORR, providing full connectivity between BORR, Centenary Road and Lillydale Road, with a PSP underpass (Underpass 9475) under Centenary Road to the west of the interchange
  - Bussell Highway – BORR Interchange: A grade separated, full connection roundabout with Bussell Highway going over BORR, including a PSP underpass (Underpass 9476) under Bussell Highway to the north of the interchange
- Construction of new road bridges as follows:
  - Bridge 1856: Lillydale Road/Centenary Road over BORR
  - Bridge 1857: BORR over Five Mile Brook
  - Bridge 1858: Yalinda Drive over BORR
  - Bridge 1859: Bussell Highway over BORR (northeast of interchange)
  - Bridge 1860: Bussell Highway over BORR (southwest of interchange).

Note that this site investigation excludes the southernmost section of the Proposal area between Ch 110,880 and Ch 115,148.

The proposed development along the BORR Southern Section between Ch 100,900 and Ch 110,880 is presented on Figures 3.01 to 3.32 (Appendix A), which includes plan and profile sections along the BORR southbound alignment (reference line MCS2) and the side road alignments. These figures correspond with the drawings listed in Table B-1, Appendix A.

5 SITE DESCRIPTION

The Bunbury town site is located approximately 200 km south of Perth, as shown on Figure 1. The BORR Southern Section commences from south-west of the BORR/ South Western Highway (south) intersection (approximate Ch 100,900) to Ch 109,100. The ground elevations along BORR southbound carriageway reference line (MCS1 in BORR Northern / Central Sections and MCS2 in BORR Southern Section) are broadly summarised below:

- From Ch 100,900 to Ch 109,100: Ground elevations generally vary between 15 m AHD and 20 m AHD. Some areas of steeper terrain are present in the vertical profile, including a high point of 30.0 m AHD at Ch 107,200 (sand dune) and a low point of 13.8 m AHD at Ch 106,880 (Five Mile Brook)
- From Ch 109,100 to Ch 110,880: Ground elevations are generally between 12 m AHD and 13 m AHD with gradients less than 1:60.

The ground elevations (existing surface level) described above are inferred from the ground profile information obtained by Mullen Nolan Group (MNG) in August 2018 (MNG, 2018), are presented on Figures 3.01 to 3.32 (Appendix A).

The Proposal area predominantly runs through areas of farmland, which are mainly used for grazing of livestock or crop production. The farmland areas generally comprise grass and scattered mature trees. The southern section of the Proposal area follows the existing Bussell Highway (Ch 109,100 to Ch 110, 900) and crosses through a number of existing roads as shown on Figure 3.

South of the proposed Centenary Road Interchange from approximately Ch 102,900 the BORR alignment crosses through existing rock quarry lots. The planned alignment extends between the existing open pit quarry footprints (Figure 3).

The Centenary Road design alignment between approximately Ch 2,620 to Ch 3,140 (reference line MCWA) extends through an existing road reserve corridor belonging to the City of Bunbury (the City). The BORR Team was made aware that the site may have buried construction waste prior to the site fieldwork programme. The City advised the following:

- The site has not been used as a rubbish tip however the City has had an issue with people dumping domestic rubbish on the site
- The City in the past used the site as a sand pit and to stockpile materials for construction projects
- The stockpiled (dumped) material included spoil of organic material such as grass, soil and concrete, additionally road base material was stockpiled at the site from time to time.

Based on a review of available historical aerial imagery for the Centenary Road design alignment from 1992 to 2019 (imagery not provided) on the Landgate online database (Landgate, 2019), that numerous earthwork activities such as reshaping of the ground and formation of access tracks and stockpiles have occurred over this timeframe.

The uncontrolled landfill area was later closed and capped with topsoil and is now predominantly covered with weeds.

5.1 Physiographic setting

The BORR Southern Section is located on the Swan Coastal Plain. The Swan Coastal Plain extends from the Darling Scarp westwards across various coastal plain units to the Indian Ocean.

The coastal plain is characterised by an alluvial plain (Pinjarra Plain) in the east, with low irregular sand dunes (Bassendean Dunes) on the western margin, and coastal dune ridges (Spearwood Dunes and Quindalup Dunes) with interdunal swamps, lagoons and inlets (Commander, 1984). The Proposal is primarily located on the Pinjarra Plain, but is also located in the Bassendean and Spearwood Dunes systems.

5.2 Regional geology

5.2.1 General

The 1:50,000 "Bunbury" Urban Geology map relative to the BORR Proposal area is presented on Figure 4, which includes descriptions of the relevant surface geological units from the original map. The Proposal area is primarily located within areas mapped as Guildford Formation and often located within areas mapped as thin Bassendean Sand over Guild Formation, Bassendean Sand and Tamala Sand over Tamala Limestone. It is also located within areas mapped as alluvium and swamp deposits at isolated locations. These surface geological units are of Quaternary Age and form part of what is collectively known as the superficial formations (Commander, 1984).

The geological units identified within the Proposal area are described in the sections below.

5.2.2 Swamp deposits

Swamp deposits occur either parallel to and immediately inland of the most recent dune line, or in scattered interdunal depressions in the Pleistocene-aged units, including the Tamala Sand, Bassendean Sand and the Guildford Formation (GSWA, 1981). The swamp deposits are typically dark grey or brown, fine sands or silts with varied but significant amounts of peat.

The 1:50,000 "Bunbury" Urban Geology map (GSWA, 1981) indicates that between Ch 101,650 to Ch 101,750 is mapped as swamp deposits with a probable maximum thickness of this unit is 5 m (Figure 4).

5.2.3 Alluvium

The alluvium unit occurs along existing or historical river and watercourses channel or flow paths. The 1:50,000 "Bunbury" Urban Geology map has separated the alluvium unit into two sub-units: younger river terraces and older river terraces. The grain sizes in this alluvium unit vary from very fine, mainly in river terraces and banks, to very course in watercourses. The sediment types include clay, silt, sand and pebbles in various admixtures and shades of brown, cream and grey, generally in lensoid deposits grading into one another. The younger terraces include units of gelatinous muds and are prone to flooding, being on average 1 m lower than the older terraces. The 1:50,000 "Bunbury" Urban Geology map indicates the probable maximum thickness of the younger and older terraces units are three m and eight m, respectively.

The Proposal area extends over young and old river terraces mainly associated with Five Mile Brook (Figure 4).

5.2.4 Bassendean Sand

The Bassendean Sand forms a series of dunes which make a discontinuous zone of low dune ridges in the central region of the coastal plain. This unit is thickest in the west, where it directly overlies the Mesozoic-aged formations, and thins eastwards where it directly overlies, or interfingers with, the Guildford Formation (Deeney, 1989). The 1:50,000 "Bunbury" Urban Geology map indicates the probable maximum thickness of this unit is 15 m.

Bassendean Sand is of eolian origin, fine to medium grained, in places coarse, and grey to off-white at surface, passing through cream and pale buff to yellow at depth (GSWA, 1981). Bassendean Sands typically contain small quantities of silt or clay and are leached of virtually all carbonates, and occasional iron-cemented, variable strength, ferruginised horizons (colloquially termed "Coffee Rock"). The Proposal area is often located in areas mapped as Bassendean Sand (Figure 4).

5.2.5 Guildford Formation

The Guildford Formation forms the broad slightly undulating Pinjarra Plain immediately west of the Darling Scarp. The Guildford Formation is mainly alluvial, but includes some shallow marine and estuarine lenses. This formation consists of plastic clays and sandy clays, clayey sands and silt which grade laterally and vertically. The clays are predominantly mottled in shades of orange and brown, although red, grey and green horizons occur. The sand is fine to medium grained or rarely very coarse grained, mainly sub-angular and sometimes sub-rounded (GSWA, 1981). A layer of coffee-brown ferruginised (liminotic) sand "coffee-rock" may also be present near the water table (Deeney, 1989). The 1:50,000 "Bunbury" Urban Geology map (GSWA, 1981) suggests that the probable maximum thickness of the Guildford Formation unit is 20 m.

The Guildford Formation is generally associated with the Palusplain Formation and is often associated with perched water tables, which result in standing surface water for long periods during winter and spring.

As shown on Figure 4, the Proposal area is mainly located in areas mapped as Guildford Formation on the Bunbury map sheet (GSWA, 1981). This formation is also expected to be present beneath Bassendean Sand, alluvial soils and swamp deposits at most locations.

5.2.6 Tamala Sand over Tamala Limestone

Tamala Sand and Tamala Limestone form the Spearwood Dune system. The Tamala Sand is expected to be underlain by Tamala Limestone, and is also expected to be overlain by alluvial soils and swamp deposits at isolated locations. The 1:50,000 "Bunbury" Urban Geology map indicates the probable maximum thickness of the Tamala Sand and Tamala Limestone units are 30 m and 40 m, respectively.

The Tamala Sand is fine to medium grained, sub-angular to sub-rounded and poorly to moderately sorted. It is off-white near surface, becoming yellow with increasing iron-oxide coating at depth and characteristically bright orange within one or two m of the underlying limestone. The Tamala Limestone ranges from coarse grained unconsolidated quartz sand to lithified calcarenite.

The Tamala Sand has been produced by decalcification on weathering of Tamala Limestone, resulting in a quartz sand predominantly leached of carbonates. An important characteristic of this formation is a high degree of variability associated with the weathering and/or formation process, and associated dissolution of the calcareous component of the parent rock. As a result, the interface between the Tamala Sand and the underlying Tamala Limestone unit can be highly irregular, both horizontally and with depth, with hard pinnacle formations at the interface between sand and rock.

The southern portion of the Proposal area is often located in areas mapped as 'sand associated with Tamala Limestone' (i.e. Tamala Sand) (Figure 4).

5.3 Acid Sulfate Soil risk mapping

A desktop review of the Acid Sulfate Soil Risk Map for the Swan Coastal Plain identified that the majority of the alignment traverses areas mapped as containing a '*moderate to low risk of ASS occurring within three m of the natural soil surface but high to moderate risk beyond 3 m of the natural soil surface*' (DWER, 2018). The wetland area to the east of the Capel Golf Course has been classified as having a '*high to moderate risk of ASS occurring within three m of the natural soil surface*' (Plate 5-1). There is also a '*high to moderate*' ASS risk encompassing and north of Dalyellup with what appears to be a seasonal tributary (Five Mile Brook) extending southeast of Dalyellup, past Gelorup and towards Lake Beddup.

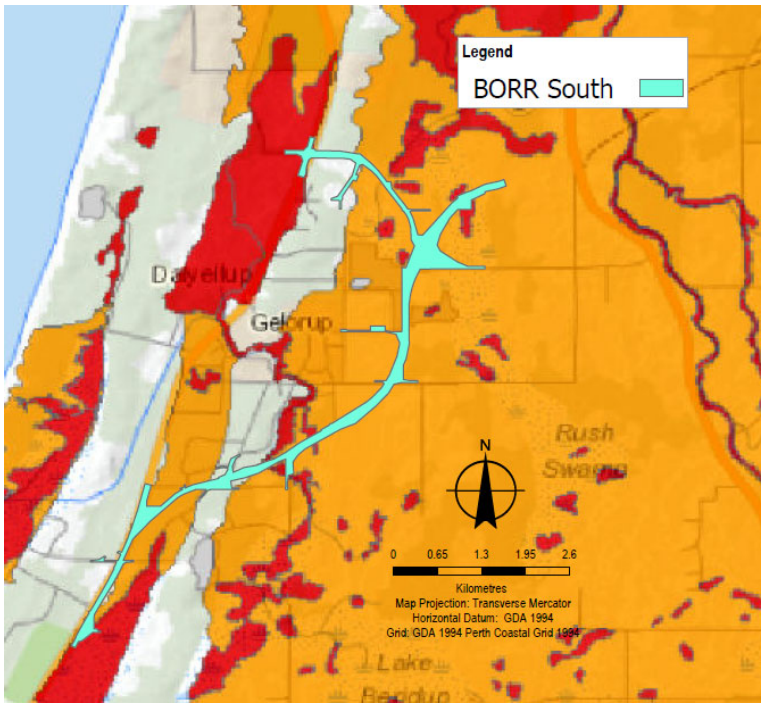

Plate 5-1 ASS risk mapping

5.4 Regional groundwater

Groundwater contours available from the Perth Groundwater Atlas (2019) indicates that the Perth Superficial Swan Aquifer generally flows west towards the Indian Ocean, with localised flow towards the river systems namely; Brunswick River, Collie River, Ferguson River and Preston River.

The available regional groundwater information is presented in the BORR Design Groundwater Levels Report (BORR IPT, 2020).

5.4.1 Groundwater quality

The Perth Superficial Swan Aquifer is likely to present total dissolved solid concentrations between 1,000 and 3,000 mg/L, indicating a marginal to brackish environment. Total dissolved solids concentrations are reported to increase generally within the Pinjarra Plain and are likely to range between 3,000 and 7,000 m/L. Increases in salinity can be found within heavy clay areas where the water table is shallow, surface drainage is poor and where upward groundwater-discharge concentrates salts near the surface (Commander, 1984).

5.5 Hydrology

5.5.1 Water courses

The survey area intersects Five Mile Brook (Ch 106,880) and a number of small drainage lines and man-made drains (Figure 4). Additionally, large parts of the survey area have been extensively modified for agricultural irrigation / drainage. For the purposes of this report, these irrigation channels are considered part of the agricultural areas and are not mapped as waterways.

5.5.2 Surface water

Surface water was observed frequently along the BORR alignment during the 2019/ 2020 groundwater and surface water monitoring program, including within existing watercourses (natural and manmade) and low lying areas. The ground surface in farmland properties was observed to be generally wet and soft during winter and spring months.

Surface water in this area during peak meteoric periods is anticipated to flow towards low lying localised areas and ultimately to the river systems. Surface water is also likely to infiltrate within local natural surfaces and enter the groundwater system. Minor base-flows present during the drier periods may be attributed to groundwater discharge (Commander, 1984).

5.5.3 Wetlands

Large sections of the survey area are low-lying palusplain, which is seasonally waterlogged or has a high water table during winter. A search of the EPBC Protected Matters Database (DAWE, 2020) did not identify any Ramsar listed, Directory of Important Wetlands in Australia or National Heritage Listed wetlands within or in a 5 km buffer of the survey area.

The Geomorphic Wetlands dataset identifies 16 wetlands within the Proposal area (DBCA, 2020). These include one Conservation Category Wetland (CCW), 13 Multiple Use Wetlands (MUW) and two Resource Enhancement Wetlands (REW). Approximately 22 % of the Proposal area is mapped as Geomorphic wetlands.

6 RISK ASSESSMENT

6.1 Risk classification and consequences

The risk matrix provided in this section takes into account the likelihood of ASS occurrence and potential disturbance associated with the Proposal. The risk assessment takes into account short term (construction activities and disturbances) and potential consequence to environmental receptors within the Proposal area and immediate vicinity (50 m buffer from centre line). Further refinement of the risk assessment will be required as the Proposal progresses. The risk is also based on the untreated 'raw risk' (i.e. before any mitigation or management strategies are applied).

The likelihood and consequence matrix are presented in Table 6-1 and Table 6-2 respectively.

Table 6-1 Risk likelihood and description

LIKELIHOOD	DESCRIPTION
Almost certain	Impacts due to sulfidic or sulfuric materials is expected to occur in most circumstances
Likely	Impacts due to sulfidic or sulfuric materials will probably occur in most circumstances
Possible	Impacts due to sulfidic or sulfuric materials could occur in some circumstances
Unlikely	Impacts due to sulfidic or sulfuric materials will probably not occur in most circumstances
Rare	Impacts due to sulfidic or sulfuric materials may only occur in exceptional circumstances

Table 6-2 Risk criteria/ environmental consequence matrix

ASPECT	ENVIRONMENTAL CONSEQUENCE				
	INSIGNIFICANT	MINOR	MODERATE	MAJOR	SEVERE
Soils/ Excavated Material	Negligible impact (acidification of in-situ soils or stockpiled material)	Contained isolated acidification event not impacting on environmental receptors (e.g. appropriately stockpiled material exceeding holding period for untreated stockpiled material)	Uncontained impact (acidification and leachate event) able to be rectified in short term with no long term remedial works required	Extensive soil acidification event within Project area and will require long-term remedial and monitoring works	Extensive and uncontained acidification event within and/ or outside Project area with long term and residual effects
	Negligible to minimal land contamination within Project area associated with acidification (leaching) or minor acidity release, which can be easily managed in short term. Does not result in adverse impacts to environment, land or infrastructure	Minimal land contamination localised within Project area and treatable (neutralised) in short term. Does not result in adverse impacts on environment, land or infrastructure	Low level land contamination in short to medium term. Results in low level and measureable adverse impacts within the Project area on environment, land or infrastructure	Land contamination within Project area resulting in adverse impacts on environment, land or infrastructure requiring medium to long term management and monitoring	Land contamination on a regional scale resulting in permanent damage with severe environmental and socioeconomic disruption
Surface Water	Negligible changes to surface water quality from baseline data within the Project area and does not change its ability to be utilised as identified beneficial water use	Minor change to surface water quality from baseline data within the Project area and surrounding area including hydraulically down gradient watercourses that does not affect identified beneficial water use	Moderate change to surface water quality from baseline data within the Project area and surrounding area including hydraulically down gradient watercourses that affects identified beneficial water use in the short term	Decline in surface water quality from baseline data in the Project area and including hydraulically down gradient watercourses that prevents utilisation of watercourse for identified beneficial water use in medium to long term	Decline in surface water quality from baseline data on a regional scale that prevents utilisation of watercourse for identified beneficial water use in long term
	Short term change to Project area water volumes that do not affect beneficial uses such as livestock and Groundwater Dependent Ecosystems	Medium term changes to Project area water volumes that do not affect identified beneficial water use	Short term changes to regional water volumes that affect identified beneficial water use	Medium term changes to regional water volumes that affect identified beneficial water use	Permanent loss of surface water resources with severe environmental and socioeconomic disruption
Groundwater	Minor localised changes to baseline data (level and quality) within radius of drawdown that does not change its ability to be utilised as identified beneficial water use	Short term localised changes to baseline data (level and quality) within radius of drawdown that does not change its ability to be utilised as identified beneficial water use	Medium term localised changes to baseline data (level and quality) within radius of drawdown that does not change its ability to be utilised as identified beneficial water use	Short to medium term changes in baseline data (level and quality) and decline in water quality outside of Project area that prevents identified beneficial water use	Long term changes in baseline data (level and quality) and decline in water quality outside of Project area that prevents identified beneficial water use

ASPECT	ENVIRONMENTAL CONSEQUENCE				
	INSIGNIFICANT	MINOR	MODERATE	MAJOR	SEVERE
Aquatic systems (fauna and flora)	No direct loss of significant flora or fauna species in Project area although increased stress incurred through indirect or induced processes	Minor or temporary localised loss of flora and/ or fauna within Project area either through direct, indirect or induced processes	Localised loss of significant flora and/ or fauna with no detrimental impact to aquatic systems with Project area or surrounding area	Localised loss of significant flora and/ or fauna with medium term impacts to aquatic systems with Project area or surrounding area	Regional loss of significant flora and/ or fauna with detrimental impact to aquatic systems with Project area or surrounding area

The risk classification matrix is provided in Table 6-3 and the descriptions of risks and likely action required is provided in Table 6-4.

Table 6-3 Risk classification matrix

LIKELIHOOD	CONSEQUENCE				
	INSIGNIFICANT	MINOR	MODERATE	MAJOR	SEVERE
Almost Certain	Medium	High	High	Extreme	Extreme
Likely	Medium	Medium	High	High	Extreme
Possible	Low	Medium	Medium	High	Extreme
Unlikely	Low	Medium	Medium	Medium	High
Rare	Low	Low	Medium	Medium	High

The following aspects were considered when determining the consequence of each potential impact:

- Type of impact (direct or indirect)
- Geographic extent, size and scale
- Duration, frequency, reversibility of the potential impact
- Whether the potential impacts are from planned or unplanned events
- Sensitivity of the receptor/resource and the value of the receptor/resource and whether impacts are likely to be from planned or unplanned events

Table 6-4 Consequence of acid sulfate material disturbance matrix

RATE RISK EVENT	ACCEPTABILITY	TREATMENT
Extreme	Unacceptable	Risk event not tolerable and alternative methods may be required
High	May be acceptable	Risk event may be tolerated and may be subject to controls including active management (management plan) and passive management (avoidance)
Medium	Acceptable subject to controls	Tolerable risk and is likely to be subject to controls or management
Low	Acceptable generally not controlled	Risk event is acceptable and generally not subject to management controls

6.2 Preliminary ASS risk assessment

The results of the desktop assessment, observed site features and conditions have been utilised to identify areas that require further investigation due to the proposed excavation or disturbance during the construction phase of BORR Southern Section. The preliminary ASS risk assessment is provided in Table 6-5.

Table 6-5 Pre-investigation ASS risk assessment

CONSTRUCTION ELEMENT	ASSUMED CONSTRUCTION SCENARIO	ASS RISK MAP[1] (DWER, 2018)	INDICATIVE GEOLOGICAL/ SOIL SETTING (DPIRD, 2019)	SENSITIVE ENVIRONMENTAL RECEPTORS	Likelihood	Consequence	OVERALL PRELIMINARY RISK ASSESSMENT
Bussell Highway – BORR Interchange	Earthworks (Fill) including re-modelling of existing fil or natural materials.	Class 1: High to moderate risk	Spearwood S4a Phase (211Sp) – Flat to gently undulating sandplain with deep, pale and sometimes bleached, sands with yellow-brown subsoils.	Tuart Woodlands TEC/ PEC retained directly adjacent to the northwest and northeast of the Proposal area.	Possible	Major	High
Centenary Road - east of Bussell Highway to Jules Road	Earthworks (Cut) including re-modelling of existing fil or natural materials.	Class 2: Moderate to low risk to the east of Bussell Highway	Bassendean B2 Phase (202Bs) – Flat to very gently undulating sandplain with well to moderately well drained deep bleached grey sands with a pale yellow B horizon or a weak iron-organic hardpan 1-2 m. Spearwood S1b Phase (211Sp) – Dune ridges with deep siliceous yellow brown sands or pale sands with yellow-brown subsoil and slopes up to 15%.	Tuart Woodlands TEC/ PEC and Banksia Woodlands TEC/ PEC retained directly adjacent to the north of the Proposal area.	Possible	Moderate	Medium
Centenary Road Interchange and Bridge 1856: Lillydale Road/ Centenary Road over BORR	Earthworks (Fill) including re-modelling of existing fil or natural materials. Bridge infrastructure assumed to consist of shallow abutment footings less than three m depth, pile caps and/ or columns. Minor dewatering operations which can be undertaken within the RIWI Exemption (Section 26C) (Dewatering) Order 2010 and/or an application for a 5C licence to take groundwater.	Class 2: Moderate to low risk	Bassendean B2 Phase (202Bs) – Flat to very gently undulating sandplain with well to moderately well drained deep bleached grey sands with a pale yellow B horizon or a weak iron-organic hardpan 1-2 m. Pinjarra P1b Phase (213Pj) – Flat to very gently undulating plain with deep acidic mottled yellow duplex (or effective duplex) soils. Moderately deep pale sand to loamy sand over clay: imperfectly drained and moderately susceptible to salinity in limited areas. Pinjarra, B6 Phase (213Pj) – Sandplain and broad extremely low rises with imperfectly drained deep or very deep grey siliceous sands.	Resource Enhancement Geomorphic Wetland UFI 1117 Aboriginal heritage – BR1 is a modified tree (scar tree) located 15 m outside the boundary of the Proposal area (Brad Goode and Associates, 2020).	Possible	Moderate	Medium
CH 105276 to CH 105482	Earthworks (Cut) including re-modelling of existing fil or natural materials.	Class 2: Moderate to low risk	Bassendean B1a Phase (202Bs) – Extremely low to very low relief dunes, undulating sandplain and discrete sand rises with deep bleached grey sands with an intensely coloured yellow B horizon occurring within 1 m of the surface.	-	Possible	Moderate	Medium

CONSTRUCTION ELEMENT	ASSUMED CONSTRUCTION SCENARIO	ASS RISK MAP[1] (DWER, 2018)	INDICATIVE GEOLOGICAL/ SOIL SETTING (DPIRD, 2019)	SENSITIVE ENVIRONMENTAL RECEPTORS	Likelihood	Consequence	OVERALL PRELIMINARY RISK ASSESSMENT
Bridge 1857: BORR over Five Mile Brook	Earthworks (Fill) including re-modelling of existing fil or natural materials. Bridge infrastructure assumed to consist of shallow abutment footings less than 3 m depth, pile caps and/ or columns. Minor dewatering operations which can be undertaken within the RIWI Exemption (Section 26C) (Dewatering) Order 2010 and/or an application for a 5C licence to take groundwater.	Class 1: High to moderate risk – Five Mile Brook Class 2: Moderate to low risk to east and west of Five Mile Brook	Five Mile Brook – Bassendean B5 Phase (212Bs) – Shallowly incised stream stream channels of minor creeks and rivers with deep grey siliceous sands or bleached sands, underlain at depths generally greater than 1.5 m by clay or less frequently a strong iron-organic hardpan. East of Five Mile Brook – Bassendean B6 Phase (212Bs) – Sandplain and broad extremely low rises with imperfectly drained deep or very deep grey siliceous sands. West of Five Mile Brook – Bassendean B1 Phase (212Bs) Extremely low to very low relief dunes, undulating sandplain and discrete sand rises with deep bleached grey sands sometimes with a pale yellow B horizon or a weak iron-organic hardpan at depths generally greater than 2 m; banksia dominant.	Five Mile Brook – Mulitple Use Geomorphic Wetland UFI 1163 Banksia Woodlands TEC/ PEC retained directly adjacent to the south of the Proposal area.	Possible	Major	High
Bridge 1858: Yalinda Drive over BORR	Earthworks (Cut) including re-modelling of existing fil or natural materials. Bridge infrastructure assumed to consist of shallow abutment footings less than three m depth, pile caps and/ or columns. Minor dewatering operations which can be undertaken within the RIWI Exemption (Section 26C) (Dewatering) Order 2010 and/or an application for a 5C licence to take groundwater.	No known risk mapped	Spearwood S1b Phase (211Sp) – Dune ridges with deep siliceous yellow brown sands or pale sands with yellow-brown subsoil and slopes up to 15%.	-	Rare	Minor	Low
Bridge 1859 and 1860: Bussell Highway over BORR	Earthworks (Cut) including re-modelling of existing fil or natural materials. Bridge infrastructure assumed to consist of shallow abutment footings less than 3 m depth, pile caps and/ or columns. Minor dewatering operations which can be undertaken within the RIWI Exemption (Section 26C) (Dewatering) Order 2010 and/or an application for a 5C licence to take groundwater.	Class 2: Moderate to low risk to the east of Bussell Highway	Spearwood S2b Phase (211Sp) – Lower slopes (1-5%) of dune ridge with shallow to deep siliceous yellow-brown sands and common limestone outcrop. Spearwood S2c Phase (211Sp) – Lower slopes (1-5%) of dune ridge with bleached or pale sands with a yellow-brown or pale brown (like S1c). Usually on the eastern edge of the Spearwood Dunes.	Banksia Woodlands TEC/ PEC retained directly adjacent to the west of the Proposal area.	Possible	Moderate	Medium

Notes:

[1] Class 1 - High to moderate risk of ASS occurring within 3 m of natural soil surface.

Class 2 - Moderate to low risk of ASS occurring within 3 m of natural soil surface but high to moderate risk of ASS beyond 3 m of natural soil surface.

7 INVESTIGATION

7.1 Fieldwork program

The site investigation fieldwork program is summarised in Table 7-1 and the test locations are presented on Figure 2 and groundwater and surface water locations in Figure 5.

Prior to any site works, preliminary tasks including the preparation of a JSEA, consultation with landowners, LGAs and Main Roads to gain authorisation to access private properties and road reserves for the selected site investigation and monitoring dates.

Table 7-1 Fieldwork schedule

DATES	FIELDWORK COMPONENT
17 – 25 July 2018	Drilling, sampling and well installation at MW05, MW06, MW07, MW09, MW10, MW11
3 – 5 September 2018	Drilling, sampling and well installation at MW04 and MW08a
6 August 2019	Drilling, sampling and well installation at MW46
28 October – 1 November 2019	Drilling and sampling at TPC49 to TPC74
19 – 22 August 2019	Groundwater and surface water sampling of MW04, MW05, MW06, MW07, MW08a, MW09, MW10, MW11, MW12, MR_MW05 and MW46
16 – 19 September 2019	
21 – 24 October 2019	
16 – 20 November 2019	
16 – 20 December 2019	
20 – 24 January 2020	

7.2 Soil investigation

7.2.1 Soil sample locations

A track mounted Geoprobe 7822DT was used to drill the boreholes and install the monitoring wells. A 14 tonne wheeled excavator was used for test pit exaction.

An experienced environmental scientist from BORR IPT logged the encountered subsurface conditions and undertook sampling of recovered materials from the boreholes. All environmental soil logging was carried out in consultation with Australian Standard AS 1726 (Standards Australia, 2017). It should be noted that ground conditions at other parts of the site may be different from the ground conditions found at the specific sample points.

The borehole logs are provided in Appendix C and should be read in conjunction with the Standard Sheets. A summary of the test locations is provided in Table 7-2.

Table 7-2 Summary of soil sample locations and details

TEST LOCATION	COORDINATES (GDA94 MGA 50)	SURFACE LEVEL (mAHD)	SCREENED INTERVAL (m)	GW LEVEL (mBGL)	GW LEVEL (mAHD)	TOTAL DEPTH (m)
BORR_MW02	369363 E 6295561 N	11.6	6.5 – 9.5	6.87	4.73	9.5
BORR_MW04	370118 E 6297060 N	9.3	9.5 – 13.15	3.71	5.59	14.0
BORR_MW05	370681 E 6298315 N	12.2	4.5 – 8.0	5.74	6.46	8.0
BORR_MW06	371109 E 6299068 N	11.6	4.0 – 8.0	5.4	6.2	8.0
BORR_MW07	372078 E 6300144 N	15.6	6.0 – 10.5	10.04	5.59	10.5
BORR_MW08	372744 E 6300344 N	-	-	-	-	16.5
BORR_MW08a	373589 E 6300390 N	16.0	2.0 – 5.5	1.84	14.16	6.0
BORR_MW09	374240 E 6301013 N	16.4	0.5 – 4.0	3.19	13.21	5.5
BORR_MW10	374851 E 6301752 N	19.3	0.5 – 4.0	1.09	18.21	4.0
BORR_MW11	375282 E 6302599 N	20.8	1.5 – 4.5	0.58	20.22	4.0
TP25.1	375656 E 6303729 N	22.1	No MW installed	Not intersected	Not intersected	2.1
TPC49	377218 E 6304822 N	16.5	No MW installed	2.0	14.5	3.0
TPC51	376736 E 6304669 N	17.4	No MW installed	0.9	16.5	2.5
TPC52	376078 E 6304426 N	18.1	No MW installed	0.4	17.7	1.5
TPC53	375909 E 6304179 N	18.9	No MW installed	1.4	17.5	2.0
TPC54	375730 E 6303913 N	19.2	No MW installed	Not intersected	Not intersected	1.7
TPC55	375925 E 6303568 N	18.9	No MW installed	1.4	17.5	2.6
TPC56	375334 E 6304231 N	19.6	No MW installed	1.0	18.6	1.9
TPC59	374324 E 6305083 N	26.1	No MW installed	Not intersected	Not intersected	2.4

TEST LOCATION	COORDINATES (GDA94 MGA 50)	SURFACE LEVEL (mAHD)	SCREENED INTERVAL (m)	GW LEVEL (mBGL)	GW LEVEL (mAHD)	TOTAL DEPTH (m)
TPC63	374070 E 6305034 N	21.6	No MW installed	Not intersected	Not intersected	2.2
TPC65	373798 E 6305125 N	6.4	No MW installed	Not intersected	Not intersected	2.7
TPC68	375414 E 6303286 N	20.0	No MW installed	0.6	19.4	2.6
TPC70	375348 E 6302782 N	20.3	No MW installed	0.8	19.5	3.0
TPC71	375346 E 6302518 N	21.7	No MW installed	Not intersected	Not intersected	2.5
TPC72	375266 E 6302198 N	20.7	No MW installed	1.0	19.7	2.5
TPC73	375148 E 6301773 N	21.1	No MW installed	Not intersected	Not intersected	2.6
TPC74	374804 E 6301378 N	19.9	No MW installed	1.9	18.0	2.2

7.2.2 Soil sampling methodology

Following logging of the soil profile, samples were collected at 0.5 m intervals or where significant changes within the soil profile was encountered to the base of the soil bore. Sampling intervals were extended from 0.25 m intervals to 0.5 m intervals due to homogenous soil profile encountered.

Soil samples consisted of approximately 200 g of material, with shell or carbonate nodules visible to the naked eye removed from the soil samples in the field. Samples were placed within a clearly labelled plastic zip-lock bag (laboratory supplied) and the air extruded immediately to prevent oxidation of the soil, as much as possible. Samples were immediately placed within an insulated container with ice to chill the samples to at least 4ºC until the end of each day of sampling. Samples were then frozen at the end of each day prior to dispatch to Eurofins MGT for analysis ensuring that all holding times were met.

7.3 Groundwater investigation

7.3.1 Groundwater sample locations

Groundwater wells were installed at boreholes, BORR MW04 to MW12 and MW46. Well construction details are provided in Table 7-3. MR MW05 was previously constructed by Main Roads however bore construction details are unavailable for this well. The groundwater monitoring locations are shown in Figure 5, Appendix A.

Groundwater monitoring well installation was undertaken in accordance with the Minimum construction requirements for water bores in Australia (National Uniform Drillers Licensing Committee , 2012) and requirements for the hydrogeological investigation for the alignment. The monitoring well bore logs are provided in Appendix C.

Table 7-3 Summary of groundwater sample locations and details

TEST LOCATION	COORDINATES (GDA94 MGA 50)	SCREENED INTERVAL (m)	CASING LEVEL (mAHD)	TOTAL DEPTH (m)
BORR_MW04	370118 E 6297060 N	9.5 – 13.15	9.45	14.0
BORR_MW05	370681 E 6298315 N	4.5 – 8.0	12.24	8.0
BORR_MW06	371109 E 6299068 N	4.0 – 8.0	11.62	8.0
BORR_MW07*	372078 E 6300144 N	6.0 – 10.5	15.62	10.5
BORR_MW08a	373589 E 6300390 N	2.5 – 6.0	15.95	6.0
BORR_MW09	374240 E 6301013 N	2.0 – 5.5	16.45	5.5
BORR_MW10	374851 E 6301752 N	0.5 – 4.0	19.35	4.0
BORR_MW11	375282 E 6302599 N	0.5 – 4.0	20.80	4.0
BORR_MW12	375853 E 6104187 N	1.5 – 4.5	19.63	4.5
BORR_MW46	373882.6 E 6305094.1	3.0 – 6.0	7.03	6.0
MR_MW05	375313.5 E 6302185.3	-	20.51	-

*Note: Monitoring of BORR MW07 was discontinued following the first and second monitoring rounds due to unfavourable condition of monitoring well.

7.3.2 Groundwater sampling methodology

Groundwater sampling methods untaken for the purpose of the field investigation have been summarised in Table 7-4.

Table 7-4 Groundwater sampling methodology overview

ACTION	METHODOLOGY
Sampling and laboratory analysis	Groundwater and surface water quality monitoring was undertaken monthly within a five day period by two environmental scientists from August 2019 to January 2020. Samples were collected at each location using a peristaltic pump with dedicated HDPE tubing installed in each monitoring well for the 12-month monitoring period to avoid cross contamination issues. At each groundwater well, the static water level (SWL) was measured using an electronic dip meter, prior to purging of the well to remove stagnant water in the well casing.

ACTION	METHODOLOGY
	During purging, field parameters (pH, temperature, oxidation-reduction potential (ORP or Eh), dissolved oxygen (DO), and electrical conductivity (EC)) were recorded on field data sheets, using a calibrated YSI ProDSS water quality meter, to assess the stabilisation of the well. The well was considered to be stabilised once field parameters were recorded within +/- 10% of previous readings. Water quality meter calibration certificates are provided in Appendix D. Following stabilisation of field parameters, groundwater samples were collected in laboratory prepared bottles and were immediately placed on ice and stored in a cool, dark environment (esky). Primary samples were then forwarded to Australian Laboratory Services (ALS) Environmental and split samples were forwarded to Eurofins MGT (Eurofins), both of which are NATA accredited analytical laboratories for parameters tested for. Samples were submitted within the specified holding times (excluding pH and reactive phosphorus), along with a Chain of Custody (CoC) form, and were placed on a standard 7-10 day turnaround. Samples were analysed for the groundwater suite detailed in Section 8.2. All groundwater samples required analysis for dissolved metals and were filtered to 0.45 microns in the field. All field and analytical results are summarised in Section 10.3. Laboratory documentation including chain of custody information, laboratory certificates, and quality assurance and control is provided in the Groundwater and Surface Water Quality Monitoring report (BORR IPT, 2020).
Equipment and decontamination	Prior to and following collection of each sample, all disposable equipment was replaced with new equipment and all non-disposable equipment was decontaminated. The decontamination process involved washing down all relevant equipment with a phosphate free detergent, rinsing the equipment with deionized water, and a final rinsing with deionized water before commencing sampling at the next location. Dedicated nitrile gloves were worn for the collection of each sample.

7.4 Surface water investigation

7.4.1 Surface water sample locations

Surface water samples were collected from four locations Southern 3, Southern 4, SW10 and SW11 with reference to *AS/NZS 5667 (1998 – Reconfirmed 2016) Water quality – Sampling. Part 1: Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples* (Standards Australia and Standards New Zealand, 1998). The surface water sample locations are shown on Figure 5 in Appendix A.

Details of the surface water monitoring sites is provided in Table 7-5.

Table 7-5 Summary of surface water sample locations and details

TEST LOCATION	EASTING (MGA94 ZONE 50)	NORTHING (MGA94 ZONE 50)	DESCRIPTION
Southern 3	376089	6304316	Geomorphic wetland UFI 1106
Southern 4	375225	6304694	

TEST LOCATION	EASTING (MGA94 ZONE 50)	NORTHING (MGA94 ZONE 50)	DESCRIPTION
SW10	373337	6300496	Five Mile Brook
SW11	370214	6297229	Southern extent of BORR referral area

7.4.2 Surface water sampling methodology

Surface sampling methodology untaken for the purpose of the field investigation is summarised in Table 7-6.

Table 7-6 Surface water sampling methodology overview

ACTION	METHODOLOGY
Sampling and laboratory analysis	Field parameters (temperature, electrical conductivity, pH, REDOX potential, dissolved oxygen, total dissolved solids and turbidity) were measured at each surface water location using a calibrated YSI ProDSS water quality meter, which was left in the water body until field parameters had stabilised. Field parameters were recorded on field data sheets. Water quality meter calibration certificates are provided in Appendix D. Visual and olfactory field observations were also noted on the field sheets. Surface water samples were collected at each location in a 1 L non-preserved bottle using an extendable sampling stick. The non-preserved bottle was used to transfer samples to laboratory prepared bottles, due to the presence of preservatives within the bottles. Samples were immediately placed on ice and stored in a cool, dark environment (esky). Primary samples were then forwarded to ALS Laboratory and split samples were forwarded to Eurofins, both of which are NATA accredited analytical laboratories. Samples were submitted within the specified holding times (excluding pH and reactive phosphorus), along with a CoC form, and were placed on a standard 7-10 day turnaround. Samples were analysed for the surface water suite detailed in Section 8.3. All surface water samples required analysis for dissolved metals and were filtered to 0.45 microns in the field. All field and analytical results are summarised in Section 10.4. Laboratory documentation including chain of custody information, laboratory certificates, and quality assurance and control is provided in the Groundwater and Surface Water Quality Monitoring report (BORR IPT, 2020).
Equipment and decontamination	Prior to and following collection of each sample, all disposable equipment was replaced with new equipment and all non-disposable equipment was decontaminated. The decontamination process involved washing down all relevant equipment with a phosphate free detergent, rinsing the equipment with deionized water, and a final rinsing with deionized water before commencing sampling at the next location. Dedicated nitrile gloves were worn for the collection of each sample.

8 LABORATORY ANALYSIS

The field and laboratory soil, groundwater and surface water results are summarised Table E-1 (soil) and Table E-2 (groundwater) and Table E-3 (surface water), along with the soil laboratory reports, sample receipts and chain of custody documentation included in Appendix E. Groundwater and surface water laboratory documentation has been provided in the Groundwater and Surface Water Quality Monitoring report (BORR IPT, 2020).

8.1 Soil

Soil samples were delivered to Eurofins MGT in Perth, a NATA accredited facility for ASS field and laboratory analysis. Soil samples were analysed for the field parameters and analytical suites listed in Table 8-1.

Table 8-1 Soil laboratory analytical suites

ASPECT	PARAMETERS AND ANALYTICAL SUITES
pH	Field pH (pH_F) and field peroxide pH (pH_{FOX})
Chromium Reducible Sulfur suite	pH KCl, Titratable Actual Acidity, Chromium Reducible Sulfur, Acid Neutralising Capacity, Net Acidity

8.2 Groundwater

NATA accredited laboratory ALS conducted the primary laboratory analysis of samples and Eurofins conducted the secondary laboratory analysis of split samples. Both laboratories completed internal quality assurance/ quality control (QA/QC) procedures as per their NATA accreditation. Groundwater samples were analysed for the field parameters and analytical suites listed in Table 8-2.

Table 8-2 Groundwater laboratory analytical suites

ANALYTE GROUP	PARAMETERS AND ANALYTICAL SUITES
Field parameters	pH, electrical conductivity (EC), dissolved oxygen (DO) (mg/L, % sat), redox, temperature (°C), total dissolved solids (TDS)
Inorganics	pH, EC, TDS
Acidity and alkalinity	Alkalinity (Carbonate as $CaCO_3$), alkalinity (bicarbonate as $CaCO_3$), alkalinity (hydroxide as $CaCO_3$), alkalinity (total as $CaCO_3$), acidity (as $CaCO_3$)
Major ions	Calcium, magnesium, potassium, sodium, chloride, sulphate, cations total, anions total, ionic balance, sulfide
Nutrients	Ammonium (as N), ammonia (as N), nitrogen (total oxidised) (as N), nitrogen (total), reactive phosphorus (as P), Kjeldahl nitrogen total, phosphorus (total).
Metals	Ammonium (as N), ammonia (as N), nitrogen (total oxidised) (as N), nitrogen (total), reactive phosphorus (as P), Kjeldahl nitrogen total, phosphorus (total).
BTEXN	Benzene, toluene, ethylbenzene, xylene, naphthalene (sum of total)
TRH	Total recoverable hydrocarbons

8.3 Surface water

NATA accredited laboratory ALS conducted the primary laboratory analysis of samples and Eurofins conducted the secondary laboratory analysis of split samples. Both laboratories completed internal quality assurance/ quality control (QA/QC) procedures as per their NATA accreditation. Surface water samples were analysed for the suites listed in Table 8-3.

Table 8-3 Surface water laboratory analytical suites

ASPECT	PARAMETERS AND ANALYTICAL SUITES
Field parameters	pH, EC, DO (mg/L, % sat), redox, temperature (°C), TDS, turbidity (NTU)
Inorganics	pH, EC, TDS
Acidity and alkalinity	Alkalinity (Carbonate as $CaCO_3$), alkalinity (bicarbonate as $CaCO_3$), alkalinity (hydroxide as $CaCO_3$), alkalinity (total as $CaCO_3$), acidity (as $CaCO_3$)
Major ions	Calcium, magnesium, potassium, sodium, chloride, sulphate, cations total, anions total, ionic balance, sulfide
Nutrients	Ammonium (as N), ammonia (as N), nitrogen (total oxidised) (as N), nitrogen (total), reactive phosphorus (as P), Kjeldahl nitrogen total, phosphorus (total)
Metals	Aluminium, cadmium, chromium, cobalt, copper, iron, lead, manganese, nickel, selenium, zinc
BTEXN	Benzene, toluene, ethylbenzene, xylene, naphthalene (sum of total)
TRH	Total recoverable hydrocarbons
Pesticides	Organo-phosphates, glyphosate

9 ASSESSMENT CRITERIA

9.1 Soil criteria

The soil assessment criteria outlined below are provided and in accordance with DWER guidelines (DER, 2015a). Soil criteria consist of an initial pH field screening and further qualitative assessment via laboratory analysis.

pH field screening

The field screening (pH_F and pH_{FOX}) criteria provided in Table 9-1 has been utilised to provide an initial assessment for the presence or absence of ASS.

Table 9-1 Initial pH screening criteria

GEOLOGICAL UNIT	PARAMETER AND TRIGGER LEVEL	INDICATION
Topsoil	$pH_F < 4.0$	Topsoil requires further assessment
Applicable to all soil encountered during site investigation	$4.0 < pH_F \leq 5.5$	Acidic Soil
	$pH_F \leq 4.0$	AASS
	$pH_{FOX} < 4.0$	PASS likely
	$\Delta pH > 2.0$	PASS likely
Table 9-1 adopted from Table A1 and A2, DER (2015a)		

Laboratory results

Soil samples were also assessed for the presence or absence of ASS based on an acid based accounting approach (net acidity excluding acid neutralising capacity [ANC]). The acid based accounting equation, as outlined in the DER (2015a) is:

Net Acidity = Potential Acidity + Existing Acidity – Acid Neutralising Capacity (ANC[1])

The trigger levels for net acidity based on soil texture are outlined in the DER (2015b) and are presented in Table 9-2. Based on the assumed quantities of material likely to be excavated during the construction phase, the 0.03 %S (equivalent 18.0 mol H+/tonne) action criteria has been utilised in this assessment.

A field $pH_{FOX} < 3$ and a net acidity greater than 0.01 %S is also an indicator of ASS in the Bassendean Sand unit (DER 2015a). Consideration should therefore be given to this additional trigger criteria, where large volumes (>1,000 m^3) are proposed to be excavated within Bassendean Sand.

[1] Due to the particular characteristics of the soil and groundwater regime in Western Australia, DER does not recognise the validity of ANC values without confirmatory kinetic testing or modified laboratory methods to provide a more accurate estimate of the actual amount of neutralising capacity that would be available under real field conditions.

Table 9-2 Action criteria based on net acidity for three texture categories

SOIL TEXTURE	CLAY CONTENT (%)	< 1,000 TONNES DISTURBED		> 1,000 TONNES DISTURBED	
		% S	MOL H+/ TONNE	% S	MOL H+/ TONNE
Coarse (sands – gravels)	< 5	0.03	18.0	0.03	18.0
Medium (sandy loam – light clay)	5 – 40	0.06	36.0	0.03	18.0
Fine (medium to heavy clays, silty clays)	> 40	0.10	64.0	0.03	18.0

Table 9-2 adopted from DER (2015a)

9.2 Groundwater and surface water criteria

The following groundwater assessment criteria was adopted for this assessment:

- Acid sulfate soil criteria, from *ASS Guideline Series: Treatment and management of soil and water in acid sulfate soil landscapes* (DER, 2015b)
- South West WA wetlands from the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC & ARMCANZ, 2000)
- Table 1C Groundwater Investigation Levels (GILs) – Fresh waters from *NEPC National Environment Protection (Assessment of Site Contamination) Measure,* Schedule B1 Guideline on Investigation Levels for Soil and Groundwater (NEPC, 2013).
- Non-potable use guideline (NPUG) from DER *Assessment and management of contaminated sites* (DER, 2014).

10 RESULTS

10.1 Soil results

10.1.1 pH screening

The preliminary pH screening tests provide important information in regard to the existing acidity of each soil profile (pH_F) and the potential acidity (pH_{FOX}) of the soil.

The pH field screening method is indicative only and cannot determine the presence or absence of ASS. The pH field screen may provide 'false positives' and 'false negatives' therefore over estimating or under estimating the true acidity potential of a soil.

The results of the ASS pH screening are presented in Table D-1 along with the sample receipts, laboratory reports and chain of custody documentation in Appendix E.

Based on the pH screening results of 145 primary soil samples, the following was noted:

- Values for pH_F ranged from 3.7 to 9.6 (excluding topsoil)
- Values for pH_{FOX} ranging from 2.4 to 10.0
- The ΔpH, defined as pH_F minus pH_{FOX}, ranged from -1.4 to 5.3.

10.1.2 Chromium Reducible Sulfur suite

Chromium Reducible Sulfur (CRS) suite analysis provides an estimation of the soils potential sulfidic acidity. This is achieved through measuring the reduced inorganic sulfur content within a soil sample. CRS is not subject to interference from organic matter or sulfate minerals and therefore is considered to provide an accurate estimation of the potential inorganic sulfidic acidity potential of a material.

Results of the CRS laboratory analysis, undertaken for 56 primary soil samples, indicated the following:

- pH_{KCL} values ranged between 4.4 and 9.4
- Titratable actual acidity (TAA) ranged between <2 mol H+/tonne and 87 mol H+/tonne
- A total of 11 (out of 56) primary samples analysed were found to have a net acidity above the assessment criteria for coarse sands and gravels (18 mol H+/tonne, 0.03 %S) with the maximum net acidity value (87 mol H+/tonne) recorded at TPC56 at a depth of 1.5 m
- A further five primary samples analysed were found to have a net acidity above the more conservative criteria for Bassendean Sand (6 mol H+/tonne, 0.01 %S) between 14 to 17 mol H+/tonne recorded at BORR MW08a, BORR MW10, TPC53, TPC68 and TPC73.

10.2 Soil discussion

Based on the findings of the field investigation and laboratory soil analysis following observations have been made:

- The field screening results indicate that most of the soils sampled were trending mildly acidic to basic, with a few outliers associated with the test pits (TPC sample IDs). The observed reaction rates when subject to peroxide digest were consistent across the alignment for the shallow soil surface and were recorded as predominantly Moderate reactions (2) with a few Extreme reactions (4) at depth for the samples analysed. The greatest potential for acid generation was generally recorded within the sandy units and Bassendean Dune Sand.

- pH_{FOX} was recorded higher than pH_F and the delta pH presents in some samples as minus (e.g. -0.7 in MW02 4.5m). The pH_{FOX} results indicate little net acidifying ability and the pH_{FOX} result may indicate the presence of naturally occurring carbonates and/ or organic compounds.
- Organic matter in topsoil samples is considered likely to be contributing to pH_{FOX} results at BORR MW04, MW8a and S01. Organic matter may cause a reaction within soil samples as organic matter is broken down during the peroxide digest.
- pHKCL and Titratable Actual Acidity (TAA) analysis determines whether there is existing acidity within the soil samples. Soil samples with pHKCL values greater than 6.5 were exempt from measurement on the basis that actual acidity is considered to be zero.
- Samples from the soil profile presented pHKCL results between 4.4 and 6.7, with only two of 56 samples analysed recording results greater than pH 7.0. Therefore indicating a low to moderate (within test pit locations) acid generating potential during disturbance (excavation and/ or dewatering). The pHKCL results were typically consistent with corresponding TAA titration results with values ranging between <2.0 and 87 H+/tonne.
- Potential acidity (SCR) values ranged between less than the laboratory limit of reporting (less than 3.0 mol H+/tonne) and 57 mol H+/tonne for all samples analysed within the shallow soil surface.
- Net acidity values when utilising the acid based equation [potential acidity + existing acidity and excluding ANC] for the shallow soil surface within all samples analysed ranged between <10 mol H+/tonne and 87 mol H+/tonne, which is above the DWER action criteria (18.0 mol H+/tonne).
- The results within the test pits in particular indicate that the soil profile has previously been exposed to variations within the groundwater table and that acidity is represented as actual (sulfidic) acidity indicating that acidity is likely to be easily mobilised and leached during excavation and dewatering operations.
- Acid Neutralising Capacity (ANC) is a measure of the soils natural ability to buffer acidity and resist the lowering of the soil pH. Based on the laboratory analysis provided there was minimal and inconsistent residual ANC recorded in the samples across the site and within soil presenting exceedance of net acidity.

Further assessment and investigation will be required to determine any location specific management requirements, if disturbance to the current ground surface is required. Ground disturbance works in this instance includes dewatering or lowering of the groundwater table, excavations and earthmoving activities.

10.3 Groundwater assessment

Groundwater samples were collected every month from August 2019 to January 2020. Monitoring of sites BORR MW06 and MW07 were discontinued due to difficulty in obtaining samples. Site MW11 became dry during the monitoring program and samples could therefore not be obtained in the January sampling round (Table 10-1).

Table 10-1 Observed groundwater elevations

LOCATION ID	GROUNDWATER DEPTH (M BTOC)	CASING LEVEL (M AHD)	GROUNDWATER ELEVATION (M AHD)	COMMENTS
BORR_MW04	3.88-4.62	9.45	5.57-4.83	
BORR_MW05	5.64-5.87	12.24	6.61-6.37	
BORR_MW06	5.31-5.63	11.62	6.31-5.99	Discontinued

LOCATION ID	GROUNDWATER DEPTH (M BTOC)	CASING LEVEL (M AHD)	GROUNDWATER ELEVATION (M AHD)	COMMENTS
BORR_MW07	10.00-10.10	15.62	5.62-5.52	Discontinued
BORR_MW08a	2.07-3.60	16.95	13.88-12.36	
BORR_MW09	3.14-3.70	16.45	13.31-12.75	
BORR_MW10	1.36-2.03	19.35	17.99-17.32	
BORR_MW11	1.25 – 3.72	20.80	19.55 – 17.08	Dry for January round
BORR_MW12	1.50 – 2.12	19.63	18.14 – 17.51	
MR_MW05	2.23-2.55	20.51	18.23-17.96	
BORR_MW46	3.52-4.14	7.03	3.51-2.89	

Based on the groundwater levels, regional groundwater flow is west towards the Indian Ocean.

The following field parameters were recorded from the groundwater wells:

- pH values ranged between 5.30 and 7.21, and are indicative of acidic to neutral conditions
- EC values generally ranged between 200 µS/cm and 25,000 µS/cm, and are indicative of fresh to saline water
- ORP values ranged between -140 mV to 180 mV and indicate variance between reducing and oxidising conditions

The following observations have been made regarding comparison to the adopted assessment criteria (Section 9.2) for the laboratory groundwater results:

- Laboratory pH was recorded outside the fresh water criteria (pH 6.5-8.5) at BORR MW08a, MW10, MW46 and MR MW05, however was greater than pH 5 DER ASS Criteria at all monitoring wells
- Total acidity concentrations exceeded the ASS criteria (40 mg/L) at BORR MW11, MW46 and MR MW05
- Total alkalinity concentrations were below the ASS criteria (30 mg/L) at BORR MW09, MW10, MW11, MW12 and MW46
- Chloride concentrations exceeded the DER 2014 guidelines for Non Potable Groundwater Use at BORR MW04, MW05, MW11 and MR MW05 (250 mg/L)
- Total Nitrogen and Total Phosphorus exceeded the DER 2014 guidelines for freshwater at all monitoring wells with the exception of BORR MW05, MW10 and MW46
- Total Iron exceeded DER 2014 guidelines for freshwaters at all monitoring wells
- Total Aluminium exceeded DER 2014 guidelines for Non Potable Groundwater Use (0.2 mg/L) at all monitoring wells however no monitoring wells exceeded the DER 2015 ASS criteria (1 mg/L) for dissolved Aluminium
- Dissolved Copper, Nickel and Zinc exceeded DER 2014 guidelines for freshwaters at all monitoring wells
- TRH and BTEXN concentrations were all reported below the adopted assessment criteria with the majority below LOR.

A summary of groundwater laboratory results is provided in Table E-2 (Appendix E). Sample receipts, laboratory reports and chain of custody have been provided in the Groundwater and Surface Water Quality Monitoring report (BORR IPT, 2020).

10.4 Surface water assessment

The following field parameters were recorded from the surface water monitoring locations:

- pH values ranged between 7.12 and 8.81, and are indicative of neutral to slightly basic conditions
- EC values generally ranged between 280 µS/cm and 12,500 µS/cm, and are indicative of fresh to saline water
- ORP values ranged between 9.6 mV to 140.6 mV and indicate variance between reducing and oxidising conditions

The following observations have been made regarding comparison to the adopted assessment criteria (Section 9.2) for the laboratory groundwater results:

- Laboratory pH was recorded outside the fresh water criteria minimum (6.5-8.5) at Southern 4, however all results were greater than pH 7
- Total Nitrogen and Total Phosphorus exceeded the DER 2014 guidelines for Freshwater at all surface water locations with the exception of SW11 for Total Phosphorus
- Chloride concentrations exceeded the DER 2014 guidelines for Non Potable Groundwater Use (250 mg/L) at Southern 3, Southern 4 and SW10
- Total Iron exceeded DER 2014 guidelines for freshwaters at all surface water locations
- Total Aluminium exceeded DER 2014 guidelines for freshwaters (0.55 mg/L) at all surface water locations however none were found to exceed the DER 2015 ASS criteria (1 mg/L) for dissolved Aluminium
- Dissolved Copper, Nickel and Zinc exceeded DER 2014 guidelines for freshwaters at all surface water locations
- TRH and BTEXN concentrations were all reported below the adopted assessment criteria with the majority below LOR
- All pesticides and herbicides results were less than LORs.

A summary of surface water laboratory results are provided in Table E-3 (Appendix E). Sample receipts, laboratory reports and chain of custody have been provided in the Groundwater and Surface Water Quality Monitoring report (BORR IPT, 2020).

11 QUALITY ASSURANCE AND QUALITY CONTROL

The Quality Assurance/ Quality Control (QA/QC) procedures are based on:

DER ASS Guideline Series (DER, 2015a)

DER *Assessment and Management of Contaminated Sites* (DER, 2014)

Assessment of Site Contamination (ASC) NEPM (NEPC, 2013)

AS 4482.1 (Standards Australia, 2005)

AS 4482.2 (Standards Australia, 1999).

QA/ QC involves all of the actions, procedures, checks and decisions, undertaken to ensure the representativeness and integrity of samples and accuracy and reliability of analytical results. QC involves protocols to monitor and measure the effectiveness of QA/ QC procedures.

The ASC NEPM (NEPC, 2013) outlines the groundwater and surface water QC sampling protocol. The type and frequencies of groundwater and surface water QC samples collected during the monitoring event were in line with the ASC NEPM (NEPC, 2013) as described below:

- Blind duplicate samples were collected to identify any variation in analyte concentration between samples from the same sampling point and the repeatability of the primary laboratory's analysis
- Split duplicate samples were collected to provide an indication of the repeatability of the analytical results between NATA accredited laboratories
- Rinsate blank samples are primarily used to assess the effectiveness of equipment decontamination procedures undertaken in the field. The sample is collected by passing laboratory supplied deionised water over the specific piece of decontaminated field equipment
- Trip blank samples are used to assess the potential for introduction of contamination during transport and storage of field samples and are collected using laboratory supplied deionised water
- Field blank samples are used to assess the potential for introduction of contamination from ambient sources in the field during sampling and are collected using laboratory supplied deionised water.

The groundwater and surface water monitoring results included in this report are a component of a wider sampling program which includes BORR Northern, Central and Southern Sections. Therefore the QA/ QC sampling has been undertaken across all BORR sections.

11.1 Field

Field QA/ QC groundwater and surface water procedures and compliance for the wider sampling program are summarised in Table 11-1.

Table 11-1 Summary of field QA/ QC compliance

QA/ QC ELEMENT	REQUIREMENT	EXCEPTIONS	REQUIREMENT ADHERED TO?	INFORMATION/ DATA ACCEPTABLE?
Equipment calibration	Field equipment to be calibrated by the equipment supplier and certification provided to confirm this.		Yes	Yes

QA/ QC ELEMENT	REQUIREMENT	EXCEPTIONS	REQUIREMENT ADHERED TO?	INFORMATION/ DATA ACCEPTABLE?
Record keeping	Detailed records of field activities maintained.		Yes	Yes
Sample labelling	Samples properly labelled (sample ID, date and sample type, preservation techniques, etc.).			
Sample vessels	Samples collected in appropriate containers with appropriate preservation used.			
Sample storage and transport	Samples stored in a chilled esky immediately after sampling and during delivery to the laboratory under CoC documentation signed by field personnel.			
Groundwater and surface water samples QA/ QC	Duplicate samples collected for analysis by the primary laboratory.	Rate of 5% (1 per 20 primary samples)	1 per 10 primary samples	Yes
	Split duplicate (inter lab duplicate)	Rate of 5% (1 per 20 primary samples)	1 per 20 primary samples	Yes
	Relative percent difference (RPD) assessment to adhere to the following protocols: 1 – 10 x LOR (no limit) 10 – 20 x LOR (0 – 50%) and 20 x LOR (0 – 30%).		Yes	Yes
	Rinsate blank		1 per piece of reusable equipment per day	Yes
	Trip blank		1 per esky	Yes
	Field blank		1 per day	Yes

11.2 Duplicate samples

A summary of the groundwater QC samples collected and analysed for BORR South are summarised in Table 11-2 and Table E-4 in Appendix E.

Table 11-2 Summary of QC samples analysed

MEDIA	QC FIELD ID	SAMPLE TYPE	DATE SAMPLED	PRIMARY SAMPLE
Groundwater	FD03	Duplicate	21/08/2019	BORR MW04
	FD03	Duplicate	19/12/2019	BORR MW12
	FS01	Inter lab duplicate	19/12/2019	BORR MW12
	FD01	Duplicate	20/01/2019	BORR MW05
	FD03	Duplicate	22/01/2019	BORR MW12
	FS01	Inter lab duplicate	22/01/2019	BORR MW12

11.3 Relative percentage difference

A summary of the groundwater QC samples collected and analysed for BORR South are summarised in Table 11-3 and Table E-4 in Appendix E..

Table 11-3 Summary of RPDs exceeding adopted ranges for groundwater QC samples

ANALYTE	PRIMARY SAMPLE/ Laboratory Report Number	QC ID/ Laboratory Report Number	RPD (%)
Acidity (as $CaCO_3$)	BORR MW05/ EP2000762	FD01/ EP2000762	73
Ionic Balance	BORR MW04/ EP1908496	FD03/ EP1908496	85
	BORR MW04/ EP1913643	FD03/ EP1913643	33
	BORR MW12/ EP2000814	FD03/ EP2000814	58
Nitrogen (Total Oxidised) (as N)	BORR MW12/ EP2000814	FS01/ 698442	38
Aluminium	BORR MW12/ EP2000814	FS01/ 698442	59
Copper (filtered)	BORR MW04/ EP1908496	FD03/ EP1908496	150
Nickel (filtered)	BORR MW04/ EP1908496	FD03/ EP1908496	171
Zinc (filtered)	BORR MW04/ EP1908496	FD03/ EP1908496	173

11.4 Laboratory QA/ QC

Laboratory QA/ QC procedures and compliance during the investigation are summarised in Table 11-4. Analytical methods for all analyses performed for all samples are detailed in laboratory analytical certificates in the BORR Groundwater and Surface Water Quality Monitoring report (BORR IPT, 2020).

Table 11-4 Summary of primary sample laboratory QA/ QC compliance

QA/ QC ELEMENT	REQUIREMENT	REQUIREMENT ADHERED TO?	INFORMATION/ DATA ACCEPTABLE?
NATA accreditation	Analysis performed under NATA accreditation	Yes	Yes
Method blanks	To be undertaken in accordance with NATA requirements	Yes	No method blank outliers were identified
Surrogate Recovery		Yes	Yes
Laboratory Control		Yes	All laboratory control spike recoveries were within control limits
Matrix Spike		Yes	Outliers identified were at concentrations below the adopted guidelines or, at or below LOR

QA/ QC ELEMENT	REQUIREMENT	REQUIREMENT ADHERED TO?	INFORMATION/ DATA ACCEPTABLE?
Duplicates		Yes	All duplicate recoveries, reported as RPDs, were calculated to be within defined criteria
Holding times	Analysis to be undertaken within NATA specified time from sampling	See below	Yes

Minor holding time exceedances to laboratory defined criteria for extraction/preparation as well as analysis were noted in laboratory reports for various groundwater and surface water samples across the six monitoring events:

- August 2019 (EP1908386 & EP1908496): 3 exceedances for extraction/preparation (1 day) and 6 exceedances for analysis of pH, BTEXN, OP Pesticides & hydrocarbons in total (1 – 5 days)
- September 2019 (EP1909465 & EP1909602): 2 exceedances for analysis of pH (2 – 6 days)
- October 2019 (EP1910866, EP1910998 & EP1911129): 4 exceedances for analysis of pH and OP Pesticides in total (1 – 9 days)
- November 2019 (EP1912183 & EP1912321): 3 exceedances for analysis of pH and OP Pesticides in total (1 – 12 days)
- December 2019 (EP1913499 & EP1913643): 4 exceedances for analysis of pH, alkalinity and OP Pesticides in total (1 – 16 days)
- January 2020 (EP2000814 & EP2000762): 2 exceedances for analysis of pH, OP Pesticides and Reactive Phosphorus as P in total (1 – 6 days).

These discrepancies predominantly relate to pH or OP pesticides (hydrocarbons, BTEXN, Reactive Phosphorus as P and alkalinity being one off occurrences) with holding times ranging between 1 and 16 days overdue. The majority of these exceedances ranged between 1-3 days overdue.

pH should be analysed for as soon as possible on the day the sample is collected, however due to the distance of the locations from the laboratory, this was not possible. Therefore pH was also measured while out in the field using a YSI to give a primary indication of the water quality. For analysis of OP Pesticides, groundwater samples have a laboratory recommended holding time of 7 days, while for BTEXN and TRH it is 14 days. However, it is considered that these exceedances were marginal and are unlikely to impact the outcomes of the report.

11.5 Summary

The results of the QA/QC procedures indicate that the groundwater and surface water monitoring results derived from the field, laboratory and analysis can be considered to be valid and reliable, and can be used to analyse and interpret the quality of groundwater and surface water of the sites. The majority of the found exceedances appear to be related to the low concentrations of the analytes detected within the water samples. As the concentrations between the primary and blind duplicate/split samples seem to be within the same order of magnitude or at minor concentrations, it is considered that these small differences and inconsistencies are insignificant and negligible, and are unlikely to have a major impact on the results or the outcomes of the report.

12 OVER-ARCHING SPOIL MANAGEMENT PLAN

This management section highlights the key construction issues that may impact on groundwater, soils, environmental receptors and groundwater users either within the Proposal footprint or within the vicinity of the Proposal footprint and includes:

- A framework for the treatment and management of excavated/disturbed material defined as ASS during construction of the alignment
- A framework for management of dewatering effluent and groundwater, specifically with regards to managing the groundwater quality and levels, during construction works
- Site-specific management procedures and action criteria for Contractor/s to use during the works to minimise potential impacts.

The following text includes generic terms for the parties that will be involved, as defined below.

- *Contractor:* BORR IPT Principal Contractor
- *Environmental Scientist*: BORR IPT Environmental Scientist
- *Superintendent*: BORR IPT Engineer.

The Contractor will be responsible for ensuring that all management measures outlined in this ASSDMP are adhered to (or as agreed otherwise) for the duration of the works.

Material deemed as ASS will be subject to further ASS investigations, in accordance with DWER guidelines, to characterise soils prior to disturbance. Further site investigation will also assist in refining this ASSDMP.

12.1 Topsoil

No ASS treatment or management of topsoils (0.03 m bgl) is necessary during construction, as all topsoil samples analysed had a pHF greater than 4.0 and less than 18.0 mol H^+/ tonne.

For the purpose of this management plan, topsoil is defined as material up to the first 300 mm of the soil profile generally containing organic and vegetative matter. It is routine practice to remove the topsoil before excavation and stockpile until it is needed for future top-dressing or rehabilitation purposes.

12.2 Spoil management

Spoil material that is directly excavated during works will be assessed by a qualified Environmental Engineer or Scientist experienced in ASS assessment and management, to determine the ASS status.

Soils typically excavated below the ground water table will currently require management during direct excavation and/ or disturbance by lowering the groundwater level. However, further investigation and refinement is required and may indicate a more conservative approach to soil management is appropriate.

Storage and Treatment Areas

Prior to excavation works, the Contractor is required to identify a treatment area and construct a bunded limestone treatment pad, approved by the Environmental Scientist or Superintendent. All excavated spoil deemed to be ASS must be stockpiled on the treatment pad at the end of each excavation day and until confirmation that neutralisation has been achieved.

The treatment pad must comprise the following components:

- Constructed of compacted crushed limestone of not less than 300 mm in thickness. The pad shall be graded to ensure good drainage towards the back of the pad to ensure runoff and any leachate is collected within a lined stormwater collection basin.
- Three sides will be bunded with limestone or similar alkaline material to a minimum height of approximately 150 mm above the surface of the pad to prevent lateral run-off. A leachate collection and treatment system will also be required to manage run-off during winter periods or rainfall events.
- The stormwater collection basin (if required) should be lined with a low permeability liner (synthetic). The leachate collection basin should be of sufficient size to retain the first 10 mm of runoff from the bunded area, and should overflow to a separate unlined infiltration area or basin after treatment (if monitoring indicates treatment is required).
- The volume of the excavated material should not exceed more than one week's volume of extraction.

The Contractor is to provide a description of their proposed methodology for neutralisation prior to the commencement of works. The method is to be approved by the Environmental Scientist prior to the commencement of the soil treatment operations, and may require adjustment during works, if validation results indicate the methodology is not effective.

Excavated soil or sediment may be temporarily stockpiled pending treatment on the bunded treatment pad for a maximum of fourteen days.

12.3 Indicative neutralisation rate

The Contractor should inform the Environmental Scientist prior to commencement of neutralisation and provide the Product Information Sheet (PIS) provided by the agricultural lime (Aglime) supplier to ensure the liming rate can be corrected prior to application. The below liming rate is indicative only and will require further refinement in the form of site investigations prior to implementation.

All excavated soil must be treated and blended with Aglime and subsequently validated (refer to Sections 12.5 and 12.6) prior to reuse.

The following uncorrected indicative liming rate calculation assumes the following variables, is adopted from the DER (2015a) guidelines, and has been based on the assumptions listed below:

Lime (kg /m3 soil) = Soil bulk density x (Net acidity (%S x 30.59) x 1.02 x Safety Factor) / ENV

- Maximum net acidity
- Safety Factor of 1.5
- Conservative bulk density of 1.6 t/ m^3
- Effective Neutralising Value (ENV) of Aglime is 100%.

Table 12-1 Indicative neutralisation rate

MATERIAL	MAXIMUM NET ACIDITY (% S)	NEUTRALISATION RATE (KG/ M^3)
Material generally described as, but not limited to below the groundwater table (further assessment required)	0.14	10.48

12.4 Mixing of neutralising agent

There are several different techniques available for mixing the Aglime into excavated materials. Some methods provide good mixing of Aglime within the excavated material, but require specialised equipment. Other methods use existing equipment, but provide incomplete mixing. Table 12-2 provides a description of several mixing methods, and should be treated as a guide in assisting the Contractor with selecting the most appropriate method.

Table 12-2 Methods of mixing neutralising agent

METHOD	POSITIVE FACTORS	NEGATIVE FACTORS
Tractor-towed disc-plough	Allows thorough mixing of Aglime and constant turning of soil will ensure an even Aglime distribution. Works well on dry materials	Requires a tractor, which may have no other use on site during construction Large treatment areas required providing turning space for the tractor
Rubber tyred heavy vehicles	Machinery already on site can be used to mix the Aglime into the excavated material.	Can result in poor lime distribution. Can compact soils, requiring disaggregation prior to use for landscaping
Excavator	Excavators already on site can be used to mix Aglime into the excavated material. Works well on moist/wet soils.	Requires specialised (longer) teeth on the excavator bucket to rip the material deep enough to thoroughly mix the Aglime. Can result in poor lime distribution.
Grader	Graders already on site can be used to mix Aglime into the excavated material. Allows material to be churned provided inclining blades and tines are used.	Can result in poor lime distribution. Can result in damage to the guard layer and liming pad.

No matter which method is chosen, a minimum of three passes will be required to ensure that the neutralising agent is mixed thoroughly into the soil. Ultimately the degree of neutralisation achieved is dependent on the characteristics of the soil and effectiveness of the mixing process.

12.5 Validation procedure

The Contractor will liaise with the Environmental Scientist or delegated authority to arrange for sampling and testing of the neutralised material prior to re-use or disposal. The Environmental Scientist or delegated authority will verify if material was neutralised correctly.

As per the DER (2015b) guidelines for validation of the effectiveness of soil neutralisation activities, the validation sampling will be undertaken using field testing (pH_F and pH_{FOX}) at a sampling intensity in accordance with Landfill Waste Classifications and Waste Definitions 1996 (As amended 2018) (DWER, 2018). The accuracy of the field testing program will be 'calibrated' by sending 25 % of samples to a laboratory for confirmatory analysis (DER, 2015b).

A summary of the required sampling densities is summarised in Table 12-3.

Table 12-3 Stockpile validation sampling frequency and suite

VOLUME OF STOCKPILE (m^3)	NUMBER OF SAMPLES	SAMPLE SUITE
<200	4	All samples: pH_F and pH_{FOX}. Select 25% of samples: CRS suite with the inclusion of a measurement for Titratable Peroxide Acidity (TPA).
200 – 500	6	
501 – 1,000	8	
1,001 to 2,000	11	
Table notes; CRS suite includes: pH_{KCL}, TAA, S_{CR}, ANC and S_{NAS}		

Table 12-3 referenced from (DWER, 2018)

Representative soil samples will be collected from the treated stockpile, i.e. from points distributed at different elevations and locations around the stockpile perimeter, and from at least 300 mm within the stockpile surface.

Samples will be collected in a zip-lock plastic bag and will be stored on ice immediately and transported to a National Association of Testing Authorities (NATA) accredited laboratory for analysis as soon after collection as possible.

12.6 Validation criteria

The stockpiled soils will be assessed with reference to DER (2015b) guidelines:

- The neutralising capacity of the treated soil must exceed the existing plus potential acidity of the soil (e.g. pH_{FOX} must be greater than 5.0)
- The neutralising material must be thoroughly mixed with the soil
- Soil pH (pH_F) must be between 6.0 and 8.5
- Excess neutralising material must remain within the soil until all acid generation reactions are complete and the soil has no further capacity to generate acidity (i.e. net acidity <0.03 %S).

If the validation results do not comply with the criteria, and if any confirmatory results indicate neutralising capacity less than the existing plus potential acidity, then additional treatment by the Contractor will be required. Subsequently, re-testing will be undertaken, and adequate verification results will be required before the material can be reused.

12.7 Reporting

Contractor to prepare the following information and provide on a weekly basis to form a log of treatment operations:

- Total volume of excavated soil and sediment
- Quantity and type of neutralising material utilised
- Dates of excavation and treatment of ASS material.
- Approximate location of neutralised ASS material once approved for re-use.

The Environmental Scientist will provide written advice as to the results of validation testing to include:

- Information about the volume of material tested
- The analytical results (pH screen within 24 hours)
- Confirmation that the excavated material is suitable for re-use and meets the neutralisation criteria.

13 OVER-ARCHING DEWATERING MANAGEMENT PLAN

The groundwater conditions at the site are indicative of an area which may be vulnerable to acidification and therefore degradation of water quality (groundwater or surface water) may occur during and after construction. The dewatering management strategies outlined below are required to mitigate and/ or reduce the impacts to environmental receptors either identified within the Proposal footprint or within the vicinity of the site.

The Contractor will be responsible for ensuring that all management measures outlined in this section (or as agreed otherwise) are adhered to for the duration of their contract.

13.1 Dewatering overview

Groundwater levels will be influenced by general seasonal variation, local rainfall recharge, and the porosity/permeability characteristics of the surrounding material. Scheduling work for drier periods of the year will reduce the requirement for dewatering.

Dewatering is expected to be required for the construction of major assets such as bridges and underpasses. Additionally, dewatering may be required for service trenching including re-location of existing services.

Surface water management may be required during the construction period. The management of surface water is not considered as active dewatering.

13.2 Pre-dewatering activities

An assessment of groundwater quality and the installation of appropriately located groundwater monitoring wells should be installed prior to commencing dewatering operations exceeding five days and/ or radius of drawdown greater than 50 m.

A minimum of three groundwater wells should be installed prior to dewatering operations and the depth of installation should reflect the drawdown required during construction phase to ensure that wells are not rendered ‘dry’ during dewatering operations.

A baseline water monitoring event will be undertaken prior to commencing dewatering operations to confirm the assumptions and management strategies outlined below.

13.3 Dewatering methods

The dewatering methodology would depend on the finalised construction method employed by the awarded Contractor. However, it is likely that the following dewatering methods, or a combination thereof, could be utilised during construction.

- Dewatering spears - likely to be used for localised areas including the inlet and outlet structures.
- Sump pumps - for localised dewatering and potentially surface water management.

13.4 Dewatering operations

The dewatering operations will aim to be short term, however the extent is currently unknown. Once detailed design has been completed or progressed sufficiently to provide details on design, a review of the design in relation to the groundwater level and likelihood of dewatering operations will be undertaken.

Dewatering operations which are unlikely to comply with the RIWI Act Exemption (outlined below) will require a formal application for a 5C dewatering licence and 26D licence to construct a well or alter a well to the DWER.

Exemption from section 5C and 26B(3) to (6) of the Act:

Sections 5C and 26B(3) to (6) of the Act do not apply in relation to a non-artesian well in a proclaimed area if –

- *the only water that can be taken from the well is from the water table aquifer; and*
- *water is taken from the well solely for the purposes of removing underground water to facilities construction or other activity (that is, dewatering); and*
- *the water is taken at a pump rate not exceeding 10 litres per second over a period of less than 30 consecutive days; and*
- *the volume of water taken over the period referred to in paragraph (c) does not exceed 25,000 kilolitres.*

13.5 Effluent management

All dewatering effluent should be directed to a retention area immediately after abstraction. The retention area is required to be of sufficient size to contain the dewatering effluent for a minimum retention period of 6 hours or until effluent has achieved the discharge water quality performance criteria discussed in Section 13.7. The retention area will consist of the following:

- Impermeable basin/ tank (below ground or above ground) to allow sufficient time for the mixing (if applicable) and aeration process to flocculate and settle solids
- Dewatering effluent should then flow to an infiltration area.

Sediment Reduction and Control

All soil disturbances within and adjacent to surface water receptors should aim to reduce sediment loads entering the receiving environment particularly riparian zones. Consequently, it is recommended that consideration is given to sediment reduction practices such as silt-booms and curtains.

13.6 Dewatering treatment

Abstracted groundwater is anticipated to generally meet the infiltration criteria (DER, 2015b) and is considered suitable for discharge without extensive neutralisation.

However, the monitoring program implemented will assist with determining additional treatment requirements in the event that groundwater quality degrades during abstraction.

In the event that dewatered effluent requires neutralisation, effluent will be treated with a lime (calcium carbonate) based product. Products which include sodium, which may increase salinity values within the local landscape will not be utilised for this Proposal.

13.7 Monitoring effluent

Sampling of surface water (effluent) will be undertaken with reference to *AS/NZS 5667.11-1998 Water Quality - Sampling - Guidance on sampling of groundwaters* (reconfirmed 2016) (Standards Australia and Stanards New Zealand, 1998).

Monitoring of the dewatering effluent will be undertaken in accordance with Table 13-1 at the following sampling locations:

- **Sample Point 1:** Monitoring effluent on abstraction (prior to retention)
- **Sample Point 2:** Monitoring effluent prior to entering the disposal point.

Daily monitoring will be undertaken by the awarded Contractor and fortnightly (or weekly subject to trigger criteria) monitoring will be undertaken by the Environmental Scientist.

Table 13-1 Dewatering effluent validation sampling frequency and suite

TRIGGER	ACTION	MONITORING
Total titratable acidity (TTA) <40 mg/L pH >6	Continue daily field measurements of pH and total titratable acidity	**Daily** – field measurement: pH, electrical conductivity (EC) & total titratable acidity **Fortnightly** - laboratory analysis: total acidity, total alkalinity and pH
Total titratable acidity <40 mg/L **pH in range of 4 to 6**	Undertake neutralisation treatment (liming)	**Daily** – field measurement: pH, EC & TTA, total alkalinity **Fortnightly** - laboratory analysis: total acidity, total alkalinity and pH
Total titratable acidity in range 40 mg/L to 100 mg/L **pH>6**	Undertake neutralisation treatment (liming). Effluent should be aerated to precipitate dissolved iron and directed to a series of settlement basins/trenches or other treatment system to allow removal of iron and other metals	**Daily** – field measurement: pH, EC & TTA, total alkalinity **Weekly** - laboratory analysis: total acidity, total alkalinity, pH **Fortnightly** - field measurement: dissolved oxygen (DO) and redox potential (ORP)
Total titratable acidity in range 40mg/L to 100 mg/L **pH in range of 4 to 6**	Undertake neutralisation treatment (liming) Effluent should be aerated to precipitate dissolved iron and directed to a series of settlement basins/trenches or other treatment system to allow removal of iron and other metals	**Daily** – field measurement: pH, EC, TTA, total alkalinity **Weekly -** laboratory analysis: total acidity, total alkalinity, pH **Fortnightly** - laboratory analysis: total acidity, total alkalinity, pH, sulfate, chloride, total iron, dissolved iron (filtered), total aluminium, dissolved aluminium (filtered), total arsenic, total chromium, total cadmium, total manganese, total nickel, total zinc, total selenium, ammoniacal nitrogen, EC, total suspended solids (TSS), total dissolved solids (TDS), total nitrogen (TN) and total phosphorus (TP) **Fortnightly** - field measurement: DO, Eh
Total titratable acidity >100 mg/L **or**	Increase neutralisation treatment (liming) rate Effluent should be aerated to precipitate dissolved iron and directed to a series of	**Twice Daily –** field measurement: pH, EC, TTA, total alkalinity **Weekly** - laboratory analysis: total acidity, total alkalinity, pH, sulfate,

TRIGGER	ACTION	MONITORING
pH<4 **or** **Total alkalinity <30 mg/L**	settlement basins/trenches or other treatment system to allow removal of iron and other metals Advise Department of Water and Environmental Regulation (DWER) Contaminated Sites Branch (CSB) immediately. CSB may advise appropriate action which may include ceasing dewatering	chloride, total iron, dissolved iron (filtered), total aluminium, dissolved aluminium (filtered), total arsenic, total chromium, total cadmium, total manganese, total nickel, total zinc, total selenium, ammoniacal nitrogen, EC, TSS, TDS, TN and TP **Fortnightly -** field measurement: DO, Eh May be required to undertake investigations to determine the size of the "acidic footprint" created and manage this impact appropriately

Table 13-1 adapted from (DER, 2015b).

13.8 Disposal of dewatering effluent

Re-infiltration

Re-infiltration is the preferred method of disposing of effluent (subject to water quality).

Re-infiltration on-site may be a feasible dewatering discharge disposal option, if a suitable area can be located and agreed upon with the relevant authorities and land owners. Re-infiltration (post retention) may be viable over completed construction trenches, however the re-infiltration rate would depend on the dewatering rates/volume and the infiltration capacity and depth to groundwater level at the time of construction.

Consideration to the peak seasonal periods will be required as the re-infiltration of effluent will be impeded by a high groundwater table and potentially a limited capacity with the local drainage network.

Alternative Forms of Disposal

Alternative disposal methods for the dewatering effluent may include the following:

- Construction support such as dust suppression or soil conditioning.
- Discharge to surface water bodies (regulatory approval required).
- Water use off-site by pumping and carting.
- Solar evaporation in a lined containment basin.
- Discharge to sewer network (permit required).
- Discharge into stormwater system (permit required).

These disposal methods would incur additional permitting and monitoring requirements and will be discussed further with the regulatory authorities, superintendent and relevant site personnel should these methods be required.

13.9 Contractor monitoring responsibilities during dewatering

The role and responsibilities of the Contractor during dewatering operations are outlined in Table 13-2. Template checklists for dewatering effluent monitoring for the Contractor are included in Appendix F.

Table 13-2 Contractor responsibilities – water monitoring

TASK	ACTIONS
Daily monitoring dewatering discharged rate and volume. Daily monitoring and recording of effluent for pH, EC and TTA subject to trigger criteria outlined in Table 13-1. Daily monitoring of dewatering effluent with respect to visual assessment, for example high sediment loading, iron precipitation, colour, odour (hydrocarbon) etc. Daily assessment of the geofabric textiles (when installed) within the dewatering treatment system and cleaning/replacement, as required. Twice per week monitoring of the groundwater bores for Static Water Level (SWL), pH, Eh, DO, EC, TTA and total alkalinity (TAlk) during dewatering operations. On completion of dewatering works, advise Environmental Scientist and arrange for the sampling of the accumulated sediments at the base of each tank or pond to determine the appropriate decommissioning requirements in accordance with Section 13.10.	Results of the water monitoring programs along with actions taken to achieve water quality targets including quality of the dewatering effluent to be provided to the Environmental Scientist on a weekly basis. Results to be provided within 24 hours of water quality falling outside the parameters in Table 13-1.

13.10 Disposal of dewatering basin sediments

At the completion of the works, the Contractor (under guidance) or the Environmental Scientist will be responsible for collection of samples of the accumulated sediments within the basins at a rate of one sample per 50 m^3 of material, or a minimum of two samples if the total volume is less than 50 m^3.

Accumulated sediments at the base of the retention area will be disposed of by the Contractor to an appropriate landfill facility, once the sediments have been analysed and assessed in accordance with the ASC NEPM (NEPC, 2013) and DWER (2018) guidelines.

Sample analysis will include, but not be limited to:

- Chromium reducible sulfur suite
- Metals (arsenic, beryllium, cadmium, chromium, lead, mercury, molybdenum, nickel, selenium) and cyanide (total).

Sediments should not be disposed of on-site without prior consultation.

14 GROUNDWATER MONITORING

Groundwater monitoring is an integral part of any project where dewatering is undertaken, as it allows for any changes in land and water quality to be monitored pre, during and post construction, giving an indication as to the success of the management strategies implemented.

The groundwater monitoring program will utilise the existing and proposed monitoring wells installed as part of the investigation (BORR IPT, 2020). A minimum of three bores within the closest vicinity to dewatering operations will be utilised in the monitoring program for the works.

It is considered that if either of these proposed groundwater wells is rendered unusable as a result of construction or vandalism, it will be required to be replaced as soon as possible after the well has been determined to be unusable.

14.1 Baseline water sampling

Baseline data was obtained during the recent 2019 / 2020 investigation (BORR IPT, 2020), however an additional baseline event, including surface water, should be undertaken prior to earth disturbing works. Historical investigation data and baseline data will be utilised to confirm and ascertain water quality performance criteria.

14.2 Monitoring program

The water monitoring program will utilise selected monitoring wells locations listed in Table 7-3 and Figure 5, Appendix A for the duration of the site works.

A minimum of three (3) bores within the closest vicinity to the dewatering operations will be utilised in the monitoring program for each phase of works. Additional monitoring wells will be installed at relevant locations, where applicable and where more extensive dewatering operations are defined during the detailed design phase.

Water monitoring will be undertaken on a fortnightly basis during dewatering operations with reference to *AS/NZS 5667.11-1998 Water Quality - Sampling - Guidance on sampling of groundwaters* (Standards Australia and Stanards New Zealand, 1998). The monitoring results will enable an assessment of groundwater quality trends. Table 14-1 outlines a summary of the overall monitoring program.

Table 14-1 Overall monitoring program

PARAMETER	FREQUENCY	RESPONSIBILITY
Baseline/ Pre-construction		
Water suite to include: <u>Field measurement</u> Static Water Level (SWL), pH, Eh, DO, EC, TTA and total alkalinity (TAlk). <u>Laboratory analysis</u> Total acidity, total alkalinity, pH, EC, total dissolved salts (TDS), dissolved solids. Major	Prior to site works commencing – groundwater and surface water	Environmental Scientist

PARAMETER	FREQUENCY	RESPONSIBILITY
cations: sodium, potassium, calcium, magnesium <u>Major anions</u> Chloride, sulfate, bicarbonate <u>Dissolved metals</u> Aluminium, arsenic, cadmium, chromium, iron, manganese, nickel, selenium, zinc Total metals: aluminium, iron <u>Nutrients</u> Total nitrogen (TN), total oxidised nitrogen, ammoniacal nitrogen, total phosphorus (TP), reactive phosphorus		
During construction (dewatering periods only)		
Water suite as above	Fortnightly during dewatering unless dewatering quality deteriorates – refer to Trigger criteria outlined in Table 13-1	<u>Field measurements:</u> Contractor (or Contractor delegated authority) <u>Laboratory analysis:</u> Environmental Scientist
Post-construction		
Water suite as above	Post-Construction once construction and dewatering have ceased	Environmental Scientist

14.3 Performance criteria and contingency

A summary of the performance criteria for the groundwater and surface water is provided in Table 14-2 and is to be implemented during monitoring events to assess water quality trends and ensure water quality is not degrading or degraded.

If any of the triggers in Table 14-2 are exceeded, it is recommended that a review of the dewatering operations is undertaken to avoid unnecessary environmental degradation and/or other user impacts. If there is a significant delay in the implementation of contingency strategies, this could result in unacceptable degradation to groundwater quality and other sensitive receptors.

Table 14-2 Groundwater trigger criteria

ANALYTE	TRIGGER CRITERIA
Static water level	Decrease of 0.1 m within 100 m radius from dewatering
pH	- 10% from baseline pH value
Total Acidity	>25% increase from the baseline value
Dissolved aluminium and/ or iron	>25% increase from the baseline value

The following contingency measures will be assessed and implemented where necessary in consultation with the Environmental Scientist:

- Commence/increase liming rates via an automated pH treatment unit
- Employ the use of aeration/settlement tanks with geotextile fabric to remove total iron, aluminium and other metal floc
- Implementation of longer settlement times (which may involve more settlement tanks to cater for areas requiring significant discharges)
- Implementation of increased aeration (for example, use of sprayer head)
- Modification of dewater effluent re-infiltration to limit drawdown in area of concern
- Modification of the construction method (i.e. implementation of cut off walls to localise impact of dewatering and reduce the cone of depression).

15 POST CONSTRUCTION REPORTING

An ASS and dewatering closure report will be prepared once excavation and dewatering for the site works has been completed. The closure report will include the following components:

- Executive summary
- Scope of work
- Site identification and details of re-development
- Existing environment and setting
- Adherence to ASSDMP
- Recommendations for ongoing monitoring (if applicable).

Post construction monitoring requirements will be re-assessed at the completion of construction program and is dependent on the groundwater quality trends. A notable decline in groundwater quality will result in post construction monitoring.

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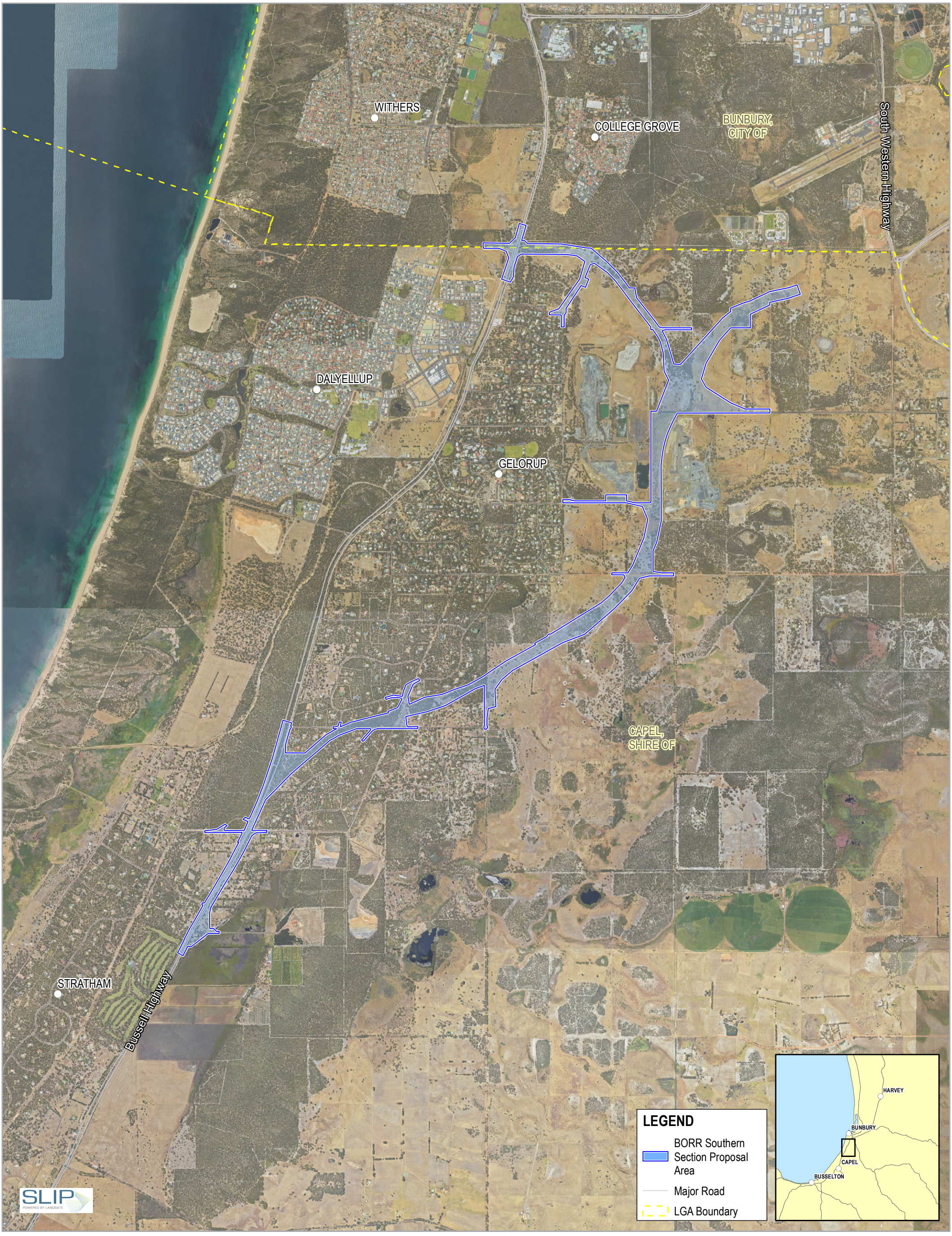
APPENDIX A

Figures



Paper Size ISO A3

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

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BUNBURY OUTER RING ROAD | PLANNING AND DEVELOPMENT

mainroads WESTERN AUSTRALIA

Main Roads Western Australia
Bunbury Outer Ring Road Southern Section
Acid Sulfate Soil and Dewatering Management Plan

Locality

Project No. **61-37041**
Revision No. **0**
Date **9/04/2020**

FIGURE 1

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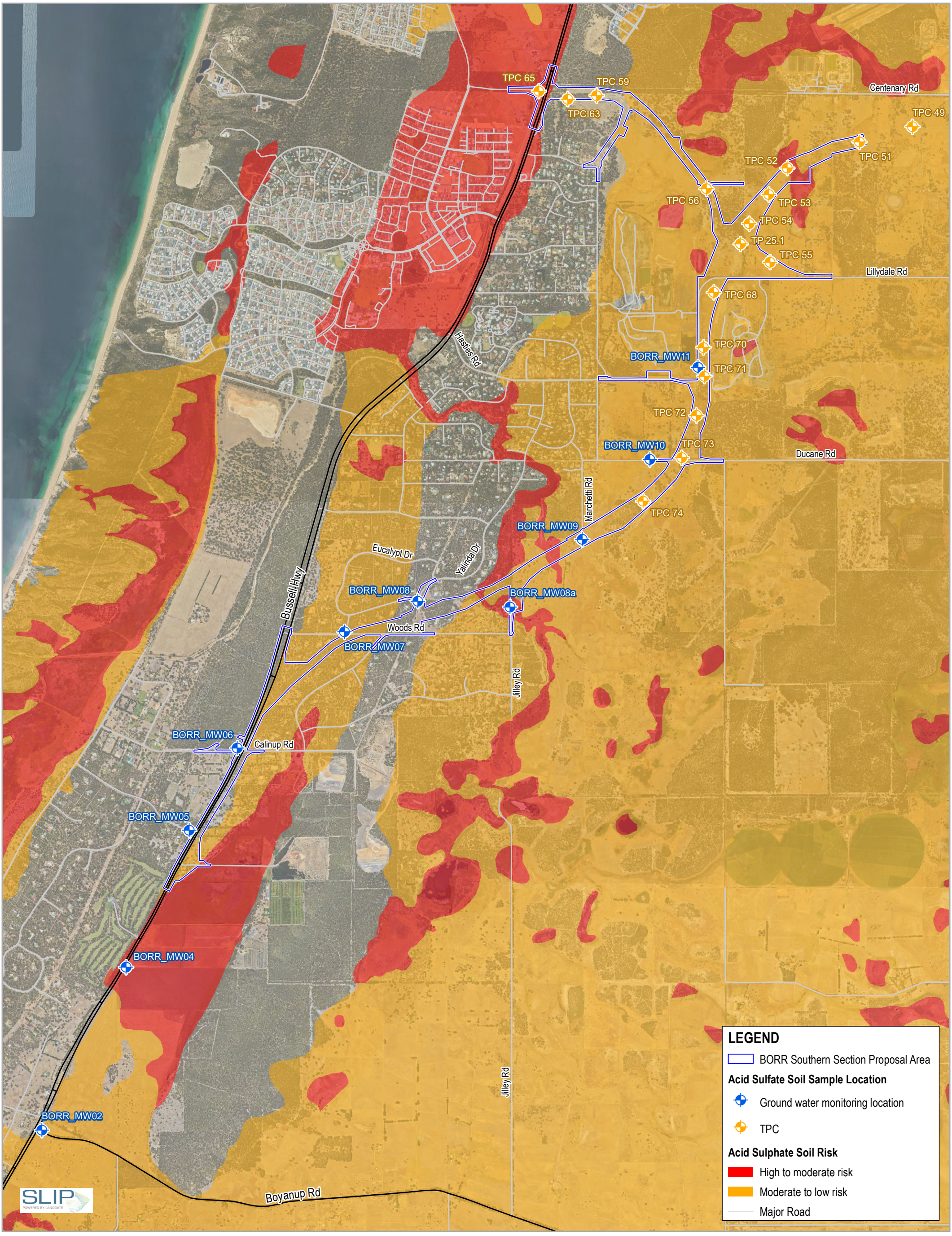
Data source: Geoscience Australia: GeoData Topo 250k Series III - 2006; Landgate: LGA Boundary - 20191021, Roads - 20180501, Imagery - WA Now accessed 20200409; BORR: Proposal Area - 20191212.
Created by: slei



Paper Size ISO A3

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

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Bunbury Outer Ring Road Southern Section
Acid Sulfate Soil and Dewatering Management Plan

Acid Sulfate Soil Sample Locations

Project No.	**61-37041**
Revision No.	**0**
Date	**23/04/2020**

FIGURE 2

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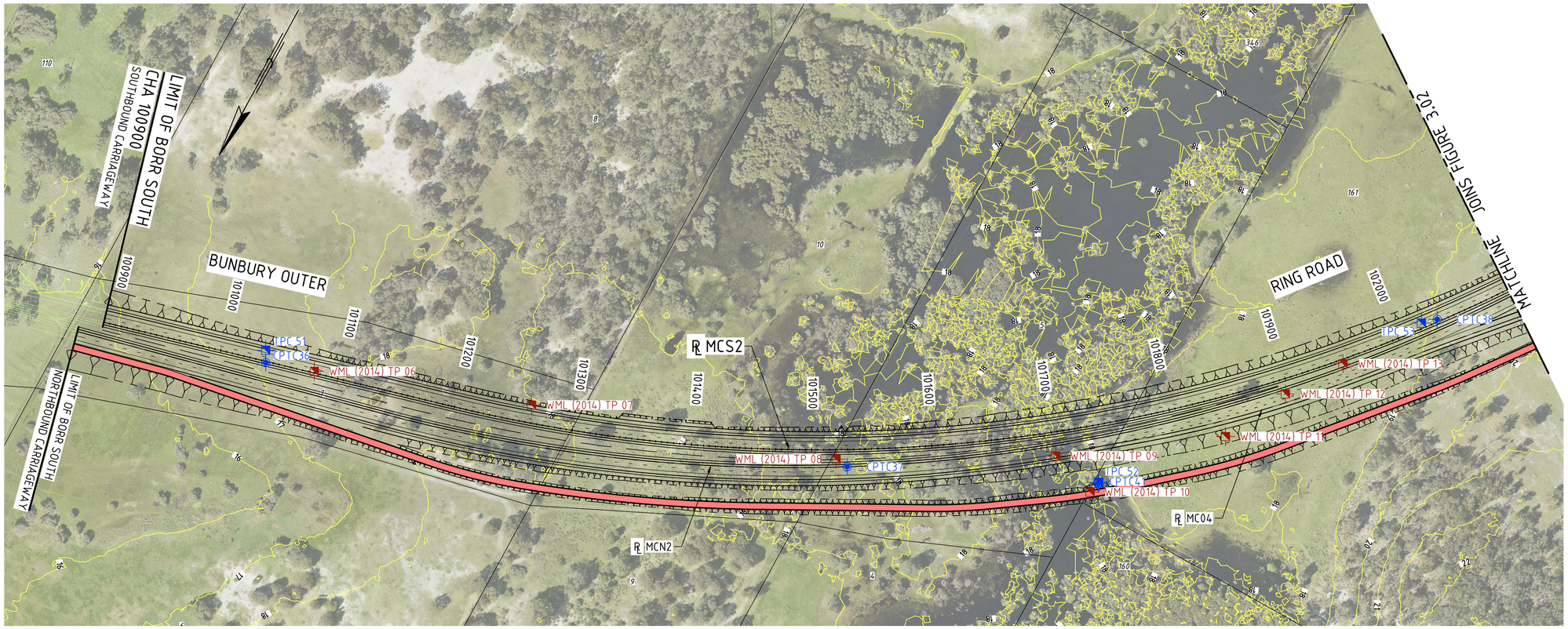
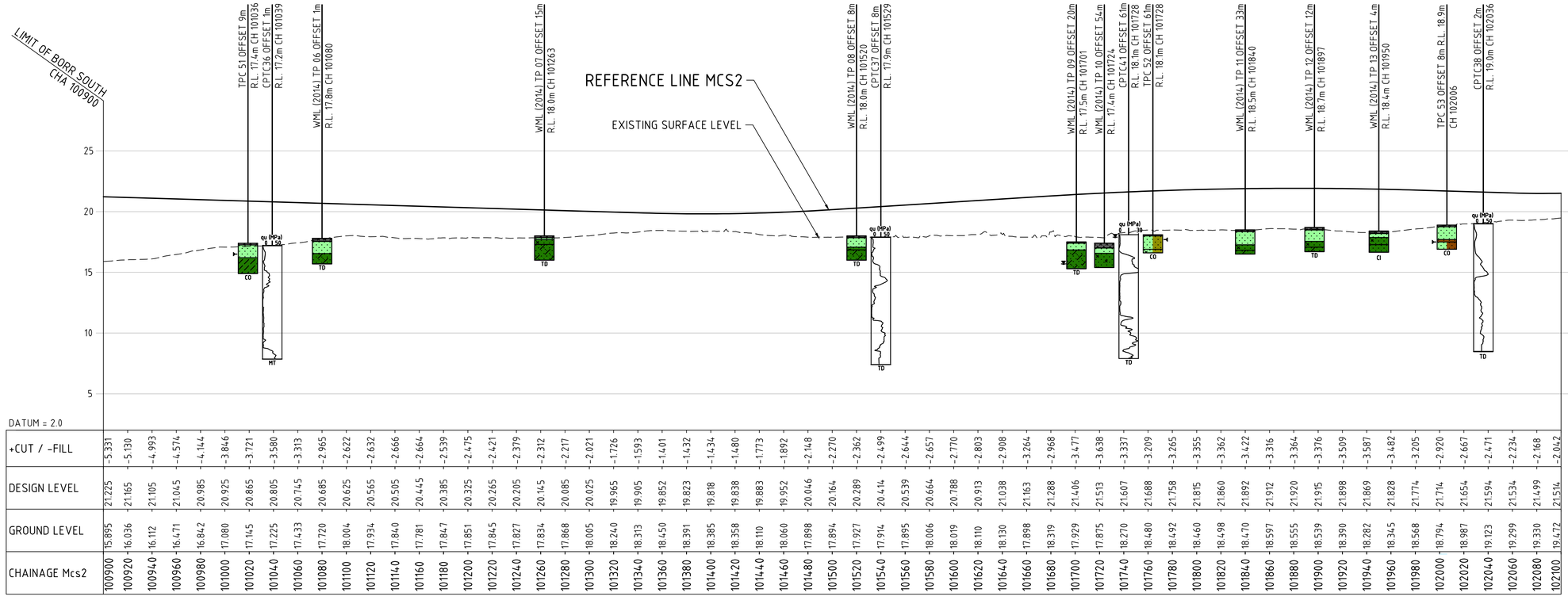
Data source: BORR: Soil sampling location - 2020; DWER: Acid Soil Risk Map - 20190627; Geoscience Australia: GeoData Topo 250k Series III - 2006; Landgate: LGA Boundary - 20191021, Roads - 20180501, Imagery - WA Now accessed 20200423; BORR: Proposal Area - 20191212. Created by: slei





PLAN

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DESIGN LEVEL	21.225	21.165	21.105	21.045	20.985	20.925	20.865	20.805	20.745	20.685	20.625	20.565	20.505	20.445	20.385
GROUND LEVEL	15.895	16.036	16.112	16.471	16.842	17.080	17.145	17.225	17.433	17.720	18.004	17.934	17.840	17.781	17.847
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+CUT / -FILL	-2.475	-2.421	-2.379	-2.312	-2.217	-2.021	-1.726	-1.593	-1.401	-1.432	-1.434	-1.480	-1.773	-1.892	-2.148
DESIGN LEVEL	20.325	20.265	20.205	20.145	20.085	20.025	19.965	19.905	19.852	19.823	19.818	19.838	19.883	19.952	20.046
GROUND LEVEL	17.851	17.845	17.827	17.834	17.868	18.005	18.240	18.313	18.450	18.391	18.385	18.358	18.110	18.060	17.898
CHAINAGE Mcs2	101200	101220	101240	101260	101280	101300	101320	101340	101360	101380	101400	101420	101440	101460	101480

+CUT / -FILL	-2.270	-2.362	-2.499	-2.644	-2.657	-2.770	-2.803	-2.908	-3.264	-2.968	-3.477	-3.638	-3.337	-3.209	-3.265
DESIGN LEVEL	20.164	20.289	20.414	20.539	20.664	20.788	20.913	21.038	21.163	21.288	21.406	21.513	21.607	21.688	21.758
GROUND LEVEL	17.894	17.927	17.914	17.895	18.006	18.019	18.110	18.130	17.898	18.319	17.929	17.875	18.270	18.480	18.492
CHAINAGE Mcs2	101500	101520	101540	101560	101580	101600	101620	101640	101660	101680	101700	101720	101740	101760	101780

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DESIGN LEVEL	21.815	21.860	21.892	21.912	21.920	21.915	21.898	21.869	21.828	21.774	21.714	21.654	21.594	21.534	21.499	21.514
GROUND LEVEL	18.460	18.498	18.470	18.597	18.555	18.539	18.390	18.282	18.345	18.568	18.794	18.987	19.123	19.299	19.330	19.472
CHAINAGE Mcs2	101800	101820	101840	101860	101880	101900	101920	101940	101960	101980	102000	102020	102040	102060	102080	102100

PROFILE

SCALE 1:2000 H, 1:200 V

NOTES :

1. SOME INVESTIGATION LOCATIONS MOVED LATERALLY ON THE PROFILE FOR VISUAL CLARITY.
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3. THE SOIL/ ROCK SYMBOL LEGEND IS SHOWN IN APPENDIX P.

LEGEND :

—	CADASTRAL BOUNDARY
▨	PROPOSED BRIDGE
🟥	PROPOSED PSP
🟨	PROPOSED SHARED PATH
▶	GROUNDWATER INFLOW LEVEL
▼	DIPPED GROUNDWATER LEVEL
≈	GROUNDWATER SEEPAGE LEVEL
TD	TARGET DEPTH
R	REFUSAL
NR	NEAR REFUSAL
CO	COLLAPSING
CI	CAVE IN
W	WATER
MT	MAXIMUM THRUST
I	INCLINATION
CR	CONE RESISTANCE
EOR	END OF REACH
B	BOUNCING OR NO LATERAL SUPPORT
N=15	SPT N VALUE
N=R	SPT REFUSAL
⬛	TOPSOIL
⬜	FILL
🟫	SWAMP DEPOSITS
🟪	TAMALA SAND
🟦	TAMALA LIMESTONE
🟫	COFFEE ROCK
🟩	BASSENDEAN SAND
🟩	GUILDFORD FORMATION
🟦	LEEDERVILLE FORMATION
🟪	RESIDUAL SOIL
🟧	BUNBURY BASALT
🟥	YARRAGADEE FORMATION
⌖ CPT18.2A	BORR CPT 2018/2019 LOCATION
⌖ BH 18.1	BORR BOREHOLE 2018/2019 LOCATION
⌖ TP 32.1	BORR TEST PIT 2018/2019 LOCATION
⌖ HA 27.1	BORR HAND AUGER 2018/2019 LOCATION
⌖ WML (2014) TP14	WML TEST PIT 2014 POINT

VERT. 1:200

HORIZ. 1:2000

SCALES

A1

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BUNBURY OUTER RING ROAD | PLANNING AND DEVELOPMENT

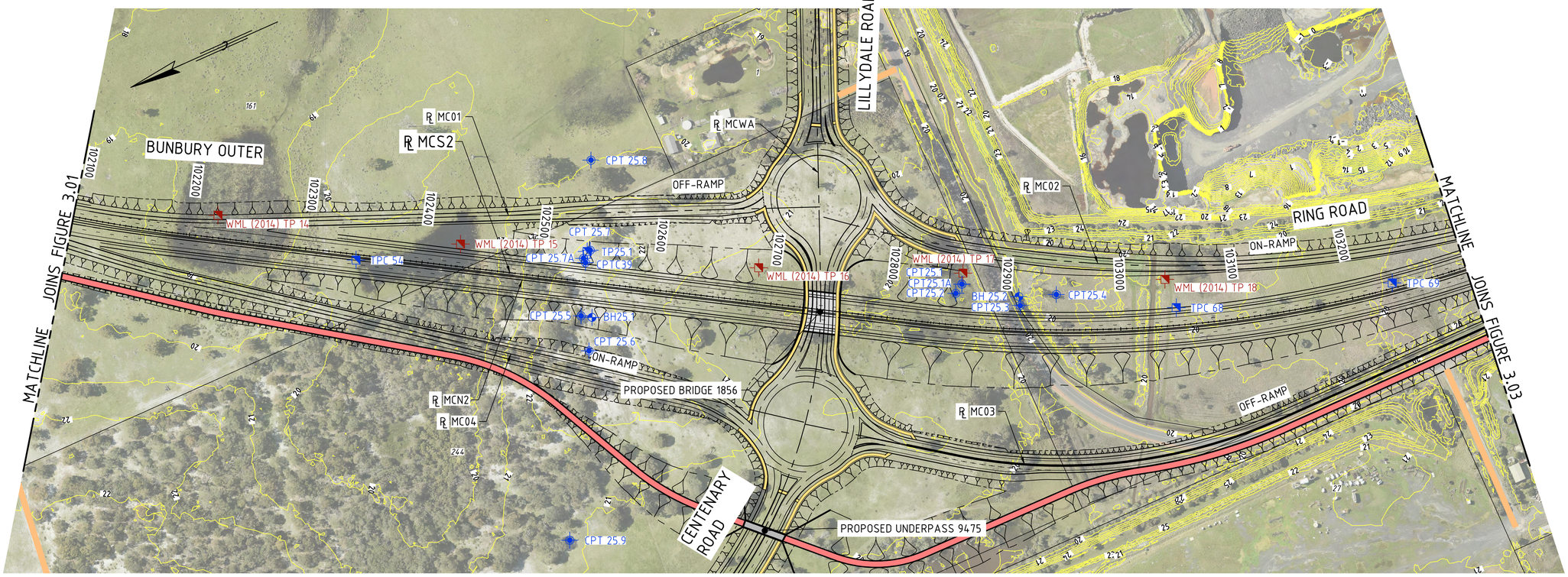
DATE 12/07/2019	PREPARED JV
SCALE 1:2000H, 1:200V	GRID PCG 94

PROJECT
BUNBURY OUTER RING ROAD

TITLE
BORR SOUTH ULTIMATE DESIGN
BORR SOUTHBOUND CARRIAGEWAY
PLAN AND PROFILE (MCS2) - SHEET 1

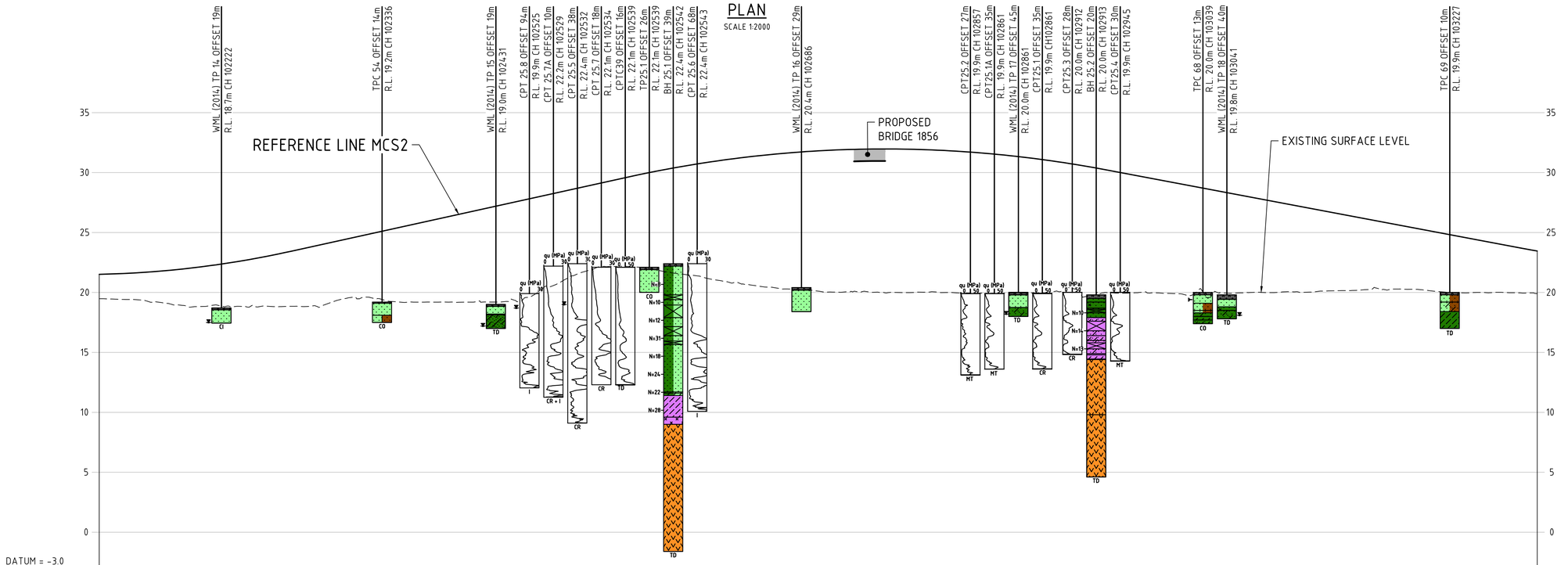
SKETCH No.
FIGURE 3.01

REV
A



PLAN

SCALE 1:2000



PROFILE

SCALE 1:2000 H, 1:200 V

DATUM = -3.0

CHAINAGE Mcs2	102100	102120	102140	102160	102180	102200	102220	102240	102260	102280	102300	102320	102340	102360	102380	102400	102420	102440	102460	102480	102500	102520	102540	102560	102580	102600	102620	102640	102660	102680	102700	102720	102740	102760	102780	102800	102820	102840	102860	102880	102900	102920	102940	102960	102980	103000	103020	103040	103060	103080	103100	103120	103140	103160	103180	103200	103220	103240	103260	103280	103300
GROUND LEVEL	19.475	19.418	19.274	19.020	18.817	18.904	18.837	18.852	18.846	18.896	19.383	19.608	19.297	19.206	19.191	19.184	19.198	19.248	19.635	20.620	21.576	22.162	22.179	21.973	21.602	21.375	20.952	20.645	20.435	20.255	20.107	20.020	20.078	20.002	19.997	20.023	19.954	19.941	19.949	19.984	20.086	19.706	19.992	19.956	19.969	19.897	20.188	19.949	19.993	19.986	20.051	20.113	20.155	20.242	20.282	20.254	20.054	19.962	19.974	19.980	19.900
DESIGN LEVEL	21.514	21.579	21.694	21.859	22.074	22.340	22.655	23.020	23.435	23.875	24.315	24.756	25.196	25.636	26.076	26.516	26.957	27.397	27.837	28.277	28.718	29.158	29.598	30.018	30.397	30.735	31.032	31.288	31.504	31.678	31.812	31.905	31.957	31.968	31.939	31.868	31.757	31.604	31.411	31.177	30.903	30.587	30.230	29.853	29.477	29.100	28.723	28.346	27.969	27.592	27.215	26.838	26.461	26.084	25.707	25.330	24.953	24.576	24.199	23.822	23.454
+CUT / -FILL	-2.038	-2.162	-2.421	-2.839	-3.258	-3.435	-3.818	-4.167	-4.590	-4.980	-4.933	-5.148	-5.898	-6.430	-6.885	-7.332	-7.758	-8.149	-8.203	-7.658	-7.141	-6.995	-7.418	-8.044	-8.794	-9.359	-10.080	-10.644	-11.069	-11.424	-11.706	-11.885	-11.879	-11.966	-11.941	-11.846	-11.803	-11.663	-11.462	-11.193	-10.816	-10.880	-10.239	-9.897	-9.507	-9.202	-8.534	-8.396	-7.976	-7.605	-7.163	-6.725	-6.305	-5.842	-5.425	-5.076	-4.899	-4.615	-4.225	-3.842	-3.553

NOTES :

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LEGEND :

- CADASTRAL BOUNDARY
- PROPOSED BRIDGE
- PROPOSED PSP
- PROPOSED SHARED PATH
- GROUNDWATER INFLOW LEVEL
- DIPPED GROUNDWATER LEVEL
- GROUNDWATER SEEPAGE LEVEL
- TD TARGET DEPTH
- R REFUSAL
- NR NEAR REFUSAL
- CO COLLAPSING
- CI CAVE IN
- W WATER
- MT MAXIMUM THRUST
- I INCLINATION
- CR CONE RESISTANCE
- EOR END OF REACH
- B BOUNCING OR NO LATERAL SUPPORT
- N=15 SPT N VALUE
- N=R SPT REFUSAL
- TOPSOIL
- FILL
- SWAMP DEPOSITS
- TAMALA SAND
- TAMALA LIMESTONE
- COFFEE ROCK
- BASSENDEAN SAND
- GUILDFORD FORMATION
- LEEDERVILLE FORMATION
- RESIDUAL SOIL
- BUNBURY BASALT
- YARRAGADEE FORMATION
- CPT18.2A BORR CPT 2018/2019 LOCATION
- BH 18.1 BORR BOREHOLE 2018/2019 LOCATION
- TP 32.1 BORR TEST PIT 2018/2019 LOCATION
- HA 27.1 BORR HAND AUGER 2018/2019 LOCATION
- WML (2014) TP14 WML TEST PIT 2014 POINT

VERT. 1:200 HORIZ. 1:2000 SCALES

A 1

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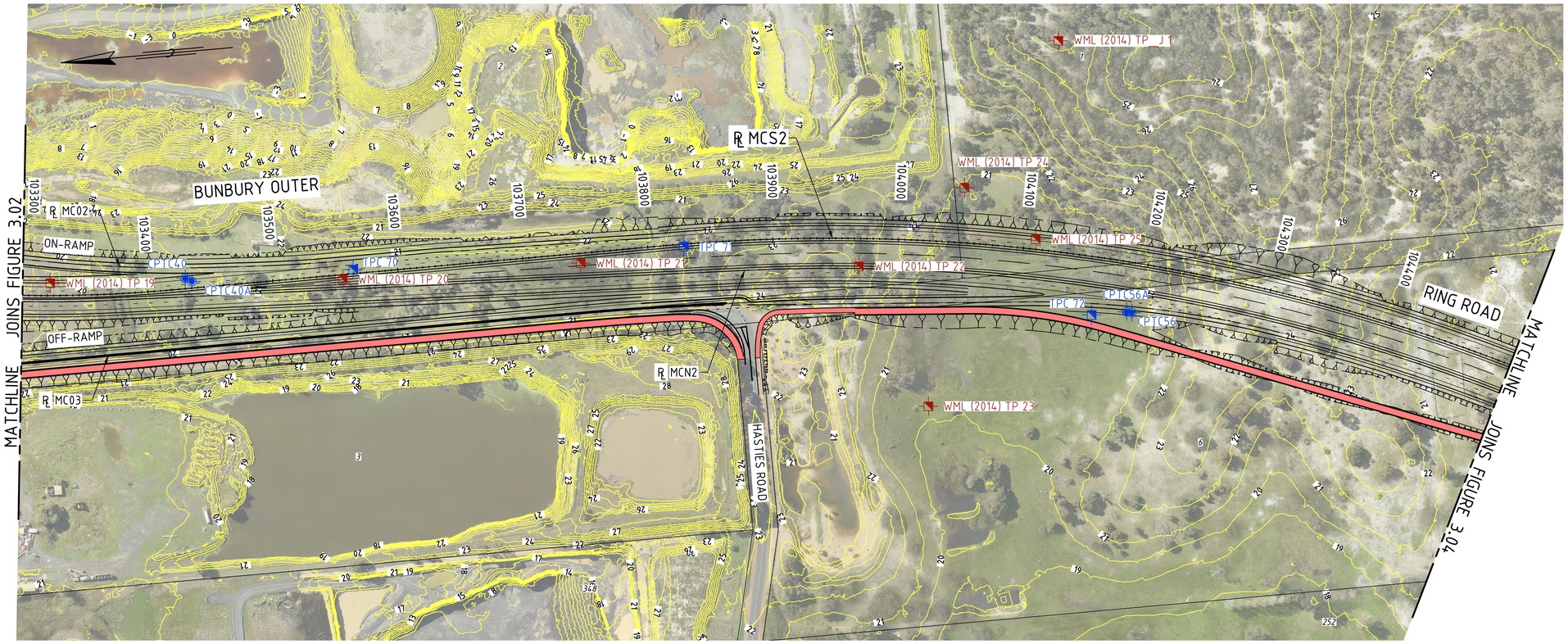
BUNBURY OUTER RING ROAD | PLANNING AND DEVELOPMENT

DATE 12/07/2019	PREPARED JV
SCALE 1:2000H, 1:200V	GRID PCG 94

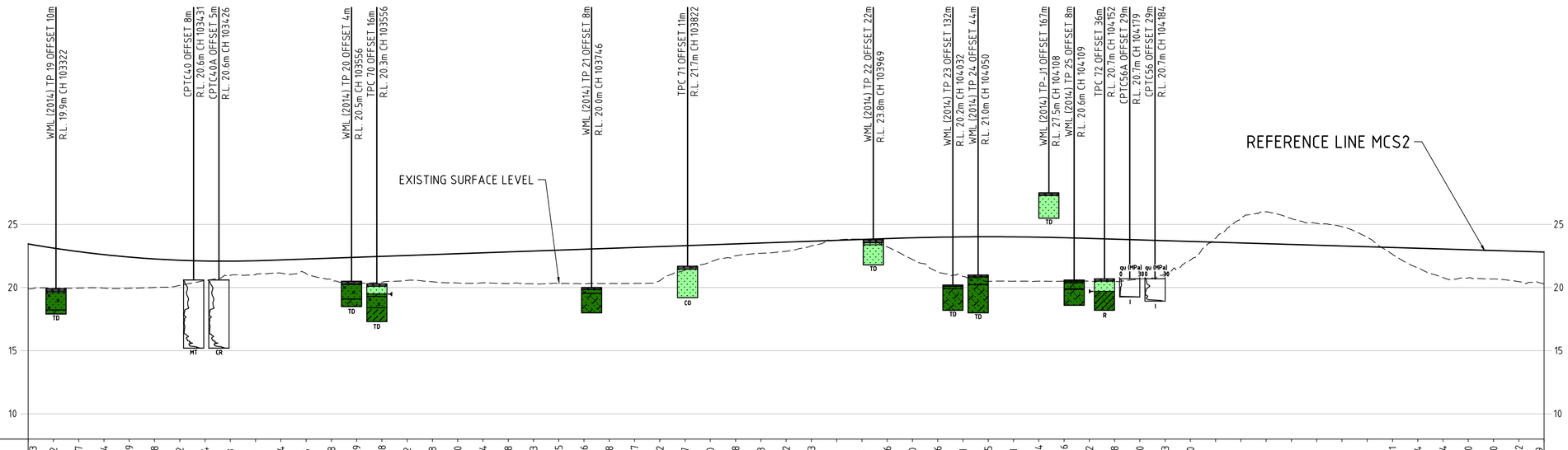
PROJECT
BUNBURY OUTER RING ROAD

TITLE
BORR SOUTH ULTIMATE DESIGN
BORR SOUTHBOUND CARRIAGEWAY
PLAN AND PROFILE (MCS2) - SHEET 2

SKETCH No.	REV
FIGURE 3.02	A



PLAN
SCALE 1:2000



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CHAINAGE Mcs2	103300	103320	103340	103360	103380	103400	103420	103440	103460	103480	103500	103520	103540	103560	103580	103600	103620	103640	103660	103680	103700	103720	103740	103760	103780	103800	103820	103840	103860	103880	103900	103920	103940	103960	103980	104000	104020	104040	104060	104080	104100	104120	104140	104160	104180	104200	104220	104240	104260	104280	104300	104320	104340	104360	104380	104400	104420	104440	104460	104480	104500
GROUND LEVEL	19.900	19.934	19.957	19.954	19.946	20.009	20.171	20.540	20.968	21.009	21.145	21.105	20.581	20.352	20.422	20.569	20.463	20.362	20.379	20.316	20.301	20.319	20.288	20.318	20.329	20.525	21.390	22.017	22.520	22.711	22.877	23.306	23.766	23.850	23.225	22.222	21.220	20.883	20.498	20.505	20.507	20.501	20.507	20.491	20.680	21.076	22.179	23.901	25.453	25.999	25.463	25.083	24.818	23.972	22.628	21.565	20.795	20.769	20.679	20.467	20.290
DESIGN LEVEL	23.454	23.127	22.844	22.607	22.414	22.266	22.163	22.105	22.091	22.122	22.189	22.259	22.330	22.400	22.471	22.541	22.612	22.682	22.753	22.823	22.894	22.964	23.035	23.105	23.176	23.246	23.317	23.387	23.458	23.528	23.599	23.669	23.740	23.810	23.881	23.943	23.987	24.014	24.023	24.016	23.990	23.948	23.890	23.830	23.770	23.710	23.650	23.590	23.530	23.470	23.410	23.350	23.290	23.230	23.170	23.110	23.050	22.990	22.930	22.870	22.810
+CUT / -FILL	-3.553	-3.192	-2.887	-2.654	-2.469	-2.258	-1.992	-1.564	-1.123	-1.112	-1.044	-1.155	-1.748	-2.049	-2.048	-1.972	-2.148	-2.320	-2.374	-2.508	-2.593	-2.645	-2.746	-2.788	-2.847	-2.722	-1.927	-1.370	-0.938	-0.818	-0.722	-0.363	0.026	0.040	-0.656	-1.720	-2.766	-3.131	-3.525	-3.511	-3.484	-3.446	-3.382	-3.338	-3.090	-2.633	-1.470	0.312	1.924	2.529	2.053	1.733	1.528	0.742	-0.541	-1.544	-2.254	-2.220	-2.250	-2.402	-2.519

PROFILE
SCALE 1:2000 H, 1:200 V

NOTES :

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- WML (2014) TP14 WML TEST PIT 2014 POINT

VERT. 1:200
HORIZ. 1:2000
SCALES
A 1

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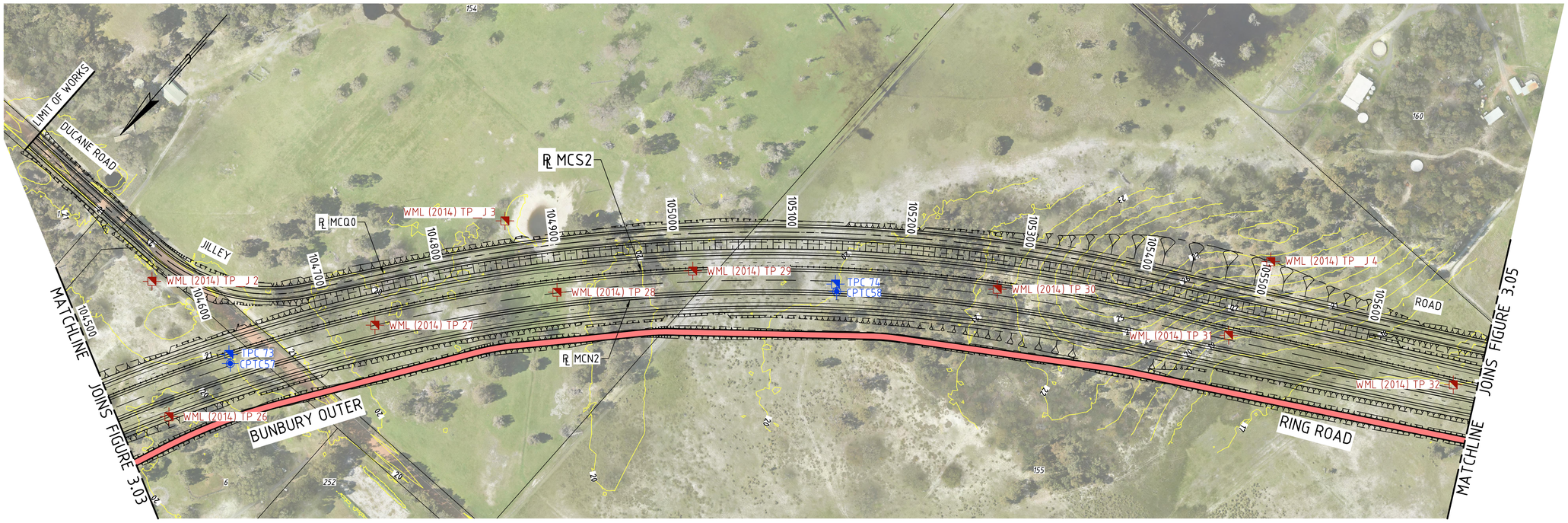
BUNBURY OUTER RING ROAD | PLANNING AND DEVELOPMENT

DATE 12/07/2019	PREPARED JV
SCALE 1:2000H, 1:200V	GRID PCG 94

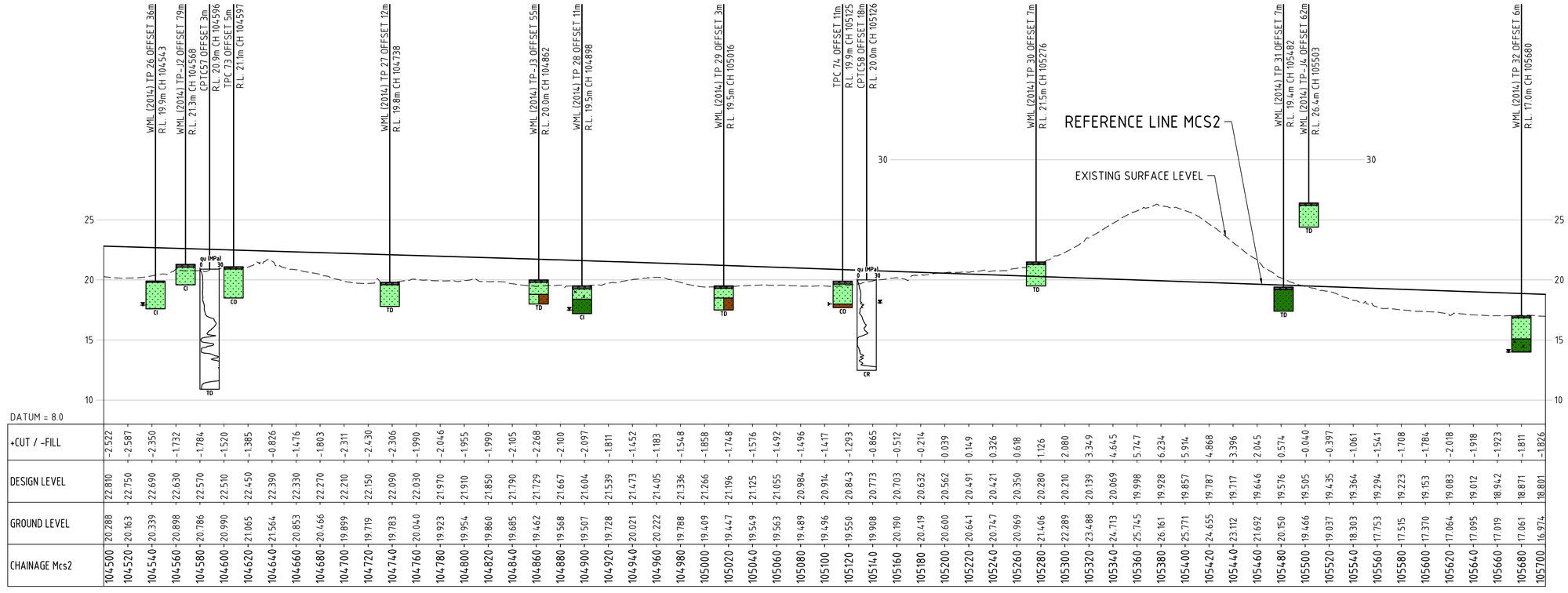
PROJECT
BUNBURY OUTER RING ROAD

TITLE
BORR SOUTH ULTIMATE DESIGN
BORR SOUTHBOUND CARRIAGEWAY
PLAN AND PROFILE (MCS2) - SHEET 3

SKETCH No.	REV
FIGURE 3.03	A



PLAN
SCALE 1:2000



DATUM = 8.0

CHAINAGE Mcs2	104500	104520	104540	104560	104580	104600	104620	104640	104660	104680	104700	104720	104740	104760	104780	104800	104820	104840	104860	104880	104900	104920	104940	104960	104980	105000	105020	105040	105060	105080	105100	105120	105140	105160	105180	105200	105220	105240	105260	105280	105300	105320	105340	105360	105380	105400	105420	105440	105460	105480	105500	105520	105540	105560	105580	105600	105620	105640	105660	105680	105700
GROUND LEVEL	20.288	20.163	20.339	20.898	20.786	20.990	21.065	21.564	20.853	20.466	19.899	19.719	19.783	20.040	19.923	19.954	19.860	19.685	19.462	19.568	19.507	19.728	20.021	20.222	19.788	19.409	19.447	19.549	19.563	19.489	19.496	19.550	19.908	20.190	20.419	20.600	20.641	20.747	20.969	21.406	22.289	23.488	24.713	25.745	26.161	25.771	24.655	23.112	21.692	20.150	19.466	19.037	18.303	17.753	17.515	17.370	17.064	17.095	17.019	17.061	16.974
DESIGN LEVEL	22.810	22.750	22.690	22.630	22.570	22.510	22.450	22.390	22.330	22.270	22.210	22.150	22.090	22.030	21.970	21.910	21.850	21.790	21.729	21.667	21.604	21.539	21.473	21.405	21.336	21.266	21.196	21.125	21.055	20.984	20.914	20.843	20.773	20.703	20.632	20.562	20.491	20.421	20.350	20.280	20.210	20.139	20.069	19.998	19.928	19.857	19.787	19.717	19.646	19.576	19.505	19.435	19.364	19.294	19.223	19.153	19.083	19.012	18.942	18.871	18.801
+CUT / -FILL	-2.522	-2.587	-2.350	-1.732	-1.784	-1.520	-1.385	-0.826	-1.476	-1.803	-2.311	-2.430	-2.306	-1.990	-2.046	-1.955	-1.990	-2.105	-2.268	-2.100	-2.097	-1.811	-1.452	-1.183	-1.548	-1.858	-1.748	-1.576	-1.492	-1.496	-1.417	-1.293	-0.865	-0.512	-0.214	0.039	0.149	0.326	0.618	1.126	2.080	3.349	4.645	5.747	6.234	5.914	4.868	3.396	2.045	0.574	-0.040	-0.397	-1.061	-1.541	-1.708	-1.784	-2.018	-1.918	-1.923	-1.811	-1.826

PROFILE
SCALE 1:2000 H, 1:200 V

NOTES :

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- WML (2014) TP14 WML TEST PIT 2014 POINT

VERT. 1:200 | HORIZ. 1:2000 | SCALES | A 1

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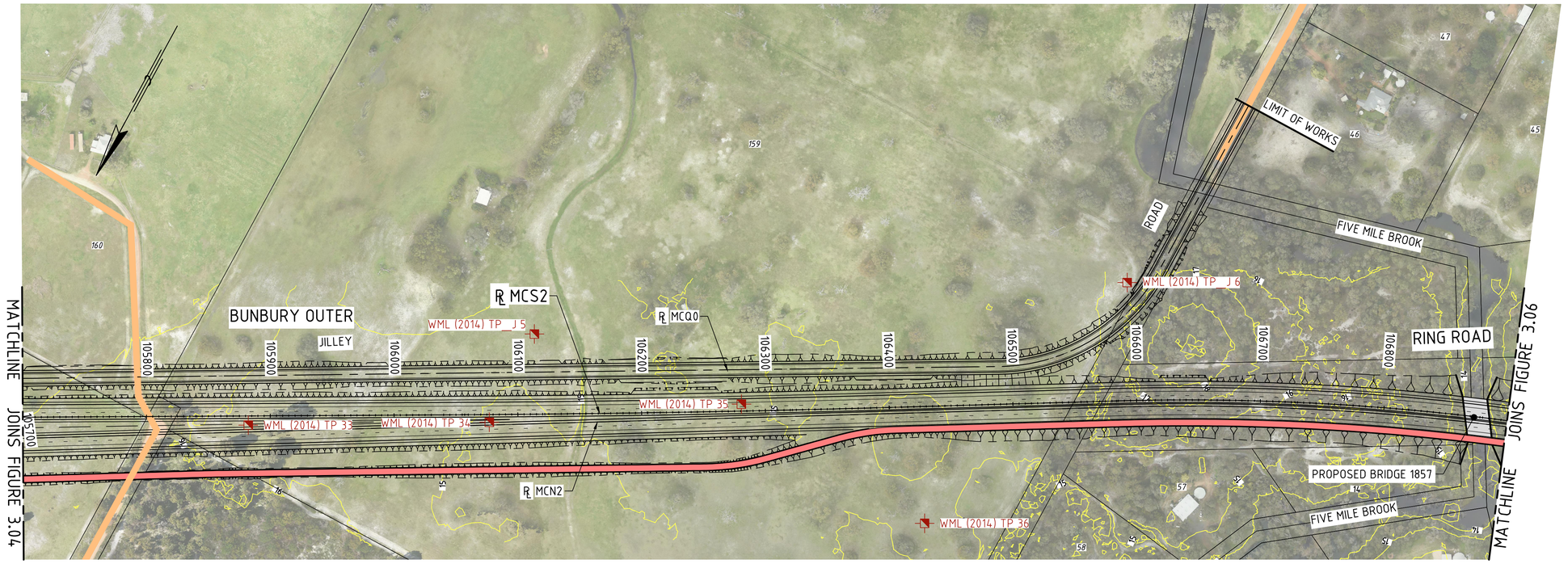
BUNBURY OUTER RING ROAD | PLANNING AND DEVELOPMENT

DATE 12/07/2019	PREPARED JV
SCALE 1:2000H, 1:200V	GRID PCG 94

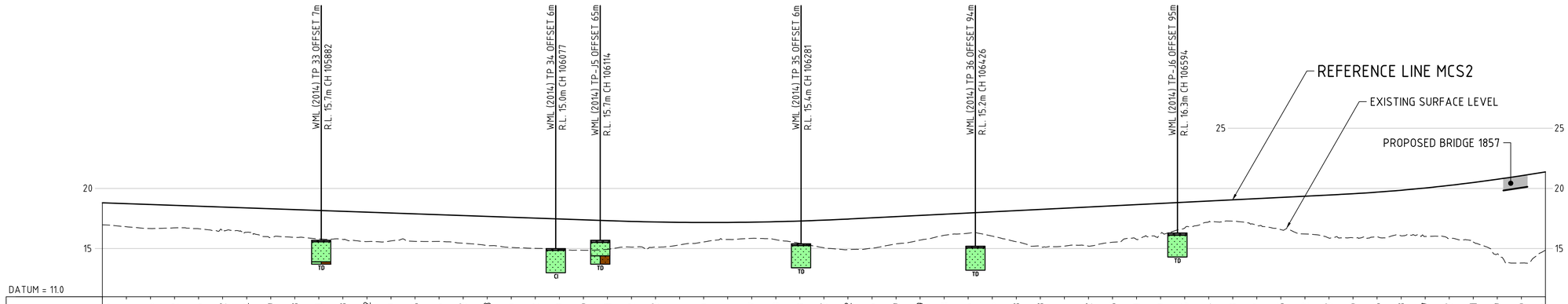
PROJECT
BUNBURY OUTER RING ROAD

TITLE
BORR SOUTH ULTIMATE DESIGN
BORR SOUTHBOUND CARRIAGEWAY
PLAN AND PROFILE (MCS2) - SHEET 4

SKETCH No.	REV
FIGURE 3.04	A



PLAN
SCALE 1:2000



DATUM = 11.0

CHAINAGE Mcs2	GROUND LEVEL	DESIGN LEVEL	+CUT / -FILL
105700	16.974	18.801	-1.826
105720	16.815	18.730	-1.915
105740	16.667	18.660	-1.994
105760	16.727	18.590	-1.862
105780	16.653	18.519	-1.866
105800	16.446	18.449	-2.002
105820	16.354	18.378	-2.024
105840	15.928	18.308	-2.379
105860	15.935	18.237	-2.303
105880	15.805	18.167	-2.361
105900	15.764	18.097	-2.333
105920	15.585	18.026	-2.442
105940	15.636	17.956	-2.319
105960	15.600	17.885	-2.285
105980	15.599	17.815	-2.216
106000	15.447	17.744	-2.297
106020	15.251	17.674	-2.423
106040	15.094	17.604	-2.510
106060	15.022	17.533	-2.512
106080	14.943	17.463	-2.519
106100	14.863	17.392	-2.530
106120	14.940	17.322	-2.381
106140	15.126	17.258	-2.132
106160	15.134	17.212	-2.077
106180	15.302	17.183	-1.881
106200	15.551	17.170	-1.620
106220	15.754	17.175	-1.421
106240	15.850	17.197	-1.347
106260	15.738	17.235	-1.498
106280	15.438	17.291	-1.853
106300	15.068	17.364	-2.297
106320	14.912	17.454	-2.542
106340	15.039	17.554	-2.515
106360	15.394	17.654	-2.259
106380	15.705	17.754	-2.049
106400	16.106	17.854	-1.748
106420	16.279	17.954	-1.675
106440	16.039	18.054	-2.014
106460	15.570	18.154	-2.583
106480	15.195	18.254	-3.058
106500	15.202	18.354	-3.151
106520	15.201	18.454	-3.252
106540	15.528	18.554	-3.025
106560	15.763	18.654	-2.891
106580	16.234	18.754	-2.519
106600	16.708	18.854	-2.146
106620	17.210	18.954	-1.744
106640	17.281	19.054	-1.773
106660	16.936	19.154	-2.217
106680	16.577	19.254	-2.676
106700	16.211	19.354	-3.142
106720	15.876	19.454	-3.577
106740	15.900	19.559	-3.660
106760	15.995	19.690	-3.695
106780	16.065	19.848	-3.783
106800	16.007	20.035	-4.027
106820	15.832	20.249	-4.417
106840	15.549	20.491	-4.941
106860	14.551	20.761	-6.209
106880	13.798	21.058	-7.260
106900	14.852	21.366	-6.515

PROFILE
SCALE 1:2000 H, 1:200 V

NOTES :

1. SOME INVESTIGATION LOCATIONS MOVED LATERALLY ON THE PROFILE FOR VISUAL CLARITY.
2. ONLY INVESTIGATION LOCATIONS WITHIN APPROXIMATELY 200m OF THE REFERENCE LINE ARE SHOWN ON THE PROFILE FOR VISUAL CLARITY.
3. THE SOIL/ ROCK SYMBOL LEGEND IS SHOWN IN APPENDIX P.

LEGEND :

- CADASTRAL BOUNDARY
- PROPOSED BRIDGE
- PROPOSED PSP
- PROPOSED SHARED PATH
- GROUNDWATER INFLOW LEVEL
- DIPPED GROUNDWATER LEVEL
- GROUNDWATER SEEPAGE LEVEL
- TD TARGET DEPTH
- R REFUSAL
- NR NEAR REFUSAL
- CO COLLAPSING
- CI CAVE IN
- W WATER
- MT MAXIMUM THRUST
- I INCLINATION
- CR CONE RESISTANCE
- EOR END OF REACH
- B BOUNCING OR NO LATERAL SUPPORT
- N=15 SPT N VALUE
- N=R SPT REFUSAL
- TOPSOIL
- FILL
- SWAMP DEPOSITS
- TAMALA SAND
- TAMALA LIMESTONE
- COFFEE ROCK
- BASSENDEAN SAND
- GUILDFORD FORMATION
- LEEDERVILLE FORMATION
- RESIDUAL SOIL
- BUNBURY BASALT
- YARRAGADEE FORMATION
- CPT18.2A BORR CPT 2018/2019 LOCATION
- BH 18.1 BORR BOREHOLE 2018/2019 LOCATION
- TP 32.1 BORR TEST PIT 2018/2019 LOCATION
- HA 27.1 BORR HAND AUGER 2018/2019 LOCATION
- WML (2014) TP14 WML TEST PIT 2014 POINT

SCALES HORIZ. 1:2000 VERT. 1:200
A1

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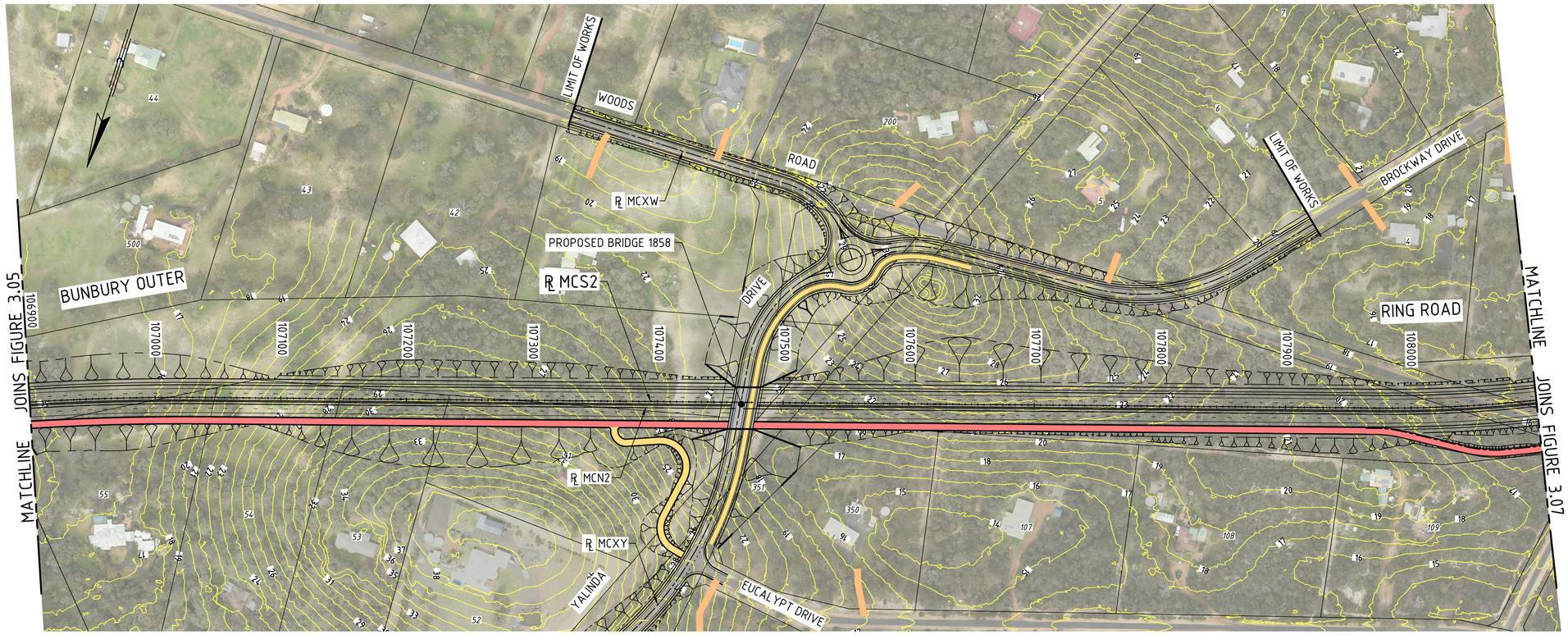
BUNBURY OUTER RING ROAD | PLANNING AND DEVELOPMENT

DATE 12/07/2019	PREPARED JV
SCALE 1:2000H, 1:200V	GRID PCG 94

PROJECT
BUNBURY OUTER RING ROAD

TITLE
BORR SOUTH ULTIMATE DESIGN
BORR SOUTHBOUND CARRIAGEWAY
PLAN AND PROFILE (MCS2) - SHEET 5

SKETCH No. FIGURE 3.05 | REV A



PLAN
SCALE 1:2000

NOTES :

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LEGEND :

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- PROPOSED PSP
- PROPOSED SHARED PATH
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- DIPPED GROUNDWATER LEVEL
- GROUNDWATER SEEPAGE LEVEL
- TD TARGET DEPTH
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- NR NEAR REFUSAL
- CO COLLAPSING
- CI CAVE IN
- W WATER
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- RESIDUAL SOIL
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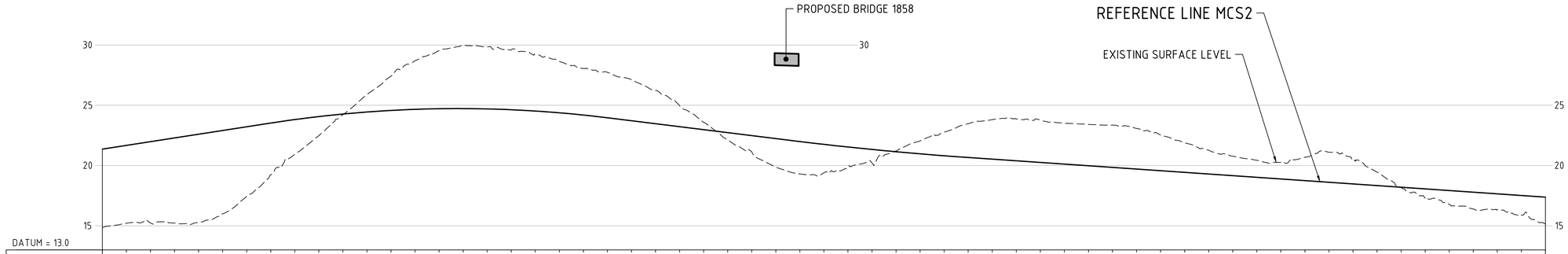
- BH 18.1 BORR BOREHOLE 2018/2019 LOCATION
- TP 32.1 BORR TEST PIT 2018/2019 LOCATION
- HA 27.1 BORR HAND AUGER 2018/2019 LOCATION
- WML (2014) TP14 WML TEST PIT 2014 POINT



CHAINAGE Mcs2	GROUND LEVEL	DESIGN LEVEL	+CUT / -FILL
106900	14.852	21.366	-6.515
106920	15.209	21.675	-6.465
106940	15.232	21.983	-6.751
106960	15.223	22.292	-7.069
106980	15.263	22.600	-7.338
107000	15.992	22.909	-6.917
107020	17.434	23.217	-5.783
107040	19.233	23.526	-4.293
107060	20.938	23.815	-2.876
107080	22.484	24.064	-1.580
107100	24.220	24.274	-0.054
107120	25.885	24.444	1.441
107140	27.427	24.575	2.852
107160	28.710	24.665	4.044
107180	29.540	24.716	4.823
107200	29.998	24.728	5.270
107220	29.856	24.700	5.157
107240	29.592	24.632	4.960
107260	29.205	24.524	4.681
107280	28.644	24.377	4.266
107300	28.058	24.190	3.867
107320	27.737	23.964	3.773
107340	27.133	23.717	3.417
107360	26.236	23.470	2.765
107380	24.966	23.223	1.742
107400	23.590	22.976	0.613
107420	22.116	22.730	-0.614
107440	21.127	22.483	-1.356
107460	19.871	22.236	-2.365
107480	19.295	21.991	-2.695
107500	19.396	21.758	-2.361
107520	19.919	21.539	-1.620
107540	20.213	21.335	-1.122
107560	21.219	21.146	0.073
107580	22.046	20.972	1.075
107600	22.770	20.812	1.958
107620	23.477	20.667	2.810
107640	23.810	20.530	3.281
107660	23.865	20.393	3.471
107680	23.776	20.256	3.519
107700	23.506	20.119	3.387
107720	23.411	19.982	3.429
107740	23.353	19.845	3.508
107760	23.082	19.708	3.374
107780	22.526	19.571	2.955
107800	21.881	19.434	2.446
107820	21.271	19.297	1.973
107840	20.776	19.161	1.615
107860	20.435	19.024	1.412
107880	20.264	18.887	1.377
107900	20.692	18.750	1.942
107920	21.106	18.613	2.493
107940	20.390	18.476	1.915
107960	19.450	18.339	1.111
107980	18.157	18.202	-0.045
108000	17.275	18.065	-0.791
108020	16.786	17.928	-1.143
108040	16.395	17.791	-1.397
108060	16.344	17.654	-1.310
108080	15.903	17.517	-1.615
108100	15.190	17.380	-2.191

PROFILE
SCALE 1:2000 H, 1:200 V

SCALES HORIZ. 1:2000 VERT. 1:200

A 1

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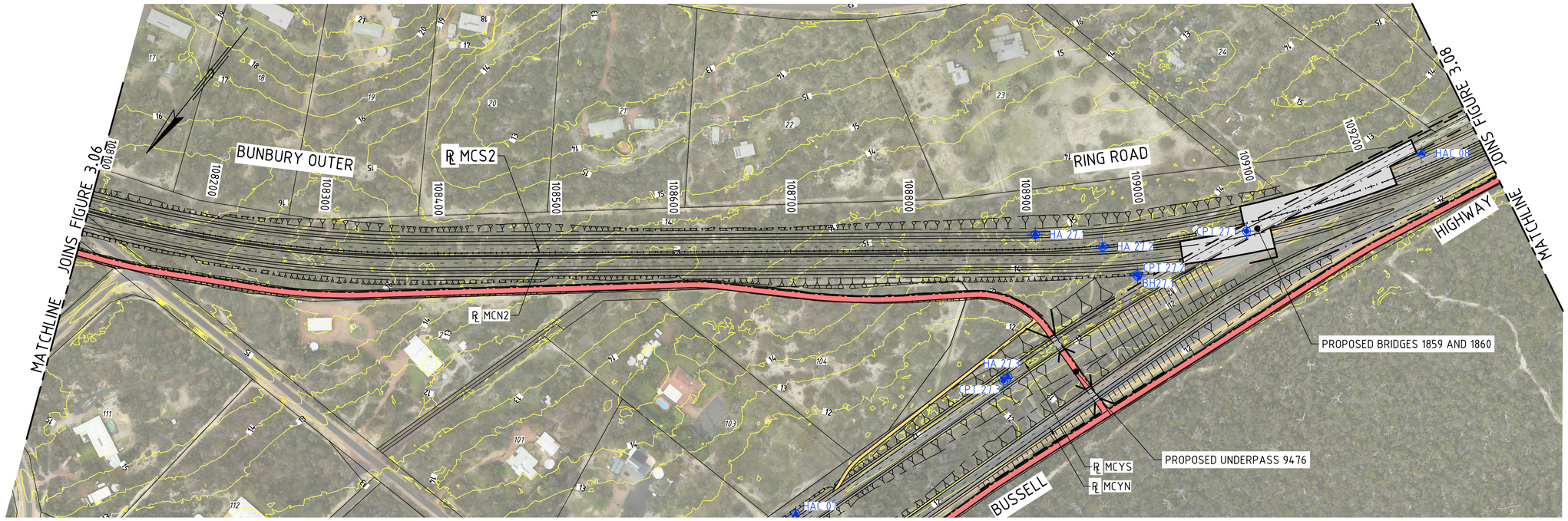
BUNBURY OUTER RING ROAD | PLANNING AND DEVELOPMENT

DATE 12/07/2019	PREPARED JV
SCALE 1:2000H, 1:200V	GRID PCG 94

PROJECT
BUNBURY OUTER RING ROAD

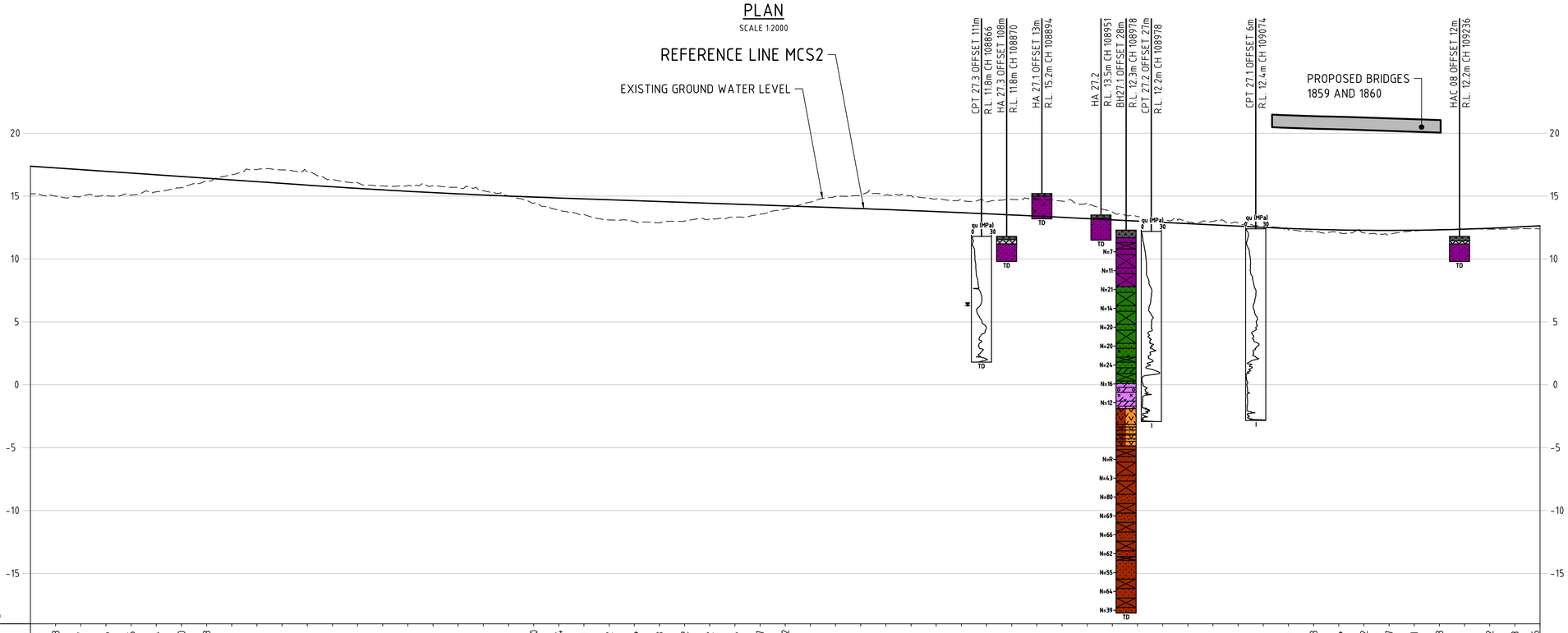
TITLE
BORR SOUTH ULTIMATE DESIGN
BORR SOUTHBOUND CARRIAGEWAY
PLAN AND PROFILE (MCS2) - SHEET 6

SKETCH No.	REV
FIGURE 3.06	A



PLAN

SCALE 1:2000



DATUM = -19.0

CHAINAGE Mcs2	GROUND LEVEL	DESIGN LEVEL	+CUT / -FILL
108100	15.190	17.380	-2.191
108120	15.005	17.243	-2.238
108140	14.980	17.106	-2.127
108160	15.034	16.969	-1.936
108180	15.086	16.833	-1.746
108200	15.341	16.696	-1.354
108220	15.669	16.559	-0.890
108240	16.164	16.422	-0.258
108260	16.694	16.285	0.409
108280	17.111	16.148	0.963
108300	17.087	16.011	1.076
108320	16.934	15.874	1.060
108340	16.316	15.742	0.575
108360	16.071	15.616	0.455
108380	15.814	15.498	0.316
108400	15.844	15.386	0.458
108420	15.819	15.280	0.538
108440	15.694	15.181	0.512
108460	15.433	15.089	0.344
108480	15.012	15.004	0.008
108500	14.436	14.925	-0.490
108520	13.880	14.853	-0.974
108540	13.532	14.783	-1.251
108560	13.112	14.713	-1.602
108580	12.999	14.643	-1.644
108600	12.875	14.573	-1.698
108620	13.021	14.503	-1.482
108640	13.182	14.433	-1.252
108660	13.330	14.363	-1.034
108680	13.557	14.293	-0.737
108700	13.982	14.223	-0.242
108720	14.530	14.153	0.377
108740	14.993	14.083	0.910
108760	15.092	14.009	1.083
108780	15.083	13.933	1.149
108800	15.033	13.854	1.179
108820	14.788	13.771	1.017
108840	14.731	13.686	1.046
108860	14.545	13.598	0.948
108880	14.737	13.506	1.231
108900	14.779	13.412	1.367
108920	14.607	13.315	1.292
108940	14.393	13.215	1.179
108960	13.744	13.115	0.629
108980	13.382	13.015	0.367
109000	13.129	12.915	0.215
109020	12.955	12.815	0.140
109040	12.979	12.715	0.264
109060	12.863	12.615	0.249
109080	12.660	12.515	0.146
109100	12.315	12.427	-0.113
109120	12.157	12.360	-0.203
109140	12.168	12.312	-0.144
109160	12.083	12.285	-0.202
109180	11.950	12.277	-0.327
109200	12.229	12.290	-0.061
109220	12.320	12.322	-0.003
109240	12.382	12.375	0.008
109260	12.376	12.447	-0.072
109280	12.396	12.539	-0.143
109300	12.405	12.639	-0.235

PROFILE

SCALE 1:2000 H, 1:200 V

NOTES :

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3. THE SOIL/ ROCK SYMBOL LEGEND IS SHOWN IN APPENDIX P.

LEGEND :

- CADASTRAL BOUNDARY
- PROPOSED BRIDGE
- PROPOSED PSP
- PROPOSED SHARED PATH
- GROUNDWATER INFLOW LEVEL
- DIPPED GROUNDWATER LEVEL
- GROUNDWATER SEEPAGE LEVEL
- TD TARGET DEPTH
- R REFUSAL
- NR NEAR REFUSAL
- CO COLLAPSING
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- W WATER
- MT MAXIMUM THRUST
- I INCLINATION
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- N=15 SPT N VALUE
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- FILL
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- TP 32.1 BORR TEST PIT 2018/2019 LOCATION
- HA 27.1 BORR HAND AUGER 2018/2019 LOCATION
- WML (2014) TP14 WML TEST PIT 2014 POINT

SCALES HORIZ. 1:2000 VERT. 1:200

A 1

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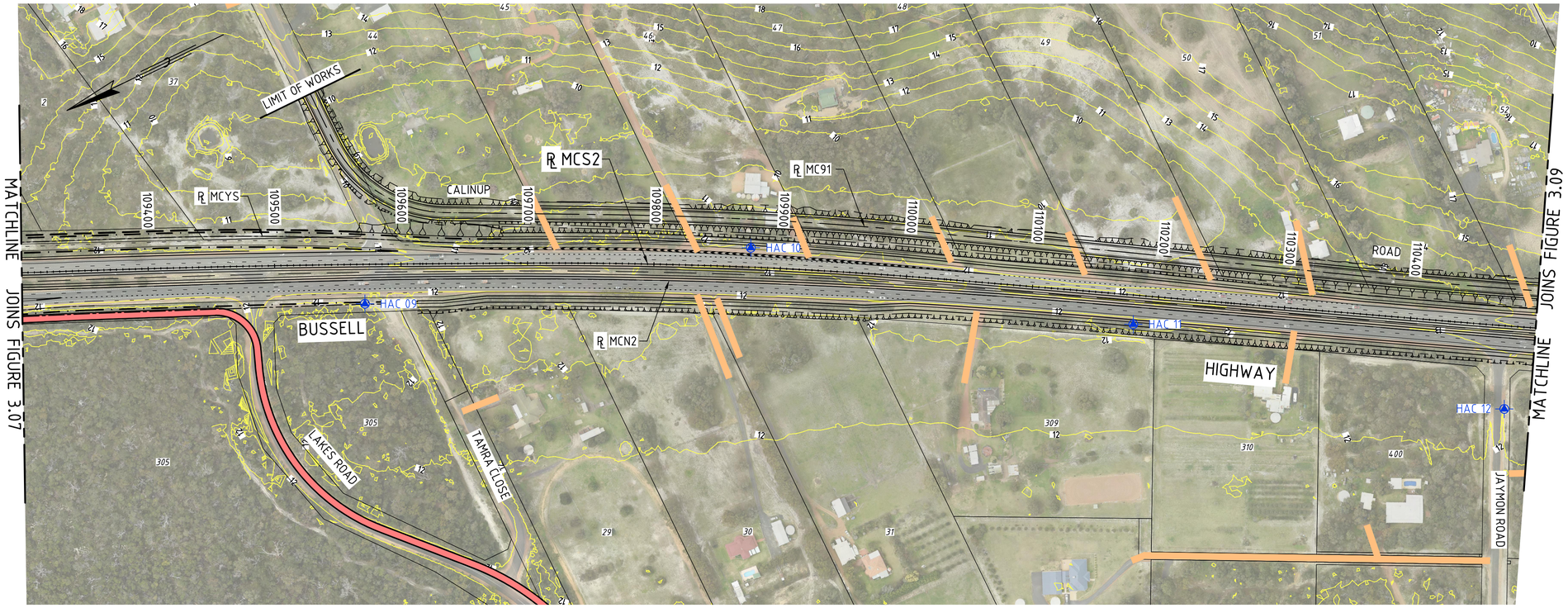
BUNBURY OUTER RING ROAD | PLANNING AND DEVELOPMENT

DATE 12/07/2019	PREPARED JV
SCALE 1:2000H, 1:200V	GRID PCG 94

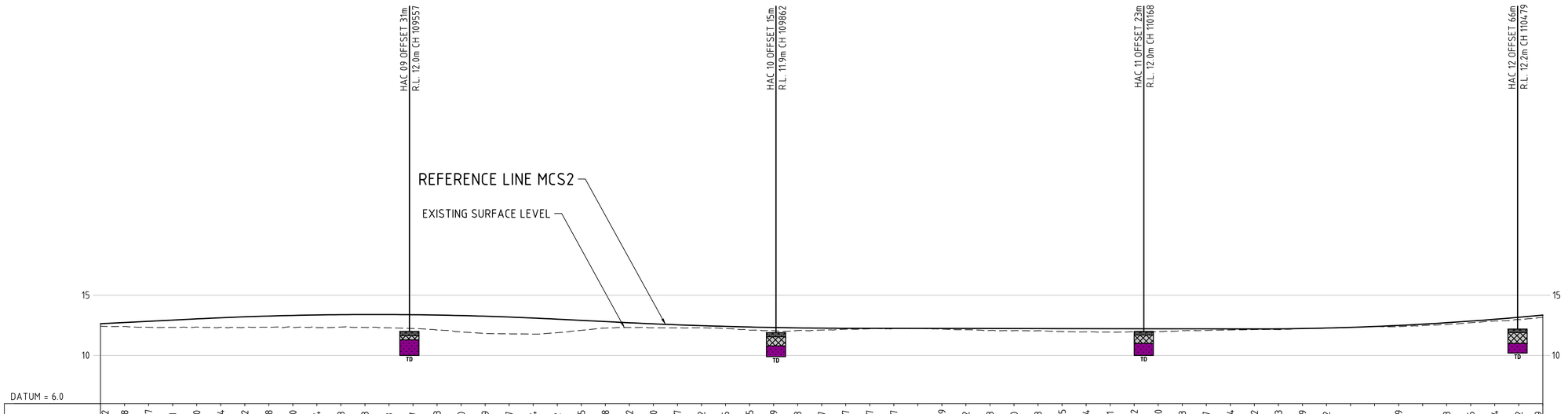
PROJECT
BUNBURY OUTER RING ROAD

TITLE
BORR SOUTH ULTIMATE DESIGN
BORR SOUTHBOUND CARRIAGEWAY
PLAN AND PROFILE (MCS2) - SHEET 7

SKETCH No. FIGURE 3.07 REV A



PLAN
SCALE 1:2000



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GROUND LEVEL	12.437	12.411	12.343	12.328	12.360	12.336	12.338	12.366	12.337	12.311	12.357	12.328	12.297	12.238	12.113	11.985	11.830	11.795	11.776	11.892	12.089	12.276	12.325	12.296	12.289	12.304	12.230	12.099	12.054	12.072	12.112	12.178	12.214	12.241	12.247	12.193	12.137	12.072	12.062	12.055	11.981	11.958	11.939	11.973	11.973	12.067	12.079	12.118	12.149	12.147	12.227	12.264	12.341	12.409	12.395	12.487	12.580	12.719	12.862	12.981	13.167
DESIGN LEVEL	12.639	12.739	12.839	12.939	13.039	13.131	13.209	13.274	13.326	13.364	13.389	13.401	13.399	13.384	13.356	13.315	13.260	13.191	13.110	13.015	12.915	12.815	12.716	12.626	12.546	12.476	12.415	12.364	12.322	12.290	12.268	12.256	12.252	12.248	12.245	12.242	12.239	12.235	12.232	12.229	12.226	12.222	12.219	12.216	12.213	12.209	12.206	12.203	12.200	12.210	12.236	12.277	12.334	12.406	12.495	12.599	12.719	12.854	13.005	13.172	13.355
+CUT / -FILL	-0.202	-0.328	-0.497	-0.611	-0.680	-0.794	-0.872	-0.908	-0.990	-1.054	-1.033	-1.073	-1.103	-1.147	-1.243	-1.330	-1.429	-1.397	-1.334	-1.122	-0.825	-0.538	-0.392	-0.330	-0.257	-0.172	-0.185	-0.265	-0.269	-0.218	-0.157	-0.077	-0.037	-0.007	0.002	-0.049	-0.102	-0.163	-0.170	-0.173	-0.245	-0.264	-0.281	-0.242	-0.240	-0.143	-0.127	-0.084	-0.052	-0.063	-0.009	-0.012	0.008	0.002	-0.099	-0.111	-0.138	-0.136	-0.144	-0.192	-0.189

PROFILE
SCALE 1:2000 H, 1:200 V

NOTES :

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- CPT18.2A BORR CPT 2018/2019 LOCATION
- BH 18.1 BORR BOREHOLE 2018/2019 LOCATION
- TP 32.1 BORR TEST PIT 2018/2019 LOCATION
- HA 27.1 BORR HAND AUGER 2018/2019 LOCATION
- WML (2014) TP14 WML TEST PIT 2014 POINT

SCALES HORIZ. 1:2000 VERT. 1:200

A 1

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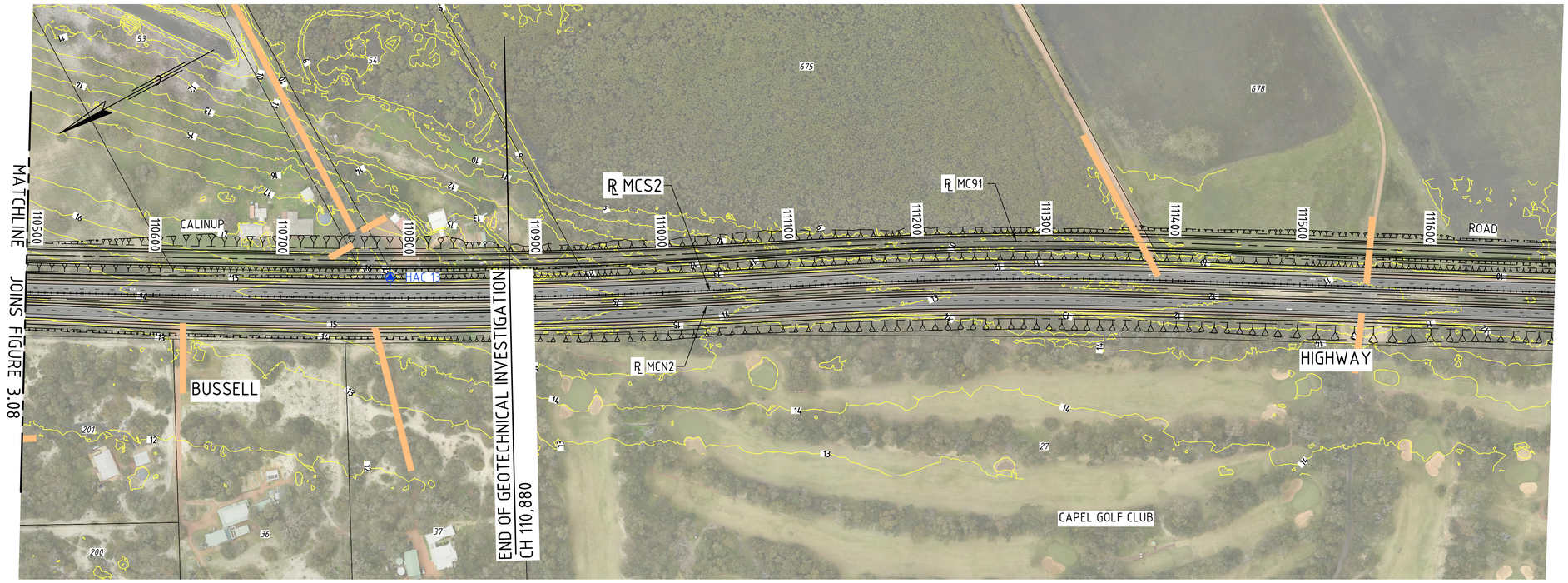
BUNBURY OUTER RING ROAD | PLANNING AND DEVELOPMENT

DATE	12/07/2019	PREPARED	JV
SCALE	1:2000H, 1:200V	GRID	PCG 94

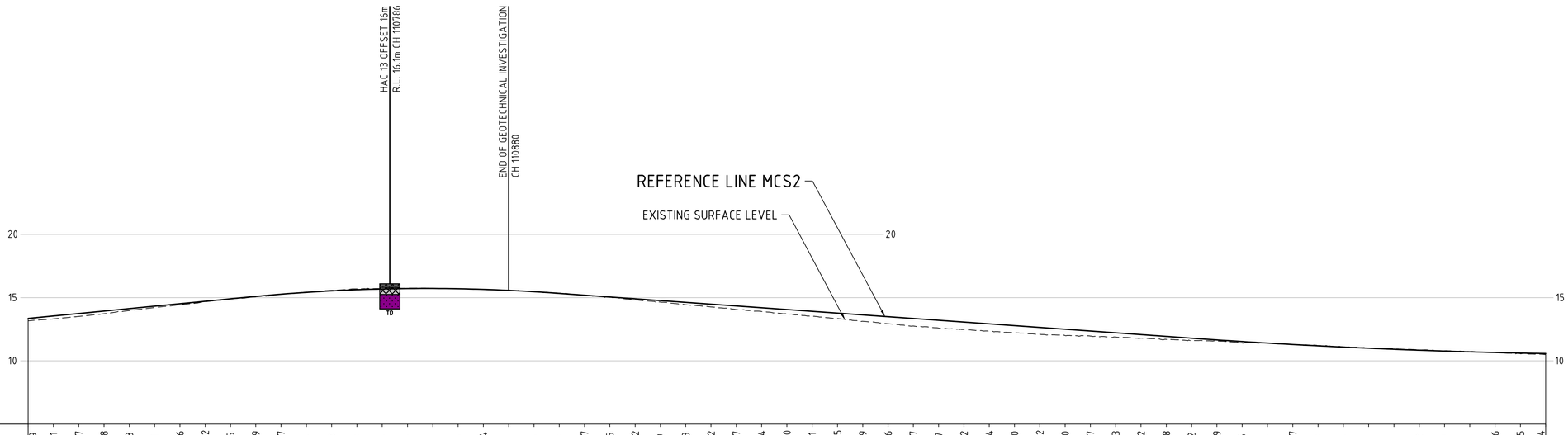
PROJECT
BUNBURY OUTER RING ROAD

TITLE
BORR SOUTH ULTIMATE DESIGN
BUSSELL HWY S/B CARRIAGEWAY
PLAN AND PROFILE (MCS2) - SHEET 8

SKETCH No.	REV
FIGURE 3.08	A



PLAN
SCALE 1:2000



DATUM = 5.0

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GROUND LEVEL	13.167	13.318	13.514	13.726	13.975	14.211	14.438	14.666	14.887	15.065	15.260	15.437	15.579	15.693	15.717	15.746	15.738	15.706	15.635	15.589	15.492	15.365	15.184	15.035	14.816	14.647	14.437	14.261	14.054	13.896	13.719	13.535	13.349	13.125	12.936	12.752	12.592	12.484	12.331	12.224	12.099	12.000	11.961	11.885	11.793	11.695	11.600	11.577	11.412	11.406	11.285	11.215	11.113	11.011	10.956	10.881	10.801	10.731	10.654	10.560	10.504
DESIGN LEVEL	13.355	13.548	13.741	13.935	14.128	14.321	14.515	14.708	14.901	15.094	15.267	15.413	15.530	15.620	15.681	15.715	15.721	15.699	15.649	15.571	15.466	15.333	15.191	15.049	14.908	14.766	14.624	14.483	14.341	14.200	14.058	13.916	13.775	13.633	13.492	13.350	13.208	13.067	12.925	12.784	12.642	12.500	12.359	12.217	12.075	11.934	11.792	11.656	11.527	11.405	11.292	11.186	11.088	10.997	10.914	10.839	10.772	10.712	10.660	10.615	10.579
+CUT / -FILL	-0.189	-0.231	-0.227	-0.208	-0.153	-0.111	-0.076	-0.042	-0.015	-0.029	-0.007	0.024	0.048	0.073	0.035	0.030	0.016	0.006	-0.014	0.018	0.026	0.033	-0.007	-0.015	-0.092	-0.119	-0.188	-0.222	-0.287	-0.304	-0.340	-0.381	-0.425	-0.509	-0.556	-0.597	-0.617	-0.582	-0.594	-0.560	-0.542	-0.500	-0.397	-0.333	-0.282	-0.238	-0.192	-0.079	-0.115	0.000	-0.007	0.028	0.026	0.013	0.041	0.042	0.029	0.019	-0.006	-0.055	-0.074

PROFILE
SCALE 1:2000 H, 1:200 V

NOTES :

1. SOME INVESTIGATION LOCATIONS MOVED LATERALLY ON THE PROFILE FOR VISUAL CLARITY.
2. ONLY INVESTIGATION LOCATIONS WITHIN APPROXIMATELY 200m OF THE REFERENCE LINE ARE SHOWN ON THE PROFILE FOR VISUAL CLARITY.
3. THE SOIL/ ROCK SYMBOL LEGEND IS SHOWN IN APPENDIX P.

LEGEND :

- CADASTRAL BOUNDARY
- PROPOSED BRIDGE
- PROPOSED PSP
- PROPOSED SHARED PATH
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- NR NEAR REFUSAL
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- CI CAVE IN
- W WATER
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- I INCLINATION
- CR CONE RESISTANCE
- EOR END OF REACH
- B BOUNCING OR NO LATERAL SUPPORT
- N=15 SPT N VALUE
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- HA 27.1 BORR HAND AUGER 2018/2019 LOCATION
- WML (2014) TP14 WML TEST PIT 2014 POINT

SCALES HORIZ. 1:2000 VERT. 1:200
A 1

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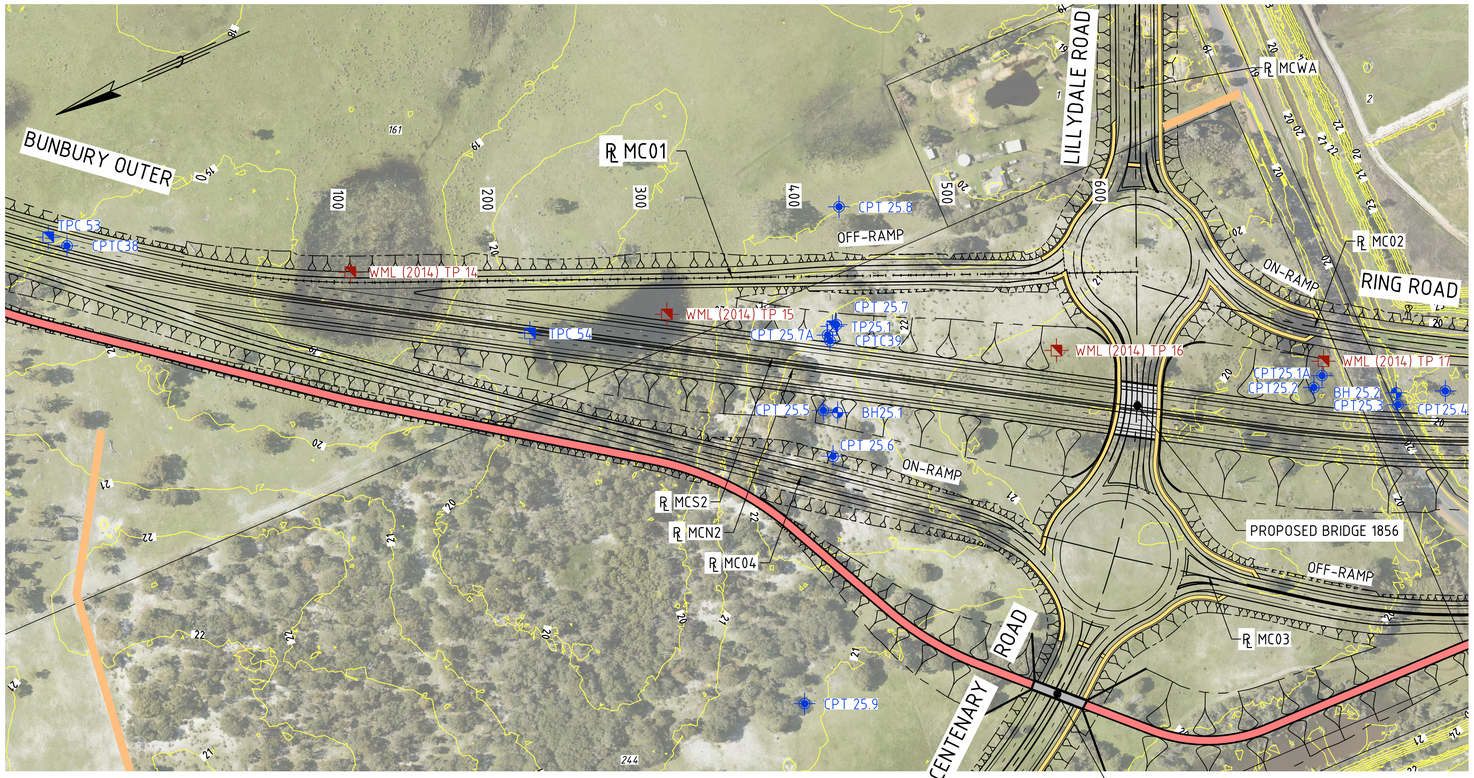
BUNBURY OUTER RING ROAD | PLANNING AND DEVELOPMENT

DATE 12/07/2019	PREPARED JV
SCALE 1:2000H, 1:200V	GRID PCG 94

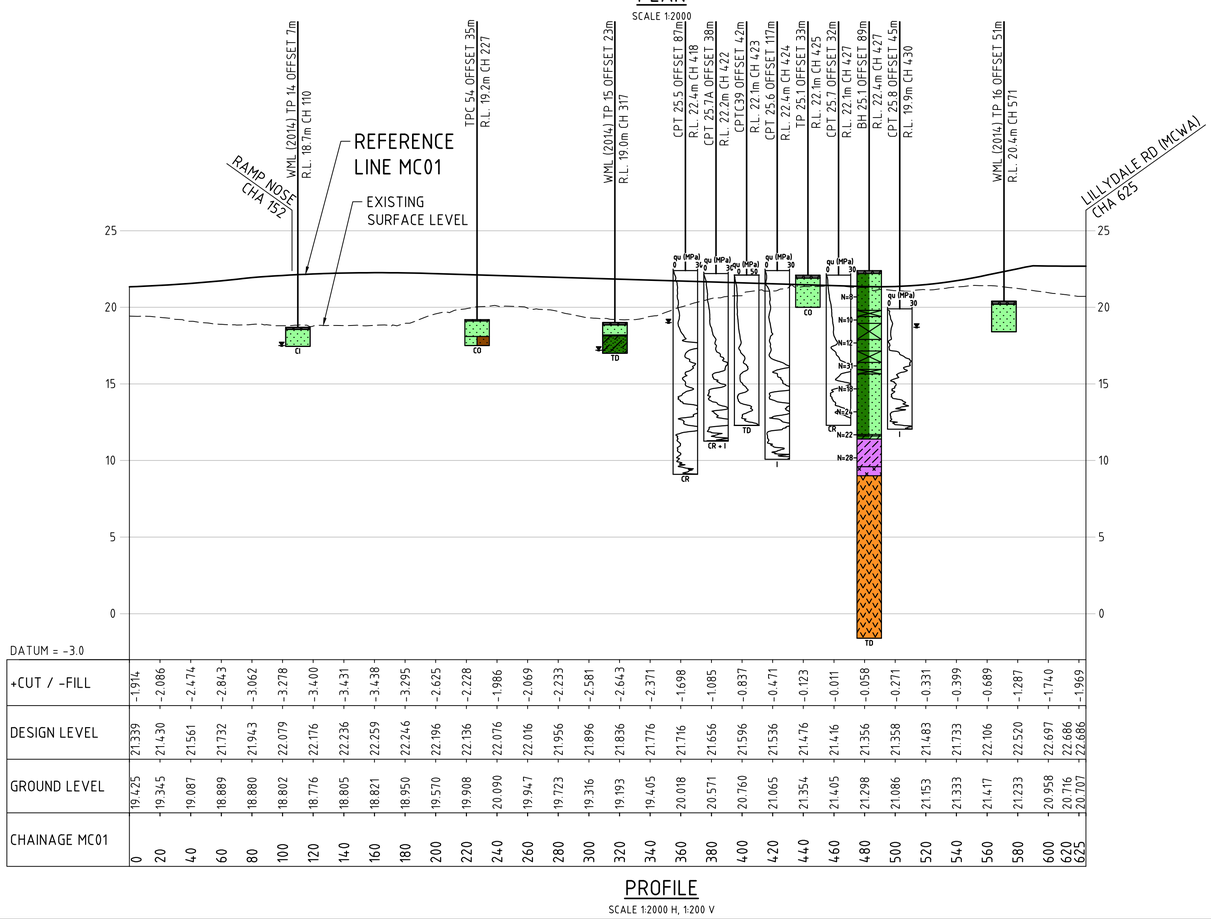
PROJECT
BUNBURY OUTER RING ROAD

TITLE
BORR SOUTH ULTIMATE DESIGN
BUSSELL HWY S/B CARRIAGEWAY
PLAN AND PROFILE (MCS2) - SHEET 9

SKETCH No. FIGURE 3.09 | REV A



PLAN
SCALE 1:2000



DATUM = -3.0

CHAINAGE MC01	GROUND LEVEL	DESIGN LEVEL	+CUT / -FILL
0	19.425	21.339	-1.914
20	19.345	21.430	-2.086
40	19.087	21.561	-2.474
60	18.889	21.732	-2.843
80	18.880	21.943	-3.062
100	18.802	22.079	-3.278
120	18.776	22.176	-3.400
140	18.805	22.236	-3.431
160	18.821	22.259	-3.438
180	18.950	22.246	-3.295
200	19.570	22.196	-2.625
220	19.908	22.136	-2.228
240	20.090	22.076	-1.986
260	19.947	22.016	-2.069
280	19.723	21.956	-2.233
300	19.316	21.896	-2.581
320	19.193	21.836	-2.643
340	19.405	21.776	-2.371
360	20.018	21.716	-1.698
380	20.571	21.656	-1.085
400	20.760	21.596	-0.837
420	21.065	21.536	-0.471
440	21.354	21.476	-0.123
460	21.405	21.416	-0.011
480	21.298	21.356	-0.058
500	21.086	21.358	-0.271
520	21.153	21.483	-0.331
540	21.333	21.733	-0.399
560	21.417	22.106	-0.689
580	21.233	22.520	-1.287
600	20.958	22.697	-1.740
620	20.716	22.686	-1.969
625	20.707	22.686	

PROFILE
SCALE 1:2000 H, 1:200 V

NOTES :

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- WML (2014) TP14 WML TEST PIT 2014 POINT

VERT. 1:200
HORIZ. 1:2000
SCALES
A1

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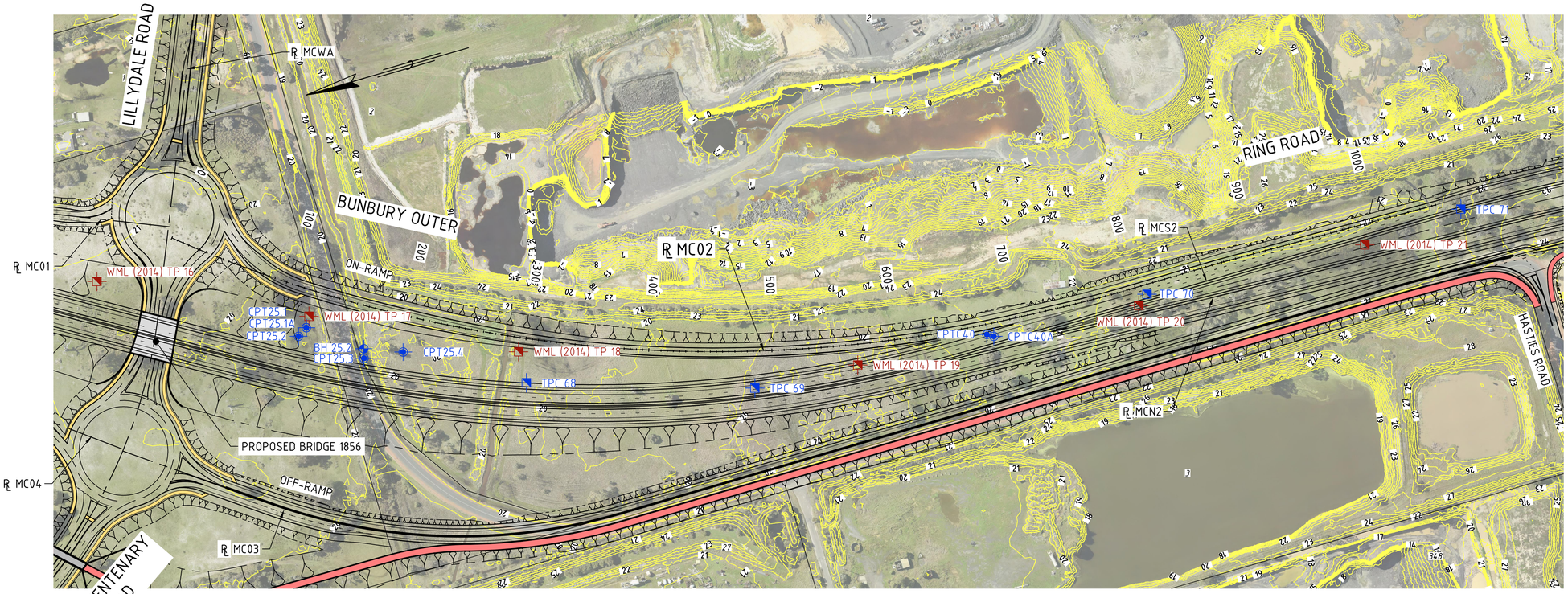
DATE 12/07/2019	PREPARED JV
SCALE 1:2000H, 1:200V	GRID PCG 94

PROJECT
BUNBURY OUTER RING ROAD

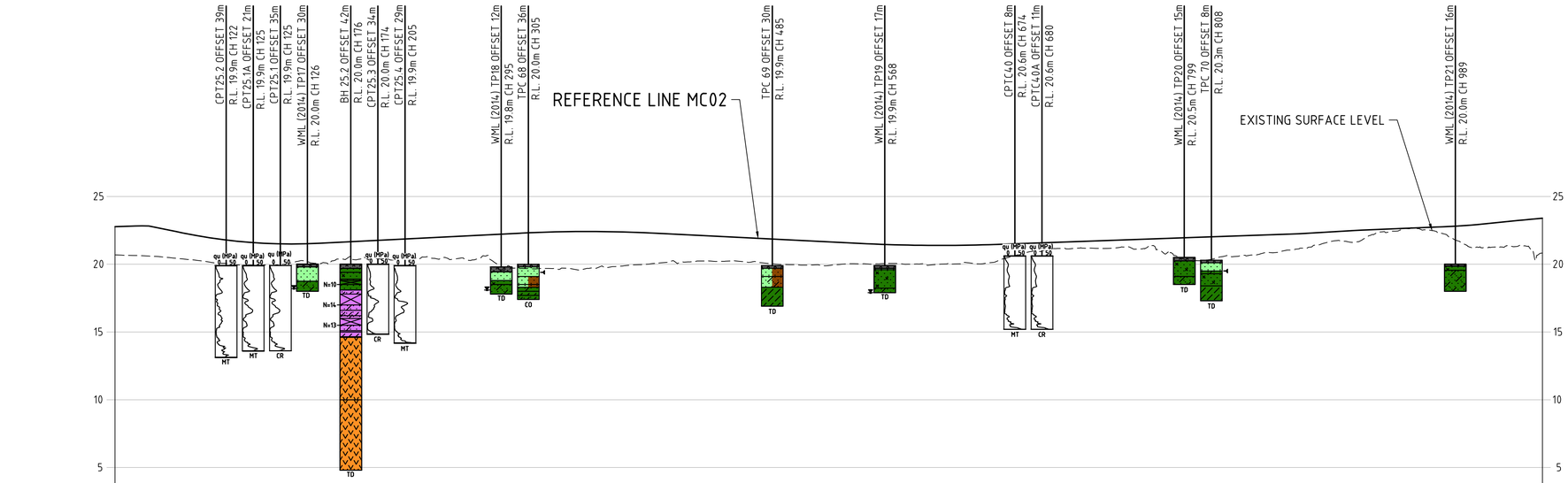
TITLE
BORR SOUTH ULTIMATE DESIGN
BORR/CENTENARY INTERCHANGE
RAMP PLAN AND PROFILE (MC01)

SKETCH No.	REV
FIGURE 3.10	A



PLAN

SCALE 1:2000



DATUM = 2.0

CHAINAGE MC02	0	20	40	60	80	100	120	140	160	180	200	220	240	260	280	300	320	340	360	380	400	420	440	460	480	500	520	540	560	580	600	620	640	660	680	700	720	740	760	780	800	820	840	860	880	900	920	940	960	980	1000	1020	1040	1053
GROUND LEVEL	20.691	20.629	20.490	20.293	20.067	19.943	19.952	20.233	20.247	20.368	20.440	20.420	20.417	20.290	20.139	19.688	19.684	19.606	19.829	19.929	20.082	20.152	20.234	20.225	20.079	19.969	19.937	20.023	20.013	20.028	19.929	20.019	20.029	20.525	20.984	21.182	21.190	21.223	21.155	20.806	20.254	20.627	20.682	20.932	21.212	21.731	21.779	22.379	22.636	22.257	21.254	21.216	21.365	20.832
DESIGN LEVEL	22.773	22.833	22.513	22.117	21.813	21.610	21.508	21.507	21.594	21.694	21.794	21.894	21.994	22.094	22.194	22.294	22.372	22.410	22.408	22.366	22.284	22.184	22.084	21.984	21.884	21.784	21.684	21.584	21.488	21.422	21.391	21.393	21.429	21.496	21.566	21.637	21.707	21.778	21.848	21.919	21.989	22.060	22.130	22.201	22.286	22.401	22.513	22.597	22.681	22.765	22.883	23.075	23.271	23.393
+CUT / -FILL	-2.082	-2.203	-2.023	-1.824	-1.746	-1.667	-1.555	-1.274	-1.348	-1.326	-1.354	-1.475	-1.577	-1.804	-2.055	-2.606	-2.687	-2.804	-2.578	-2.436	-2.202	-2.032	-1.851	-1.760	-1.806	-1.815	-1.748	-1.562	-1.475	-1.394	-1.461	-1.374	-1.401	-0.971	-0.583	-0.454	-0.517	-0.555	-0.693	-1.113	-1.735	-1.433	-1.448	-1.269	-1.075	-0.670	-0.734	-0.218	-0.044	-0.508	-1.628	-1.859	-1.906

PROFILE

SCALE 1:2000 H, 1:200 V

NOTES :

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- WML (2014) TP14 WML TEST PIT 2014 POINT

SCALES HORIZ. 1:2000 VERT. 1:200

A 1

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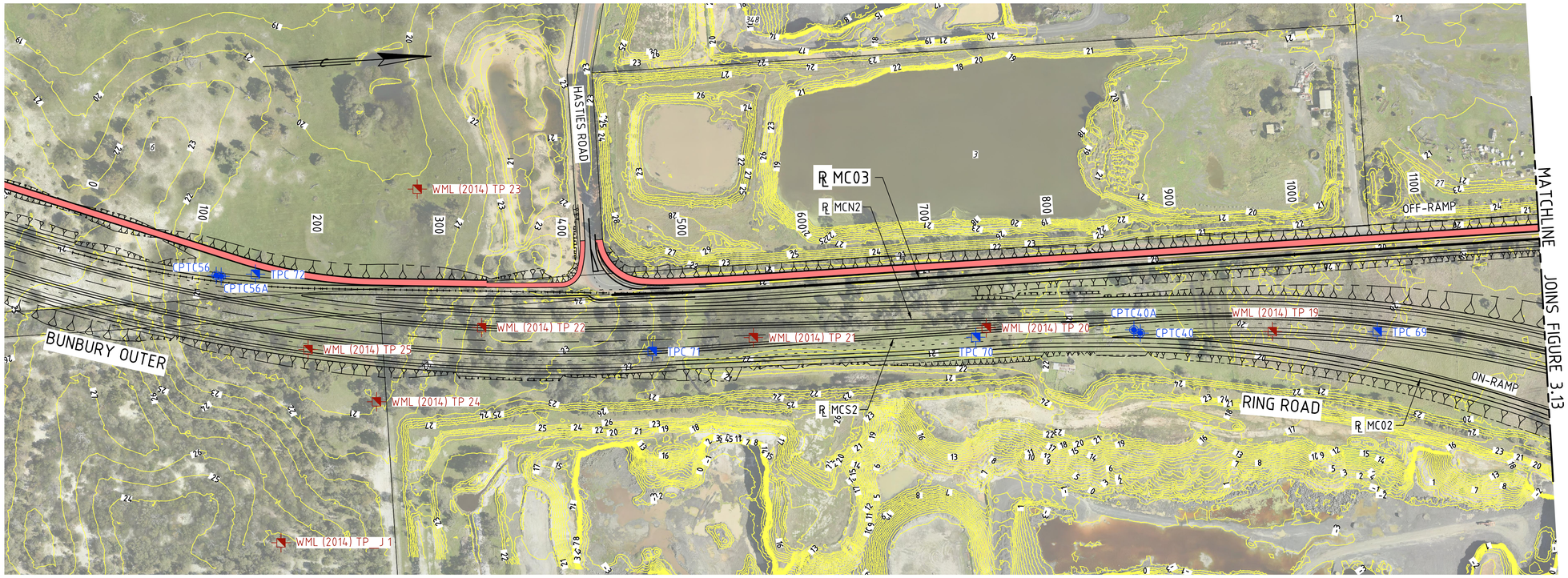
DATE 12/07/2019	PREPARED JV
SCALE 1:2000H, 1:200V	GRID PCG 94

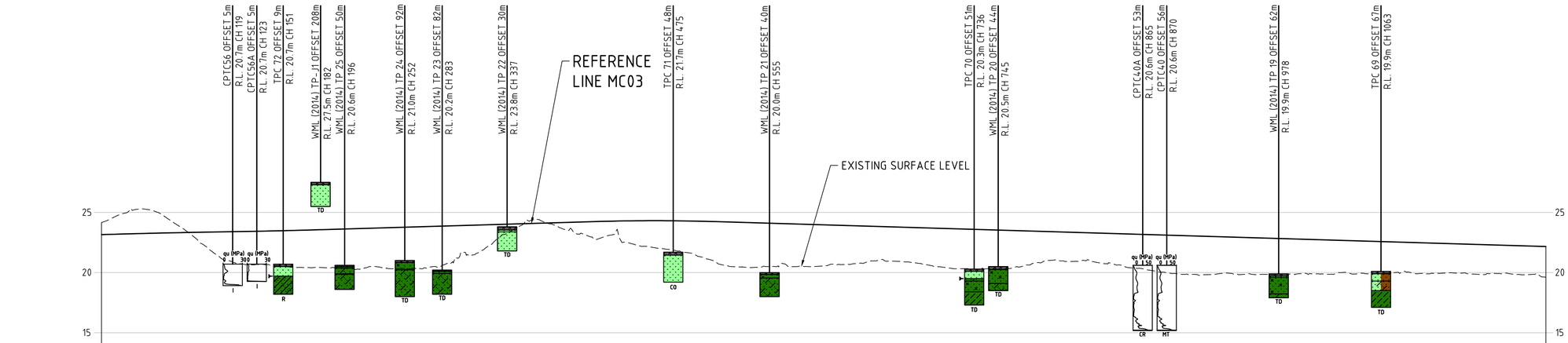
PROJECT: BUNBURY OUTER RING ROAD

TITLE: BORR SOUTH ULTIMATE DESIGN
BORR/CENTENARY INTERCHANGE
RAMP PLAN AND PROFILE (MC02)

SKETCH No. FIGURE 3.11 | REV A



PLAN
SCALE 1:2000



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CHAINAGE MC03	0	20	40	60	80	100	120	140	160	180	200	220	240	260	280	300	320	340	360	380	400	420	440	460	480	500	520	540	560	580	600	620	640	660	680	700	720	740	760	780	800	820	840	860	880	900	920	940	960	980	1000	1020	1040	1060	1080	1100	1120	1140	1160	1180	1200
GROUND LEVEL	24.163	24.956	25.223	24.151	22.695	21.146	20.659	20.611	20.422	20.430	20.378	20.398	20.325	20.341	20.458	21.677	22.111	23.443	24.350	23.771	23.215	23.053	22.413	22.060	21.800	21.248	20.562	20.419	20.502	20.532	20.539	20.680	20.975	20.944	20.758	20.436	20.328	20.306	20.483	20.806	20.938	21.046	20.738	20.353	20.018	19.853	19.833	19.891	19.814	19.887	19.936	19.854	19.875	19.942	20.017	19.898	19.980	19.874	19.916	19.815	19.621
DESIGN LEVEL	23.155	23.214	23.267	23.312	23.350	23.383	23.419	23.460	23.508	23.561	23.620	23.679	23.738	23.797	23.857	23.916	23.975	24.034	24.094	24.153	24.212	24.269	24.304	24.315	24.303	24.267	24.210	24.150	24.089	24.029	23.969	23.909	23.849	23.789	23.729	23.669	23.609	23.549	23.488	23.428	23.368	23.308	23.248	23.188	23.128	23.068	23.008	22.947	22.887	22.827	22.767	22.707	22.647	22.587	22.527	22.467	22.406	22.346	22.286	22.226	22.166
+CUT / -FILL	1.008	1.742	1.957	0.840	-0.655	-2.236	-2.760	-2.849	-3.086	-3.131	-3.241	-3.280	-3.414	-3.456	-3.398	-2.238	-1.864	-0.591	0.256	-0.381	-0.997	-1.216	-1.891	-2.256	-2.504	-3.019	-3.647	-3.731	-3.588	-3.497	-3.430	-3.230	-2.875	-2.845	-2.970	-3.233	-3.281	-3.242	-3.005	-2.622	-2.431	-2.263	-2.509	-2.834	-3.110	-3.214	-3.174	-3.057	-3.073	-2.940	-2.831	-2.854	-2.772	-2.645	-2.509	-2.568	-2.427	-2.472	-2.370	-2.411	-2.545

PROFILE
SCALE 1:2000 H, 1:200 V

NOTES :

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- WML (2014) TP14 WML TEST PIT 2014 POINT

VERT. 1:200
HORIZ. 1:2000
SCALES
A 1

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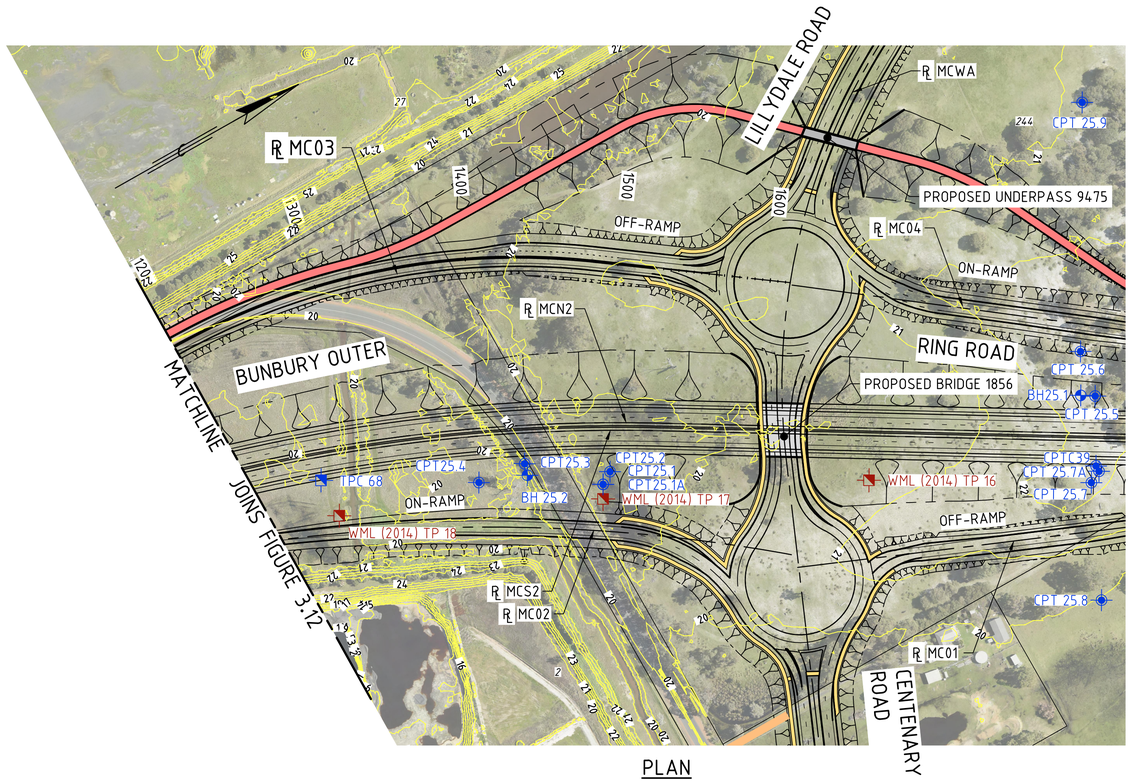
BUNBURY OUTER RING ROAD | PLANNING AND DEVELOPMENT

DATE	12/07/2019	PREPARED	JV
SCALE	1:2000H, 1:200V	GRID	PCG 94

PROJECT
BUNBURY OUTER RING ROAD

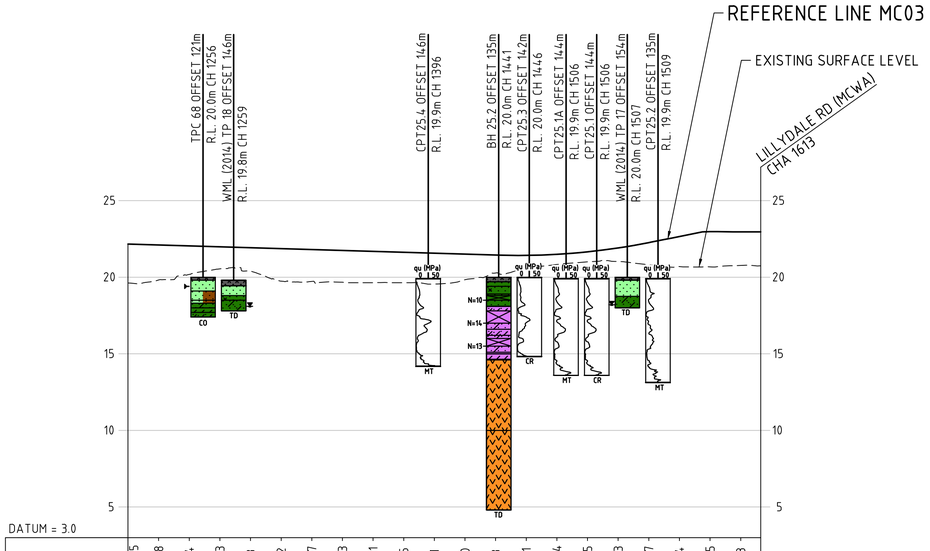
TITLE
BORR SOUTH ULTIMATE DESIGN
BORR/CENTENARY INTERCHANGE RAMP
PLAN AND PROFILE (MC03) - SHEET 1

SKETCH No.	REV
FIGURE 3.12	A



PLAN

SCALE 1:2000



DATUM = 3.0

CHAINAGE MC03	1200	1220	1240	1260	1280	1300	1320	1340	1360	1380	1400	1420	1440	1460	1480	1500	1520	1540	1560	1580	1600	1613
+CUT / -FILL	-2.545	-2.288	-1.864	-1.443	-1.518	-2.122	-2.077	-2.073	-2.041	-1.985	-2.011	-1.670	-1.168	-0.901	-0.664	-0.655	-0.883	-1.447	-1.964	-2.305	-2.193	
DESIGN LEVEL	22.166	22.106	22.046	21.986	21.926	21.866	21.805	21.745	21.685	21.625	21.565	21.505	21.445	21.424	21.495	21.657	21.912	22.258	22.657	22.980	22.962	22.961
GROUND LEVEL	19.621	19.818	20.181	20.543	20.408	19.744	19.728	19.672	19.644	19.641	19.554	19.835	20.276	20.523	20.831	21.003	21.029	20.811	20.693	20.675	20.770	20.742

PROFILE

SCALE 1:2000 H, 1:200 V

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SCALES HORIZ. 1:2000 VERT. 1:200

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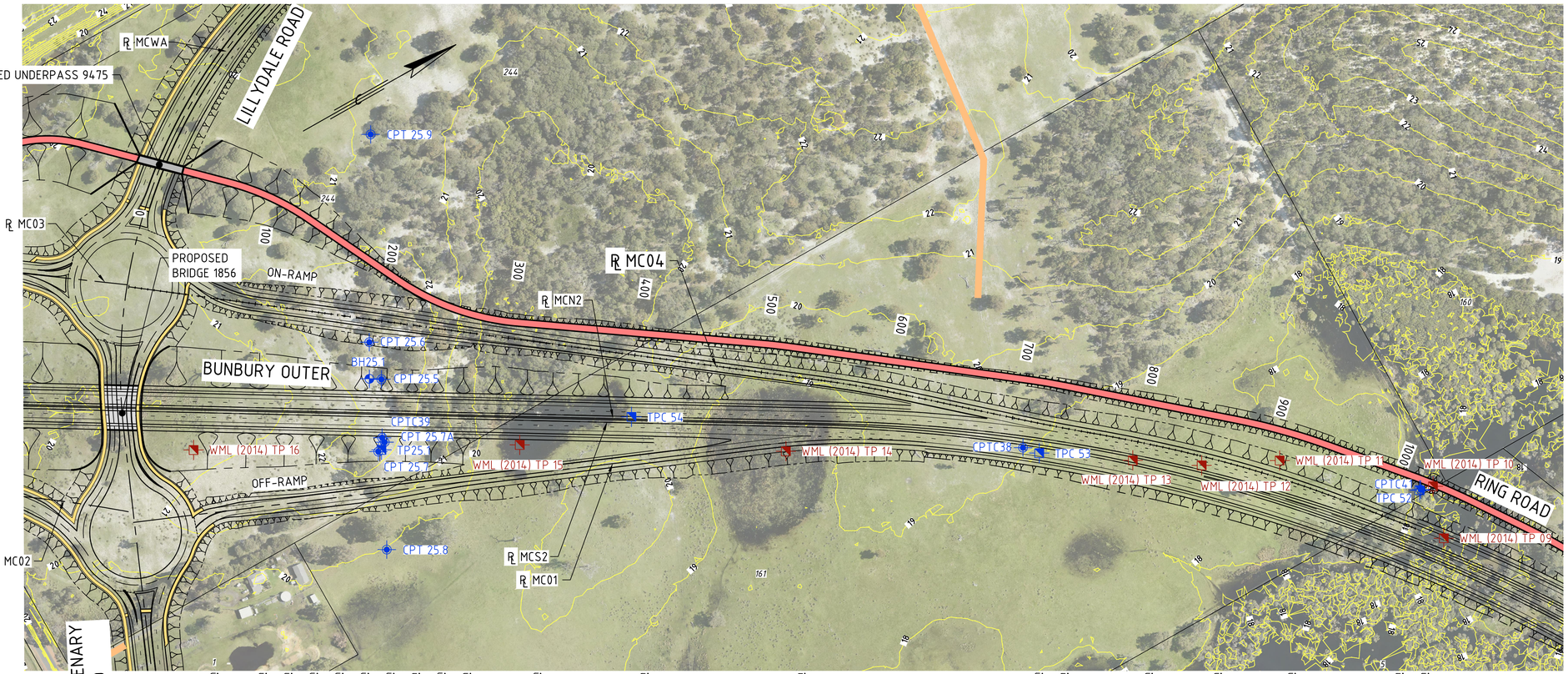
DATE	12/07/2019	PREPARED	JV
SCALE	1:2000H, 1:200V	GRID	PCG 94

PROJECT: BUNBURY OUTER RING ROAD

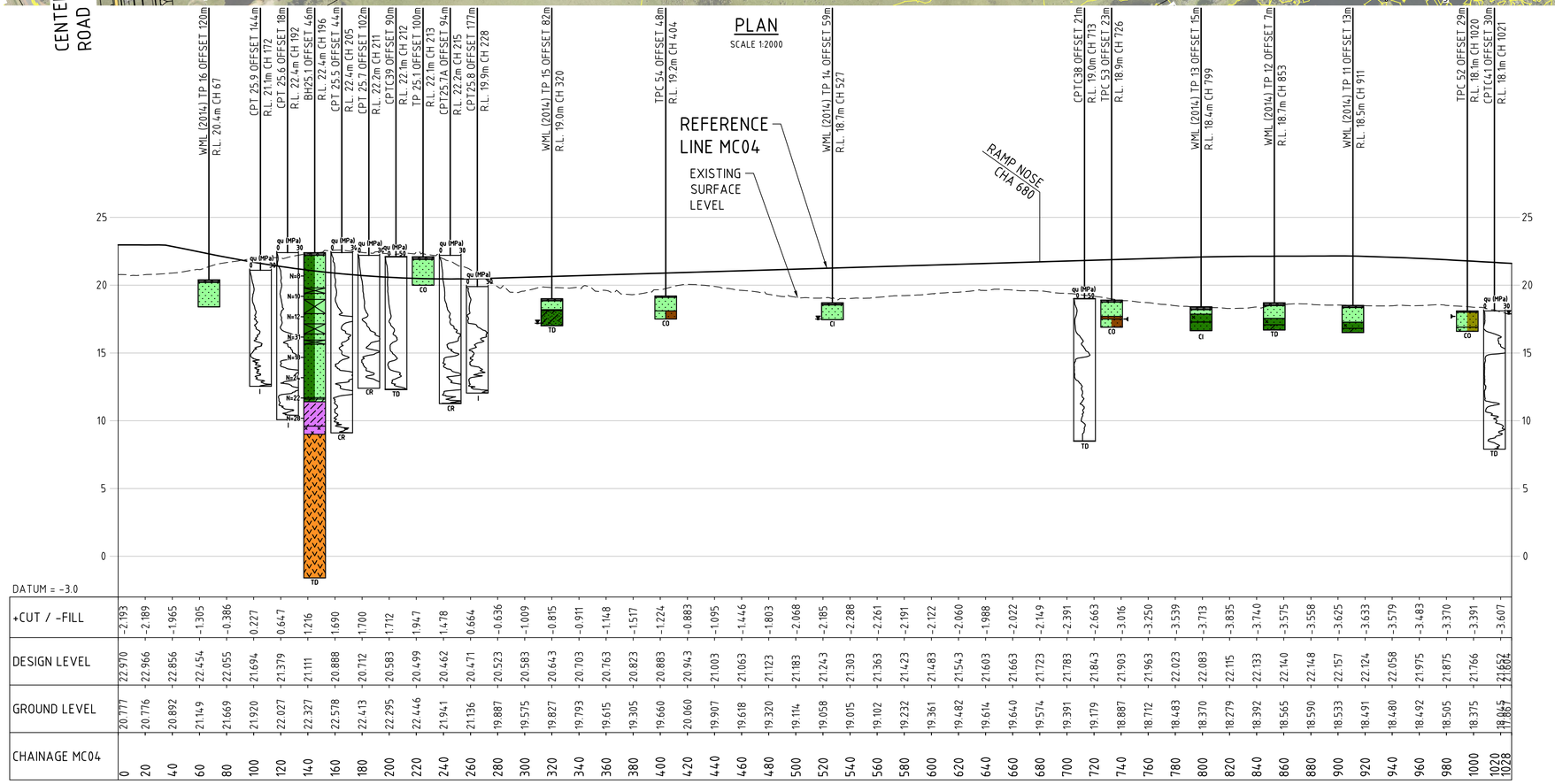
TITLE: BORR SOUTH ULTIMATE DESIGN
BORR/CENTENARY INTERCHANGE RAMP
PLAN AND PROFILE (MC03) - SHEET 2

SKETCH No. FIGURE 3.13

REV A



PLAN
SCALE 1:2000



DATUM = -3.0

CHAINAGE MC04	0	20	40	60	80	100	120	140	160	180	200	220	240	260	280	300	320	340	360	380	400	420	440	460	480	500	520	540	560	580	600	620	640	660	680	700	720	740	760	780	800	820	840	860	880	900	920	940	960	980	1000	1020	1028
GROUND LEVEL	20.777	20.776	20.892	21.149	21.669	21.920	22.027	22.327	22.578	22.413	22.295	22.446	21.941	21.136	19.887	19.575	19.827	19.793	19.615	19.305	19.660	20.060	19.907	19.618	19.320	19.114	19.058	19.015	19.102	19.232	19.361	19.482	19.614	19.640	19.574	19.391	19.179	18.887	18.712	18.483	18.370	18.279	18.392	18.565	18.590	18.533	18.491	18.480	18.492	18.505	18.375	18.045	18.867
DESIGN LEVEL	22.970	22.966	22.856	22.454	22.055	21.694	21.379	21.111	20.888	20.712	20.583	20.499	20.462	20.411	20.523	20.583	20.643	20.703	20.763	20.823	20.883	20.943	21.003	21.063	21.123	21.183	21.243	21.303	21.363	21.423	21.483	21.543	21.603	21.663	21.723	21.783	21.843	21.903	21.963	22.023	22.083	22.115	22.133	22.140	22.148	22.157	22.124	22.058	21.975	21.875	21.766	21.652	21.604
+CUT / -FILL	-2.193	-2.189	-1.965	-1.305	-0.386	0.227	0.647	1.216	1.690	1.700	1.712	1.947	1.478	0.664	-0.636	-1.009	-0.815	-0.911	-1.148	-1.517	-1.224	-0.883	-1.095	-1.446	-1.803	-2.068	-2.185	-2.288	-2.261	-2.191	-2.122	-2.060	-1.988	-2.022	-2.149	-2.391	-2.663	-3.016	-3.250	-3.539	-3.713	-3.835	-3.740	-3.575	-3.558	-3.625	-3.633	-3.579	-3.483	-3.370	-3.391	-3.607	-3.562

PROFILE
SCALE 1:2000 H, 1:200 V

NOTES :

1. SOME INVESTIGATION LOCATIONS MOVED LATERALLY ON THE PROFILE FOR VISUAL CLARITY.
2. ONLY INVESTIGATION LOCATIONS WITHIN APPROXIMATELY 200m OF THE REFERENCE LINE ARE SHOWN ON THE PROFILE FOR VISUAL CLARITY.
3. THE SOIL/ ROCK SYMBOL LEGEND IS SHOWN IN APPENDIX P.

LEGEND :

- CADASTRAL BOUNDARY
- PROPOSED BRIDGE
- PROPOSED PSP
- PROPOSED SHARED PATH
- GROUNDWATER INFLOW LEVEL
- DIPPED GROUNDWATER LEVEL
- GROUNDWATER SEEPAGE LEVEL
- TD TARGET DEPTH
- R REFUSAL
- NR NEAR REFUSAL
- CO COLLAPSING
- CI CAVE IN
- W WATER
- MT MAXIMUM THRUST
- I INCLINATION
- CR CONE RESISTANCE
- EOR END OF REACH
- B BOUNCING OR NO LATERAL SUPPORT
- N=15 SPT N VALUE
- N=R SPT REFUSAL
- TOPSOIL
- FILL
- SWAMP DEPOSITS
- TAMALA SAND
- TAMALA LIMESTONE
- COFFEE ROCK
- BASSENDEAN SAND
- GUILDFORD FORMATION
- LEEDERVILLE FORMATION
- RESIDUAL SOIL
- BUNBURY BASALT
- YARRAGADEE FORMATION
- CPT18.2A BORR CPT 2018/2019 LOCATION
- BH 18.1 BORR BOREHOLE 2018/2019 LOCATION
- TP 32.1 BORR TEST PIT 2018/2019 LOCATION
- HA 27.1 BORR HAND AUGER 2018/2019 LOCATION
- WML (2014) TP14 WML TEST PIT 2014 POINT

SCALES HORIZ. 1:2000 VERT. 1:200

A 1

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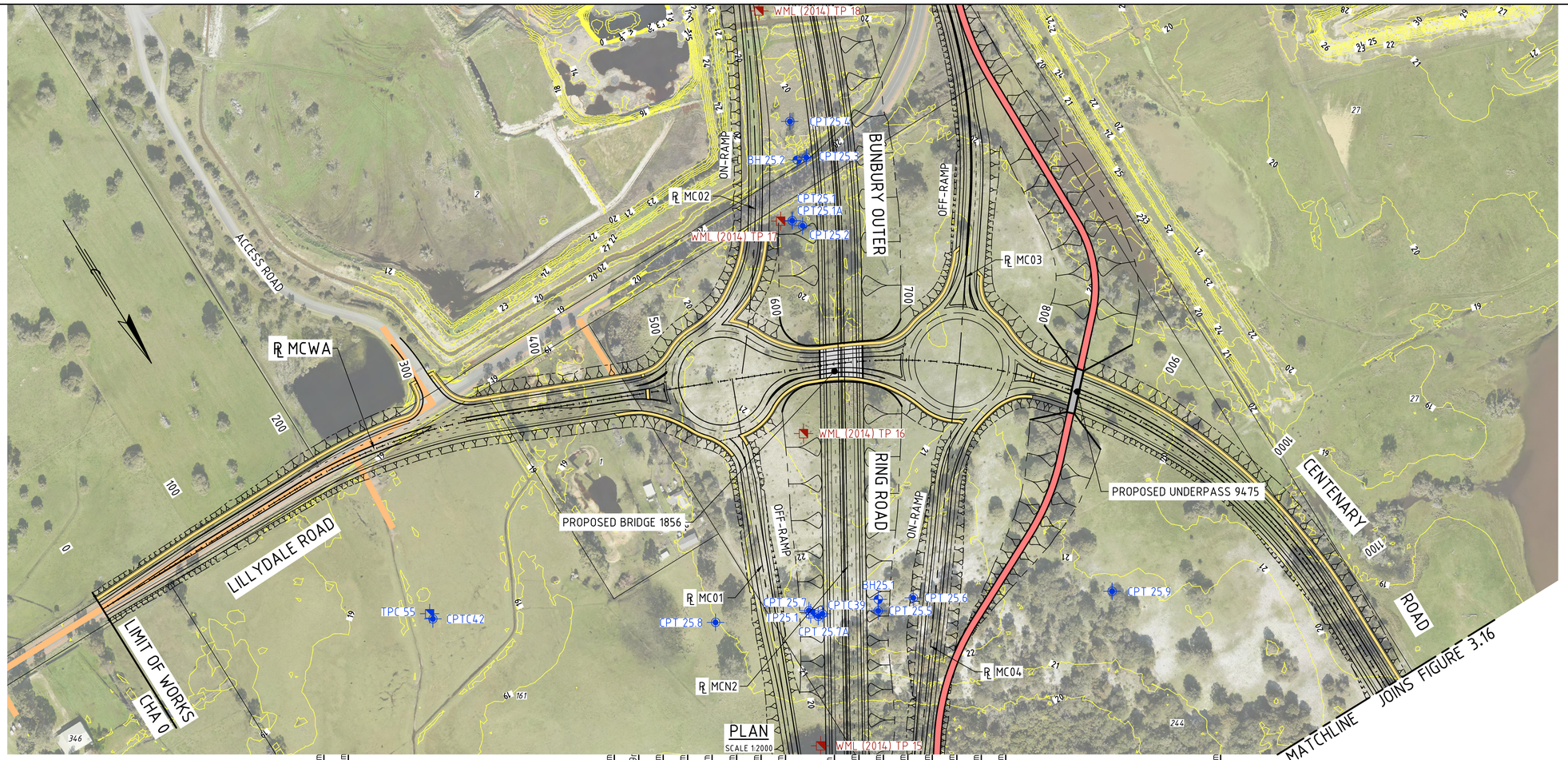
BUNBURY OUTER RING ROAD | PLANNING AND DEVELOPMENT

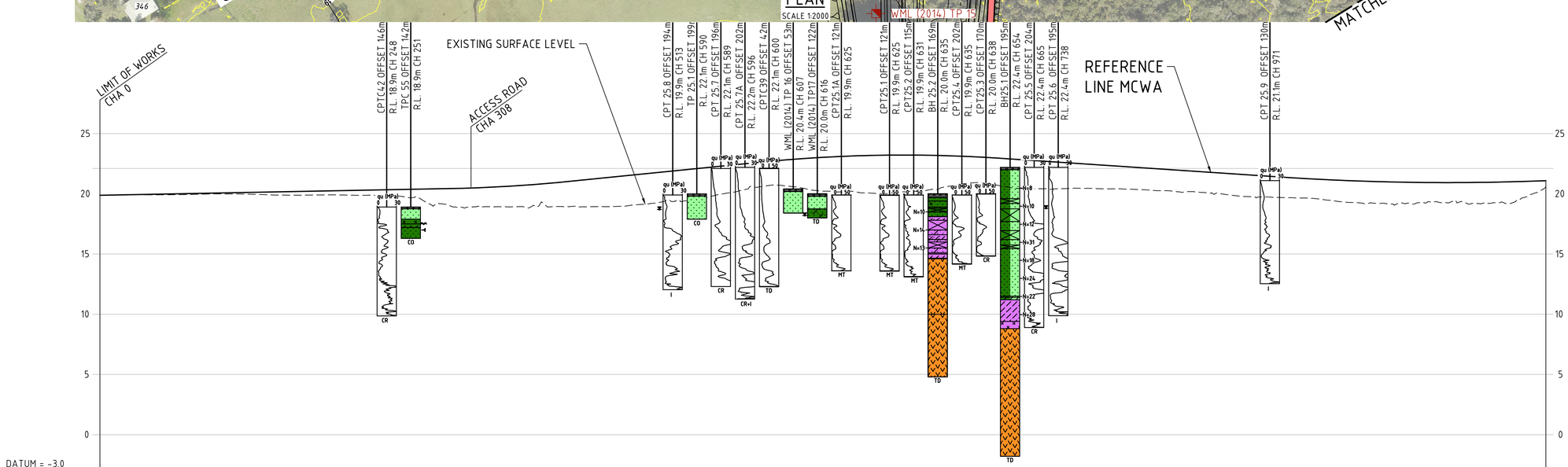
DATE	12/07/2019	PREPARED	JV
SCALE	1:2000H, 1:200V	GRID	PCG 94

PROJECT: BUNBURY OUTER RING ROAD

TITLE: BORR SOUTH ULTIMATE DESIGN
BORR/CENTENARY INTERCHANGE
RAMP PLAN AND PROFILE (MC04)

SKETCH No. FIGURE 3.14 | REV A





DATUM = -3.0

CHAINAGE MCWA	0	20	40	60	80	100	120	140	160	180	200	220	240	260	280	300	320	340	360	380	400	420	440	460	480	500	520	540	560	580	600	620	640	660	680	700	720	740	760	780	800	820	840	860	880	900	920	940	960	980	1000	1020	1040	1060	1080	1100	1120	1140	1160	1180	1200
GROUND LEVEL	19.872	19.905	19.909	19.922	19.960	19.993	19.980	19.917	19.886	19.903	19.905	19.879	19.847	19.683	19.198	18.886	18.929	18.914	19.034	18.943	18.917	18.931	19.037	19.222	19.483	19.732	20.049	20.619	20.730	20.532	20.220	20.180	20.059	20.096	20.224	20.544	20.873	20.803	20.439	20.419	20.428	20.457	20.410	20.356	20.255	20.166	20.073	19.871	19.682	19.694	19.647	19.466	19.279	19.193	19.243	19.233	19.275	19.198	19.241	19.642	20.592
DESIGN LEVEL	19.877	19.915	19.954	19.992	20.031	20.069	20.107	20.146	20.184	20.223	20.261	20.300	20.338	20.376	20.415	20.457	20.528	20.632	20.768	20.937	21.134	21.335	21.536	21.737	21.939	22.140	22.341	22.542	22.737	22.899	23.028	23.124	23.186	23.215	23.210	23.172	23.100	22.995	22.863	22.730	22.596	22.462	22.329	22.195	22.061	21.927	21.794	21.660	21.526	21.393	21.269	21.164	21.079	21.013	20.966	20.939	20.931	20.943	20.974	21.024	21.084
+CUT / -FILL	-0.006	-0.011	-0.045	-0.070	-0.071	-0.077	-0.128	-0.229	-0.298	-0.320	-0.357	-0.420	-0.490	-0.693	-1.216	-1.572	-1.600	-1.718	-1.733	-1.993	-2.217	-2.404	-2.499	-2.516	-2.456	-2.408	-2.293	-1.924	-2.007	-2.367	-2.808	-2.945	-3.128	-3.120	-2.987	-2.629	-2.228	-2.193	-2.424	-2.311	-2.168	-2.005	-1.918	-1.839	-1.807	-1.762	-1.721	-1.789	-1.845	-1.698	-1.622	-1.697	-1.800	-1.819	-1.723	-1.705	-1.656	-1.745	-1.733	-1.383	-0.492

PROFILE
SCALE 1:2000 H, 1:200 V

NOTES :

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3. THE SOIL/ ROCK SYMBOL LEGEND IS SHOWN IN APPENDIX P.

LEGEND :

- CADASTRAL BOUNDARY
- PROPOSED BRIDGE
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- GROUNDWATER SEEPAGE LEVEL
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- CO COLLAPSING
- CI CAVE IN
- W WATER
- MT MAXIMUM THRUST
- I INCLINATION
- CR CONE RESISTANCE
- EOR END OF REACH
- B BOUNCING OR NO LATERAL SUPPORT
- N=15 SPT N VALUE
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- TAMALA SAND
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- TP 32.1 BORR TEST PIT 2018/2019 LOCATION
- HA 27.1 BORR HAND AUGER 2018/2019 LOCATION
- WML (2014) TP14 WML TEST PIT 2014 POINT

VERT. 1:200
HORIZ. 1:2000
SCALES

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1

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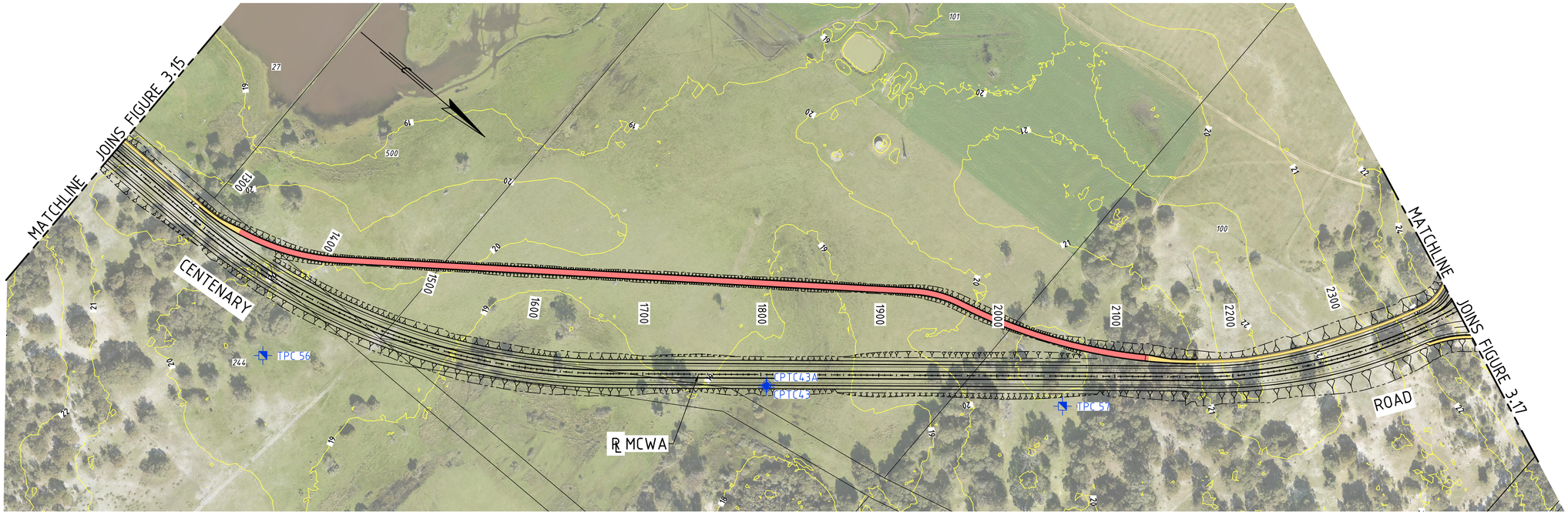
BUNBURY OUTER RING ROAD | PLANNING AND DEVELOPMENT

DATE 12/07/2019	PREPARED JV
SCALE 1:2000H, 1:200V	GRID PCG 94

PROJECT
BUNBURY OUTER RING ROAD

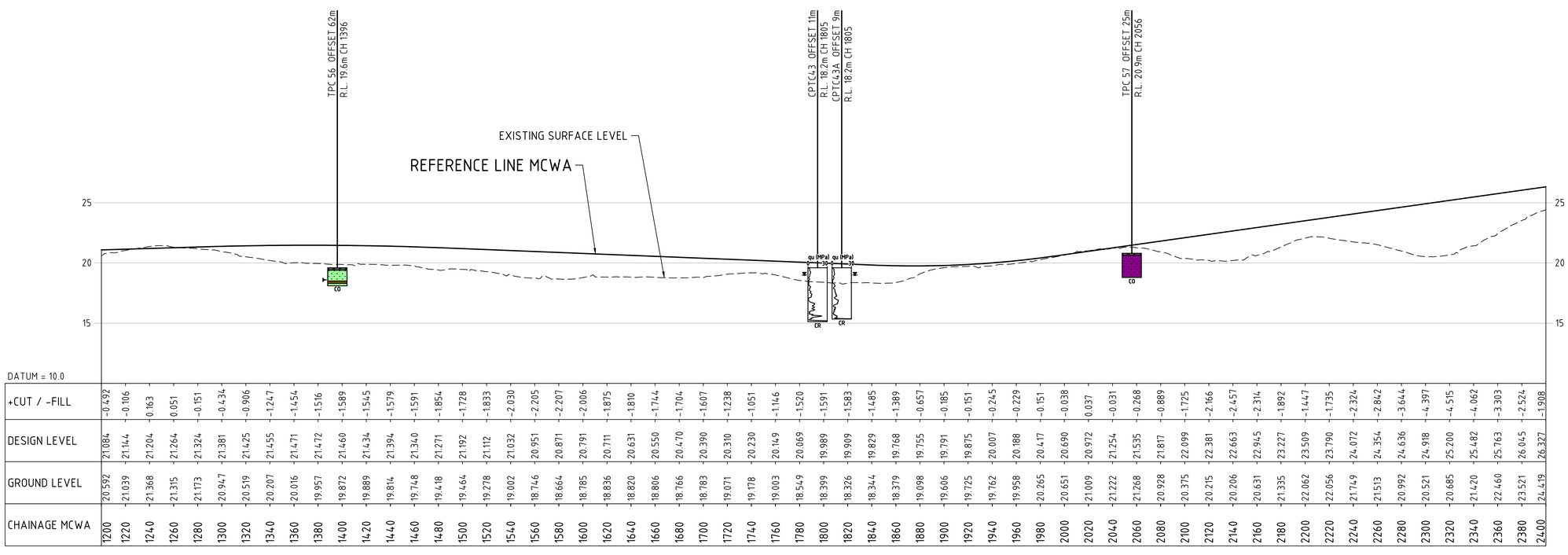
TITLE
BORR SOUTH ULTIMATE DESIGN
CENTENARY ROAD
PLAN AND PROFILE (MCWA) - SHEET 1

SKETCH No.	REV
FIGURE 3.15	A



PLAN

SCALE 1:2000



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CHAINAGE MCWA	1200	1220	1240	1260	1280	1300	1320	1340	1360	1380	1400	1420	1440	1460	1480	1500	1520	1540	1560	1580	1600	1620	1640	1660	1680	1700	1720	1740	1760	1780	1800	1820	1840	1860	1880	1900	1920	1940	1960	1980	2000	2020	2040	2060	2080	2100	2120	2140	2160	2180	2200	2220	2240	2260	2280	2300	2320	2340	2360	2380	2400
GROUND LEVEL	20.592	21.039	21.368	21.315	21.173	20.947	20.519	20.207	20.016	19.957	19.872	19.889	19.814	19.748	19.418	19.464	19.278	19.002	18.746	18.664	18.785	18.836	18.820	18.806	18.766	18.783	19.071	19.178	19.003	18.549	18.399	18.326	18.344	18.379	19.098	19.606	19.725	19.762	19.958	20.265	20.651	21.009	21.222	21.268	20.928	20.375	20.215	20.206	20.631	21.335	22.062	22.056	21.749	21.513	20.992	20.521	20.685	21.420	22.460	23.521	24.419
DESIGN LEVEL	21.084	21.144	21.204	21.264	21.324	21.381	21.425	21.455	21.471	21.472	21.460	21.434	21.394	21.340	21.271	21.192	21.112	21.032	20.951	20.871	20.791	20.711	20.631	20.550	20.470	20.390	20.310	20.230	20.149	20.069	19.989	19.909	19.829	19.768	19.755	19.791	19.875	20.007	20.188	20.417	20.690	20.972	21.254	21.535	21.817	22.099	22.381	22.663	22.945	23.227	23.509	23.790	24.072	24.354	24.636	24.918	25.200	25.482	25.763	26.045	26.327
+CUT / -FILL	-0.492	-0.106	0.163	0.051	-0.151	-0.434	-0.906	-1.247	-1.454	-1.516	-1.589	-1.545	-1.579	-1.591	-1.854	-1.728	-1.833	-2.030	-2.205	-2.207	-2.006	-1.875	-1.810	-1.744	-1.704	-1.607	-1.238	-1.051	-1.146	-1.520	-1.591	-1.583	-1.485	-1.389	-0.657	-0.185	-0.151	-0.245	-0.229	-0.151	-0.038	0.037	-0.031	-0.268	-0.889	-1.725	-2.166	-2.457	-2.314	-1.892	-1.447	-1.735	-2.324	-2.842	-3.644	-4.397	-4.515	-4.062	-3.303	-2.524	-1.908

PROFILE

SCALE 1:2000 H, 1:200 V

NOTES :

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- PROPOSED PSP
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- DIPPED GROUNDWATER LEVEL
- GROUNDWATER SEEPAGE LEVEL
- TD TARGET DEPTH
- R REFUSAL
- NR NEAR REFUSAL
- CO COLLAPSING
- CI CAVE IN
- W WATER
- MT MAXIMUM THRUST
- I INCLINATION
- CR CONE RESISTANCE
- EOR END OF REACH
- B BOUNCING OR NO LATERAL SUPPORT
- N=15 SPT N VALUE
- N=R SPT REFUSAL
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- SWAMP DEPOSITS
- TAMALA SAND
- TAMALA LIMESTONE
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- BASSENDEAN SAND
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- CPT18.2A BORR CPT 2018/2019 LOCATION
- BH 18.1 BORR BOREHOLE 2018/2019 LOCATION
- TP 32.1 BORR TEST PIT 2018/2019 LOCATION
- HA 27.1 BORR HAND AUGER 2018/2019 LOCATION
- WML (2014) TP14 WML TEST PIT 2014 POINT

VERT. 1:200

HORIZ. 1:2000

SCALES

A 1

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BUNBURY OUTER RING ROAD | PLANNING AND DEVELOPMENT

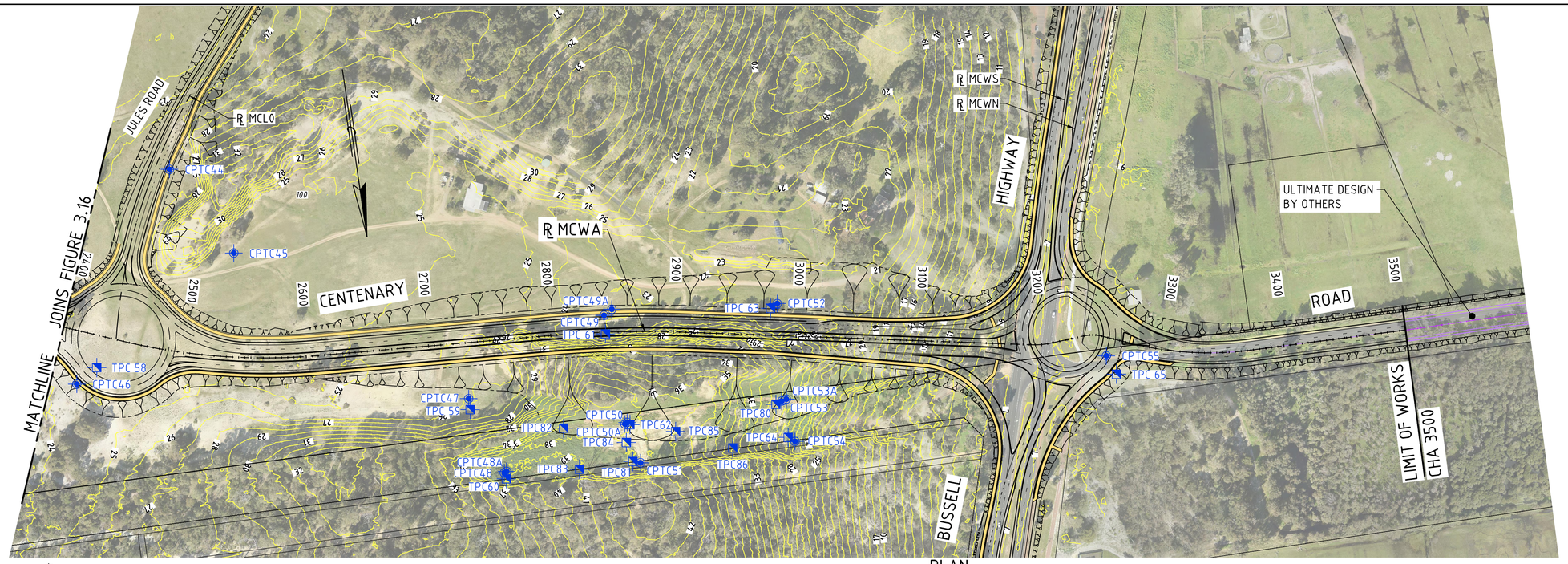
DATE	12/07/2019	PREPARED	JV
SCALE	1:2000H, 1:200V	GRID	PCG 94

PROJECT: BUNBURY OUTER RING ROAD

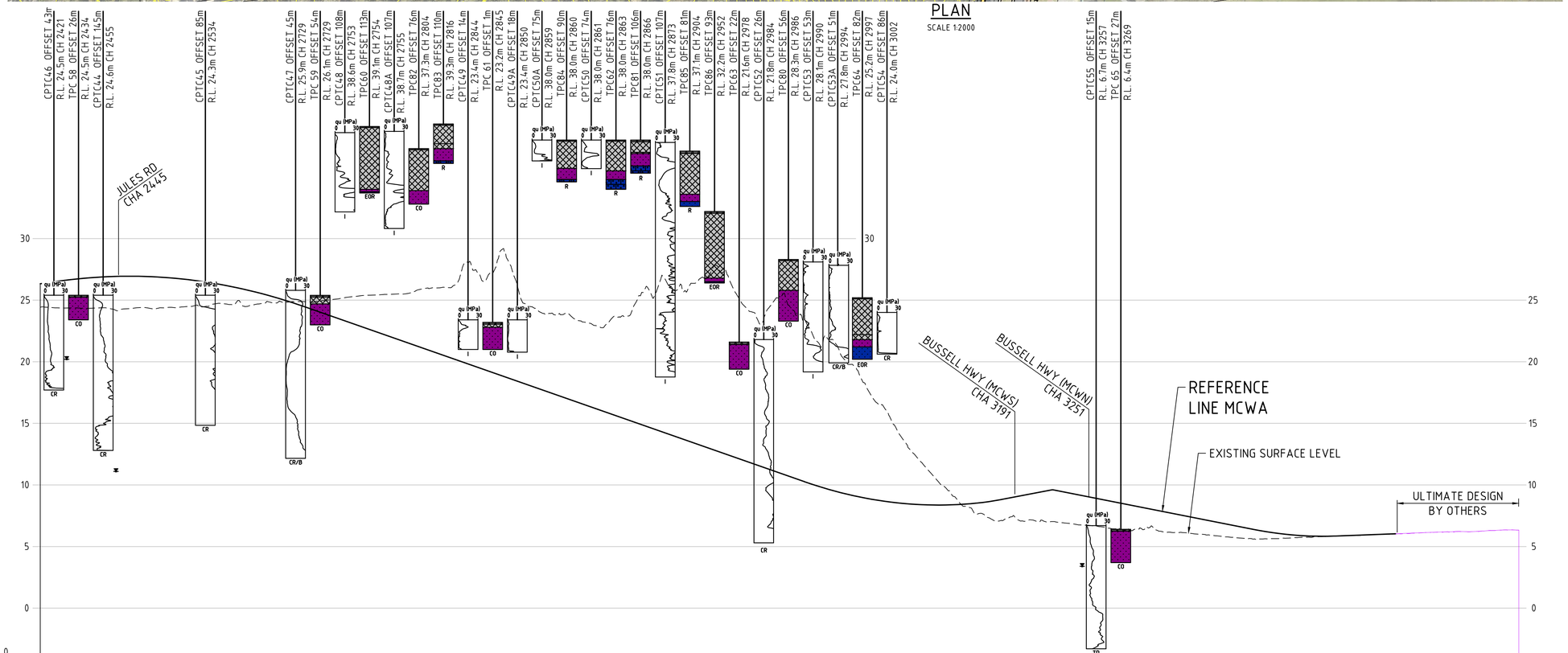
TITLE: BORR SOUTH ULTIMATE DESIGN
CENTENARY ROAD
PLAN AND PROFILE (MCWA) - SHEET 2

SKETCH No. FIGURE 3.16

REV A



PLAN
SCALE 1:2000



CHAINAGE MCWA	2400	2420	2440	2460	2480	2500	2520	2540	2560	2580	2600	2620	2640	2660	2680	2700	2720	2740	2760	2780	2800	2820	2840	2860	2880	2900	2920	2940	2960	2980	3000	3020	3040	3060	3080	3100	3120	3140	3160	3180	3200	3220	3240	3260	3280	3300	3320	3340	3360	3380	3400	3420	3440	3460	3480	3500	3520	3540	3560	3580	3600
GROUND LEVEL	24.419	24.359	24.335	24.241	24.393	24.379	24.493	24.671	24.933	24.732	24.831	24.822	25.084	25.355	25.464	25.581	26.002	26.668	26.517	28.164	24.411	23.791	23.233	23.072	24.082	25.674	26.264	26.664	26.486	23.962	25.236	23.360	21.824	19.689	16.575	13.726	11.281	9.177	7.628	7.129	7.076	7.016	6.808	6.613	6.341	6.525	6.134	6.004	5.831	5.636	5.640	5.715	5.803	5.885	5.974	6.006	6.105	6.189	6.198	6.302	6.336
DESIGN LEVEL	26.327	26.606	26.814	26.924	26.936	26.850	26.665	26.383	26.002	25.523	24.945	24.273	23.573	22.873	22.173	21.473	20.773	20.073	19.373	18.673	17.973	17.273	16.573	15.873	15.173	14.473	13.773	13.073	12.373	11.673	10.973	10.273	9.638	9.131	8.753	8.504	8.383	8.391	8.527	8.817	9.201	9.585	9.251	8.856	8.461	8.066	7.671	7.277	6.882	6.487	6.130	5.911	5.835	5.889	5.966	6.043	6.119	6.189	6.198	6.302	6.336
+CUT / -FILL	-1.908	-2.247	-2.480	-2.683	-2.544	-2.471	-2.173	-1.711	-1.068	-0.790	-0.114	0.549	1.511	2.482	3.292	4.108	5.229	6.596	7.145	9.492	6.438	6.518	6.660	7.199	8.909	11.201	12.491	13.592	14.114	12.289	14.263	13.088	12.186	10.558	7.822	5.223	2.898	0.786	-0.898	-1.687	-2.124	-2.569	-2.443	-2.243	-2.120	-1.541	-1.537	-1.273	-1.050	-0.850	-0.490	-0.197	-0.032	-0.005	0.009	-0.036	-0.015	0.000	0.000	0.000	0.000

PROFILE
SCALE 1:2000 H, 1:200 V

NOTES :

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SCALES: HORIZ. 1:2000 VERT. 1:200

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BUNBURY OUTER RING ROAD | PLANNING AND DEVELOPMENT

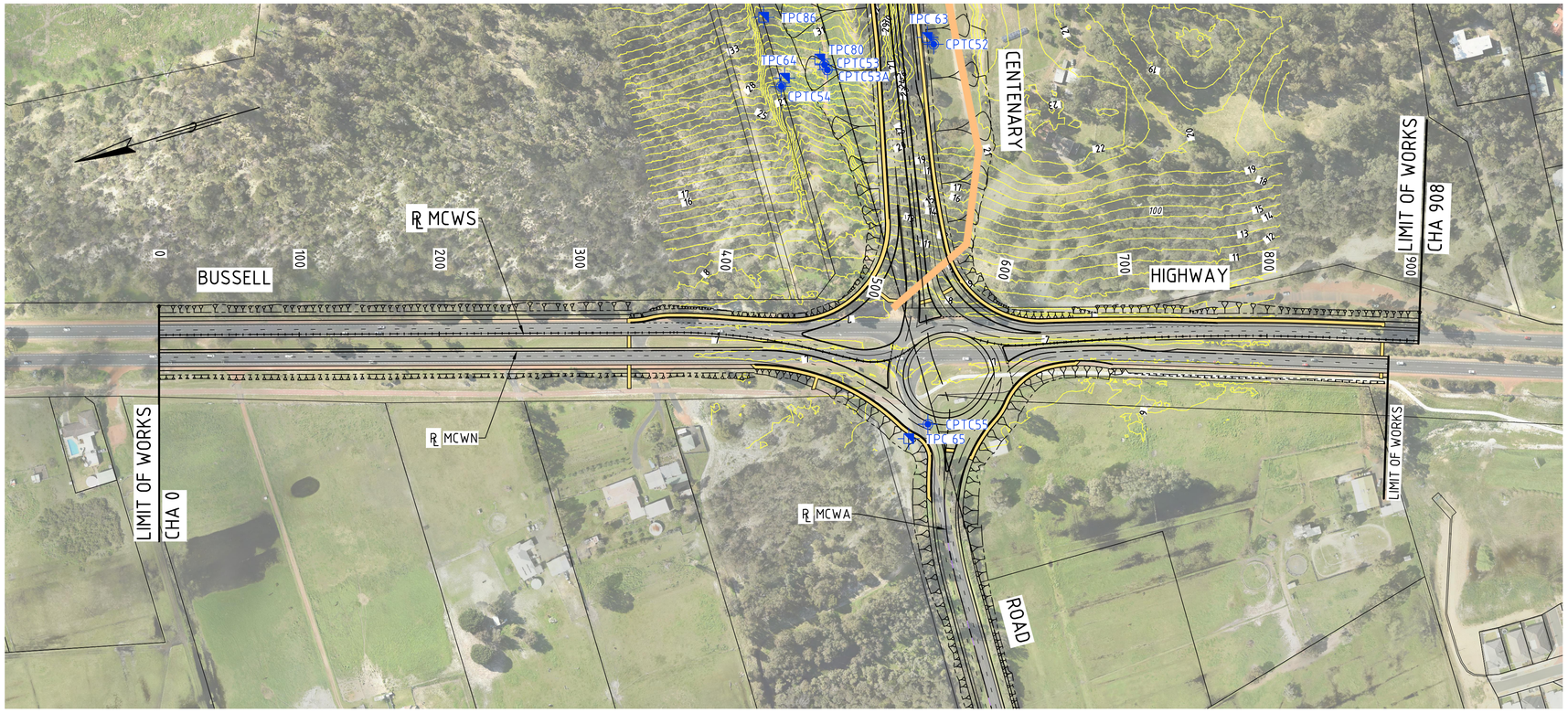
DATE 12/07/2019	PREPARED JV
SCALE 1:2000H, 1:200V	GRID PCG 94

PROJECT: BUNBURY OUTER RING ROAD

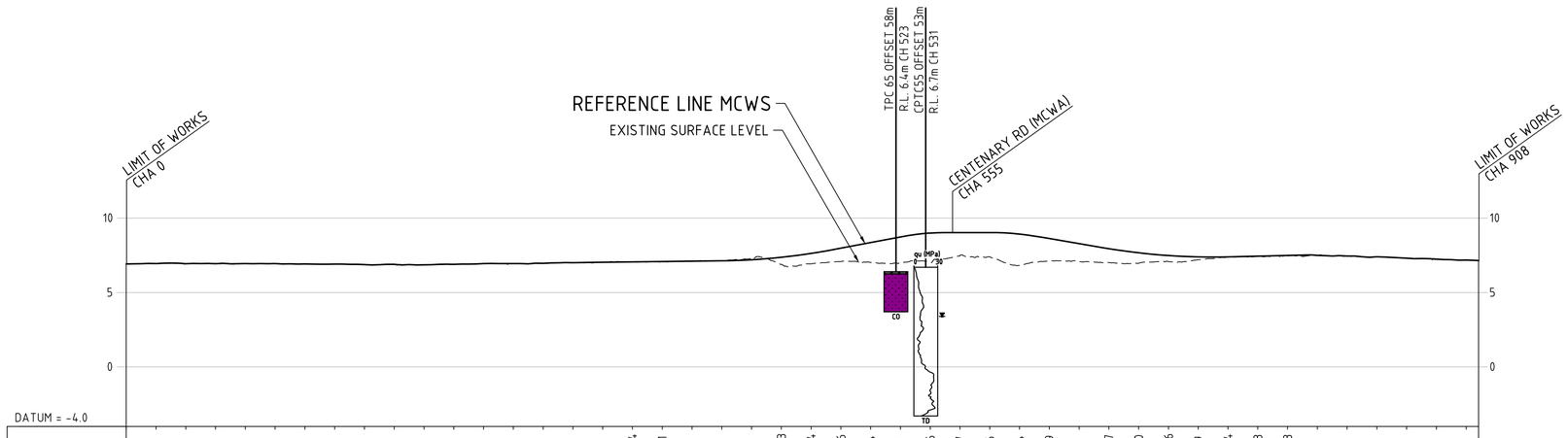
TITLE: BORR SOUTH ULTIMATE DESIGN CENTENARY ROAD / LILLYDALE ROAD PLAN AND PROFILE (MCWA) - SHEET 3

SKETCH No.	REV
FIGURE 3.17	A

A1



PLAN
SCALE 1:2000



CHAINAGE MCWS	GROUND LEVEL	DESIGN LEVEL	+CUT / -FILL
0	6.917	6.917	0.000
20	6.946	6.946	0.000
40	6.934	6.934	0.000
60	6.939	6.939	0.000
80	6.943	6.943	0.000
100	6.942	6.942	0.000
120	6.917	6.917	0.000
140	6.912	6.912	0.000
160	6.871	6.871	0.000
180	6.895	6.895	0.000
200	6.862	6.862	0.000
220	6.896	6.896	0.000
240	6.944	6.944	0.000
260	6.944	6.944	0.000
280	6.957	6.957	0.000
300	6.999	6.999	0.000
320	7.037	7.029	0.007
340	7.050	7.054	-0.004
360	7.057	7.078	-0.021
380	7.122	7.102	0.019
400	7.158	7.126	0.031
420	7.309	7.201	0.108
440	6.885	7.368	-0.483
460	6.924	7.628	-0.704
480	7.083	7.979	-0.896
500	7.022	8.357	-1.334
520	7.016	8.734	-1.717
540	7.049	8.996	-1.946
560	7.471	9.029	-1.557
580	7.393	9.029	-1.636
600	6.823	8.928	-2.104
620	7.124	8.624	-1.499
640	7.092	8.284	-1.192
660	7.009	7.945	-0.937
680	6.968	7.669	-0.700
700	7.079	7.485	-0.406
720	7.196	7.394	-0.199
740	7.363	7.397	-0.034
760	7.436	7.443	-0.008
780	7.462	7.490	-0.028
800	7.496	7.496	0.000
820	7.449	7.449	0.000
840	7.397	7.397	0.000
860	7.307	7.307	0.000
880	7.235	7.235	0.000
900	7.182	7.182	0.000
908	7.146	7.146	0.000

PROFILE
SCALE 1:2000 H, 1:200 V

NOTES :

1. SOME INVESTIGATION LOCATIONS MOVED LATERALLY ON THE PROFILE FOR VISUAL CLARITY.
2. ONLY INVESTIGATION LOCATIONS WITHIN APPROXIMATELY 200m OF THE REFERENCE LINE ARE SHOWN ON THE PROFILE FOR VISUAL CLARITY.
3. THE SOIL/ ROCK SYMBOL LEGEND IS SHOWN IN APPENDIX P.

LEGEND :

- CADASTRAL BOUNDARY
- PROPOSED BRIDGE
- PROPOSED PSP
- PROPOSED SHARED PATH
- GROUNDWATER INFLOW LEVEL
- DIPPED GROUNDWATER LEVEL
- GROUNDWATER SEEPAGE LEVEL
- TD TARGET DEPTH
- R REFUSAL
- NR NEAR REFUSAL
- CO COLLAPSING
- CI CAVE IN
- W WATER
- MT MAXIMUM THRUST
- I INCLINATION
- CR CONE RESISTANCE
- EOR END OF REACH
- B BOUNCING OR NO LATERAL SUPPORT
- N=15 SPT N VALUE
- N=R SPT REFUSAL
- TOPSOIL
- FILL
- SWAMP DEPOSITS
- TAMALA SAND
- TAMALA LIMESTONE
- COFFEE ROCK
- BASSENDEAN SAND
- GUILDFORD FORMATION
- LEEDERVILLE FORMATION
- RESIDUAL SOIL
- BUNBURY BASALT
- YARRAGADEE FORMATION
- CPT18.2A BORR CPT 2018/2019 LOCATION
- BH 18.1 BORR BOREHOLE 2018/2019 LOCATION
- TP 32.1 BORR TEST PIT 2018/2019 LOCATION
- HA 27.1 BORR HAND AUGER 2018/2019 LOCATION
- WML (2014) TP14 WML TEST PIT 2014 POINT

SCALES HORIZ. 1:2000 VERT. 1:200

A 1

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BUILDING OUR FUTURE

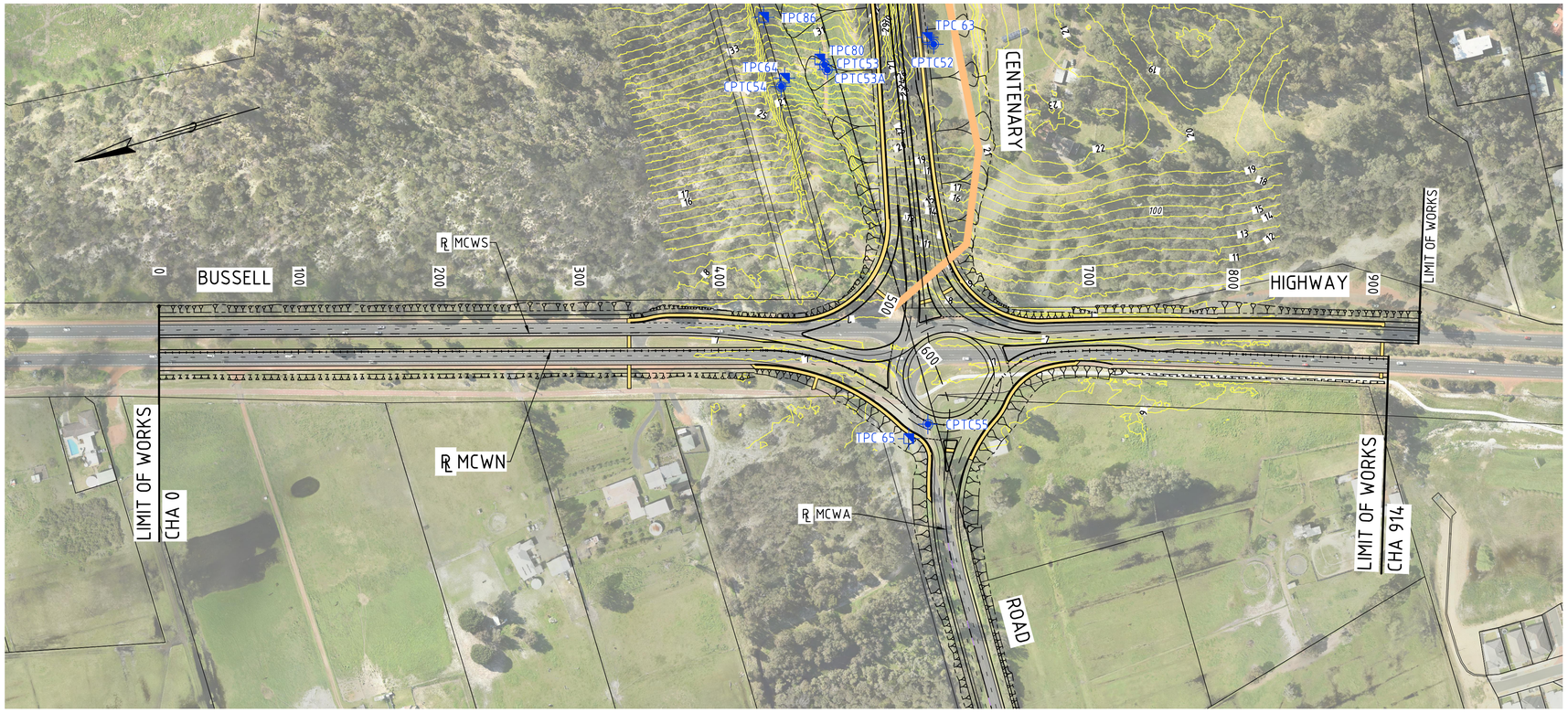
mainroads WESTERN AUSTRALIA
BUNBURY OUTER RING ROAD | PLANNING AND DEVELOPMENT

DATE 12/07/2019	PREPARED JV
SCALE 1:2000H, 1:200V	GRID PCG 94

PROJECT
BUNBURY OUTER RING ROAD

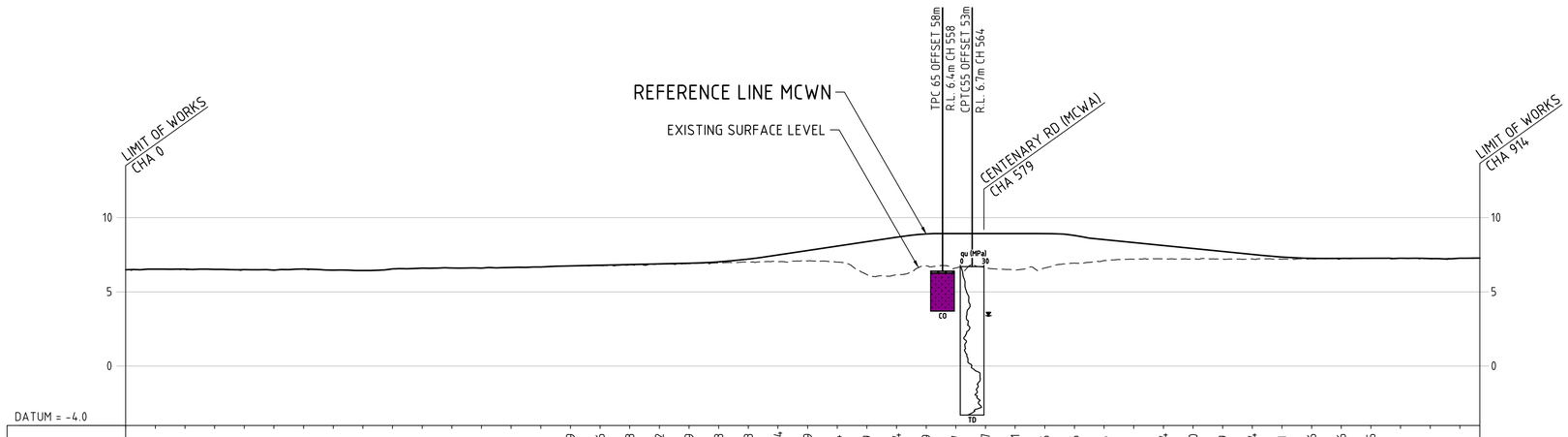
TITLE
BORR SOUTH ULTIMATE DESIGN
BUSSELL/CENTENARY ROUNDABOUT
PLAN AND PROFILE (MCWS)

SKETCH No.	REV
FIGURE 3.18	A



PLAN

SCALE 1:2000



DATUM = -4.0

CHAINAGE MCWN	0	20	40	60	80	100	120	140	160	180	200	220	240	260	280	300	320	340	360	380	400	420	440	460	480	500	520	540	560	580	600	620	640	660	680	700	720	740	760	780	800	820	840	860	880	900	914
+CUT / -FILL	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-0.009	-0.036	-0.028	-0.022	-0.029	-0.073	-0.203	-0.444	-0.699	-1.074	-2.219	-2.534	-2.149	-2.317	-2.297	-2.451	-2.315	-1.866	-1.416	-1.123	-0.894	-0.680	-0.519	-0.304	-0.141	-0.036	-0.006	-0.025	0.000	0.000	0.000	0.000
DESIGN LEVEL	6.485	6.527	6.529	6.511	6.499	6.466	6.535	6.467	6.438	6.549	6.596	6.608	6.600	6.645	6.674	6.750	6.795	6.839	6.883	6.928	7.022	7.210	7.486	7.784	8.083	8.381	8.682	8.902	8.929	8.929	8.929	8.921	8.799	8.523	8.323	8.123	7.923	7.723	7.523	7.346	7.257	7.253	7.264	7.264	7.241	7.264	7.276
GROUND LEVEL	6.485	6.527	6.529	6.511	6.499	6.466	6.535	6.467	6.438	6.549	6.596	6.608	6.600	6.645	6.674	6.742	6.758	6.811	6.862	6.898	6.950	7.007	7.042	7.085	7.009	6.162	6.148	6.753	6.612	6.632	6.477	6.605	6.933	7.108	7.200	7.229	7.244	7.204	7.220	7.204	7.221	7.247	7.239	7.264	7.241	7.264	7.276

PROFILE

SCALE 1:2000 H, 1:200 V

NOTES :

1. SOME INVESTIGATION LOCATIONS MOVED LATERALLY ON THE PROFILE FOR VISUAL CLARITY.
2. ONLY INVESTIGATION LOCATIONS WITHIN APPROXIMATELY 200m OF THE REFERENCE LINE ARE SHOWN ON THE PROFILE FOR VISUAL CLARITY.
3. THE SOIL / ROCK SYMBOL LEGEND IS SHOWN IN APPENDIX P.

LEGEND :

- CADASTRAL BOUNDARY
- PROPOSED BRIDGE
- PROPOSED PSP
- PROPOSED SHARED PATH
- GROUNDWATER INFLOW LEVEL
- DIPPED GROUNDWATER LEVEL
- GROUNDWATER SEEPAGE LEVEL
- TD TARGET DEPTH
- R REFUSAL
- NR NEAR REFUSAL
- CO COLLAPSING
- CI CAVE IN
- W WATER
- MT MAXIMUM THRUST
- I INCLINATION
- CR CONE RESISTANCE
- EOR END OF REACH
- B BOUNCING OR NO LATERAL SUPPORT
- N=15 SPT N VALUE
- N=R SPT REFUSAL
- TOPSOIL
- FILL
- SWAMP DEPOSITS
- TAMALA SAND
- TAMALA LIMESTONE
- COFFEE ROCK
- BASSENDEAN SAND
- GUILDFORD FORMATION
- LEEDERVILLE FORMATION
- RESIDUAL SOIL
- BUNBURY BASALT
- YARRAGADEE FORMATION
- CPT18.2A BORR CPT 2018/2019 LOCATION
- BH 18.1 BORR BOREHOLE 2018/2019 LOCATION
- TP 32.1 BORR TEST PIT 2018/2019 LOCATION
- HA 27.1 BORR HAND AUGER 2018/2019 LOCATION
- WML (2014) TP14 WML TEST PIT 2014 POINT

SCALES HORIZ. 1:2000 VERT. 1:200

A 1

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BUNBURY OUTER RING ROAD | PLANNING AND DEVELOPMENT

DATE	12/07/2019	PREPARED	JV
SCALE	1:2000H, 1:200V	GRID	PCG 94

PROJECT: BUNBURY OUTER RING ROAD

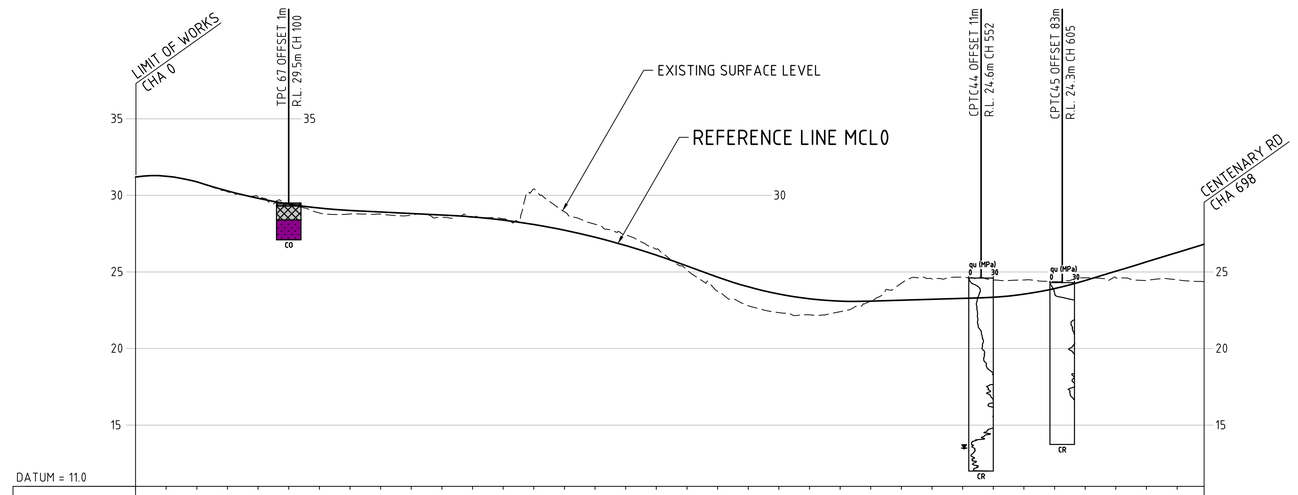
TITLE: BORR SOUTH ULTIMATE DESIGN BUSSELL/CENTENARY ROUNDABOUT PLAN AND PROFILE (MCWN)

SKETCH No. FIGURE 3.19

REV A

PLAN

SCALE 1:2000



DATUM = 11.0

CHAINAGE MCL0	0	20	40	60	80	100	120	140	160	180	200	220
+CUT / -FILL	0.000	0.000	0.001	-0.052	0.076	-0.025	-0.318	-0.231	-0.136	-0.105	-0.150	-0.009
DESIGN LEVEL	31.199	31.248	30.881	30.289	29.805	29.432	29.168	29.013	28.913	28.813	28.713	28.589
GROUND LEVEL	31.199	31.248	30.881	30.237	29.881	29.406	28.850	28.783	28.778	28.708	28.564	28.580

CHAINAGE MCL0	240	260	280	300	320	340	360	380	400	420	440	460
+CUT / -FILL	0.085	2.326	1.203	0.850	0.699	0.381	-0.255	-0.926	-1.234	-1.217	-1.041	-0.690
DESIGN LEVEL	28.384	28.095	27.721	27.263	26.721	26.095	25.387	24.658	24.029	23.559	23.247	23.093
GROUND LEVEL	28.469	30.420	28.925	28.113	27.421	26.477	25.132	23.732	22.796	22.341	22.205	22.404

CHAINAGE MCL0	480	500	520	540	560	580	600	620	640	660	680	698
+CUT / -FILL	-0.011	1.105	1.316	1.384	1.121	0.928	0.454	0.176	-0.416	-1.216	-1.783	
DESIGN LEVEL	23.096	23.156	23.216	23.276	23.347	23.547	23.912	24.442	25.045	25.654	26.267	26.809
GROUND LEVEL	23.085	24.262	24.532	24.661	24.467	24.474	24.365	24.618	24.628	24.439	24.484	24.366

PROFILE

SCALE 1:2000 H, 1:200 V

NOTES :

1. SOME INVESTIGATION LOCATIONS MOVED LATERALLY ON THE PROFILE FOR VISUAL CLARITY.
2. ONLY INVESTIGATION LOCATIONS WITHIN APPROXIMATELY 200m OF THE REFERENCE LINE ARE SHOWN ON THE PROFILE FOR VISUAL CLARITY.
3. THE SOIL/ ROCK SYMBOL LEGEND IS SHOWN IN APPENDIX P.

LEGEND :

—	CADASTRAL BOUNDARY
■	PROPOSED BRIDGE
🟥	PROPOSED PSP
🟨	PROPOSED SHARED PATH
▸	GROUNDWATER INFLOW LEVEL
▼	DIPPED GROUNDWATER LEVEL
≈	GROUNDWATER SEEPAGE LEVEL
TD	TARGET DEPTH
R	REFUSAL
NR	NEAR REFUSAL
CO	COLLAPSING
CI	CAVE IN
W	WATER
MT	MAXIMUM THRUST
I	INCLINATION
CR	CONE RESISTANCE
EOR	END OF REACH
B	BOUNCING OR NO LATERAL SUPPORT
N=15	SPT N VALUE
N=R	SPT REFUSAL
■	TOPSOIL
■	FILL
■	SWAMP DEPOSITS
🟪	TAMALA SAND
🟦	TAMALA LIMESTONE
🟫	COFFEE ROCK
🟩	BASSENDEAN SAND
🟩	GUILDFORD FORMATION
🟦	LEEDERVILLE FORMATION
🟪	RESIDUAL SOIL
🟧	BUNBURY BASALT
🟥	YARRAGADEE FORMATION
⌖ CPT18.2A	BORR CPT 2018/2019 LOCATION
⌖ BH 18.1	BORR BOREHOLE 2018/2019 LOCATION
⌖ TP 32.1	BORR TEST PIT 2018/2019 LOCATION
⌖ HA 27.1	BORR HAND AUGER 2018/2019 LOCATION
⌖ WML (2014) TP14	WML TEST PIT 2014 POINT

VERT. 1:200

HORIZ. 1:2000

SCALES

A1

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mainroads WESTERN AUSTRALIA

BUNBURY OUTER RING ROAD | PLANNING AND DEVELOPMENT

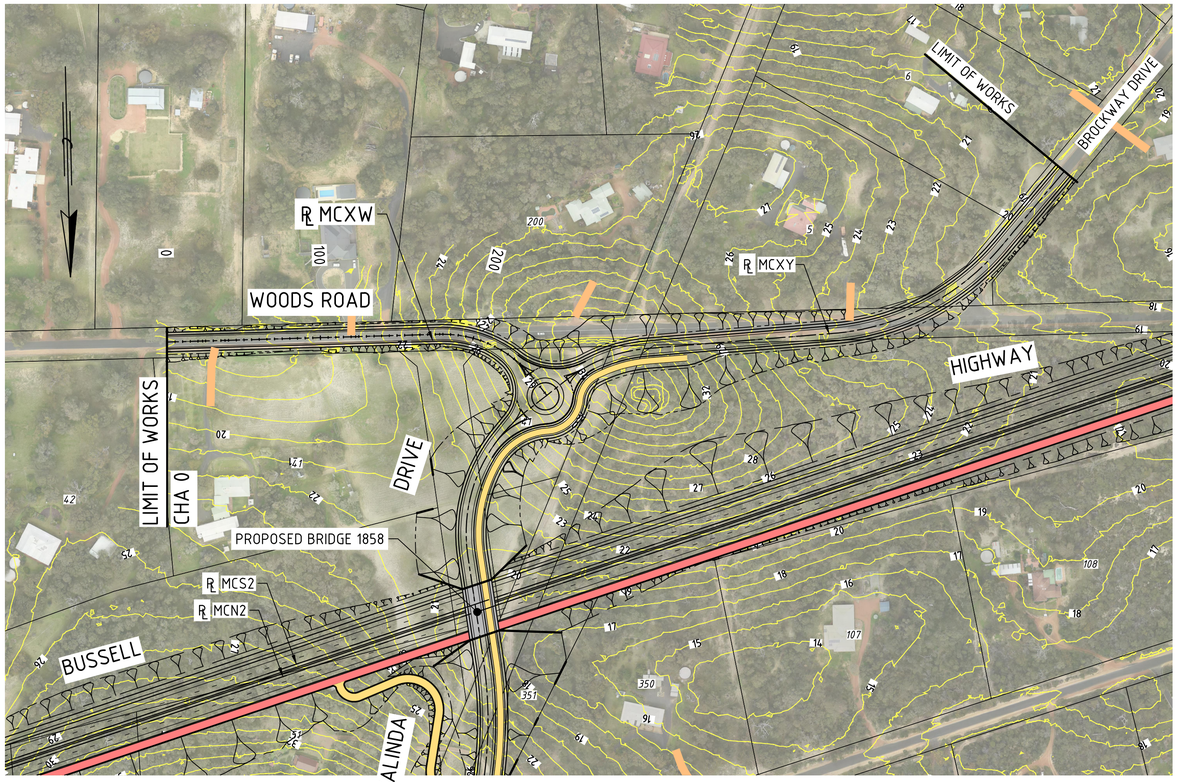
DATE 12/07/2019	PREPARED JV
SCALE 1:2000H, 1:200V	GRID PCG 94

PROJECT
BUNBURY OUTER RING ROAD

TITLE
BORR SOUTH ULTIMATE DESIGN
JULES ROAD
PLAN AND PROFILE (MCL0)

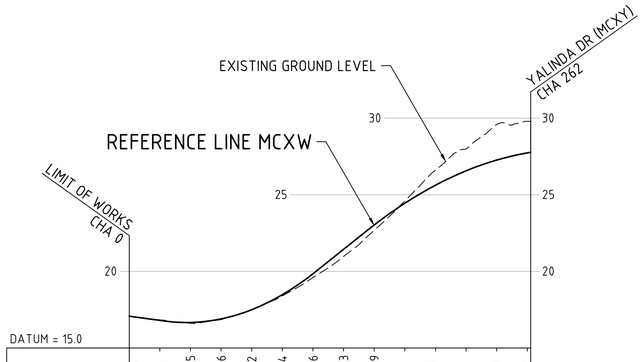
SKETCH No.
FIGURE 3.20

REV
A



PLAN

SCALE 1:2000



CHAINAGE MCXW	0	20	40	60	80	100	120	140	160	180	200	220	240	260	262
GROUND LEVEL	17.077	16.837	16.618	16.850	17.500	18.400	19.595	20.974	22.680	24.601	26.606	27.988	29.596	29.791	29.796
DESIGN LEVEL	17.077	16.803	16.664	16.896	17.502	18.484	19.840	21.436	23.028	24.448	25.628	26.568	27.268	27.736	27.779
+CUT / -FILL	0.000	0.034	-0.045	-0.046	-0.002	-0.084	-0.246	-0.463	-0.349	0.153	0.977	1.419	2.328	2.055	

PROFILE

SCALE 1:2000 H, 1:200 V

NOTES :

1. SOME INVESTIGATION LOCATIONS MOVED LATERALLY ON THE PROFILE FOR VISUAL CLARITY.
2. ONLY INVESTIGATION LOCATIONS WITHIN APPROXIMATELY 200m OF THE REFERENCE LINE ARE SHOWN ON THE PROFILE FOR VISUAL CLARITY.
3. THE SOIL/ ROCK SYMBOL LEGEND IS SHOWN IN APPENDIX P.

LEGEND :

- CADASTRAL BOUNDARY
- PROPOSED BRIDGE
- PROPOSED PSP
- PROPOSED SHARED PATH
- GROUNDWATER INFLOW LEVEL
- DIPPED GROUNDWATER LEVEL
- GROUNDWATER SEEPAGE LEVEL
- TD TARGET DEPTH
- R REFUSAL
- NR NEAR REFUSAL
- CO COLLAPSING
- CI CAVE IN
- W WATER
- MT MAXIMUM THRUST
- I INCLINATION
- CR CONE RESISTANCE
- EOR END OF REACH
- B BOUNCING OR NO LATERAL SUPPORT
- N=15 SPT N VALUE
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- TOPSOIL
- FILL
- SWAMP DEPOSITS
- TAMALA SAND
- TAMALA LIMESTONE
- COFFEE ROCK
- BASSENDEAN SAND
- GUILDFORD FORMATION
- LEEDERVILLE FORMATION
- RESIDUAL SOIL
- BUNBURY BASALT
- YARRAGADEE FORMATION
- CPT18.2A BORR CPT 2018/2019 LOCATION
- BH 18.1 BORR BOREHOLE 2018/2019 LOCATION
- TP 32.1 BORR TEST PIT 2018/2019 LOCATION
- HA 27.1 BORR HAND AUGER 2018/2019 LOCATION
- WML (2014) TP14 WML TEST PIT 2014 POINT

SCALES HORIZ. 1:2000 VERT. 1:200

A 1

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BUNBURY OUTER RING ROAD | PLANNING AND DEVELOPMENT

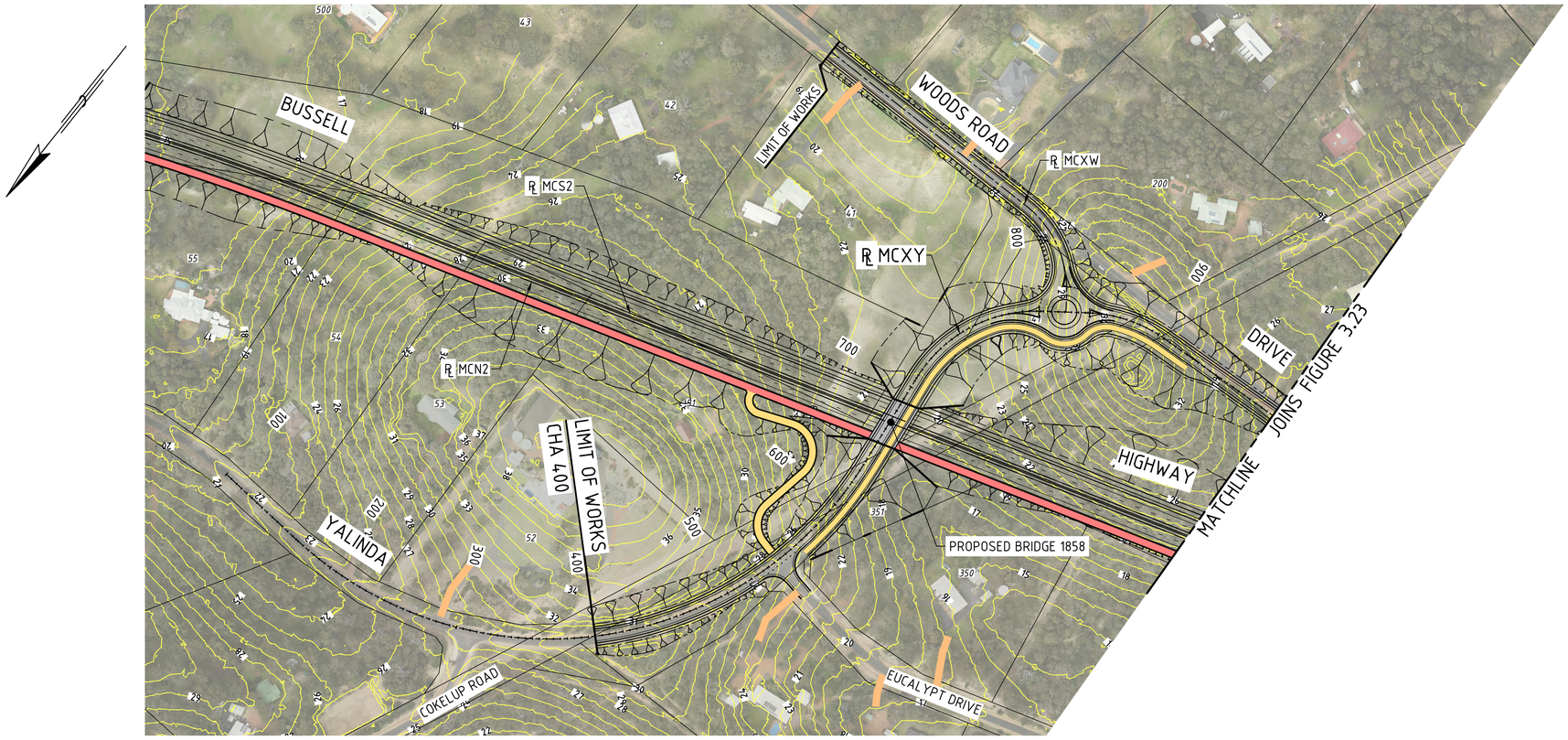
DATE	12/07/2019	PREPARED	JV
SCALE	1:2000H, 1:200V	GRID	PCG 94

PROJECT: BUNBURY OUTER RING ROAD

TITLE: BORR SOUTH ULTIMATE DESIGN
WOODS ROAD
PLAN AND PROFILE (MCXW)

SKETCH No. FIGURE 3.21

REV A



PLAN
SCALE 1:2000

NOTES :

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3. THE SOIL/ ROCK SYMBOL LEGEND IS SHOWN IN APPENDIX P.

LEGEND :

- CADASTRAL BOUNDARY
- PROPOSED BRIDGE
- PROPOSED PSP
- PROPOSED SHARED PATH
- GROUNDWATER INFLOW LEVEL
- DIPPED GROUNDWATER LEVEL
- GROUNDWATER SEEPAGE LEVEL
- TD TARGET DEPTH
- R REFUSAL
- NR NEAR REFUSAL
- CO COLLAPSING
- CI CAVE IN
- W WATER
- MT MAXIMUM THRUST
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- CR CONE RESISTANCE
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- N=15 SPT N VALUE
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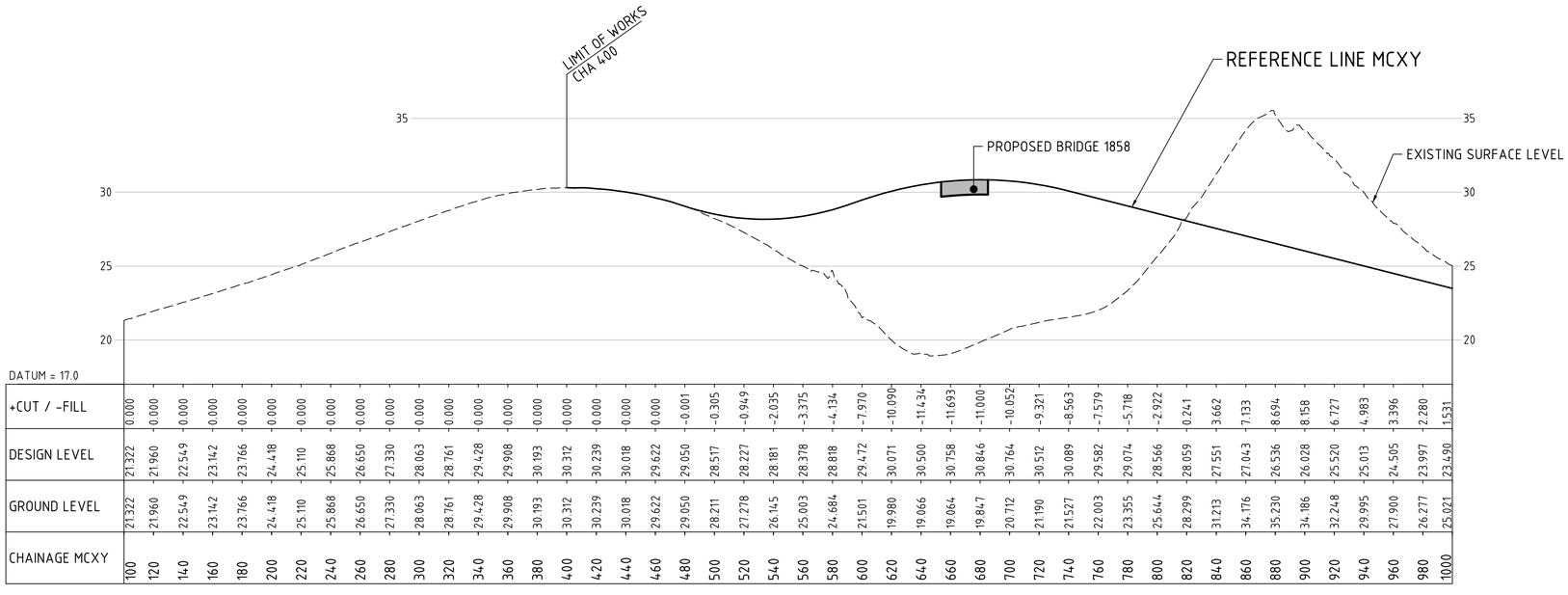
- RESIDUAL SOIL
- BUNBURY BASALT
- YARRAGADEE FORMATION
- CPT18.2A BORR CPT 2018/2019 LOCATION
- BH 18.1 BORR BOREHOLE 2018/2019 LOCATION
- TP 32.1 BORR TEST PIT 2018/2019 LOCATION
- HA 27.1 BORR HAND AUGER 2018/2019 LOCATION
- WML (2014) TP14 WML TEST PIT 2014 POINT



DATUM = 17.0

CHAINAGE MCXY	100	120	140	160	180	200	220	240	260	280	300	320	340	360	380	400	420	440	460	480	500	520	540	560	580	600	620	640	660	680	700	720	740	760	780	800	820	840	860	880	900	920	940	960	980	1000
GROUND LEVEL	21.322	21.960	22.549	23.142	23.766	24.418	25.110	25.868	26.650	27.330	28.063	28.761	29.428	29.908	30.193	30.312	30.239	30.018	29.622	29.050	28.211	27.278	26.145	25.003	24.684	21.501	19.980	19.066	19.064	19.847	20.712	21.190	21.527	22.003	23.355	25.644	28.299	31.213	34.176	35.230	34.186	32.248	29.995	27.900	26.277	25.021
DESIGN LEVEL	21.322	21.960	22.549	23.142	23.766	24.418	25.110	25.868	26.650	27.330	28.063	28.761	29.428	29.908	30.193	30.312	30.239	30.018	29.622	29.050	28.517	28.227	28.181	28.378	28.818	29.472	30.071	30.500	30.758	30.846	30.764	30.512	30.089	29.582	29.074	28.566	28.059	27.551	27.043	26.536	26.028	25.520	25.013	24.505	23.997	23.490
+CUT / -FILL	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	−0.305	−0.949	−2.035	−3.375	−4.134	−7.970	−10.090	−11.434	−11.693	−11.000	−10.052	−9.321	−8.563	−7.579	−5.718	−2.922	0.241	3.662	7.133	8.694	8.158	6.727	4.983	3.396	2.280	1.531

PROFILE
SCALE 1:2000 H, 1:200 V

VERT. 1:200
HORIZ. 1:2000
SCALES
A 1

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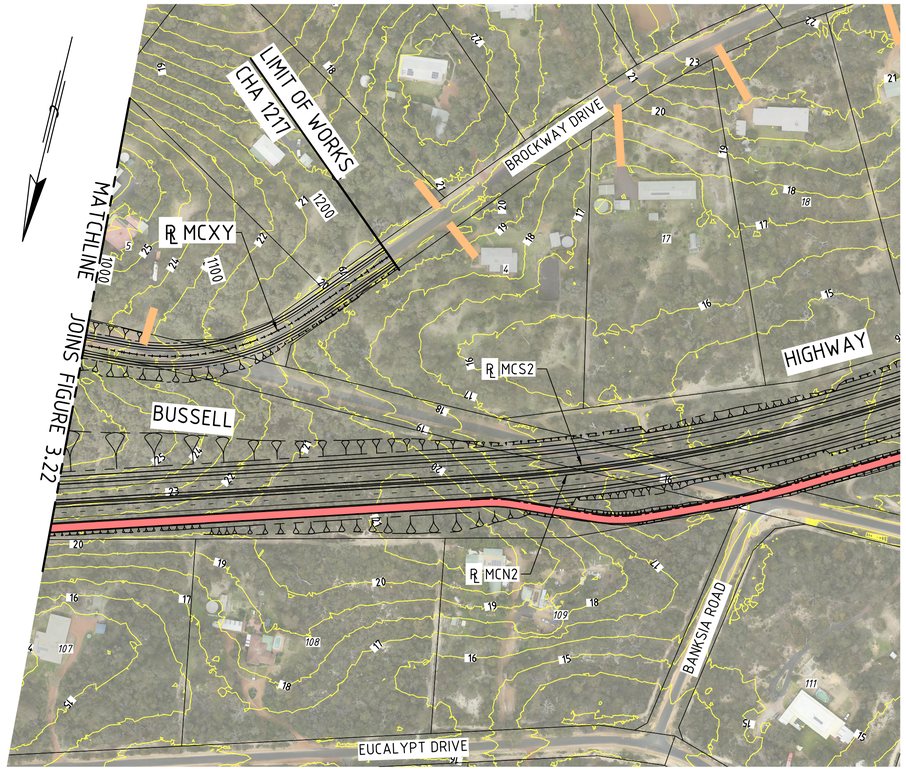
mainroads WESTERN AUSTRALIA
BUNBURY OUTER RING ROAD | PLANNING AND DEVELOPMENT

DATE	12/07/2019	PREPARED	JV
SCALE	1:2000H, 1:200V	GRID	PCG 94

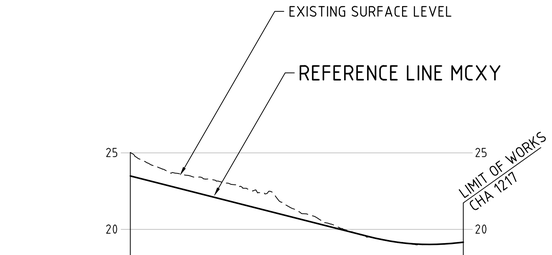
PROJECT
BUNBURY OUTER RING ROAD

TITLE
BORR SOUTH ULTIMATE DESIGN
YALINDA DRIVE
PLAN AND PROFILE (MCXY) - SHEET 1

SKETCH No.	REV
FIGURE 3.22	A



PLAN
SCALE 1:2000



DATUM = 17.0												
+CUT / -FILL	1.531	1.003	0.987	1.112	1.047	0.752	0.416	0.050	0.007	0.006	-0.002	
DESIGN LEVEL	23.490	22.982	22.474	21.967	21.459	20.951	20.444	19.936	19.432	19.101	19.030	19.168
GROUND LEVEL	25.021	23.984	23.462	23.078	22.505	21.703	20.860	19.985	19.439	19.106	19.028	19.168
CHAINAGE MCXY	1000	1020	1040	1060	1080	1100	1120	1140	1160	1180	1200	1217

PROFILE
SCALE 1:2000 H, 1:200 V

NOTES :

1. SOME INVESTIGATION LOCATIONS MOVED LATERALLY ON THE PROFILE FOR VISUAL CLARITY.
2. ONLY INVESTIGATION LOCATIONS WITHIN APPROXIMATELY 200m OF THE REFERENCE LINE ARE SHOWN ON THE PROFILE FOR VISUAL CLARITY.
3. THE SOIL/ ROCK SYMBOL LEGEND IS SHOWN IN APPENDIX P.

LEGEND :

- CADASTRAL BOUNDARY
- PROPOSED BRIDGE
- PROPOSED PSP
- PROPOSED SHARED PATH
- GROUNDWATER INFLOW LEVEL
- DIPPED GROUNDWATER LEVEL
- GROUNDWATER SEEPAGE LEVEL
- TD TARGET DEPTH
- R REFUSAL
- NR NEAR REFUSAL
- CO COLLAPSING
- CI CAVE IN
- W WATER
- MT MAXIMUM THRUST
- I INCLINATION
- CR CONE RESISTANCE
- EOR END OF REACH
- B BOUNCING OR NO LATERAL SUPPORT
- N=15 SPT N VALUE
- N=R SPT REFUSAL
- TOPSOIL
- FILL
- SWAMP DEPOSITS
- TAMALA SAND
- TAMALA LIMESTONE
- COFFEE ROCK
- BASSENDEAN SAND
- GUILDFORD FORMATION
- LEEDERVILLE FORMATION
- RESIDUAL SOIL
- BUNBURY BASALT
- YARRAGADEE FORMATION
- CPT18.2A BORR CPT 2018/2019 LOCATION
- BH 18.1 BORR BOREHOLE 2018/2019 LOCATION
- TP 32.1 BORR TEST PIT 2018/2019 LOCATION
- HA 27.1 BORR HAND AUGER 2018/2019 LOCATION
- WML (2014) TP14 WML TEST PIT 2014 POINT

SCALES HORIZ. 1:2000 VERT. 1:200

A1

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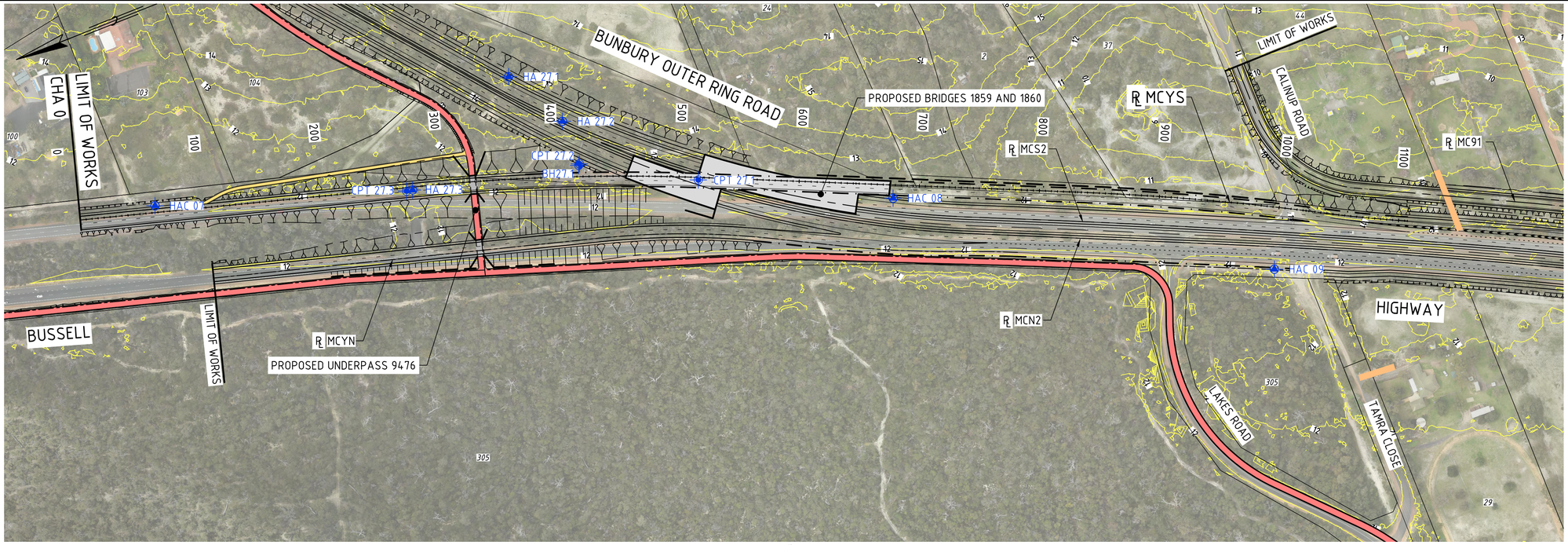
mainroads WESTERN AUSTRALIA
BUNBURY OUTER RING ROAD | PLANNING AND DEVELOPMENT

DATE 12/07/2019	PREPARED JV
SCALE 1:2000H, 1:200V	GRID PCG 94

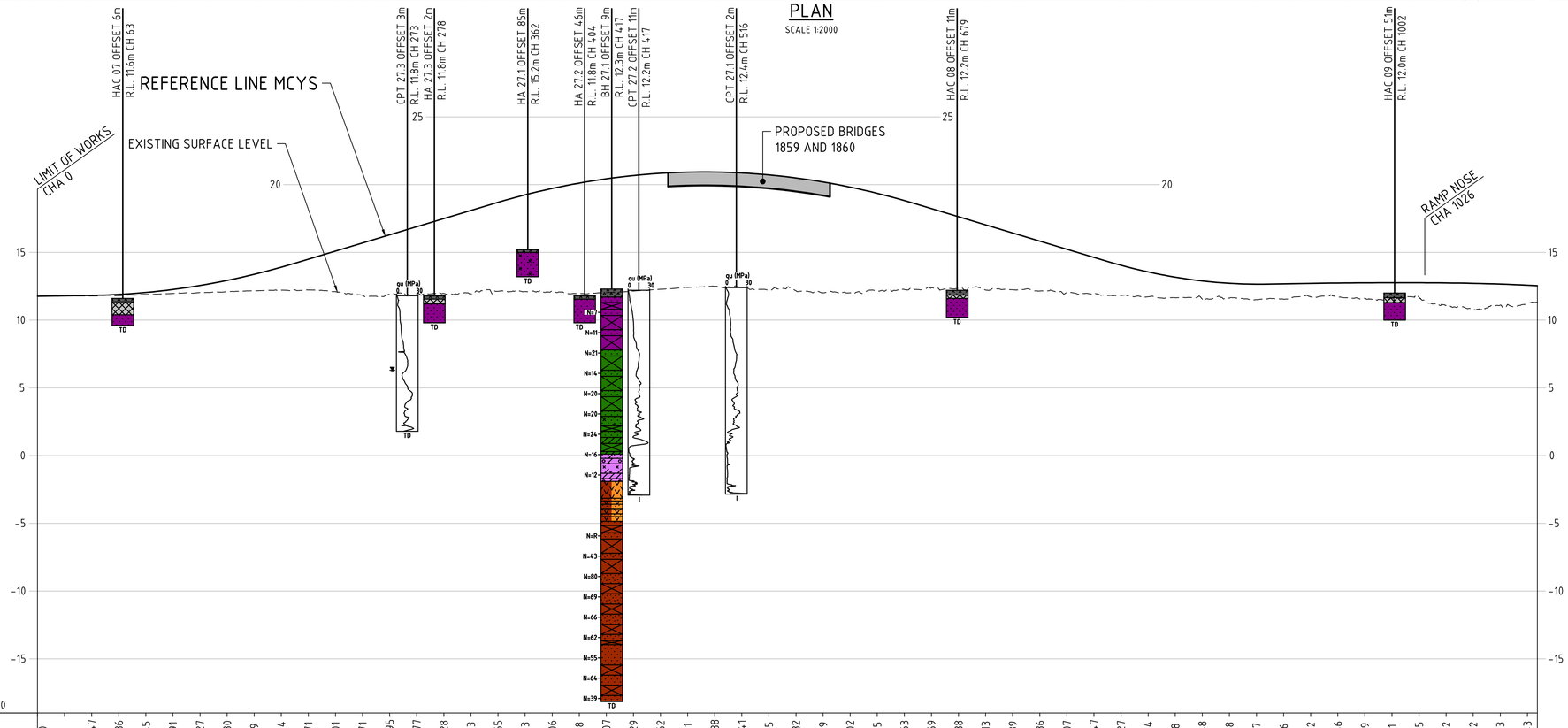
PROJECT
BUNBURY OUTER RING ROAD

TITLE
BORR SOUTH ULTIMATE DESIGN
YALINDA DRIVE
PLAN AND PROFILE (MCXY) - SHEET 2

SKETCH No.	REV
FIGURE 3.23	A



PLAN
SCALE 1:2000



DATUM = -19.0

CHAINAGE MCYS	GROUND LEVEL	DESIGN LEVEL	+CUT / -FILL
0	11.762	11.762	0.000
20	11.807	11.794	0.013
40	11.778	11.825	-0.047
60	11.808	11.895	-0.086
80	11.895	12.040	-0.145
100	11.970	12.261	-0.291
120	12.031	12.558	-0.527
140	12.101	12.931	-0.830
160	12.161	13.380	-1.219
180	12.210	13.904	-1.694
200	12.223	14.495	-2.271
220	12.093	15.095	-3.001
240	11.823	15.695	-3.871
260	11.900	16.295	-4.395
280	11.917	16.895	-4.977
300	11.966	17.495	-5.528
320	11.942	18.095	-6.153
340	12.130	18.694	-6.565
360	12.112	19.245	-7.133
380	12.112	19.718	-7.606
400	11.956	20.114	-8.158
420	12.026	20.433	-8.407
440	12.144	20.674	-8.529
460	12.276	20.838	-8.562
480	12.413	20.924	-8.511
500	12.495	20.933	-8.438
520	12.424	20.864	-8.441
540	12.204	20.718	-8.515
560	12.163	20.495	-8.332
580	12.015	20.194	-8.179
600	12.013	19.816	-7.802
620	12.145	19.360	-7.215
640	12.264	18.827	-6.563
660	12.373	18.232	-5.859
680	12.344	17.632	-5.288
700	12.219	17.032	-4.813
720	12.244	16.432	-4.189
740	12.146	15.832	-3.686
760	12.025	15.232	-3.207
780	11.986	14.632	-2.647
800	11.819	14.046	-2.227
820	11.721	13.554	-1.834
840	11.651	13.169	-1.518
860	11.542	12.890	-1.348
880	11.629	12.718	-1.088
900	11.506	12.652	-1.147
920	11.543	12.680	-1.136
940	11.712	12.714	-1.002
960	11.692	12.739	-1.046
980	11.606	12.754	-1.149
1000	11.621	12.761	-1.141
1020	11.693	12.759	-1.065
1040	11.073	12.745	-1.672
1060	10.821	12.714	-1.892
1080	11.105	12.658	-1.553
1100	11.233	12.576	-1.343
1107	11.348	12.540	

PROFILE
SCALE 1:2000 H, 1:200 V

NOTES :

1. SOME INVESTIGATION LOCATIONS MOVED LATERALLY ON THE PROFILE FOR VISUAL CLARITY.
2. ONLY INVESTIGATION LOCATIONS WITHIN APPROXIMATELY 200m OF THE REFERENCE LINE ARE SHOWN ON THE PROFILE FOR VISUAL CLARITY.
3. THE SOIL / ROCK SYMBOL LEGEND IS SHOWN IN APPENDIX P.

LEGEND :

- CADASTRAL BOUNDARY
- PROPOSED BRIDGE
- PROPOSED PSP
- PROPOSED SHARED PATH
- GROUNDWATER INFLOW LEVEL
- DIPPED GROUNDWATER LEVEL
- GROUNDWATER SEEPAGE LEVEL
- TD TARGET DEPTH
- R REFUSAL
- NR NEAR REFUSAL
- CO COLLAPSING
- CI CAVE IN
- W WATER
- MT MAXIMUM THRUST
- I INCLINATION
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- WML (2014) TP14 WML TEST PIT 2014 POINT

SCALES HORIZ. 1:2000 VERT. 1:200

A
1

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BUNBURY OUTER RING ROAD | PLANNING AND DEVELOPMENT

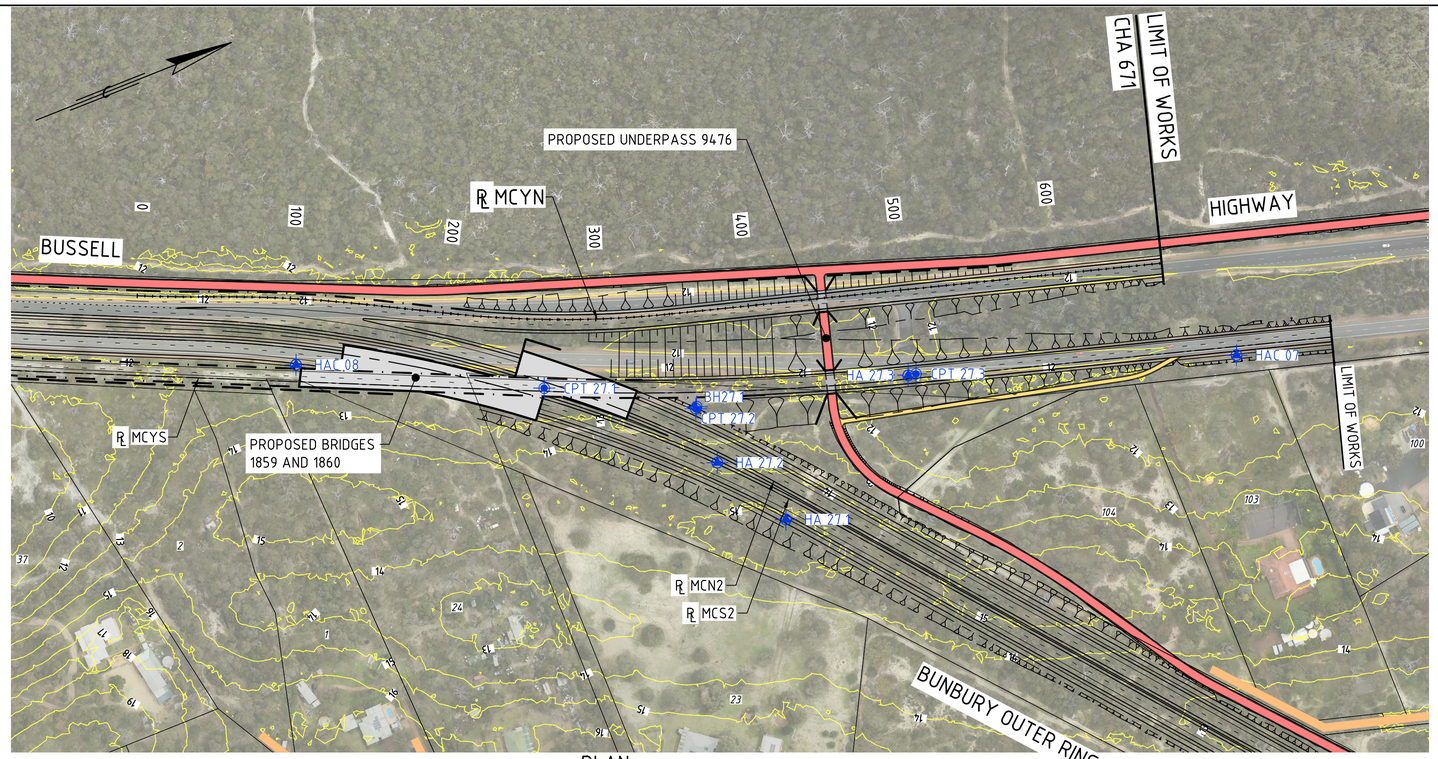
DATE 12/07/2019	PREPARED JV
SCALE 1:2000H, 1:200V	GRID PCG 94

PROJECT
BUNBURY OUTER RING ROAD

TITLE
BORR SOUTH ULTIMATE DESIGN
BORR/BUSSELL HWY INTERCHANGE
PLAN AND PROFILE (MCYS)

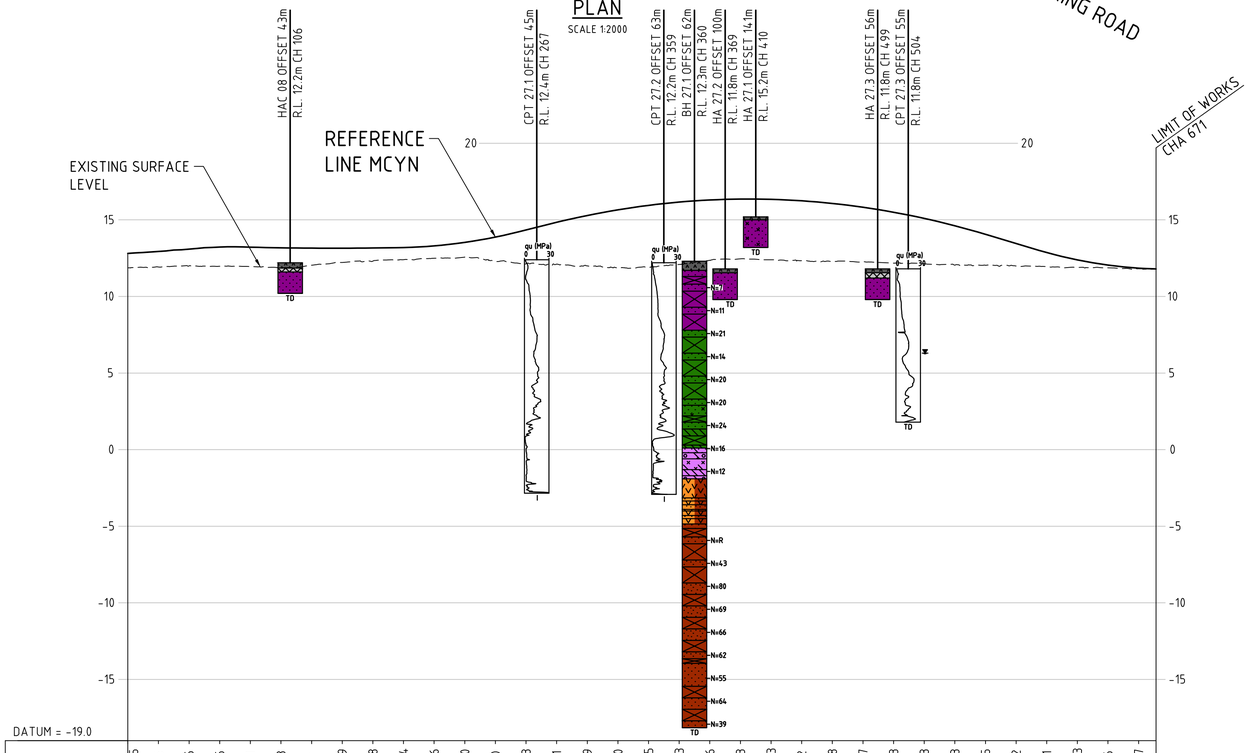
SKETCH No.
FIGURE 3.24

REV
A



PLAN

SCALE 1:2000



DATUM = -19.0

CHAINAGE MCYN	0	20	40	60	80	100	120	140	160	180	200	220	240	260	280	300	320	340	360	380	400	420	440	460	480	500	520	540	560	580	600	620	640	660	671
GROUND LEVEL	11.875	11.924	11.996	11.971	11.956	11.898	12.041	12.221	12.312	12.400	12.495	12.569	12.318	12.139	12.110	11.997	11.884	11.922	12.087	12.361	12.454	12.398	12.333	12.286	12.258	12.175	12.143	12.042	12.033	11.986	11.946	11.895	11.873	11.812	11.796
DESIGN LEVEL	12.810	12.940	13.091	13.225	13.217	13.176	13.154	13.151	13.170	13.193	13.301	13.529	13.877	14.342	14.841	15.286	15.655	15.946	16.161	16.298	16.357	16.340	16.246	16.074	15.825	15.499	15.095	14.615	14.057	13.457	12.867	12.389	12.049	11.868	11.796
+CUT / -FILL	-0.935	-1.015	-1.095	-1.255	-1.261	-1.278	-1.112	-0.929	-0.858	-0.794	-0.806	-0.960	-1.560	-2.203	-2.731	-3.289	-3.770	-4.025	-4.073	-3.936	-3.903	-3.943	-3.912	-3.788	-3.567	-3.323	-2.953	-2.573	-2.025	-1.472	-0.921	-0.493	-0.176	-0.037	

PROFILE

SCALE 1:2000 H, 1:200 V

NOTES :

1. SOME INVESTIGATION LOCATIONS MOVED LATERALLY ON THE PROFILE FOR VISUAL CLARITY.
2. ONLY INVESTIGATION LOCATIONS WITHIN APPROXIMATELY 200m OF THE REFERENCE LINE ARE SHOWN ON THE PROFILE FOR VISUAL CLARITY.
3. THE SOIL/ ROCK SYMBOL LEGEND IS SHOWN IN APPENDIX P.

LEGEND :

- CADASTRAL BOUNDARY
- PROPOSED BRIDGE
- PROPOSED PSP
- PROPOSED SHARED PATH
- GROUNDWATER INFLOW LEVEL
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- GROUNDWATER SEEPAGE LEVEL
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- NR NEAR REFUSAL
- CO COLLAPSING
- CI CAVE IN
- W WATER
- MT MAXIMUM THRUST
- I INCLINATION
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- HA 27.1 BORR HAND AUGER 2018/2019 LOCATION
- WML (2014) TP14 WML TEST PIT 2014 POINT

SCALES: HORIZ. 1:2000 VERT. 1:200

A 1

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BUNBURY OUTER RING ROAD | PLANNING AND DEVELOPMENT

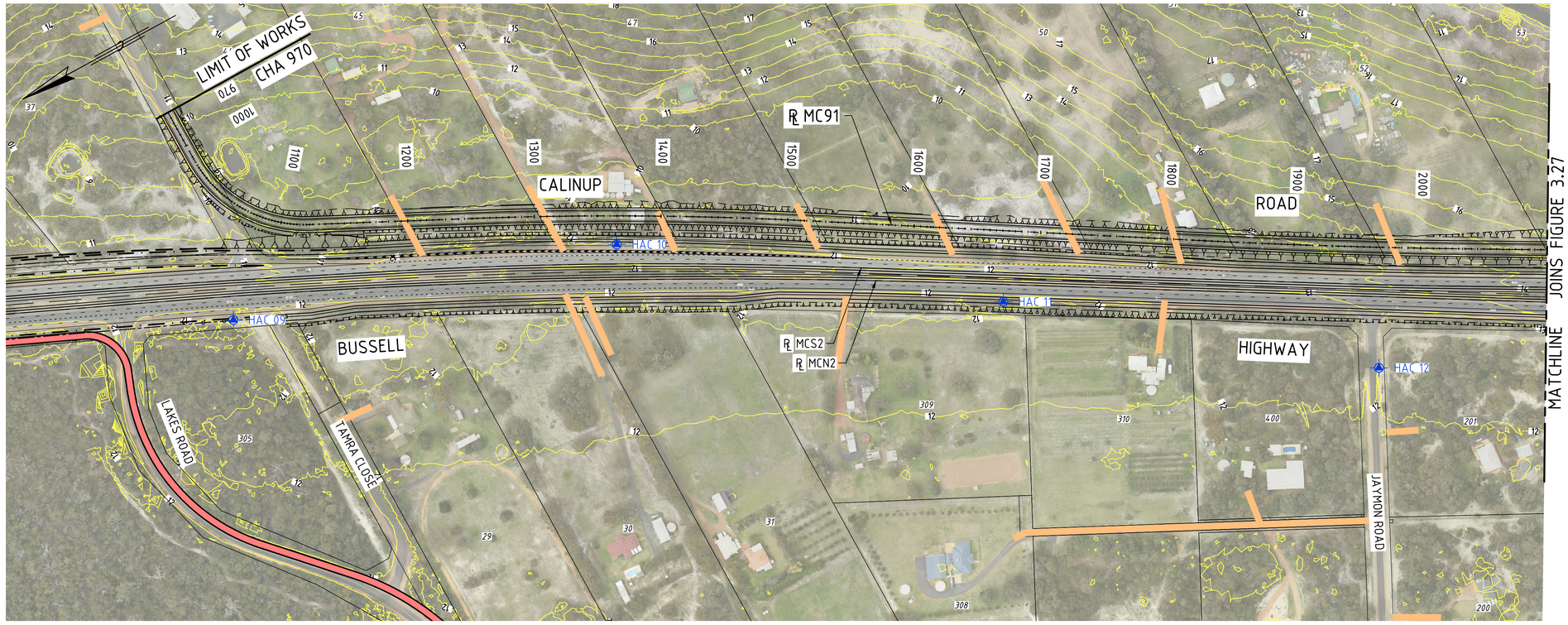
DATE	12/07/2019	PREPARED	JV
SCALE	1:2000H, 1:200V	GRID	PCG 94

PROJECT: BUNBURY OUTER RING ROAD

TITLE: BORR SOUTH ULTIMATE DESIGN
BORR/BUSSELL HWY INTERCHANGE
PLAN AND PROFILE (MCYN)

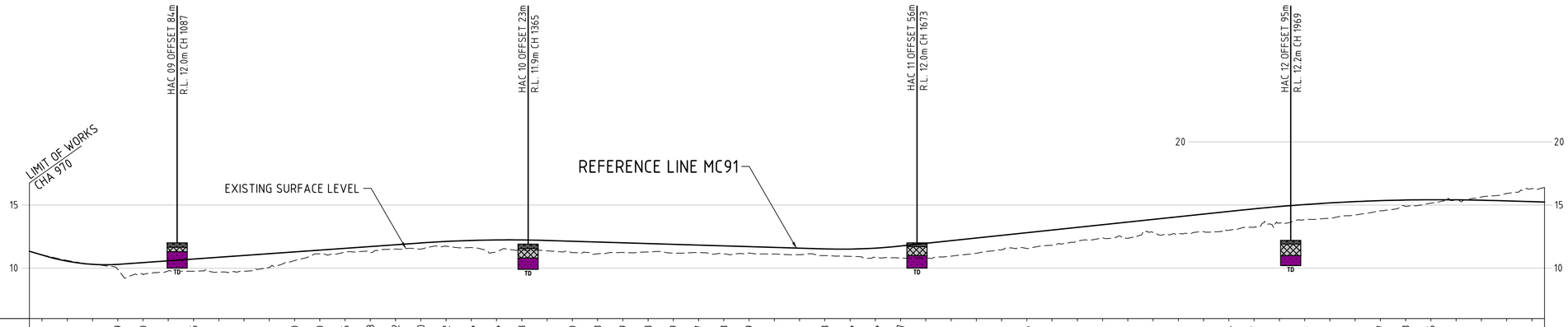
SKETCH No. FIGURE 3.25

REV A



PLAN

SCALE 1:2000



DATUM = 6.0

CHAINAGE MC91	970	980	1000	1020	1040	1060	1080	1100	1120	1140	1160	1180	1200	1220	1240	1260	1280	1300	1320	1340	1360	1380	1400	1420	1440	1460	1480	1500	1520	1540	1560	1580	1600	1620	1640	1660	1680	1700	1720	1740	1760	1780	1800	1820	1840	1860	1880	1900	1920	1940	1960	1980	2000	2020	2040	2060	2080	2100	2120	2140	2160
GROUND LEVEL	11.331	11.060	10.609	10.315	9.895	9.503	9.775	9.752	9.705	9.748	10.047	10.594	11.135	11.272	11.226	11.509	11.512	11.732	11.628	11.308	11.429	11.371	11.229	11.134	11.239	11.273	11.186	11.228	11.136	11.194	11.112	11.065	10.993	10.933	10.850	10.803	10.811	10.946	11.182	11.454	11.559	11.808	12.148	12.398	12.367	12.818	12.674	12.885	13.004	13.229	13.569	13.834	13.957	14.200	14.539	14.887	15.143	15.428	15.636	15.914	16.297
DESIGN LEVEL	11.331	11.038	10.548	10.299	10.293	10.434	10.576	10.717	10.859	11.001	11.142	11.284	11.426	11.568	11.709	11.851	11.993	12.113	12.193	12.232	12.231	12.189	12.129	12.068	12.007	11.946	11.886	11.825	11.764	11.703	11.642	11.582	11.521	11.507	11.583	11.750	11.961	12.171	12.382	12.593	12.803	13.014	13.224	13.435	13.646	13.856	14.067	14.277	14.488	14.696	14.880	15.037	15.167	15.270	15.346	15.396	15.417	15.412	15.380	15.324	15.264
+CUT / -FILL	0.022	0.062	0.016	-0.399	-0.930	-0.801	-0.965	-1.153	-1.252	-1.095	-0.690	-0.290	-0.295	-0.483	-0.342	-0.480	-0.382	-0.564	-0.924	-0.803	-0.819	-0.900	-0.933	-0.769	-0.673	-0.699	-0.597	-0.628	-0.509	-0.531	-0.517	-0.528	-0.574	-0.734	-0.947	-1.149	-1.225	-1.201	-1.138	-1.245	-1.206	-1.077	-1.036	-1.278	-1.039	-1.392	-1.393	-1.484	-1.467	-1.311	-1.204	-1.210	-1.071	-0.807	-0.508	-0.275	0.016	0.256	0.589	1.032

PROFILE

SCALE 1:2000 H, 1:200 V

NOTES :

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LEGEND :

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- WML (2014) TP14 WML TEST PIT 2014 POINT

SCALES: HORIZ. 1:2000 VERT. 1:200

A 1

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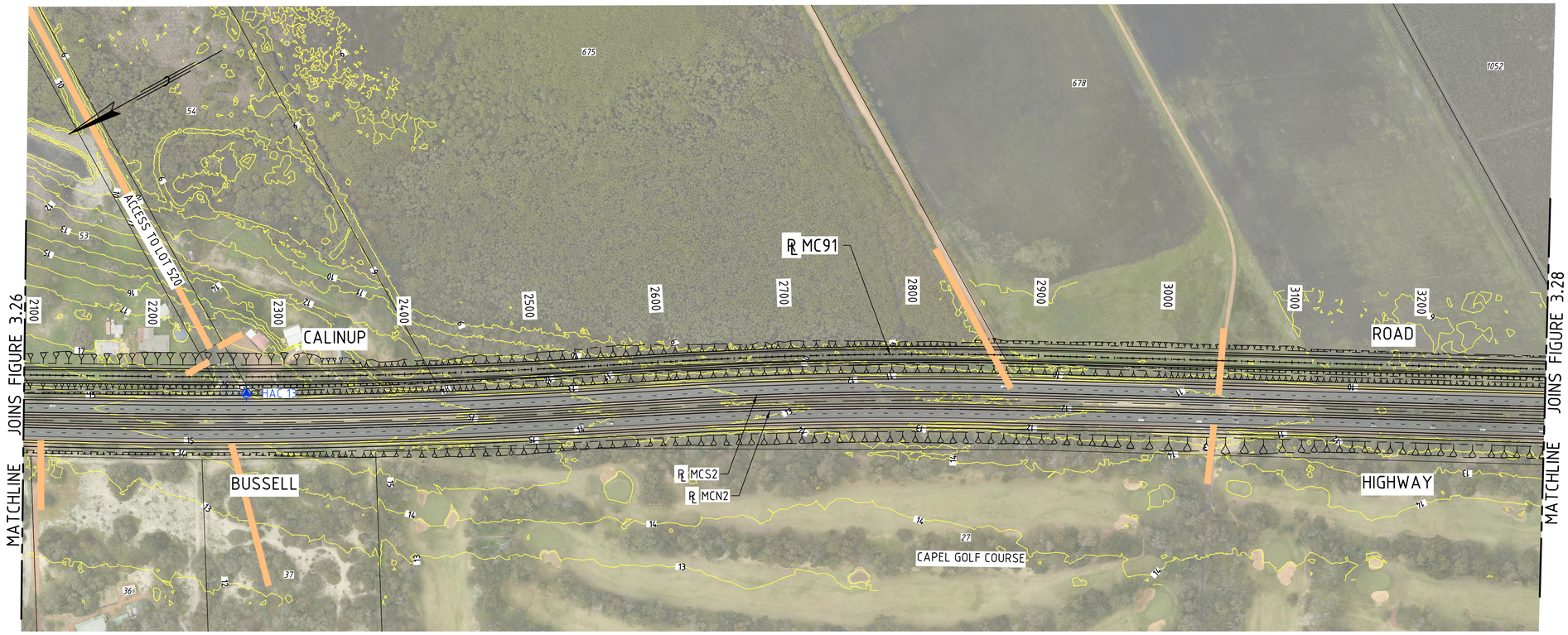
BUNBURY OUTER RING ROAD | PLANNING AND DEVELOPMENT

DATE 12/07/2019	PREPARED JV
SCALE 1:2000H, 1:200V	GRID PCG 94

PROJECT: BUNBURY OUTER RING ROAD

TITLE: BORR SOUTH ULTIMATE DESIGN
CALINUP ROAD
PLAN AND PROFILE (MC91) - SHEET 1

SKETCH No. FIGURE 3.26 | REV A



PLAN
SCALE 1:2000

NOTES :

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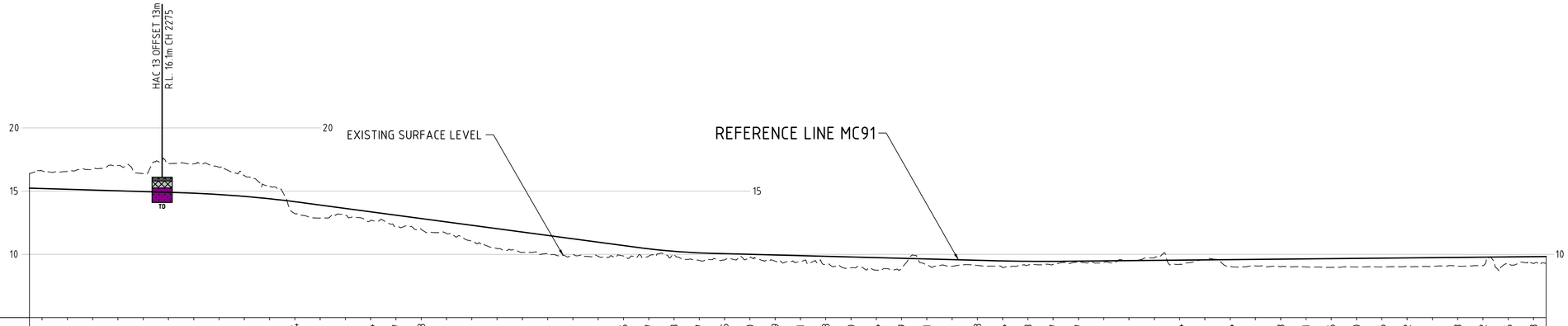

DATUM = 5.0

CHAINAGE MC91	2180	2200	2220	2240	2260	2280	2300	2320	2340	2360	2380	2400	2420	2440	2460	2480	2500	2520	2540	2560	2580	2600	2620	2640	2660	2680	2700	2720	2740	2760	2780	2800	2820	2840	2860	2880	2900	2920	2940	2960	2980	3000	3020	3040	3060	3080	3100	3120	3140	3160	3180	3200	3220	3240	3260	3280	3300	3320	3340	3360
GROUND LEVEL	16.602	16.562	16.739	17.030	16.386	17.176	17.162	16.893	16.227	15.325	13.221	12.872	13.103	12.682	12.221	11.984	11.654	11.046	10.463	10.154	10.025	9.988	9.848	9.869	9.870	9.978	9.520	9.561	9.732	9.462	9.437	9.196	8.932	8.756	8.898	9.163	9.061	9.121	8.956	9.149	9.210	9.386	9.367	9.525	9.740	9.207	9.567	9.047	9.090	9.022	8.999	8.973	8.999	9.003	9.045	9.047	9.068	9.105	9.239	9.277
DESIGN LEVEL	15.204	15.144	15.084	15.024	14.964	14.904	14.836	14.730	14.583	14.394	14.164	13.900	13.633	13.366	13.099	12.832	12.565	12.297	12.030	11.763	11.496	11.229	10.962	10.695	10.436	10.241	10.117	10.055	10.003	9.950	9.897	9.845	9.792	9.740	9.687	9.635	9.582	9.529	9.480	9.451	9.447	9.463	9.483	9.502	9.522	9.542	9.561	9.581	9.600	9.620	9.639	9.659	9.678	9.698	9.718	9.737	9.757	9.776	9.796	9.815
+CUT / -FILL	1.398	1.417	1.655	2.005	1.421	2.271	2.325	2.162	1.644	0.931	-0.944	-1.029	-0.531	-0.684	-0.877	-0.848	-0.910	-1.252	-1.567	-1.610	-1.471	-1.241	-1.113	-0.825	-0.567	-0.263	-0.597	-0.495	-0.270	-0.489	-0.461	-0.648	-0.860	-0.984	-0.789	-0.471	-0.521	-0.408	-0.524	-0.303	-0.237	-0.077	-0.115	0.023	0.217	-0.334	0.005	-0.534	-0.510	-0.598	-0.641	-0.685	-0.680	-0.696	-0.672	-0.691	-0.688	-0.672	-0.556	-0.538

PROFILE
SCALE 1:2000 H, 1:200 V

VERT. 1:200
HORIZ. 1:2000
SCALES

A
1

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BUNBURY OUTER RING ROAD | PLANNING AND DEVELOPMENT

DATE 12/07/2019	PREPARED JV
SCALE 1:2000H, 1:200V	GRID PCG 94

PROJECT
BUNBURY OUTER RING ROAD

TITLE
BORR SOUTH ULTIMATE DESIGN
CALINUP ROAD
PLAN AND PROFILE (MC91) - SHEET 2

SKETCH No.	REV
FIGURE 3.27	A

PLAN
SCALE 1:2000

NOTES :

1. SOME INVESTIGATION LOCATIONS MOVED LATERALLY ON THE PROFILE FOR VISUAL CLARITY.
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- PROPOSED SHARED PATH
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- GROUNDWATER SEEPAGE LEVEL
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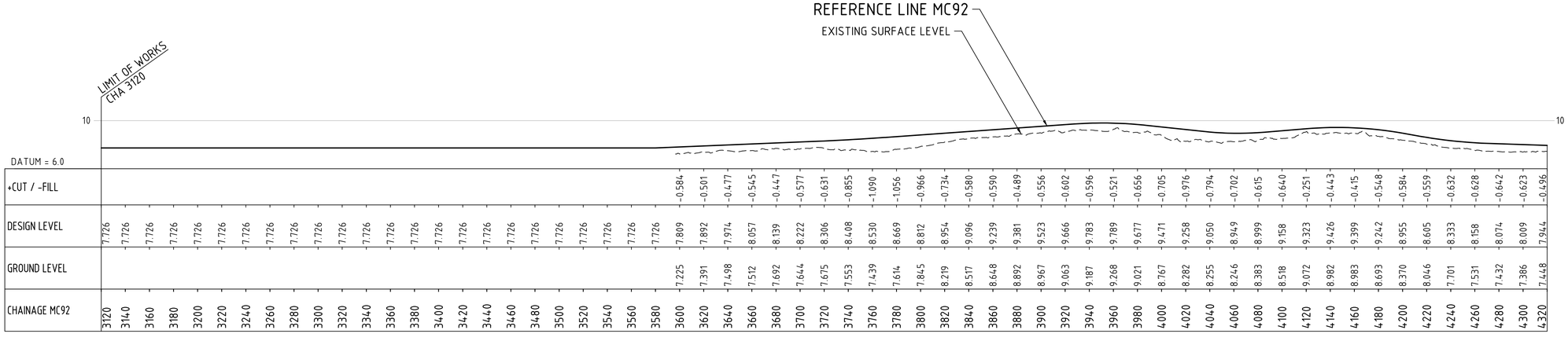
- NR NEAR REFUSAL
- CO COLLAPSING
- CI CAVE IN
- W WATER
- MT MAXIMUM THRUST
- I INCLINATION
- CR CONE RESISTANCE
- EOR END OF REACH
- B BOUNCING OR NO LATERAL SUPPORT
- N=15 SPT N VALUE
- N=R SPT REFUSAL
- TOPSOIL
- FILL
- SWAMP DEPOSITS
- TAMALA SAND
- TAMALA LIMESTONE
- COFFEE ROCK
- BASSENDEAN SAND
- GUILDFORD FORMATION
- LEEDERVILLE FORMATION
- RESIDUAL SOIL
- BUNBURY BASALT
- YARRAGADEE FORMATION
- CPT18.2A BORR CPT 2018/2019 LOCATION
- BH 18.1 BORR BOREHOLE 2018/2019 LOCATION
- TP 32.1 BORR TEST PIT 2018/2019 LOCATION
- HA 27.1 BORR HAND AUGER 2018/2019 LOCATION
- WML (2014) TP14 WML TEST PIT 2014 POINT



PROFILE
SCALE 1:2000 H, 1:200 V

VERT. 1:200
HORIZ. 1:2000
SCALES

A
1

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mainroads WESTERN AUSTRALIA
BUNBURY OUTER RING ROAD | PLANNING AND DEVELOPMENT

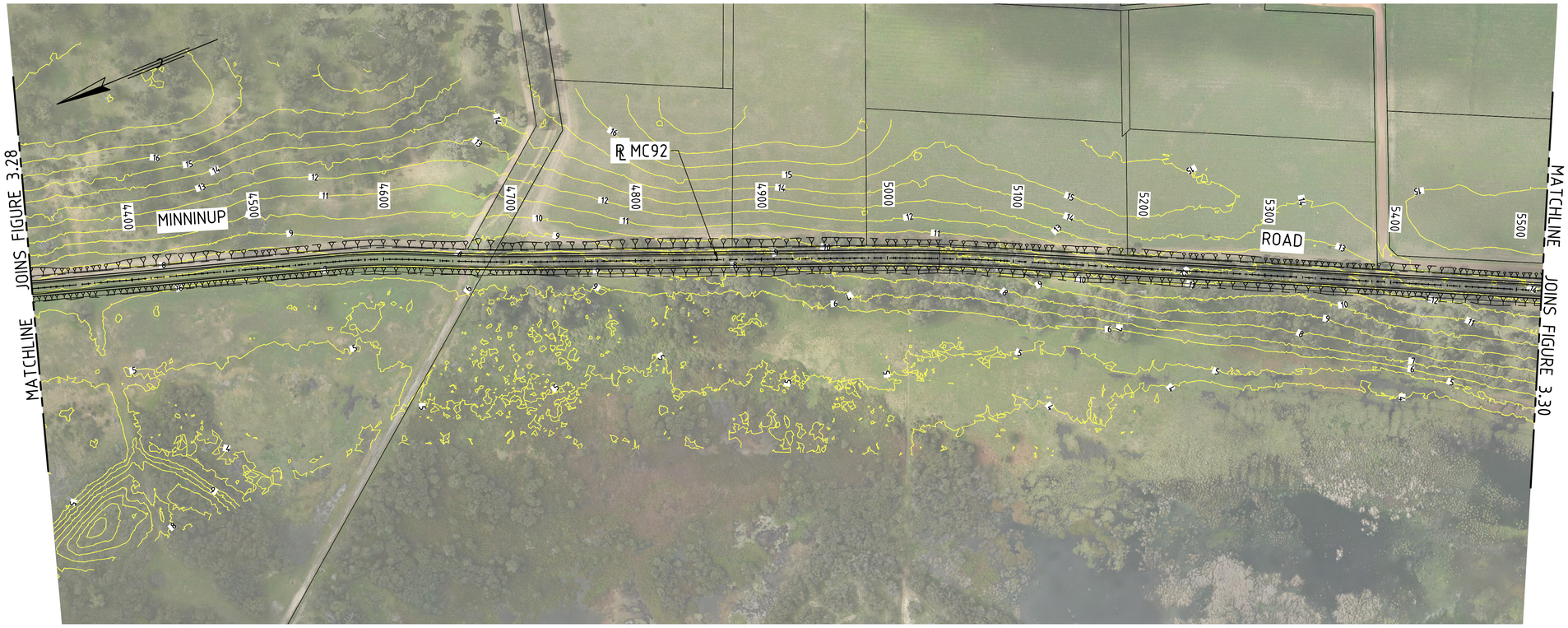
DATE 12/07/2019	PREPARED JV
SCALE 1:2000H, 1:200V	GRID PCG 94

PROJECT
BUNBURY OUTER RING ROAD

TITLE
BORR SOUTH ULTIMATE DESIGN
MINNINUP ROAD
PLAN AND PROFILE (MC92) - SHEET 1

SKETCH No.
FIGURE 3.28

REV
A



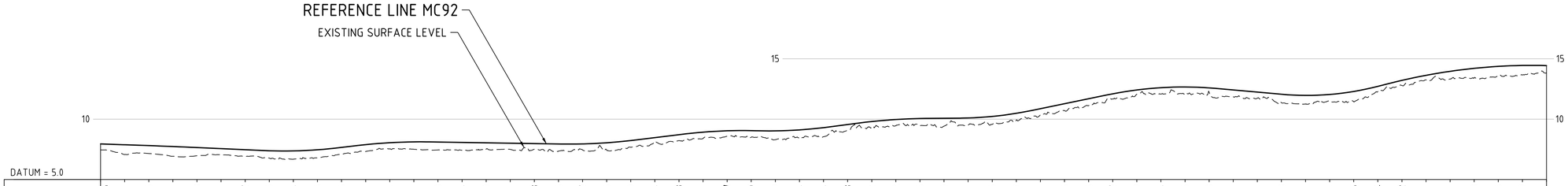
PLAN
SCALE 1:2000

NOTES :

1. SOME INVESTIGATION LOCATIONS MOVED LATERALLY ON THE PROFILE FOR VISUAL CLARITY.
2. ONLY INVESTIGATION LOCATIONS WITHIN APPROXIMATELY 200m OF THE REFERENCE LINE ARE SHOWN ON THE PROFILE FOR VISUAL CLARITY.
3. THE SOIL/ ROCK SYMBOL LEGEND IS SHOWN IN APPENDIX P.

LEGEND :

	CADASTRAL BOUNDARY
	PROPOSED BRIDGE
	PROPOSED PSP
	PROPOSED SHARED PATH
	GROUNDWATER INFLOW LEVEL
	DIPPED GROUNDWATER LEVEL
	GROUNDWATER SEEPAGE LEVEL
TD	TARGET DEPTH
R	REFUSAL
NR	NEAR REFUSAL
CO	COLLAPSING
CI	CAVE IN
W	WATER
MT	MAXIMUM THRUST
I	INCLINATION
CR	CONE RESISTANCE
EOR	END OF REACH
B	BOUNCING OR NO LATERAL SUPPORT
N=15	SPT N VALUE
N=R	SPT REFUSAL
	TOPSOIL
	FILL
	SWAMP DEPOSITS
	TAMALA SAND
	TAMALA LIMESTONE
	COFFEE ROCK
	BASSENDEAN SAND
	GUILDFORD FORMATION
	LEEDERVILLE FORMATION
	RESIDUAL SOIL
	BUNBURY BASALT
	YARRAGADEE FORMATION
CPT18.2A	BORR CPT 2018/2019 LOCATION
BH 18.1	BORR BOREHOLE 2018/2019 LOCATION
TP 32.1	BORR TEST PIT 2018/2019 LOCATION
HA 27.1	BORR HAND AUGER 2018/2019 LOCATION
WML (2014) TP14	WML TEST PIT 2014 POINT



CHAINAGE MC92	GROUND LEVEL	DESIGN LEVEL	+CUT / -FILL
4320	7.448	7.944	-0.496
4340	7.069	7.879	-0.810
4360	7.155	7.810	-0.655
4380	6.923	7.733	-0.810
4400	6.970	7.648	-0.678
4420	7.046	7.559	-0.512
4440	6.923	7.470	-0.547
4460	6.778	7.383	-0.606
4480	6.684	7.369	-0.684
4500	6.796	7.462	-0.666
4520	7.096	7.661	-0.566
4540	7.320	7.891	-0.571
4560	7.536	8.049	-0.514
4580	7.505	8.119	-0.613
4600	7.452	8.105	-0.653
4620	7.419	8.073	-0.654
4640	7.521	8.041	-0.520
4660	7.495	8.009	-0.513
4680	7.504	7.977	-0.473
4700	7.348	7.945	-0.596
4720	7.451	7.949	-0.497
4740	7.448	8.044	-0.596
4760	7.671	8.230	-0.559
4780	8.168	8.472	-0.304
4800	8.221	8.714	-0.493
4820	8.406	8.924	-0.519
4840	8.590	9.037	-0.447
4860	8.511	9.051	-0.540
4880	8.301	9.029	-0.729
4900	8.406	9.109	-0.704
4920	8.542	9.296	-0.754
4940	9.089	9.557	-0.468
4960	9.389	9.801	-0.412
4980	9.466	9.968	-0.502
5000	9.448	10.053	-0.605
5020	9.424	10.073	-0.650
5040	9.496	10.098	-0.601
5060	9.571	10.225	-0.655
5080	9.918	10.484	-0.567
5100	10.358	10.868	-0.510
5120	10.714	11.279	-0.565
5140	11.124	11.690	-0.566
5160	11.673	12.099	-0.427
5180	12.060	12.418	-0.359
5200	12.072	12.607	-0.534
5220	12.067	12.664	-0.596
5240	12.222	12.590	-0.368
5260	11.848	12.418	-0.571
5280	11.726	12.241	-0.514
5300	11.365	12.063	-0.698
5320	11.256	11.968	-0.713
5340	11.431	12.045	-0.614
5360	11.448	12.293	-0.846
5380	12.280	12.713	-0.434
5400	12.787	13.209	-0.422
5420	13.257	13.629	-0.371
5440	13.331	13.962	-0.631
5460	13.417	14.210	-0.793
5480	13.535	14.371	-0.836
5500	13.668	14.447	-0.779
5520	13.806	14.437	-0.631

PROFILE
SCALE 1:2000 H, 1:200 V

VERT. 1:200
HORIZ. 1:2000
SCALES

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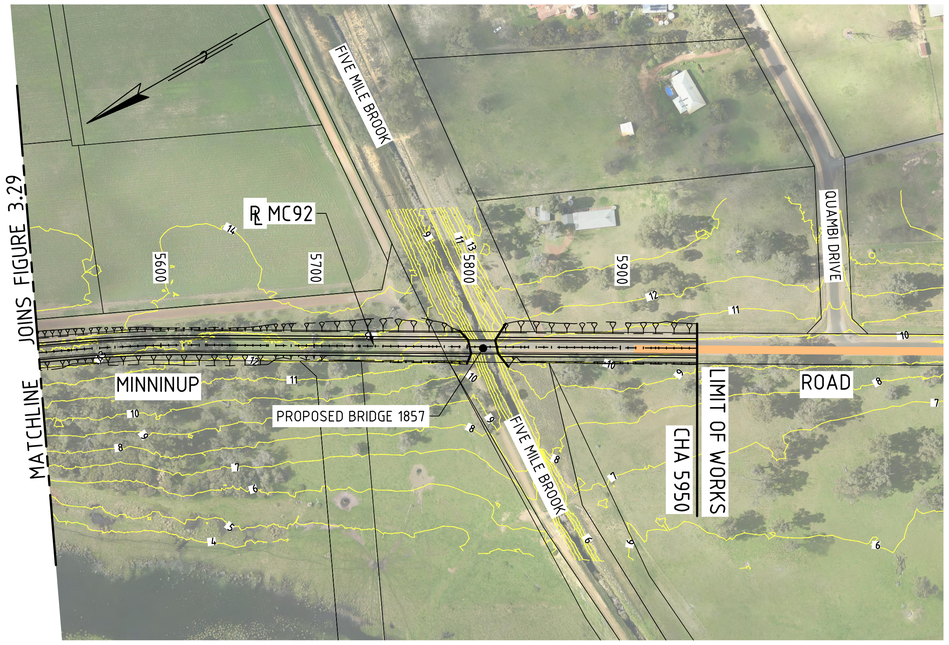
DATE 12/07/2019	PREPARED JV
SCALE 1:2000H, 1:200V	GRID PCG 94

PROJECT
BUNBURY OUTER RING ROAD

TITLE
BORR SOUTH ULTIMATE DESIGN
MINNINUP ROAD
PLAN AND PROFILE (MC92) - SHEET 2

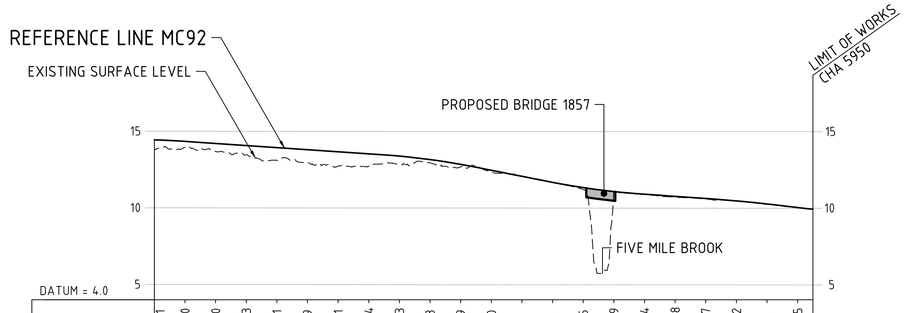
SKETCH No.
FIGURE 3.29

REV
A



PLAN

SCALE 1:2000



CHAINAGE MC92	5520	5540	5560	5580	5600	5620	5640	5660	5680	5700	5720	5740	5760	5780	5800	5820	5840	5860	5880	5900	5920	5940	5950
GROUND LEVEL	13.806	13.950	13.675	13.466	13.103	12.978	12.741	12.732	12.824	12.937	12.669	12.332	12.076	11.667	11.196	11.034	10.867	10.703	10.575	10.453	10.261	10.018	9.907
DESIGN LEVEL	14.437	14.340	14.205	14.069	13.933	13.797	13.661	13.526	13.377	13.151	12.838	12.452	12.057	11.662	11.320	11.064	10.891	10.751	10.611	10.454	10.253	10.023	9.907
+CUT / -FILL	-0.631	-0.390	-0.530	-0.603	-0.831	-0.819	-0.921	-0.794	-0.553	-0.213	-0.169	-0.120	0.019	0.004	-0.125	-0.029	-0.024	-0.048	-0.037	-0.002	0.008	-0.005	

PROFILE

SCALE 1:2000 H, 1:200 V

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- CADASTRAL BOUNDARY
- PROPOSED BRIDGE
- PROPOSED PSP
- PROPOSED SHARED PATH
- GROUNDWATER INFLOW LEVEL
- DIPPED GROUNDWATER LEVEL
- GROUNDWATER SEEPAGE LEVEL
- TD TARGET DEPTH
- R REFUSAL
- NR NEAR REFUSAL
- CO COLLAPSING
- CI CAVE IN
- W WATER
- MT MAXIMUM THRUST
- I INCLINATION
- CR CONE RESISTANCE
- EOR END OF REACH
- B BOUNCING OR NO LATERAL SUPPORT
- N=15 SPT N VALUE
- N=R SPT REFUSAL
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- WML (2014) TP14 WML TEST PIT 2014 POINT

SCALES HORIZ. 1:2000 VERT. 1:200

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BUNBURY OUTER RING ROAD | PLANNING AND DEVELOPMENT

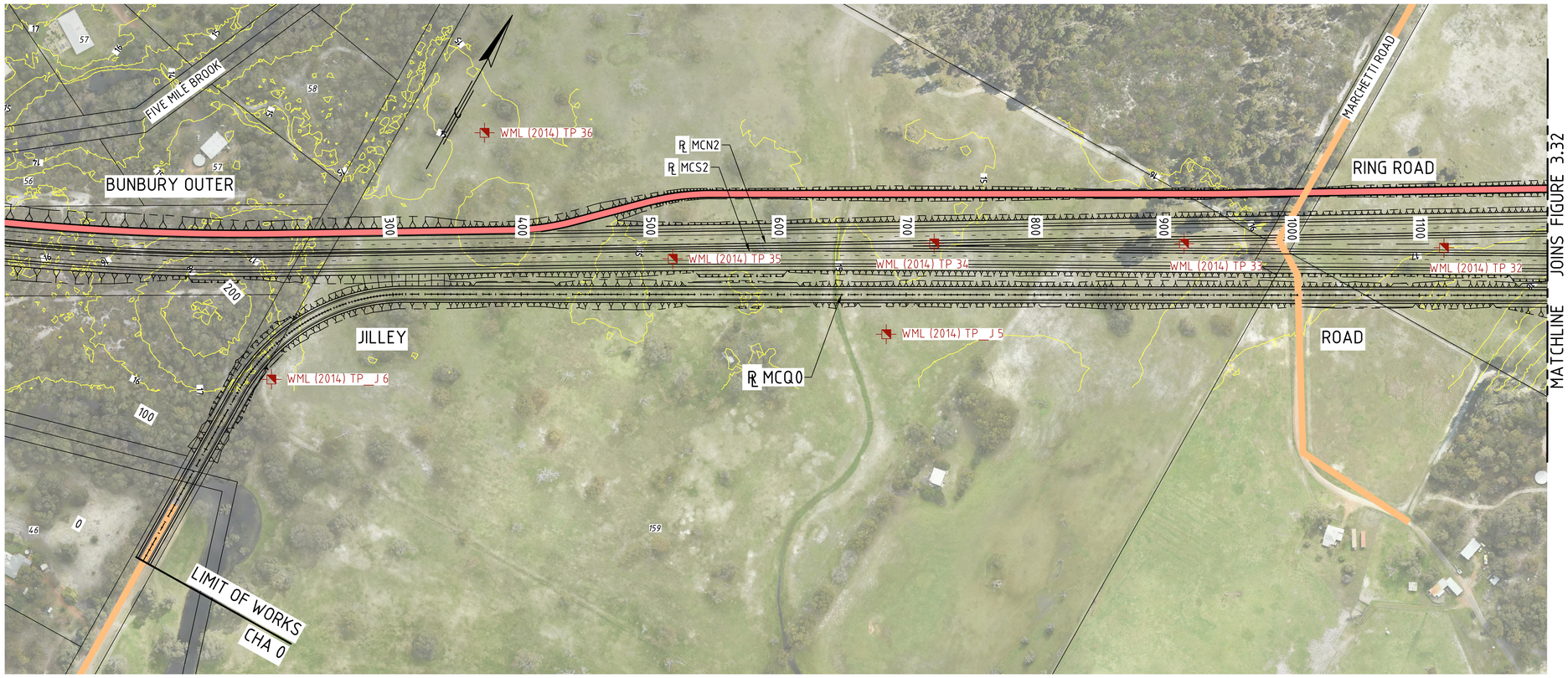
DATE	12/07/2019	PREPARED	JV
SCALE	1:2000H, 1:200V	GRID	PCG 94

PROJECT: BUNBURY OUTER RING ROAD

TITLE: BORR SOUTH ULTIMATE DESIGN
MINNINUP ROAD
PLAN AND PROFILE (MC92) - SHEET 3

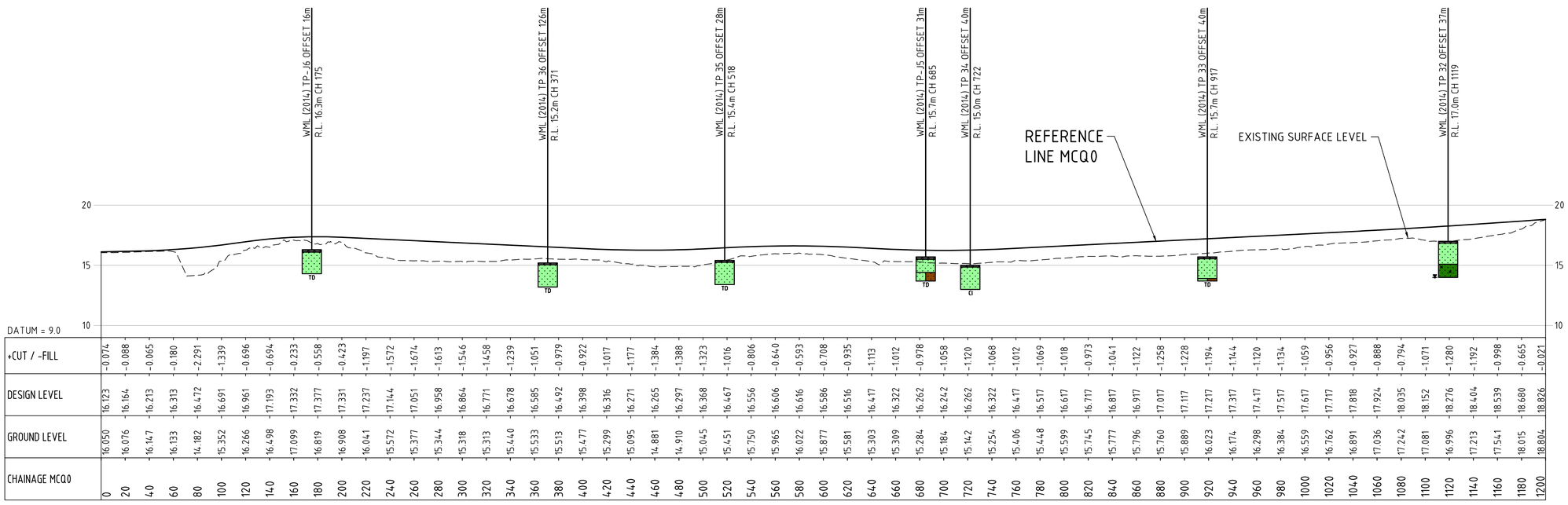
SKETCH No. FIGURE 3.30

REV A



PLAN

SCALE 1:2000



CHAINAGE MCQ0	0	20	40	60	80	100	120	140	160	180	200	220	240	260	280	300	320	340	360	380	400	420	440	460	480	500	520	540	560	580	600	620	640	660	680	700	720	740	760	780	800	820	840	860	880	900	920	940	960	980	1000	1020	1040	1060	1080	1100	1120	1140	1160	1180	1200
GROUND LEVEL	16.050	16.076	16.147	16.133	14.182	15.352	16.266	16.498	17.099	16.819	16.908	16.041	15.572	15.377	15.344	15.318	15.313	15.440	15.533	15.513	15.477	15.299	15.095	14.881	14.910	15.045	15.451	15.750	15.965	16.022	15.877	15.581	15.303	15.309	15.284	15.184	15.142	15.254	15.406	15.448	15.599	15.745	15.777	15.796	15.760	15.889	16.023	16.174	16.298	16.384	16.559	16.762	16.891	17.036	17.242	17.081	16.996	17.213	17.541	18.015	18.804
DESIGN LEVEL	16.123	16.164	16.213	16.313	16.472	16.691	16.961	17.193	17.332	17.377	17.331	17.237	17.144	17.051	16.958	16.864	16.771	16.678	16.585	16.492	16.398	16.316	16.271	16.265	16.297	16.368	16.467	16.556	16.606	16.616	16.586	16.516	16.417	16.322	16.262	16.242	16.262	16.322	16.417	16.517	16.617	16.717	16.817	16.917	17.017	17.117	17.217	17.317	17.417	17.517	17.617	17.717	17.818	17.924	18.035	18.152	18.276	18.404	18.539	18.680	18.826
+CUT / -FILL	-0.074	-0.088	-0.065	-0.180	-2.291	-1.339	-0.696	-0.694	-0.233	-0.558	-0.423	-1.197	-1.572	-1.674	-1.613	-1.546	-1.458	-1.239	-1.051	-0.979	-0.922	-1.017	-1.177	-1.384	-1.388	-1.323	-1.016	-0.806	-0.640	-0.593	-0.708	-0.935	-1.113	-1.012	-0.978	-1.058	-1.120	-1.068	-1.012	-1.069	-1.018	-0.973	-1.041	-1.122	-1.258	-1.228	-1.194	-1.144	-1.120	-1.134	-1.059	-0.956	-0.927	-0.888	-0.794	-1.071	-1.280	-1.192	-0.998	-0.665	-0.021

PROFILE

SCALE 1:2000 H, 1:200 V

NOTES :

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- HA 27.1 BORR HAND AUGER 2018/2019 LOCATION
- WML (2014) TP14 WML TEST PIT 2014 POINT

VERT. 1:200 HORIZ. 1:2000

SCALES

A 1

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BUNBURY OUTER RING ROAD | PLANNING AND DEVELOPMENT

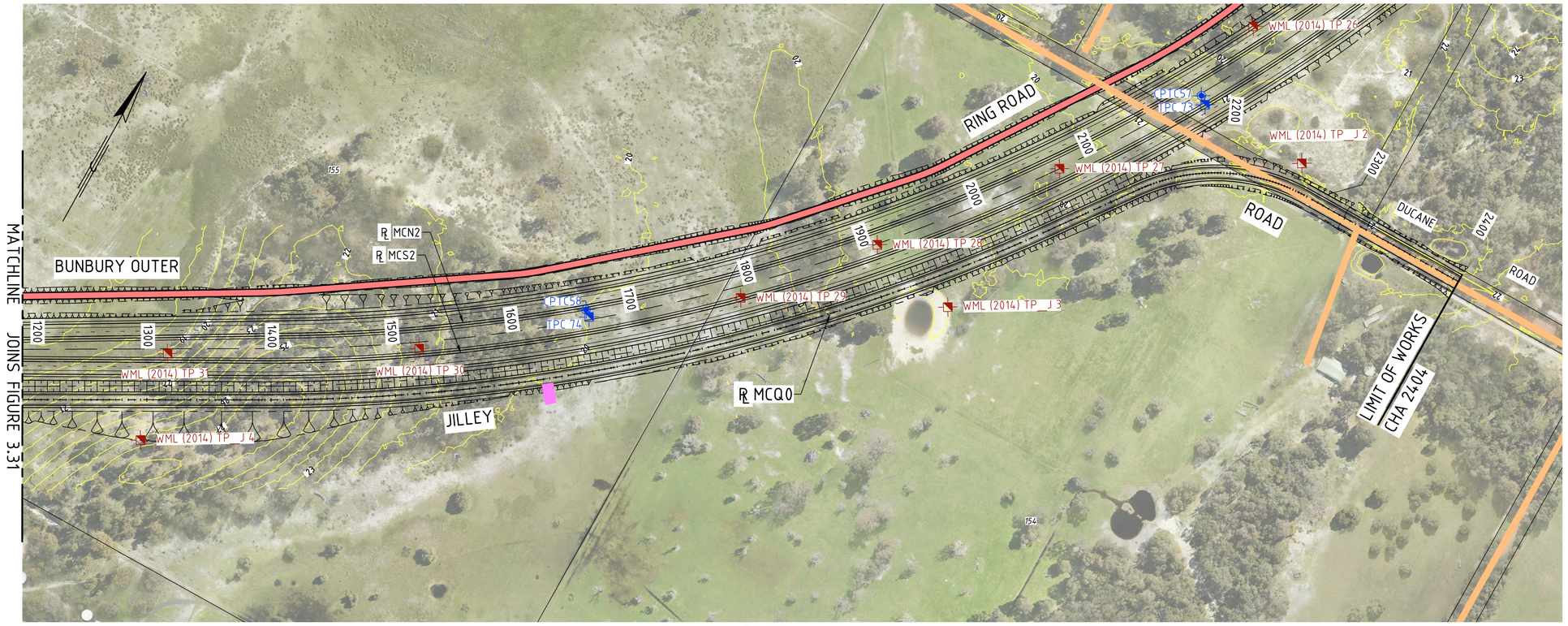
DATE	12/07/2019	PREPARED	JV
SCALE	1:2000H, 1:200V	GRID	PCG 94

PROJECT: BUNBURY OUTER RING ROAD

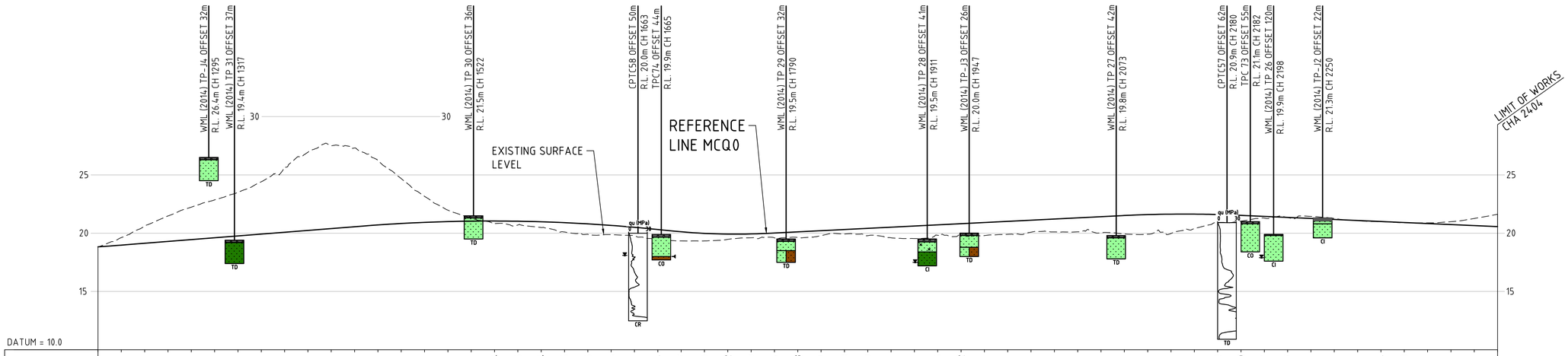
TITLE: BORR SOUTH ULTIMATE DESIGN
JILLEY ROAD
PLAN AND PROFILE (MCQ0) - SHEET 1

SKETCH No. FIGURE 3.31

REV A



PLAN
SCALE 1:2000



CHAINAGE MCQ0	1200	1220	1240	1260	1280	1300	1320	1340	1360	1380	1400	1420	1440	1460	1480	1500	1520	1540	1560	1580	1600	1620	1640	1660	1680	1700	1720	1740	1760	1780	1800	1820	1840	1860	1880	1900	1920	1940	1960	1980	2000	2020	2040	2060	2080	2100	2120	2140	2160	2180	2200	2220	2240	2260	2280	2300	2320	2340	2360	2380
GROUND LEVEL	18.804	19.623	20.605	21.476	22.238	22.858	23.504	24.414	25.663	26.952	27.522	27.316	26.242	24.686	23.163	21.979	21.292	20.801	20.701	20.485	20.100	19.914	19.873	19.786	19.462	19.334	19.335	19.470	19.606	19.604	19.642	19.800	19.926	19.791	19.605	19.541	19.823	19.817	19.795	19.906	20.086	20.109	20.115	20.030	19.934	19.914	19.980	20.403	20.902	21.039	21.294	21.346	21.439	21.264	21.069	20.977	20.886	20.886	20.990	21.263
DESIGN LEVEL	18.826	18.978	19.135	19.293	19.451	19.608	19.766	19.924	20.082	20.240	20.398	20.555	20.707	20.832	20.928	20.996	21.035	21.045	21.027	20.980	20.904	20.800	20.667	20.506	20.316	20.121	19.984	19.922	19.935	20.019	20.119	20.219	20.319	20.419	20.519	20.619	20.719	20.819	20.919	21.019	21.119	21.219	21.319	21.419	21.519	21.596	21.636	21.638	21.602	21.529	21.441	21.353	21.265	21.177	21.090	21.002	20.914	20.826	20.738	20.650
+CUT / -FILL	-0.021	0.645	1.470	2.184	2.787	3.250	3.738	4.489	5.581	6.712	7.125	6.761	5.534	3.855	2.234	0.983	0.257	-0.244	-0.325	-0.494	-0.805	-0.886	-0.795	-0.721	-0.854	-0.787	-0.650	-0.452	-0.329	-0.415	-0.478	-0.419	-0.393	-0.629	-0.914	-1.079	-0.896	-0.942	-1.124	-1.114	-1.033	-1.110	-1.205	-1.389	-1.585	-1.683	-1.655	-1.235	-0.700	-0.490	-0.147	-0.007	0.173	0.087	-0.021	-0.024	-0.028	0.059	0.251	0.612	1.057

PROFILE
SCALE 1:2000 H, 1:200 V

NOTES :

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VERT. 1:200
HORIZ. 1:2000

SCALES A 1

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BUNBURY OUTER RING ROAD | PLANNING AND DEVELOPMENT

DATE 12/07/2019	PREPARED JV
SCALE 1:2000H, 1:200V	GRID PCG 94

PROJECT
BUNBURY OUTER RING ROAD

TITLE
BORR SOUTH ULTIMATE DESIGN
JILLEY ROAD
PLAN AND PROFILE (MCQ0) - SHEET 2

SKETCH No.	REV
FIGURE 3.32	A

LEGEND

- BORR Southern Section Proposal Area
- Major Road
- Minor Road
- River

Quarry or pit

- Active
- Inactive

Mineral occurrence

- Ls/Sd Limestone/Sand
- Rc Rock for aggregate
- Sd Sand

Geology (50k GSWA Mapsheet)

- Qhs — *SAFETY BAY SAND: Calcareous quartz sand dunes*
- Qhsm — *SAFETY BAY SAND: Mobile dunes*
- Qhw — *Swamp deposits, mainly peaty sand*
- Qha — *Alluvium*
- Qts — *Sand associated with Tamala Limestone, high dunes*
- Qpb — *BASSENDEAN SAND: low rounded dunes*
- Qpb/Qpa — *Thin Bassendean Sand over Guildford Formation*
- Qpa — *GUILDFORD FORMATION: mainly alluvial sandy clay*
- Kbb — *BUNBURY BASALT: tholeiitic vesicular basalt*
- Ocean

Centenary Rd
Ch 100,900
Sd
Qha
Proposed Centenary Road Interchange, Bridge 1856, and Underpass 9475
Existing Rock Quarry
Qpa
Lillydale Rd
Kbb
Rc/Kbb
Bussell Hwy
Hasties Rd
Sd
Five Mile Brook
Rc
Existing Rock Quarry
Ch 103,870
Sd
Ducane Rd
Ch 105,000
Qts
Marchetti Rd
Qpb/Qpa
Qpb
Eucalypt Dr
Yalinda Dr
Proposed Bridge 1858
Proposed Bridge 1857
Woods Rd
Five Mile Brook
Jilley Rd
Five Mile Brook
Ch 109,100
Calinup Rd
Proposed Bussell Highway - BORR Interchange, Bridges 1859 and 1860, and Underpass 9476
Sd
Ch 110,000
Ch 110,880
Qhw
Jilley Rd
SLIP POWERED BY LANDGATE

Paper Size ISO A3

0 250 500 750 1,000

Meters

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

BORR Team

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BUNBURY OUTER RING ROAD | PLANNING AND DEVELOPMENT

Main Roads Western Australia
Bunbury Outer Ring Road Southern Section
Acid Sulfate Soil and Dewatering Management Plan

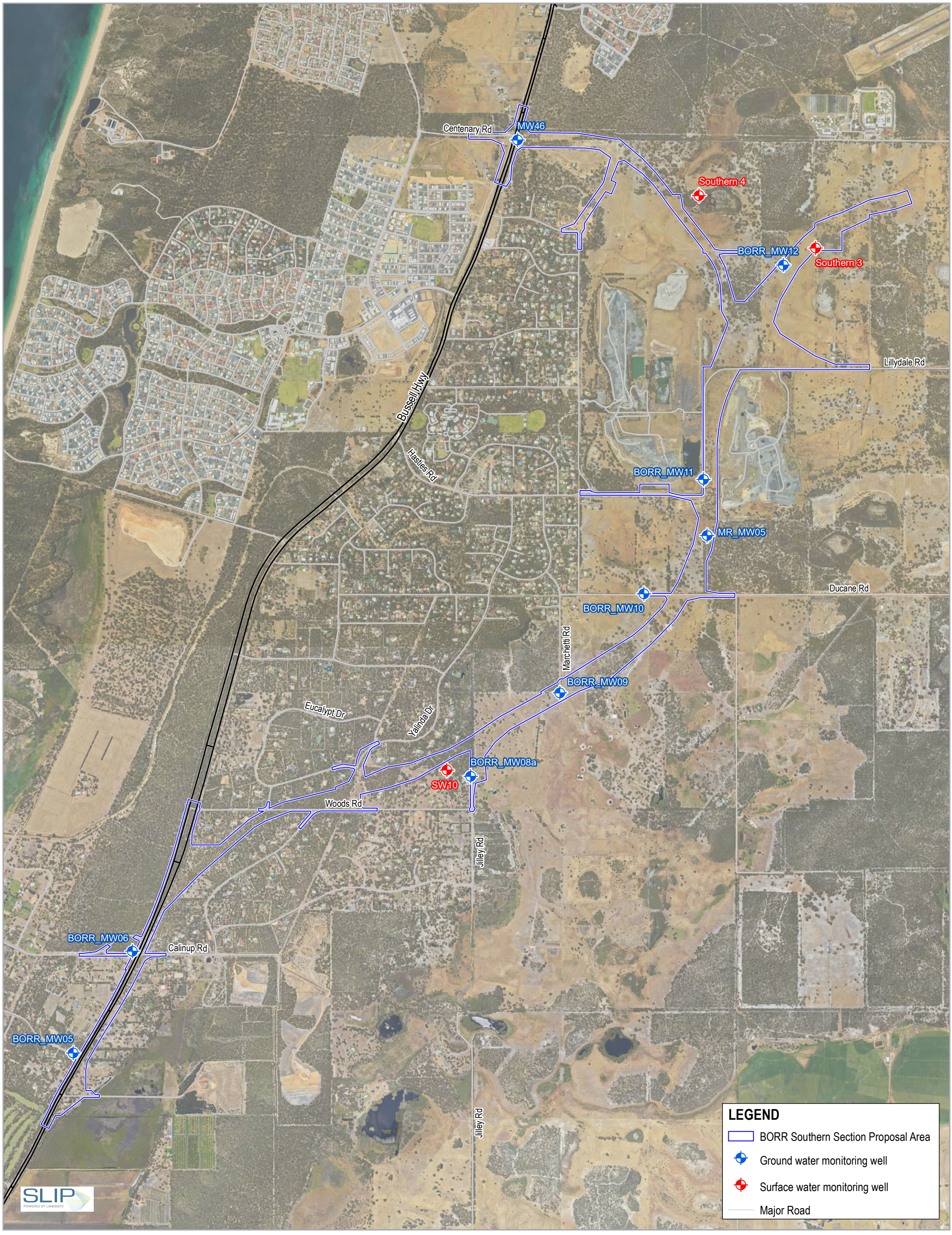
Regional Surface Geology

Project No. **61-37041**
Revision No. **0**
Date **24/04/2020**

FIGURE 4

G:\61\37041\19_0_GIS\Maps\Working\BORR South ASS & DMP\6137041_004_BORRSouthGeology_Rev0.mxd
Print date: 24 Apr 2020 - 16:00

Data source: BORR: Soil sampling location - 2020; DWER: Acid Soil Risk Map - 20190627; DMIRS: Geology - 50k Bunbury Mapsheets; Geoscience Australia: GeoData Topo 250k Series III - 2006; Landgate: LGA Boundary - 20191021, Rivers, Roads - 20180501, Imagery - WA Now accessed 20200424; BORR: Proposal Area - 20191212. Created by: slei



Paper Size ISO A3

0 250 500 750 1,000

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

N

BORR Team

Australian Government
BUILDING OUR FUTURE

mainroads WESTERN AUSTRALIA
BUNBURY OUTER RING ROAD | PLANNING AND DEVELOPMENT

Main Roads Western Australia
Bunbury Outer Ring Road Southern Section
Acid Sulfate Soil and Dewatering Management Plan

Groundwater and Surface Water Monitoring Locations

Project No.	**61-37041**
Revision No.	**0**
Date	**9/04/2020**

FIGURE 5

G:\61\37041\19_0_GIS\Maps\Working\BORR South ASS & DMP\6137041_005_BORRSouthGWSWMonLoc_Rev0.mxd
Print date: 09 Apr 2020 - 16:10

Data source: BORR: Ground water and surface water location - 2020; Geoscience Australia: GeoData Topo 250k Series III - 2006; Landgate: LGA Boundary - 20191021, Roads - 20180501, Imagery - WA Now accessed 20200409; BORR: Proposal Area - 20191212. Created by: slei

APPENDIX B

Summary of design drawings

Table B-1 Summary of design drawings used for this investigation

DRAWING NO.	REV	DATE	TITLE	CONTENT	CORRESPONDING GEOTECHNICAL FIGURE DRAWING
BORR-02-SK-FW-1201	A	12/07/2019	BORR South Ultimate Design	BORR Southbound Carriageway Plan and Profile (MCS2) - Sheet 1	Figure 3.01
BORR-02-SK-FW-1202	A	12/07/2019	BORR South Ultimate Design	BORR Southbound Carriageway Plan and Profile (MCS2) - Sheet 2	Figure 3.02
BORR-02-SK-FW-1203	A	12/07/2019	BORR South Ultimate Design	BORR Southbound Carriageway Plan and Profile (MCS2) - Sheet 3	Figure 3.03
BORR-02-SK-FW-1204	A	12/07/2019	BORR South Ultimate Design	BORR Southbound Carriageway Plan and Profile (MCS2) - Sheet 4	Figure 3.04
BORR-02-SK-FW-1205	A	12/07/2019	BORR South Ultimate Design	BORR Southbound Carriageway Plan and Profile (MCS2) - Sheet 5	Figure 3.05
BORR-02-SK-FW-1206	A	12/07/2019	BORR South Ultimate Design	BORR Southbound Carriageway Plan and Profile (MCS2) - Sheet 6	Figure 3.06
BORR-02-SK-FW-1207	A	12/07/2019	BORR South Ultimate Design	BORR Southbound Carriageway Plan and Profile (MCS2) - Sheet 7	Figure 3.07
BORR-02-SK-FW-1208	A	12/07/2019	BORR South Ultimate Design	BORR Southbound Carriageway Plan and Profile (MCS2) - Sheet 8	Figure 3.08
BORR-02-SK-FW-1209	A	12/07/2019	BORR South Ultimate Design	BORR Southbound Carriageway Plan and Profile (MCS2) - Sheet 9	Figure 3.09
BORR-02-SK-FW-1241	A	12/07/2019	BORR South Ultimate Design	BORR/Centenary Interchange Ramp Plan and Profile (MC01)	Figure 3.10
BORR-02-SK-FW-1242	A	12/07/2019	BORR South Ultimate Design	BORR/Centenary Interchange Ramp Plan and Profile (MC02)	Figure 3.11
BORR-02-SK-FW-1243	A	12/07/2019	BORR South Ultimate Design	BORR/Centenary Interchange Ramp Plan and Profile (MC03) - Sheet 1	Figure 3.12
BORR-02-SK-FW-1244	A	12/07/2019	BORR South Ultimate Design	BORR/Centenary Interchange Ramp Plan and Profile (MC03) - Sheet 2	Figure 3.13
BORR-02-SK-FW-1245	A	12/07/2019	BORR South Ultimate Design	BORR/Centenary Interchange Ramp Plan and Profile (MC04)	Figure 3.14
BORR-02-SK-FW-1251	A	12/07/2019	BORR South Ultimate Design	Centenary Road Plan and Profile (MCWA) - Sheet 1	Figure 3.15
BORR-02-SK-FW-1252	A	12/07/2019	BORR South Ultimate Design	Centenary Road Plan and Profile (MCWA) - Sheet 2	Figure 3.16
BORR-02-SK-FW-1253	A	12/07/2019	BORR South Ultimate Design	Centenary Road/Lillydale Road Plan and Profile (MCWA) - Sheet 3	Figure 3.17
BORR-02-SK-FW-1261	A	12/07/2019	BORR South Ultimate Design	Bussell/Centenary Roundabout Plan and Profile (MCWS)	Figure 3.18

DRAWING NO.	REV	DATE	TITLE	CONTENT	CORRESPONDING GEOTECHNICAL FIGURE DRAWING
BORR-02-SK-FW-1262	A	12/07/2019	BORR South Ultimate Design	Bussell/Centenary Roundabout Plan and Profile (MCWN)	Figure 3.19
BORR-02-SK-FW-1271	A	12/07/2019	BORR South Ultimate Design	Jules Road Plan and Profile (MCL0)	Figure 3.20
BORR-02-SK-FW-1281	A	12/07/2019	BORR South Ultimate Design	Woods Road Plan and Profile (MCXW)	Figure 3.21
BORR-02-SK-FW-1282	A	12/07/2019	BORR South Ultimate Design	Yalinda Drive Plan and Profile (MCXY) - Sheet 1	Figure 3.22
BORR-02-SK-FW-1283	A	12/07/2019	BORR South Ultimate Design	Yalinda Drive Plan and Profile (MCXY) - Sheet 2	Figure 3.23
BORR-02-SK-FW-1291	A	12/07/2019	BORR South Ultimate Design	BORR/Bussell Hwy Interchange Plan and Profile (MCYS)	Figure 3.24
BORR-02-SK-FW-1292	A	12/07/2019	BORR South Ultimate Design	BORR/Bussell Hwy Interchange Plan and Profile (MCYN)	Figure 3.25
BORR-02-SK-FW-1321	A	12/07/2019	BORR South Ultimate Design	Calinup Road Plan and Profile (MC91) - Sheet 1	Figure 3.26
BORR-02-SK-FW-1322	A	12/07/2019	BORR South Ultimate Design	Calinup Road Plan and Profile (MC91) - Sheet 2	Figure 3.27
BORR-02-SK-FW-1331	A	12/07/2019	BORR South Ultimate Design	Minninup Road Plan and Profile (MC92) - Sheet 1	Figure 3.28
BORR-02-SK-FW-1332	A	12/07/2019	BORR South Ultimate Design	Minninup Road Plan and Profile (MC92) - Sheet 2	Figure 3.29
BORR-02-SK-FW-1333	A	12/07/2019	BORR South Ultimate Design	Minninup Road Plan and Profile (MC92) - Sheet 3	Figure 3.30
BORR-02-SK-FW-1341	A	12/07/2019	BORR South Ultimate Design	Jilley Road Plan and Profile (MCQ0) - Sheet 1	Figure 3.31
BORR-02-SK-FW-1342	A	12/07/2019	BORR South Ultimate Design	Jilley Road Plan and Profile (MCQ0) - Sheet 2	Figure 3.32

APPENDIX C

Borehole logs

STANDPIPE PIEZOMETER LOG

Borehole No.: **BORR_MW02**

Client: Main Roads Western Australia
Project: Bunbury Outer Ring Road Project
Geotechnical Investigation
Job No.: 61/37041

Coordinates: **E** 369 363, **N** 6295 561
Ground Surface Elevation: +11.6m AHD **Total Depth:** 9.5m
Commenced: 24-Jul-18 **Completed:** 24-Jul-18
Contractor: DPP

Rig Type & Mounting: Track mounted Geoprobe 7822DT **Inclination:** Vertical
Flushing Fluid: N/A
Hole Diameter (mm): 55

Logged:	AW	24-Jul-18
Processed:	VC/SP	12-Feb-20
Checked:		

Depth Scale (m)	Daily Progress/ Observations: Date	Casing Depth (m)	Fluid Depth (m)	Drilling Method	Water	Depth (m)/ [Elev.]	Geological Unit	Graphic Log	Classification	Strata Description (type; colour; fines plasticity or particle characteristics; minor components; structure and/or origin)	Moisture Condition	Consistency/ Relative Density	Sample Type & Depth	Sample No.	Sample/ Test Records & Comments	Piezometer Components	Depth Scale (m)
	24/07									TOPSOIL							
				Hand Auger		[+11.52]			Cl	Silty CLAY Brown to pale tan-brown, medium plasticity fines, with fine grained sand.	SM	F			This log is not intended for geotechnical purposes	Cement	
													0.50	ASS	BORR_MW02_0.5		
1													1.00	ASS	BORR_MW02_1.0	Solid Pipe Bentonite	1
													1.50	ASS	BORR_MW02_1.5		
2										At 2.1 m, iron staining.			2.00	ASS	BORR_MW02_2.0		2
													2.50	ASS	BORR_MW02_2.5		
3				Direct Push									3.00	ASS	BORR_MW02_3.0		3
													3.50	ASS	BORR_MW02_3.5		
4													4.00	ASS	BORR_MW02_4.0		4
						4.4 [+7.22]			CL	Sandy CLAY Pale yellow to pale brown, non-plastic fines; coarse grained sand.	M	D	4.50	ASS	BORR_MW02_4.5		
5																	5

STANDPIPE PIEZOMETER LOG

Borehole No.: **BORR_MW02**

Sheet 2 of 2

Client: Main Roads Western Australia
Project: Bunbury Outer Ring Road Project
Geotechnical Investigation
Job No.: 61/37041

Coordinates: **E** 369 363, **N** 6295 561
Ground Surface Elevation: +11.6m AHD **Total Depth:** 9.5m
Commenced: 24-Jul-18 **Completed:** 24-Jul-18
Contractor: DPP

Rig Type & Mounting: Track mounted Geoprobe 7822DT **Inclination:** Vertical
Flushing Fluid: N/A
Hole Diameter (mm): 55

Logged:	AW	24-Jul-18
Processed:	VC/SP	12-Feb-20
Checked:		

Depth Scale (m)	Daily Progress/ Observations: Date	Casing Depth (m)	Fluid Depth (m)	Drilling Method	Water	Depth (m)/ [Elev.]	Geological Unit	Graphic Log	Classification	Strata Description (type; colour; fines plasticity or particle characteristics; minor components; structure and/or origin)	Moisture Condition	Consistency/ Relative Density	Sample Type & Depth	Sample No.	Sample/ Test Records & Comments	Piezometer Components	Depth Scale (m)
						5.2 [+6.42]			CL		M	D	5.00	ASS	BORR_MW02_5.0		
									SW	SAND Yellow and grey, fine to coarse grained, well graded, sub-angular to sub-rounded.		L					
						5.7 [+5.92]			CL-CI	Sandy CLAY Grey, low to medium plasticity fines.		F					
6					Groundwater Encountered at 6.87 m												6
						6.9 [+4.72]			SC	Clayey SAND Yellow and grey, fine to coarse grained, well graded, sub-angular to sub-rounded.	S	MD				Gravel Pack	
7																Slotted Pipe	7
8																	8
9													9.00	ASS	BORR_MW02_9.0	9.5 m: base of the groundwater monitoring bore	9
	24/07			Direct Push		9.5 [+2.12]				Termination Depth = 9.50m (Target Depth)							
10																	10

GENERAL LOG 20191018 BORR LOGS.GPJ GHDLIB.GDT 12/2/20

STANDPIPE PIEZOMETER LOG

Borehole No.: **BORR_MW04**

Client: Main Roads Western Australia
Project: Bunbury Outer Ring Road Project
Geotechnical Investigation
Job No.: 61/37041

Coordinates: **E** 370 118, **N** 6297 058
Ground Surface Elevation: +9.3m AHD **Total Depth:** 14.0m
Commenced: 03-Sep-18 **Completed:** 03-Sep-18
Contractor: DPP

Rig Type & Mounting: Track mounted Geoprobe 7822DT **Inclination:** Vertical
Flushing Fluid: N/A
Hole Diameter (mm): 55

Logged:	SP	03-Sep-18
Processed:	VC/SP	12-Feb-20
Checked:		

Depth Scale (m)	Daily Progress/ Observations: Date	Casing Depth (m)	Fluid Depth (m)	Drilling Method	Water	Depth (m)/ [Elev.]	Geological Unit	Graphic Log	Classification	Strata Description (type; colour; fines plasticity or particle characteristics; minor components; structure and/or origin)	Moisture Condition	Consistency/ Relative Density	Sample Type & Depth	Sample No.	Sample/ Test Records & Comments	Piezometer Components	Depth Scale (m)
0	03/09			Hand Auger					CL	CLAY Dark black, low plasticty fines; trace rootlets; trace sand.	M	S			This log is not intended for geotechnical purposes	Cement	
													0.50	ASS	BORR_MW04_0.5		
1						1.1 [+8.20]			CL	CLAY Dark grey, low plasticity fines; trace sand; trace silt.		D	1.00	ASS	BORR_MW04_1.0	Solid Pipe Bentonite	1
													1.50	ASS	BORR_MW04_1.5		
2						2.1 [+7.20]			SP	SAND Pale grey to pale red-brown, medium to coarse grained, poorly graded, sub-angular to sub-rounded; trace clay.		MD	2.00	ASS	BORR_MW04_2.0		2
						2.6 [+6.70]			SC	Clayey SAND Dark grey to pale brown, fine to coarse grained, poorly graded, sub-angular to sub-rounded.			2.50	ASS	BORR_MW04_2.5		
3				Direct Push	Groundwater Encountered at 3.71 m	3.0 [+6.30]			SP	SAND Pale grey, fine to medium grained, poorly graded sub-angular to sub-rounded; trace clay.		L	3.00	ASS	BORR_MW04_3.0		3
						3.5 [+5.80]			CL	Sandy CLAY Pale grey to pale brown, low plasticity fines; with grey to brown pockets of sand.	SM	D	3.50	ASS	BORR_MW04_3.5		
4													4.00	ASS	BORR_MW04_4.0		4
													4.50	ASS	BORR_MW04_4.5		
5																	5

GENERAL LOG 20191018 BORR LOGS.GPJ GHDLIB.GDT 12/2/20

STANDPIPE PIEZOMETER LOG

Borehole No.: **BORR_MW04**

Client: Main Roads Western Australia
Project: Bunbury Outer Ring Road Project
Geotechnical Investigation
Job No.: 61/37041

Coordinates: **E** 370 118, **N** 6297 058
Ground Surface Elevation: +9.3m AHD **Total Depth:** 14.0m
Commenced: 03-Sep-18 **Completed:** 03-Sep-18
Contractor: DPP

Rig Type & Mounting: Track mounted Geoprobe 7822DT **Inclination:** Vertical
Flushing Fluid: N/A
Hole Diameter (mm): 55

Logged:	SP	03-Sep-18
Processed:	VC/SP	12-Feb-20
Checked:		

Depth Scale (m)	Daily Progress/ Observations: Date	Casing Depth (m)	Fluid Depth (m)	Drilling Method	Water	Depth (m)/ [Elev.]	Geological Unit	Graphic Log	Classification	Strata Description (type; colour; fines plasticity or particle characteristics; minor components; structure and/or origin)	Moisture Condition	Consistency/ Relative Density	Sample Type & Depth	Sample No.	Sample/ Test Records & Comments	Piezometer Components	Depth Scale (m)
6				Direct Push					CL	Sandy CLAY Pale grey to pale brown, low plasticity fines; with grey to brown pockets of sand.	SM	D	5.00	ASS	BORR_MW04_5.0		6
7																	7
8						8.0 [+1.30]			SC	Clayey SAND Dark yellow, fine to coarse grained, poorly graded, sub-angular to sub-rounded; trace gravel, fine to coarse grained.	S	L					8
9				Solid Flight Auger						From 9 m, pale yellow.							9
10																	10

STANDPIPE PIEZOMETER LOG

Borehole No.: **BORR_MW04**

Sheet 3 of 3

Client: Main Roads Western Australia
Project: Bunbury Outer Ring Road Project
Geotechnical Investigation
Job No.: 61/37041

Coordinates: **E** 370 118, **N** 6297 058
Ground Surface Elevation: +9.3m AHD **Total Depth:** 14.0m
Commenced: 03-Sep-18 **Completed:** 03-Sep-18
Contractor: DPP

Rig Type & Mounting: Track mounted Geoprobe 7822DT **Inclination:** Vertical
Flushing Fluid: N/A
Hole Diameter (mm): 55

Logged:	SP	03-Sep-18
Processed:	VC/SP	12-Feb-20
Checked:		

Depth Scale (m)	Daily Progress/ Observations: Date	Casing Depth (m)	Fluid Depth (m)	Drilling Method	Water	Depth (m)/ [Elev.]	Geological Unit	Graphic Log	Classification	Strata Description (type; colour; fines plasticity or particle characteristics; minor components; structure and/or origin)	Moisture Condition	Consistency/ Relative Density	Sample Type & Depth	Sample No.	Sample/ Test Records & Comments	Piezometer Components	Depth Scale (m)
11									SC	Clayey SAND Dark yellow, fine to coarse grained, poorly graded, sub-angular to sub-rounded; trace gravel, fine to coarse grained.	S	L				Gravel Pack Slotted Pipe	11
12				Solid Flight Auger									12.00	ASS	BORR_MW04_12.0		12
13																13.15 m: base of the groundwater monitoring bore.	13
14	03/09					14.0 [-4.70]				Termination Depth = 14.00m (Target Depth)							14
15																	15

STANDPIPE PIEZOMETER LOG

Borehole No.: **BORR_MW05**

Sheet 1 of 2

Client: Main Roads Western Australia
Project: Bunbury Outer Ring Road Project
Geotechnical Investigation
Job No.: 61/37041

Coordinates: **E** 370 681, **N** 6298 315
Ground Surface Elevation: +12.2m AHD **Total Depth:** 8.0m
Commenced: 24-Jul-18 **Completed:** 24-Jul-18
Contractor: DPP

Rig Type & Mounting: Track mounted Geoprobe 7822DT **Inclination:** Vertical
Flushing Fluid: N/A
Hole Diameter (mm): 55

Logged:	AW	24-Jul-18
Processed:	VC/SP	12-Feb-20
Checked:		

Depth Scale (m)	Daily Progress/ Observations: Date	Casing Depth (m)	Fluid Depth (m)	Drilling Method	Water	Depth (m)/ [Elev.]	Geological Unit	Graphic Log	Classification	Strata Description (type; colour; fines plasticity or particle characteristics; minor components; structure and/or origin)	Moisture Condition	Consistency/ Relative Density	Sample Type & Depth	Sample No.	Sample/ Test Records & Comments	Piezometer Components	Depth Scale (m)
0	24/07			Hand Auger		0.2 [+12.00]				TOPSOIL					This log is not intended for geotechnical purposes.	Cement	0
									SP	SAND Yellow to pale yellow, fine to medium grained, sub-angualr to sub-rounded.	SM	L	0.50	ASS	BORR_MW05_0.5		
1													1.00	ASS	BORR_MW05_1.0	Solid Pipe Bentonite	1
													1.50	ASS	BORR_MW05_1.5		
2													2.00	ASS	BORR_MW05_2.0		2
													2.50	ASS	BORR_MW05_2.5		
3				Direct Push									3.00	ASS	BORR_MW05_3.0		3
						3.5 [+8.70]			SP	SAND White to pale tan-grey, fine to coarse grained, poorly graded, sub-angular to sub-rounded.	M		3.50	ASS	BORR_MW05_3.5		
4													4.00	ASS	BORR_MW05_4.0		4
													4.50	ASS	BORR_MW05_4.5		
5																	5

GENERAL LOG 20191018 BORR LOGS.GPJ GHDLIB.GDT 12/2/20

STANDPIPE PIEZOMETER LOG

Borehole No.: **BORR_MW05**

Sheet 2 of 2

Client: Main Roads Western Australia
Project: Bunbury Outer Ring Road Project
Geotechnical Investigation
Job No.: 61/37041

Coordinates: **E** 370 681, **N** 6298 315
Ground Surface Elevation: +12.2m AHD **Total Depth:** 8.0m
Commenced: 24-Jul-18 **Completed:** 24-Jul-18
Contractor: DPP

Rig Type & Mounting: Track mounted Geoprobe 7822DT **Inclination:** Vertical
Flushing Fluid: N/A
Hole Diameter (mm): 55

Logged:	AW	24-Jul-18
Processed:	VC/SP	12-Feb-20
Checked:		

Depth Scale (m)	Daily Progress/ Observations: Date	Casing Depth (m)	Fluid Depth (m)	Drilling Method	Water	Depth (m)/ [Elev.]	Geological Unit	Graphic Log	Classification	Strata Description (type; colour; fines plasticity or particle characteristics; minor components; structure and/or origin)	Moisture Condition	Consistency/ Relative Density	Sample Type & Depth	Sample No.	Sample/ Test Records & Comments	Piezometer Components	Depth Scale (m)
6				Direct Push	▼ GWE at 5.74 m				SP	SAND White to pale tan-grey, fine to coarse grained, poorly graded, sub-angular to sub-rounded.	M	L	5.00	ASS	BORR_MW05_5.0 GWE: Groundwater Encountered	Gravel Pack Slotted Pipe	6
7						7.0 [+5.20]			SC	Clayey SAND Grey, fine to coarse grained, poorly graded.	S	MD	7.80			8.0 m: base of the groundwater monitoring bore.	7
8	24/07					8.0 [+4.20]				Termination Depth = 8.00m (Target Depth)				ASS	BORR_MW05_8.0		8
9																	9
10																	10

STANDPIPE PIEZOMETER LOG

Borehole No.: **BORR_MW06**

Sheet 1 of 2

Client: Main Roads Western Australia
Project: Bunbury Outer Ring Road Project
Geotechnical Investigation
Job No.: 61/37041

Coordinates: **E** 371 109, **N** 6299 072
Ground Surface Elevation: +11.6m AHD **Total Depth:** 8.0m
Commenced: 17-Jul-18 **Completed:** 17-Jul-18
Contractor: DPP

Rig Type & Mounting: Track mounted Geoprobe 7822DT **Inclination:** Vertical
Flushing Fluid: N/A
Hole Diameter (mm): 55

Logged:	AO	17-Jul-18
Processed:	VC/SP	12-Feb-20
Checked:		

Depth Scale (m)	Daily Progress/ Observations: Date	Casing Depth (m)	Fluid Depth (m)	Drilling Method	Water	Depth (m)/ [Elev.]	Geological Unit	Graphic Log	Classification	Strata Description (type; colour; fines plasticity or particle characteristics; minor components; structure and/or origin)	Moisture Condition	Consistency/ Relative Density	Sample Type & Depth	Sample No.	Sample/ Test Records & Comments	Piezometer Components	Depth Scale (m)
0	17/07			Hand Auger		0.2 [+11.40]				TOPSOIL - SAND					This log is not intended for geotechnical purposes	Cement	0
									SP	SAND Dark yellow to pale brown, fine to medium grained, sub-angular to sub-rounded.	SM	L	0.50	ASS	BORR_MW06_0.5		
1													1.00	ASS	BORR_MW06_1.0	Solid Pipe Bentonite	1
													1.50	ASS	BORR_MW06_1.5		
2													2.00	ASS	BORR_MW06_2.0		2
													2.50	ASS	BORR_MW06_2.5		
3				Direct Push		3.0 [+8.60]			SP	SAND Grey to white, fine to medium grained, sub-angular to sub-rounded.			3.00	ASS	BORR_MW06_3.0		3
													3.50	ASS	BORR_MW06_3.5		
4													4.00	ASS	BORR_MW06_4.0		4
													4.50	ASS	BORR_MW06_4.5		
5																	5

STANDPIPE PIEZOMETER LOG

Borehole No.: **BORR_MW06**

Sheet 2 of 2

Client: Main Roads Western Australia
Project: Bunbury Outer Ring Road Project
Geotechnical Investigation
Job No.: 61/37041

Coordinates: **E** 371 109, **N** 6299 072
Ground Surface Elevation: +11.6m AHD **Total Depth:** 8.0m
Commenced: 17-Jul-18 **Completed:** 17-Jul-18
Contractor: DPP

Rig Type & Mounting: Track mounted Geoprobe 7822DT **Inclination:** Vertical
Flushing Fluid: N/A
Hole Diameter (mm): 55

Logged:	AO	17-Jul-18
Processed:	VC/SP	12-Feb-20
Checked:		

Depth Scale (m)	Daily Progress/ Observations: Date	Casing Depth (m)	Fluid Depth (m)	Drilling Method	Water	Depth (m)/ [Elev.]	Geological Unit	Graphic Log	Classification	Strata Description (type; colour; fines plasticity or particle characteristics; minor components; structure and/or origin)	Moisture Condition	Consistency/ Relative Density	Sample Type & Depth	Sample No.	Sample/ Test Records & Comments	Piezometer Components	Depth Scale (m)
6				Direct Push	▼				SP	SAND Grey to white, fine to medium grained, sub-angular to sub-rounded.	VM	L	5.00	ASS	BORR_MW06_5.0 Groundawater Encountered at 5.40 m.	Gravel Pack	6
													5.50	ASS	BORR_MW06_5.5		
										From 6.0 m, coarse sand content increasing.			6.00	ASS	BORR_MW06_6.0	Slotted Pipe	
7										From 7.0 m, trace shells.			7.00	ASS	BORR_MW06_7.0	8.0 m: base of the groundwater monitoring bore.	7
8	17/07					8.0 [+3.60]				Termination Depth = 8.00m (Target Depth)			8.00	ASS	BORR_MW06_8.0		8
9																	9
10																	10

STANDPIPE PIEZOMETER LOG

Borehole No.: **BORR_MW07**

Sheet 1 of 2

Client: Main Roads Western Australia
Project: Bunbury Outer Ring Road Project
Geotechnical Investigation
Job No.: 61/37041

Coordinates: **E** 372 079, **N** 6300 144
Ground Surface Elevation: +15.6m AHD **Total Depth:** 10.5m
Commenced: 23-Jul-18 **Completed:** 23-Jul-18
Contractor: DPP

Rig Type & Mounting: Track mounted Geoprobe 7822DT **Inclination:** Vertical
Flushing Fluid: N/A
Hole Diameter (mm): 55

Logged:	AW	23-Jul-18
Processed:	VC/SP	12-Feb-20
Checked:		

Depth Scale (m)	Daily Progress/ Observations: Date	Casing Depth (m)	Fluid Depth (m)	Drilling Method	Water	Depth (m)/ [Elev.]	Geological Unit	Graphic Log	Classification	Strata Description (type; colour; fines plasticity or particle characteristics; minor components; structure and/or origin)	Moisture Condition	Consistency/ Relative Density	Sample Type & Depth	Sample No.	Sample/ Test Records & Comments	Piezometer Components	Depth Scale (m)
0	23/07			Hand Auger		0.2 [+15.40]				TOPSOIL					This log is not intended for geotechnical purposes	Cement	0
									SP	SAND Yellow to pale yellow, fine to medium grained, sub-angular to sub-rounded.	SM	L	0.50	ASS	BORR_MW07_0.5		
1													1.00	ASS	BORR_MW07_1.0		1
													1.50	ASS	BORR_MW07_1.5		
2													2.00	ASS	BORR_MW07_2.0	Solid Pipe Backfill	2
													2.50	ASS	BORR_MW07_2.5		
3				Direct Push									3.00	ASS	BORR_MW07_3.0		3
													3.50	ASS	BORR_MW07_3.5		
4													4.00	ASS	BORR_MW07_4.0		4
													4.50	ASS	BORR_MW07_4.5		
5						5.4 [+10.20]			SM		M	L	5.00	ASS	BORR_MW07_5.0		5

STANDPIPE PIEZOMETER LOG

Borehole No.: **BORR_MW07**

Sheet 2 of 2

Client: Main Roads Western Australia
Project: Bunbury Outer Ring Road Project
Geotechnical Investigation
Job No.: 61/37041

Coordinates: **E** 372 079, **N** 6300 144
Ground Surface Elevation: +15.6m AHD **Total Depth:** 10.5m
Commenced: 23-Jul-18 **Completed:** 23-Jul-18
Contractor: DPP

Rig Type & Mounting: Track mounted Geoprobe 7822DT **Inclination:** Vertical
Flushing Fluid: N/A
Hole Diameter (mm): 55

Logged:	AW	23-Jul-18
Processed:	VC/SP	12-Feb-20
Checked:		

Depth Scale (m)	Daily Progress/ Observations: Date	Casing Depth (m)	Fluid Depth (m)	Drilling Method	Water	Depth (m)/ [Elev.]	Geological Unit	Graphic Log	Classification	Strata Description (type; colour; fines plasticity or particle characteristics; minor components; structure and/or origin)	Moisture Condition	Consistency/ Relative Density	Sample Type & Depth	Sample No.	Sample/ Test Records & Comments	Piezometer Components	Depth Scale (m)
6				Direct Push					SM	Silty SAND Yellow to dark yellow, fine to medium grained, well graded sub-angualr to sub-rounded.	M	L				Bentonite	6
7																	7
8																Gravel Pack Slotted Pipe	8
9					Groundwater Encountered at 10.04 m	9.0 [+6.60]			SW	SAND Grey to white, fine to coarse grained, well graded, sub-angular to sub-rounded.	S						9
10	23/07					10.5 [+5.10]				Termination Depth = 10.50m (Target Depth)			10.00	ASS	BORR_MW07_10.0	10.5 m: base of the groundwater monitoring bore.	10
11																	11

GENERAL LOG 20191018 BORR LOGS.GPJ GHDLIB.GDT 12/2/20

BOREHOLE LOG

ENVIRONMENTAL-GROUNDWATER

MONITORING WELL BORR MW08

Client Main Roads
Project BORR
Project No. 6137041
Site Bunbury Outer Ring Road
Location Bunbury
Date Drilled 24/07/2018 - 24/07/2018

Drill Co. DPP
Driller David Miekle
Rig Type Geoprobe
Drill Method Push tube and hollow auger
Total Depth (m) 16.50
Diameter (mm) 110

Easting, Northing 372744, 6300434
Grid Ref GDA94_MGA_zone_50
Elevation
Collar RL
Logged By A Wallace
Checked By A Osbaldeston

B.C.L No. N/A

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	HA		MW8_0.5				TOPSOIL				0
1	PT		MW8_1.0				SW - SAND fine to medium, well graded, subangular to subrounded, yellow to pale yellow (NATURAL - SOIL)	SM	L		-1
2			MW8_1.5								-2
3			MW8_2.0								-3
4			MW8_2.5								-4
5			MW8_3.0								-5
6			MW8_3.5				SP - SAND fine to coarse, poorly graded, subangular to subrounded, pale yellow (NATURAL - SOIL)	D	L		-6
7			MW8_4.0								-7
8			MW8_4.5								-8
9			MW8_5.0								-9
10							SP - SAND fine to medium, well graded, subangular to subrounded, tan (NATURAL - SOIL)	D	L	with limestone gravels	-10
11											-11
12											-12
13			MW8_13.0								-13
14							SP - SAND fine to coarse, poorly graded, subangular to subrounded, yellow (NATURAL - SOIL)	D	L		-14
15											-15
16											-16
17							Termination Depth at: 16.50 m. Maximum rig depth.				-17
18											-18
19											-19

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations

AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, RB-Rotary Blade, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler

Moisture Abbreviations

D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated

Consistency Abbreviations

Granular Soils VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense

Cohesive Soils VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

STANDPIPE PIEZOMETER LOG

Borehole No.: **BORR_MW08a**

Sheet 1 of 1

Client: Main Roads Western Australia
Project: Bunbury Outer Ring Road Project
Geotechnical Investigation
Job No.: 61/37041

Coordinates: **E** 373 589, **N** 6300 390
Ground Surface Elevation: +16.0m AHD **Total Depth:** 6.0m
Commenced: 05-Sep-18 **Completed:** 05-Sep-18
Contractor: DPP

Rig Type & Mounting: Track mounted Geoprobe 7822DT **Inclination:** Vertical
Flushing Fluid: N/A
Hole Diameter (mm): 55

Logged:	SP	05-Sep-18
Processed:	VC/SP	12-Feb-20
Checked:		

Depth Scale (m)	Daily Progress/ Observations: Date	Casing Depth (m)	Fluid Depth (m)	Drilling Method	Water	Depth (m)/ [Elev.]	Geological Unit	Graphic Log	Classification	Strata Description (type; colour; fines plasticity or particle characteristics; minor components; structure and/or origin)	Moisture Condition	Consistency/ Relative Density	Sample Type & Depth	Sample No.	Sample/ Test Records & Comments	Piezometer Components	Depth Scale (m)
0	05/09			Hand Auger	Groundwater Encountered at 1.84 m	[+15.87]			SP	SAND	SM	L			This log is not intended for geotechnical purposes	Cement	0
									SP	Dark black-brown, fine to medium grained, poorly graded, sub-angular to sub-rounded; with organics; trace roots; trace gravel (likely from adjecent road).							
						0.6 [+15.37]			SP	SAND	SM-M		0.50	ASS	BORR_MW08a_0.5		
1										Pale yellow-brown to dark black-grey, fine to medium grained, poorly graded, sub-angular to sub-rounded; trace organics. From 0.2 m, black to grey.			1.00	ASS	BORR_MW08a_1.0	Solid Pipe Bentonite	1
										SAND Pale white-grey to pale yellow-brown, fine to medium grained, sub-angular to sub-rounded. From 1.4 m, pale yellow-brown. At 1.6 m, approx. 100 mm grey-black lense.			1.50	ASS	BORR_MW08a_1.5		
2													2.00	ASS	BORR_MW08a_2.0		2
						2.2 [+13.77]			SC	Clayey SAND Pale brown-yellow, fine to medium grained, poorly graded, sub-angular to sub-rounded.	M	F	2.50	ASS	BORR_MW08a_2.5		
						2.9 [+13.07]			SP	SAND Pale grey-white, fine to medium grained, poorly graded, sub-angular to sub-rounded.	S	L	3.00	ASS	BORR_MW08a_3.0		
3													3.50	ASS	BORR_MW08a_3.5		3
										Between 3.8 m and 4.1 m, trace roots.							
4													4.00	ASS	BORR_MW08a_4.0	Gravel Pack Slotted Pipe	4
													4.50	ASS	BORR_MW08a_4.5		
5				Direct Push									5.00	ASS	BORR_MW08a_5.0		5
													5.50	ASS	BORR_MW08a_5.5	6.0 m: base of the groundwater monitoring bore.	
													5.80	ASS	BORR_MW08a_6.0		
6	05/09					6.0 [+9.97]				Termination Depth = 6.00m (Target Depth)							6

STANDPIPE PIEZOMETER LOG

Borehole No.: **BORR_MW09**

Sheet 1 of 1

Client: Main Roads Western Australia
Project: Bunbury Outer Ring Road Project
Geotechnical Investigation
Job No.: 61/37041

Coordinates: **E** 374 240, **N** 6301 013
Ground Surface Elevation: +16.4m AHD **Total Depth:** 5.5m
Commenced: 25-Jul-18 **Completed:** 25-Jul-18
Contractor: DPP

Rig Type & Mounting: Track mounted Geoprobe 7822DT **Inclination:** Vertical
Flushing Fluid: N/A
Hole Diameter (mm): 55

Logged:	AW	25-Jul-18
Processed:	VC/SP	12-Feb-20
Checked:		

Depth Scale (m)	Daily Progress/ Observations: Date	Casing Depth (m)	Fluid Depth (m)	Drilling Method	Water	Depth (m)/ [Elev.]	Geological Unit	Graphic Log	Classification	Strata Description (type; colour; fines plasticity or particle characteristics; minor components; structure and/or origin)	Moisture Condition	Consistency/ Relative Density	Sample Type & Depth	Sample No.	Sample/ Test Records & Comments	Piezometer Components	Depth Scale (m)
0	25/07			Hand Auger		0.2 [+16.20]				TOPSOIL					This log is not intended for geotechnical purposes	Cement	0
									SP	SAND Grey-white, fine to coarse grained, poorly graded, sub-angular to sub-rounded.	M	L	0.50	ASS	BORR_MW09_0.5		
1													1.00	ASS	BORR_MW09_1.0	Solid Pipe Bentonite	1
													1.50	ASS	BORR_MW09_1.5		
2													2.00	ASS	BORR_MW09_2.0		2
						2.3 [+14.10]			SM	Silty SAND Yellow and brown, fine to medium grained, well graded, sub-angular to sub-rounded.	W		2.50	ASS	BORR_MW09_2.5		
						2.7 [+13.70]			SP	SAND Grey-white, fine to coarse grained, poorly graded, sub-angular to sub-rounded.	S						
3				Direct Push	Groundwater Encountered at 3.19 m								3.00	ASS	BORR_MW09_3.0		3
													3.50	ASS	BORR_MW09_3.5	Gravel Pack Slotted Pipe	
4													4.00	ASS	BORR_MW09_4.0		4
													4.50	ASS	BORR_MW09_4.5		
						4.7 [+11.70]			SC	Clayey SAND Grey, fine to medium grained, poorly graded, sub-angular to sub-rounded.		MD					
5													5.00	ASS	BORR_MW09_5.0	5.5 m: base of the groundwater monitoring bore.	5
	25/07					5.5 [+10.90]							5.30	ASS	BORR_MW09_5.5		
										Termination Depth = 5.50m (Target Depth)							

GENERAL LOG 20191018 BORR LOGS.GPJ GHDLIB.GDT 12/2/20

STANDPIPE PIEZOMETER LOG

Borehole No.: **BORR_MW10**

Sheet 1 of 1

Client: Main Roads Western Australia
Project: Bunbury Outer Ring Road Project
Geotechnical Investigation
Job No.: 61/37041

Coordinates: **E** 374 851, **N** 6301 752
Ground Surface Elevation: +19.3m AHD **Total Depth:** 4.0m
Commenced: 25-Jul-18 **Completed:** 25-Jul-18
Contractor: DPP

Rig Type & Mounting: Track mounted Geoprobe 7822DT **Inclination:** Vertical
Flushing Fluid: N/A
Hole Diameter (mm): 55

Logged:	AW	25-Jul-18
Processed:	VC/SP	12-Feb-20
Checked:		

Depth Scale (m)	Daily Progress/ Observations: Date	Casing Depth (m)	Fluid Depth (m)	Drilling Method	Water	Depth (m)/ [Elev.]	Geological Unit	Graphic Log	Classification	Strata Description (type; colour; fines plasticity or particle characteristics; minor components; structure and/or origin)	Moisture Condition	Consistency/ Relative Density	Sample Type & Depth	Sample No.	Sample/ Test Records & Comments	Piezometer Components	Depth Scale (m)
0	25/07					0.3 [+19.00]				TOPSOIL					This log is not intended for geotechnical purposes	Cement	0
				Hand Auger	GWE at 1.09 m				SP	SAND Grey-white, fine to coarse grained, poorly graded, sub-angular to sub-rounded.	M	L	0.50	ASS	BORR_MW10_0.5 GWE: Groundwater Encountered	Solid Pipe	
1						1.5 [+17.80]			SM	Silty SAND Yellow and brown, fine to medium grained, well graded, sub-angular to sub-rounded.	W		1.00 1.50	ASS ASS	BORR_MW10_1.0 BORR_MW10_1.5		1
2				Direct Push		2.5 [+16.80]			SP	SAND Grey-white, fine to coarse grained, poorly graded, sub-angular to sub-rounded.	S		2.00 2.50	ASS ASS	BORR_MW10_2.0 BORR_MW10_2.5	Gravel Pack Slotted Pipe	2
3						3.2 [+16.10]			CL	Sandy CLAY Grey, low plasticity fines.		F	3.00 3.50 3.80	ASS ASS ASS	BORR_MW10_3.0 BORR_MW10_3.5 BORR_MW10_4.0	4.0 m: base of the groundwater monitoring bore.	3
4	25/07					4.0 [+15.30]				Termination Depth = 4.00m (Target Depth)							4
5																	5

GENERAL LOG 20191018 BORR LOGS.GPJ GHDLIB.GDT 12/2/20

STANDPIPE PIEZOMETER LOG

Borehole No.: **BORR_MW11**

Sheet 1 of 1

Client: Main Roads Western Australia
Project: Bunbury Outer Ring Road Project
Geotechnical Investigation
Job No.: 61/37041

Coordinates: **E** 375 282, **N** 6302 599
Ground Surface Elevation: +20.8m AHD **Total Depth:** 4.0m
Commenced: 25-Jul-18 **Completed:** 25-Jul-18
Contractor: DPP

Rig Type & Mounting: Track mounted Geoprobe 7822DT **Inclination:** Vertical
Flushing Fluid: N/A
Hole Diameter (mm): 55

Logged:	AW	25-Jul-18
Processed:	VC/SP	12-Feb-20
Checked:		

Depth Scale (m)	Daily Progress/ Observations: Date	Casing Depth (m)	Fluid Depth (m)	Drilling Method	Water	Depth (m)/ [Elev.]	Geological Unit	Graphic Log	Classification	Strata Description (type; colour; fines plasticity or particle characteristics; minor components; structure and/or origin)	Moisture Condition	Consistency/ Relative Density	Sample Type & Depth	Sample No.	Sample/ Test Records & Comments	Piezometer Components	Depth Scale (m)
0	25/07			Hand Auger	GWE at 0.58 m	0.2 [+20.60]				TOPSOIL					This log is not intended for geotechnical purposes. GWE: Groundwater Encountered	Cement; Solid Pipe	0
									SP	SAND Grey-white, fine to coarse grained, poorly graded, sub-angular to sub-rounded.	M	L	0.50	ASS	BORR_MW11_0.5		
1													1.00	ASS	BORR_MW11_1.0		1
													1.50	ASS	BORR_MW11_1.5		
2				Direct Push		2.2 [+18.60]							2.00	ASS	BORR_MW11_2.0	Gravel Pack; Slotted Pipe	2
									SC	Clayey SAND Green-grey, fine to medium grained, poorly graded.	S		2.50	ASS	BORR_MW11_2.5		
3						3.0 [+17.80]			SC	Sandy CLAY Low to medium plasticity fines.	M	D	3.00	ASS	BORR_MW11_3.0		3
										From 3.5 m, with Bunbury Basalt gravels.			3.50	ASS	BORR_MW11_3.5	4.0 m: base of the groundwater monitoring bore.	
													3.80	ASS	BORR_MW11_4.0		
4	25/07					4.0 [+16.80]				Termination Depth = 4.00m (Target Depth)							4
5																	5

GENERAL LOG 20191018 BORR LOGS.GPJ GHDLIB.GDT 12/2/20

STANDPIPE PIEZOMETER LOG

Borehole No.: **BORR_MW12**

Sheet 1 of 1

Client: Main Roads Western Australia
Project: Bunbury Outer Ring Road Project
Geotechnical Investigation
Job No.: 61/37041

Coordinates: **E** 375 853, **N** 6304 187
Ground Surface Elevation: +19.6m AHD **Total Depth:** 4.5m
Commenced: 06-Sep-18 **Completed:** 06-Sep-18
Contractor: DPP

Rig Type & Mounting: Track mounted Geoprobe 7822DT **Inclination:** Vertical
Flushing Fluid: N/A
Hole Diameter (mm): 55

Logged:	SP	06-Sep-18
Processed:	VC/SP	12-Feb-20
Checked:		

Depth Scale (m)	Daily Progress/ Observations: Date	Casing Depth (m)	Fluid Depth (m)	Drilling Method	Water	Depth (m)/ [Elev.]	Geological Unit	Graphic Log	Classification	Strata Description (type; colour; fines plasticity or particle characteristics; minor components; structure and/or origin)	Moisture Condition	Consistency/ Relative Density	Sample Type & Depth	Sample No.	Sample/ Test Records & Comments	Piezometer Components	Depth Scale (m)
0	06/09			Hand Auger	▼ Groundwater Encountered at 1.09 m	0.2 [+19.40]			SP	SAND Black-grey, fine to medium grained, poorly graded, sub-angular to sub-rounded; with roots; trace silt.	SM	L			This log is not intended for geotechnical purposes.	Cement	0
									SP	SAND Pale grey-white, fine to medium grained, poorly graded, sub-angular to sub-rounded; trace silt; trace roots.						Solid Pipe Bentonite	
1										From 1.2 m, pale grey to pale grey-brown; no roots.	S						1
										From 1.7 m, pale brown-yellow; trace gravel.							
2										From 2.0 m, pale yellow-brown to pale white; no gravel.							2
				Direct Push						From 2.7 m, white to pale white.							
3																Gravel Pack Slotted Pipe	3
										From 3.8 m, pale brown to black.							
4										From 4.0 m, black.						4.5 m: base of the groundwater monitoring bore.	4
	06/09					4.5 [+15.10]				Termination Depth = 4.50m (Target Depth)							
5																	5

GENERAL LOG 20191018 BORR LOGS.GPJ GHDLIB.GDT 12/2/20

STANDPIPE PIEZOMETER LOG

Borehole No.: **BORR_MW46**

Sheet 1 of 1

Client: Main Roads Western Australia
Project: Bunbury Outer Ring Road Project
Geotechnical Investigation
Job No.: 61/37041

Coordinates: **E** 373 883, **N** 6305 094
Ground Surface Elevation: +7.1m AHD **Total Depth:** 6.0m
Commenced: 06-Aug-19 **Completed:** 06-Aug-19
Contractor: DPP

Rig Type & Mounting: Track mounted Geoprobe 7822DT **Inclination:** Vertical
Flushing Fluid: N/A
Hole Diameter (mm): 55

Logged:	AT	06-Aug-19
Processed:	AT	12-Feb-20
Checked:		

Depth Scale (m)	Daily Progress/ Observations: Date	Casing Depth (m)	Fluid Depth (m)	Drilling Method	Water	Depth (m)/ [Elev.]	Geological Unit	Graphic Log	Classification	Strata Description (type; colour; fines plasticity or particle characteristics; minor components; structure and/or origin)	Moisture Condition	Consistency/ Relative Density	Sample Type & Depth	Sample No.	Sample/ Test Records & Comments	Piezometer Components	Depth Scale (m)
0	06/08			Hand Auger		0.3 [+6.80]			SP	TOPSOIL - SAND Brown, fine to medium grained, sub-angular to sub-rounded; trace non-plastic fines; trace rootlets; trace gravel; up to 20 mm.	M	-	0.30	D	This log is not intended for geotechincal purposes 0.3 to 0.5 m: 1 x Disturbed sample.		0
						0.8 [+6.30]			SP	FILL - SAND Pale grey to grey, fine to medium grained, sub-angular to sub-rounded; trace non-plastic fines.							
1									SP	SAND Pale yellow to pale brown, fine to coarse grained, sub-angular to sub-rounded; trace non-plastic fines.			1.00	D	1.0 to 1.3 m: 1 x Disturbed sample.	Solid Pipe Bentonite	1
										From 1.5 m, grey to dark brown, organic odour. From 1.6 m, pale brown; trace coarse grained sand.			1.60	D	1.6 to 1.9 m: 1 x Disturbed sample.		
2										From 1.9 m, pale orange-brown to brown, coarse grained; quartz up to 15 mm.			1.90	D	1.9 to 2.2 m: 1 x Disturbed sample.		2
					▼ Groundwater Encountered at 3.69 m					From 2.5 m, pale brown, fine to medium grained.							
3													3.00	D	3.0 to 3.3 m: 1 x Disturbed sample.		3
4				Direct Push						From 4.0 m, pale grey to pale brown.	W		4.00	D	4.0 to 4.3 m: 1 x Disturbed sample.	Gravel Pack Slotted Pipe	4
										From 4.4 m, pale brown, fine to coarse grained.							
5										From 5.5 m, pale orange-brown.			5.70	D	5.7 to 6.0 m: 1 x Disturbed sample.	6.0 m: base of the groundwater monitoring bore.	5
6	06/08					6.0 [+1.10]				Termination Depth = 6.00m (Target Depth)							6

TEST EXCAVATION LOG

Test Pit No.: **TP25.1**

Sheet 1 of 1

Client: Main Roads Western Australia
Project: Bunbury Outer Ring Road Project
Geotechnical Investigation
Job No.: 61/37041

Coordinates: **E** 375 656, **N** 6303 729
Ground Surface Elevation: +22.1m AHD **Total Depth:** 2.1m
Commenced: 29-Oct-19 **Completed:** 29-Oct-19
Contractor: Picton Civil

Equipment: 14t wheeled excavator
Bucket Size (m): 0.4
Excavation Width (m): Not Recorded
Excavation Length (m): Not Recorded
Orientation/ Bearing: Not Recorded

Logged:	TF	29-Oct-19
Processed:	VC	26-Feb-20
Checked:		

Depth Scale (m)	Water	Depth (m)/ [Elev.]	Geological Unit	Graphic Log	Classification	Strata Description (type; colour; fines plasticity or particle characteristics; minor components; structure and/or origin)	Moisture Condition	Consistency/ Relative Density	Sample Type & Depth	Sample No.	Sample/Test Records & Comments
0		0.2 [+21.9]	Topsoil		SP	TOPSOIL - SAND Grey, fine to coarse grained, sub-angular to sub-rounded, quartz sand; trace silt; trace organics (rootlets).	D	L-MD			
			Bassendean Sand		SP	SAND Pale grey, fine to coarse grained, sub-angular to sub-rounded, quartz sand; trace silt.	D-M	MD			0.5 to 1.0m: ASS sample 14.
1	Groundwater Not Intersected					From 0.7m, pale yellow.			1.00 – 1.30	B	1.0 to 1.3m: 2x Bulk disturbed samples. 1.0 to 1.5m: ASS sample 15.
2		2.1 [+20.0]				From 1.6m, orange.	M				1.6 to 2.0m: ASS sample 16.
3						Termination Depth = 2.10m (Collapsing)					

PSP Test Results

Blows recorded per interval

0 20 40

Recorded Blows

1 1 1 1 1 1 1 1 1 1 1 0 1 1 1 1 1 1 1 1 1 1 1 1 2 2 1 2 2 1 2 2 2 2 2 2 2 2 2 3 3

TEST EXCAVATION LOG

Test Pit No.: **TPC49**

Sheet 1 of 1

Client: Main Roads Western Australia
Project: Bunbury Outer Ring Road Project
Geotechnical Investigation
Job No.: 61/37041

Coordinates: **E** 377 218, **N** 6304 822
Ground Surface Elevation: +16.5m AHD **Total Depth:** 3.0m
Commenced: 30-Oct-19 **Completed:** 30-Oct-19
Contractor: Picton Civil

Equipment: 14t wheeled excavator
Bucket Size (m): 0.4
Excavation Width (m): Not Recorded
Excavation Length (m): Not Recorded
Orientation/ Bearing: Not Recorded

Logged:	TF	30-Oct-19
Processed:	VC	26-Feb-20
Checked:		

Depth Scale (m)	Water	Depth (m)/ [Elev.]	Geological Unit	Graphic Log	Classification	Strata Description (type; colour; fines plasticity or particle characteristics; minor components; structure and/or origin)	Moisture Condition	Consistency/ Relative Density	Sample Type & Depth	Sample No.	Sample/Test Records & Comments
		0.2 [+16.4]	TS		SP	TOPSOIL - SAND Grey, fine to medium grained, sub-angular to sub-rounded, quartz sand; trace silt; trace organics (rootlets).	M	L-MD			TS: Topsoil
			Bassendean Sand		SP	SAND Pale brown, fine to coarse grained, sub-angular to sub-rounded, quartz sand; trace silt.	M-W	MD-D	0.30 0.60	B	0.3 to 0.6m: 2x Bulk disturbed samples. 0.6 to 0.8m: ASS sample 19.
1		1.7 [+14.8]	Guildford Formation		SC	Clayey SAND Purple-brown, mottled orange-brown, fine to coarse grained, sub-angular to sub-rounded sand; low plasticity fines.			1.70 1.90	D	1.7 to 1.9m: 1x Disturbed sample. 1.7 to 1.9m: ASS sample 20.
2	≈					From 2.4m, with medium to coarse grained gravel-sized nodules of weakly cemented material.			2.50 2.70	D	2.5 to 2.7m: 1x Disturbed sample. 2.5 to 2.7m: ASS sample 21.
		2.9 [+13.6]			SC	Clayey SAND Mottled brown and blue-grey, fine to coarse grained, sub-angular to sub-rounded, weakly cemented sand; medium plasticity fines.					
3		3.0 [+13.5]				Termination Depth = 3.00m (Target Depth)					

DCP Test Results
Blows recorded per interval
0 20 40
Recorded Blows
0 1 1 1 1 1 2 1 1 1 1 1 1 1 2 1 1 2 1 1 2 1 2 1 2 1 2 2 1 2 4 3 2 2 2 2 2 3 2 4

TEST EXCAVATION LOG

Test Pit No.: **TPC51**

Sheet 1 of 1

Client: Main Roads Western Australia
Project: Bunbury Outer Ring Road Project
Geotechnical Investigation
Job No.: 61/37041

Coordinates: **E** 376 736, **N** 6304 669
Ground Surface Elevation: +17.4m AHD **Total Depth:** 2.5m
Commenced: 01-Nov-19 **Completed:** 01-Nov-19
Contractor: Picton Civil

Equipment: 14t wheeled excavator
Bucket Size (m): 0.4
Excavation Width (m): Not Recorded
Excavation Length (m): Not Recorded
Orientation/ Bearing: Not Recorded

Logged:	TF	01-Nov-19
Processed:	VC	26-Feb-20
Checked:		

Depth Scale (m)	Water	Depth (m)/ [Elev.]	Geological Unit	Graphic Log	Classification	Strata Description (type; colour; fines plasticity or particle characteristics; minor components; structure and/or origin)	Moisture Condition	Consistency/ Relative Density	Sample Type & Depth	Sample No.	Sample/Test Records & Comments
0		0.2 [+17.3]	TS		SP	TOPSOIL - SAND Grey, fine to medium grained, sub-angular to sub-rounded, quartz sand; trace silt; trace organics (rootlets).	M	VL-L			TS: Topsoil
			Bassendean Sand		SP	SAND Pale grey, fine to coarse grained, sub-angular to sub-rounded, quartz sand; trace silt.		L	0.30	B	0.3 to 0.6m: 2x Bulk disturbed samples.
1	▼					From 0.6m, mottled orange-brown.			0.60		
		1.2 [+16.2]	Guildford Formation		SC/ CL	Clayey SAND/Sandy CLAY Mottled red-brown and orange-brown, fine to coarse grained, sub-angular to sub-rounded sand; low plasticity fines.		St	1.40	D	1.4 to 1.6m: 1x Disturbed sample. 1.4 to 1.6m: ASS sample 36.
2						From 1.9m, mottled blue-grey and orange-brown.			1.60		
									2.10	D	2.1 to 2.3m: 1x Disturbed sample.
		2.5 [+14.9]				Termination Depth = 2.50m (Collapsing)			2.30		2.3 to 2.4m: ASS sample 37.
3											

DCP Test Results

Blows recorded per interval

0 20 40

Recorded Blows

0 1 0 0 1 0 1 1 1 1 2 1 1 2 1 1 1 1 1 1 1 2 1 2 2 2 3 2 2 3 2 2 2 2 2 3 3 3 3 4

GENERAL LOG 20191018 BORR LOGS.GPJ GHDLIB.GDT 26/2/20

TEST EXCAVATION LOG

Test Pit No.: **TPC52**

Sheet 1 of 1

Client: Main Roads Western Australia
Project: Bunbury Outer Ring Road Project
Geotechnical Investigation
Job No.: 61/37041

Coordinates: **E** 376 078, **N** 6304 426
Ground Surface Elevation: +18.1m AHD **Total Depth:** 1.5m
Commenced: 29-Oct-19 **Completed:** 29-Oct-19
Contractor: Picton Civil

Equipment: 14t wheeled excavator
Bucket Size (m): 0.4
Excavation Width (m): Not Recorded
Excavation Length (m): Not Recorded
Orientation/ Bearing: Not Recorded

Logged:	TF	29-Oct-19
Processed:	VC	26-Feb-20
Checked:		

Depth (m)/ [Elev.]	Geological Unit	Classification	Strata Description (type; colour; fines plasticity or particle characteristics; minor components; structure and/or origin)	Moisture Condition	Consistency/ Relative Density	Sample Type & Depth	Sample No.	Sample/Test Records & Comments
0.1 [+18.0]	TS	SM	TOPSOIL - Silty SAND Dark grey, fine to medium grained, sub-rounded, quartz sand; with organics (rootlets, roots, fine grained organics).	W	VL			TS: Topsoil
	Bassendean Sand/Swamp Deposits	SP	SAND Dark grey, fine to coarse grained, sub-angular to sub-rounded, quartz sand; trace silt; trace organics (rootlets) From 0.3m, mottled grey and pale brown; variable clay content with depth.		L	0.50 – 0.80	B	0.5 to 0.8m: 2x Bulk disturbed samples. 0.5 to 1.0m: ASS sample 9.
1.2 [+16.9]		SM	Silty SAND Pale grey, mottled green, fine to coarse grained, sub-angular to sub-rounded sand; non-plastic fines.		L-MD	1.20 – 1.50	D	1.2 to 1.5m: 1x Disturbed sample. 1.2 to 1.5m: ASS sample 10.
1.5 [+16.6]			Termination Depth = 1.50m (Collapsing)					

DCP Test Results

Blows recorded per interval

0 20 40

Recorded Blows

0 0 1 0 1 1 0 1 1 1 0 1 1 1 1 1 1 1 1 1 1 1 0 1 2 2 1 2 1 1 1 1

3 3 5 5 8 8 10 8 9 7

Depth Scale (m): 1, 2, 3

GENERAL LOG 20191018 BORR LOGS.GPJ GHDLIB.GDT 26/2/20

TEST EXCAVATION LOG

Test Pit No.: **TPC53**

Sheet 1 of 1

Client: Main Roads Western Australia
Project: Bunbury Outer Ring Road Project
Geotechnical Investigation
Job No.: 61/37041

Coordinates: **E** 375 909, **N** 6304 179
Ground Surface Elevation: +18.9m AHD **Total Depth:** 2.0m
Commenced: 28-Oct-19 **Completed:** 28-Oct-19
Contractor: Picton Civil

Equipment: 14t wheeled excavator
Bucket Size (m): 0.4
Excavation Width (m): Not Recorded
Excavation Length (m): Not Recorded
Orientation/ Bearing: Not Recorded

Logged:	TF	28-Oct-19
Processed:	VC	26-Feb-20
Checked:		

Depth Scale (m)	Water	Depth (m)/ [Elev.]	Geological Unit	Graphic Log	Classification	Strata Description (type; colour; fines plasticity or particle characteristics; minor components; structure and/or origin)	Moisture Condition	Consistency/ Relative Density	Sample Type & Depth	Sample No.	Sample/Test Records & Comments	PSP Test Results: Blows recorded per interval (0 20 40) Recorded Blows	Depth Scale (m)
0		0.2 [+18.8]	TS		SP	TOPSOIL - SAND Dark grey, fine to coarse grained, sub-angular to sub-rounded, quartz sand; trace silt; trace organics (rootlets).	D	MD			TS: Topsoil	2 1 1 2 1 2 1 2 2 2 2 2 2 2 2 1 2 1 2 4 7 8	0
			Bassendean Sand		SP	SAND Grey, fine to medium grained, sub-angular to sub-rounded sand; trace silt.	M	MD-D				Refusal - Deviation of rod	
1		1.2 [+17.7]	CR		SP	SAND Dark brown, fine to medium grained sand; weakly iron cemented.					1.2 to 1.4m: ASS sample 4. CR: Coffee Rock		1
		1.4 [+17.5]	Bassendean Sand/CR		SP	SAND Mottled grey and brown, fine to medium grained, sub-angular to sub-rounded, quartz sand; with gravel-sized fragments of weakly iron cemented material (Coffee Rock); trace silt.	W	MD			1.4 to 1.6m: ASS sample 5. 1.7 to 1.9m: ASS sample 6.		
2		2.0 [+16.9]				Termination Depth = 2.00m (Collapsing)							2
3													3

TEST EXCAVATION LOG

Test Pit No.: **TPC54**

Sheet 1 of 1

Client: Main Roads Western Australia
Project: Bunbury Outer Ring Road Project
Geotechnical Investigation
Job No.: 61/37041

Coordinates: **E** 375 730, **N** 6303 913
Ground Surface Elevation: +19.2m AHD **Total Depth:** 1.7m
Commenced: 28-Oct-19 **Completed:** 28-Oct-19
Contractor: Picton Civil

Equipment: 14t wheeled excavator
Bucket Size (m): 0.4
Excavation Width (m): Not Recorded
Excavation Length (m): Not Recorded
Orientation/ Bearing: Not Recorded

Logged:	DW	28-Oct-19
Processed:	VC	26-Feb-20
Checked:		

Depth Scale (m)	Water	Depth (m)/ [Elev.]	Geological Unit	Graphic Log	Classification	Strata Description (type; colour; fines plasticity or particle characteristics; minor components; structure and/or origin)	Moisture Condition	Consistency/ Relative Density	Sample Type & Depth	Sample No.	Sample/Test Records & Comments
		0.1 [+19.1]	TS		SP	TOPSOIL - SAND Dark grey, fine to medium grained, sub-angular to sub-rounded, quartz sand; trace silt; trace organics (rootlets).	D-M	MD			TS: Topsoil
			Bassendean Sand		SP	SAND Grey, fine to coarse grained, sub-angular to sub-rounded, quartz sand; trace silt.	M	MD-D	0.40 – 0.70	B	0.4 to 0.7m: 2x Bulk disturbed sampples. 0.4 to 0.7m: ASS sample 7.
1	Groundwater Not Intersected										
			Bassendean Sand/CR			From 1.1m, dark brown; weakly iron cemented; hydrogen sulfide odour.					1.1 to 1.3m: ASS sample 8. CR: Coffee Rock
						From 1.3m, becoming brown, uncemented; with fine to medium grained gravel-sized nodules of weakly iron cemented, pale brown material.	W				
		1.7 [+17.5]				Termination Depth = 1.70m (Collapsing)					
2											
3											

PSP Test Results

Blows recorded per interval

0 20 40

Recorded Blows

1 2 1 2 2 2 2 2 3 2 2 1 2 2 1 2 2 1 2 1 2 1 2 3 3 3 4 6 5 5 5 5 4 4 5 4 5 4 4 5

Depth Scale (m): 1, 2, 3

GENERAL LOG 20191018 BORR LOGS.GPJ GHDLIB.GDT 26/2/20

TEST EXCAVATION LOG

Test Pit No.: **TPC55**

Sheet 1 of 1

Client: Main Roads Western Australia
Project: Bunbury Outer Ring Road Project
Geotechnical Investigation
Job No.: 61/37041

Coordinates: **E** 375 925, **N** 6303 568
Ground Surface Elevation: +18.9m AHD **Total Depth:** 2.6m
Commenced: 29-Oct-19 **Completed:** 29-Oct-19
Contractor: Picton Civil

Equipment: 14t wheeled excavator
Bucket Size (m): 0.4
Excavation Width (m): Not Recorded
Excavation Length (m): Not Recorded
Orientation/ Bearing: Not Recorded

Logged:	TF	29-Oct-19
Processed:	VC	26-Feb-20
Checked:		

Depth (m)/ [Elev.]	Geological Unit	Classification	Strata Description (type; colour; fines plasticity or particle characteristics; minor components; structure and/or origin)	Moisture Condition	Consistency/ Relative Density	Sample Type & Depth	Sample No.	Sample/Test Records & Comments
0.2 [+18.8]	TS	SP	TOPSOIL - SAND Dark grey, fine to medium grained, sub-angular to sub-rounded, quartz sand; trace silt; trace organics (rootlets).	D	L			TS: Topsoil
	Bassendean Sand	SP-SM	SAND Pale brown, fine to coarse grained, sub-angular to sub-rounded, quartz sand; with silt. From 0.6m, with fine to medium grained gravel-sized nodules of weakly iron cemented material.	M	MD	0.30	B	0.3 to 0.6m: 2x Bulk disturbed samples. 0.4 to 0.5m: ASS sample 11.
1.0 [+17.9]		MH	SILT Green, mottled orange, high plasticity fines; with fine grained, sub-angular to sub-rounded sand.	w< PL	St-VSt	1.10 1.30	D	1.1 to 1.3m: 1x Disturbed sample. 1.2 to 1.3m: ASS sample 12.
1.4 [+17.5]	Guildford Formation	CL	Silty CLAY Pale yellow, low plasticity fines; laminated.		VSt-H	1.40 1.60	D	1.4 to 1.6m: 1x Disturbed sample. 1.5 to 1.6m: ASS sample 13.
1.7 [+17.2]		SP	SAND Orange, fine to coarse grained, sub-angular to sub-rounded sand; trace silt; with pockets of CLAY, comprising green, high plasticity fines; with orange, fine to coarse grained, sub-angular to sub-rounded sand.	W	VD			
2.6 [+16.3]			Termination Depth = 2.60m (Collapsing)					

DCP Test Results

Blows recorded per interval

0 20 40

Recorded Blows

1 1 1 2 2 2 2 2 2 2 1 2 2 1 1 1 1 1 2 2 2 2 2 1 2 3 4 3 6 10 8 9 7 6 6 4 6 11 10 10

Refusal

Depth Scale (m): 0, 1, 2, 3

TEST EXCAVATION LOG

Test Pit No.: **TPC56**

Sheet 1 of 1

Client: Main Roads Western Australia
Project: Bunbury Outer Ring Road Project
Geotechnical Investigation
Job No.: 61/37041

Coordinates: **E** 375 334, **N** 6304 231
Ground Surface Elevation: +19.6m AHD **Total Depth:** 1.9m
Commenced: 28-Oct-19 **Completed:** 28-Oct-19
Contractor: Picton Civil

Equipment: 14t wheeled excavator
Bucket Size (m): 0.4
Excavation Width (m): Not Recorded
Excavation Length (m): Not Recorded
Orientation/ Bearing: Not Recorded

Logged:	TF	28-Oct-19
Processed:	VC	26-Feb-20
Checked:		

Depth (m)/ [Elev.]	Geological Unit	Classification	Strata Description (type; colour; fines plasticity or particle characteristics; minor components; structure and/or origin)	Moisture Condition	Consistency/ Relative Density	Sample Type & Depth	Sample No.	Sample/Test Records & Comments
0.2 [+19.4]	Topsoil	SP	TOPSOIL - SAND Dark grey, fine to medium grained, sub-angular to sub-rounded, quartz sand; trace silt; trace organics (rootlets).	D	MD			
	Bassendean Sand	SP	SAND Grey, fine to coarse grained, sub-angular to sub-rounded, quartz sand; trace silt.	M		0.40 – 0.70	B	0.4 to 0.7m: 2 x Bulk disturbed samples. 0.4 to 0.7m: ASS sample 1.
	CR		Between 1.1m and 1.3m, dark brown, fine to medium grained; weakly iron cemented; mild hydrogen sulfide odour.	W				1.1 to 1.3m: ASS sample 2. CR: Coffee Rock
1.5 [+18.1]	BS		From 1.3m, grey.					BS: Bassendean Sand
	GF	SC	Clayey SAND Interbedded green and dark grey, fine to coarse grained, sub-rounded sand; medium plasticity fines.			1.50 – 1.80	D	1.5 to 1.8m: 1x Disturbed sample. 1.5 to 1.8m: ASS sample 3.
1.9 [+17.7]			Termination Depth = 1.90m (Collapsing)		D			GF: Guildford Formation

PSP Test Results
Blows recorded per interval
0 20 40
Recorded Blows: 1 1 2 1 1 1 2 2 1 2 1 2 1 2 1 1 1 2 3 2 3 2 2 2 2 3 2 3 3 3 4 4 6 9 9

Depth Scale (m): 1 2 3

GENERAL LOG 20191018 BORR LOGS.GPJ GHDLIB.GDT 26/2/20

TEST EXCAVATION LOG

Test Pit No.: **TPC59**

Sheet 1 of 1

Client: Main Roads Western Australia
Project: Bunbury Outer Ring Road Project
Geotechnical Investigation
Job No.: 61/37041

Coordinates: **E** 374 324, **N** 6305 083
Ground Surface Elevation: +26.1m AHD **Total Depth:** 2.4m
Commenced: 29-Oct-19 **Completed:** 29-Oct-19
Contractor: Picton Civil

Equipment: 14t wheeled excavator
Bucket Size (m): 0.4
Excavation Width (m): Not Recorded
Excavation Length (m): Not Recorded
Orientation/ Bearing: Not Recorded

Logged:	TF	29-Oct-19
Processed:	VC	26-Feb-20
Checked:		

Depth Scale (m)	Water	Depth (m)/ [Elev.]	Geological Unit	Graphic Log	Classification	Strata Description (type; colour; fines plasticity or particle characteristics; minor components; structure and/or origin)	Moisture Condition	Consistency/ Relative Density	Sample Type & Depth	Sample No.	Sample/Test Records & Comments	PSP Test Results: Blows recorded per interval (0 20 40) / Recorded Blows	Depth Scale (m)
		0.2 [+26.0]	TS		SP	TOPSOIL - SAND Grey, fine to medium grained, sub-angular to sub-rounded, quartz sand; trace silt; trace organics (rootlets).	D	MD			TS: Topsoil	1 1 2 1 2 1 2 2 2 2 1 3 2 3 4 5 4 6 8 9 9 11 11	
			Fill		SP		M						
						FILL - SAND Interbedded dark grey and pale yellow-brown, fine to medium grained, sub-angular to sub-rounded sand; trace silt.							
1	Groundwater Not Intersected	0.7 [+25.4]	Tamala Sand		SP	SAND Yellow-brown, fine to medium grained, sub-angular to sub-rounded, quartz sand; trace silt.		D					1
								VD			1.0 to 1.7m: ASS sample 17.	Refusal	
2													2
		2.4 [+23.7]				Termination Depth = 2.40m (Collapsing)							
3													3

GENERAL LOG 20191018 BORR LOGS.GPJ GHDLIB.GDT 26/2/20

TEST EXCAVATION LOG

Test Pit No.: **TPC63**

Sheet 1 of 1

Client: Main Roads Western Australia
Project: Bunbury Outer Ring Road Project
Geotechnical Investigation
Job No.: 61/37041

Coordinates: **E** 374 070, **N** 6305 034
Ground Surface Elevation: +21.6m AHD **Total Depth:** 2.2m
Commenced: 30-Oct-19 **Completed:** 30-Oct-19
Contractor: Picton Civil

Equipment: 14t wheeled excavator
Bucket Size (m): 0.4
Excavation Width (m): Not Recorded
Excavation Length (m): Not Recorded
Orientation/ Bearing: Not Recorded

Logged:	TF	30-Oct-19
Processed:	VC	26-Feb-20
Checked:		

Depth Scale (m)	Water	Depth (m)/ [Elev.]	Geological Unit	Graphic Log	Classification	Strata Description (type; colour; fines plasticity or particle characteristics; minor components; structure and/or origin)	Moisture Condition	Consistency/ Relative Density	Sample Type & Depth	Sample No.	Sample/Test Records & Comments	PSP Test Results: Blows recorded per interval (0 20 40)	Recorded Blows	Depth Scale (m)
0					SP-SM	TOPSOIL - SAND Dark grey, fine to medium grained, sub-angular to sub-rounded, quartz sand; trace laterite gravel, fine to medium grained; with silt; trace organics (rootlets and fine organics).	D	MD			At 0.1m, large concrete slab (600mm x 600mm x 150mm) found at edge of pit (construction waste).		1 0 1 2 2 2 4 4 6 5 6 5 5 5 5 5 3 5 6 4 5 6 4 5 5 5 4 5 5 4 5 4 5 5 5 7 6	0
		0.2 [+21.4]	Topsoil		SP	SAND Yellow-brown, mottled grey, fine to medium grained, sub-angular to sub-rounded, quartz sand; trace silt increasing with depth.	M	MD-D						
1	Groundwater Not Intersected		Tamala Sand					D-VD						1
								D						
2		2.2 [+19.4]				Termination Depth = 2.20m (Collapsing)					2.0 to 2.2m: ASS sample 18.			2
3														3

TEST EXCAVATION LOG

Test Pit No.: **TPC65**

Sheet 1 of 1

Client: Main Roads Western Australia
Project: Bunbury Outer Ring Road Project
Geotechnical Investigation
Job No.: 61/37041

Coordinates: **E** 373 798, **N** 6305 125
Ground Surface Elevation: +6.4m AHD **Total Depth:** 2.7m
Commenced: 02-Nov-19 **Completed:** 02-Nov-19
Contractor: Picton Civil

Equipment: 14t wheeled excavator
Excavation Width (m): Not Recorded
Excavation Length (m): Not Recorded
Bucket Size (m): 0.4
Orientation/ Bearing: Not Recorded

Logged:	TF	02-Nov-19
Processed:	VC	26-Feb-20
Checked:		

Depth Scale (m)	Water	Depth (m)/ [Elev.]	Geological Unit	Graphic Log	Classification	Strata Description (type; colour; fines plasticity or particle characteristics; minor components; structure and/or origin)	Moisture Condition	Consistency/ Relative Density	Sample Type & Depth	Sample No.	Sample/Test Records & Comments	PSP Test Results: Blows recorded per interval (0 20 40) / Recorded Blows	Depth Scale (m)
0		0.2 [+6.3]	TS		SP	TOPSOIL - SAND Grey, fine to medium grained, sub-angular to sub-rounded, quartz sand; trace silt; trace organics (rootlets).	M	MD			TS: Topsoil	1 0 1 1 1 1 1 2 1 1 1 2 1 2 1 2 2 1 2 2 3 2 2 3 2 3 2 3 3 3 4 4 4 4 5 4 4	0
					SP	SAND Pale yellow-brown, fine to coarse grained, sub-angular to sub-rounded, quartz sand; trace silt.			0.40 – 0.70	B	0.4 to 0.7m: 2x Bulk disturbed samples.		
1	Groundwater Not Intersected		Tamala Sand										1
								D			2.0 to 2.1m: ASS sample 38.		
2						From 2.3m, yellow-brown, fine to coarse grained sand; trace fine grained, sub-angular gravel.							2
		2.7 [+3.7]				Termination Depth = 2.70m (Collapsing)							
3													3

TEST EXCAVATION LOG

Test Pit No.: **TPC68**

Sheet 1 of 1

Client: Main Roads Western Australia
Project: Bunbury Outer Ring Road Project
Geotechnical Investigation
Job No.: 61/37041

Coordinates: **E** 375 414, **N** 6303 286
Ground Surface Elevation: +20.0m AHD **Total Depth:** 2.6m
Commenced: 31-Oct-19 **Completed:** 31-Oct-19
Contractor: Picton Civil

Equipment: 14t wheeled excavator
Bucket Size (m): 0.4
Excavation Width (m): Not Recorded
Excavation Length (m): Not Recorded
Orientation/ Bearing: Not Recorded

Logged:	TF	31-Oct-19
Processed:	VC	26-Feb-20
Checked:		

Depth Scale (m)	Water	Depth (m)/ [Elev.]	Geological Unit	Graphic Log	Classification	Strata Description (type; colour; fines plasticity or particle characteristics; minor components; structure and/or origin)	Moisture Condition	Consistency/ Relative Density	Sample Type & Depth	Sample No.	Sample/Test Records & Comments
0		0.2 [+19.8]	Topsoil		SP	TOPSOIL - SAND Dark grey, fine to medium grained, sub-angular to sub-rounded, quartz sand; trace silt; trace organics (rootlets).	M	L-MD			
		0.9	Bassendean Sand		SP	SAND Dark grey, fine to coarse grained, sub-angular to sub-rounded, quartz sand; trace silt.			0.30 0.60	B	0.3 to 0.6m: 2x Bulk disturbed samples.
		1.5 [+19.1]	Coffee Rock/BS		SP-SM	SAND Dark brown, fine to coarse grained, sub-angular to angular sand; weakly iron cemented; with silt. From 1.1m, becoming brown and not cemented.	W	MD-D	1.00 1.20	D	0.8 to 0.9m: ASS sample 22. CR: Coffee Rock 1.0 to 1.2m: 1x Disturbed sample. 1.2 to 1.3m: ASS sample 23.
		1.7 [+18.5]			SP-SM	SAND Yellow, fine to medium grained, sub-angular to sub-rounded sand; with silt.	M		1.50 1.70	D	1.5 to 1.7m: 1x Disturbed sample. 1.6 to 1.7m: ASS sample 24.
		2.0 [+18.3]	Guildford Formation		SC	Clayey SAND Grey, fine to coarse grained, sub-rounded sand; medium plasticity fines.		D	1.70 1.90	D	1.7 to 1.9m: 1x Disturbed sample. 1.8 to 1.9m: ASS sample 25.
		2.3 [+18.0]			CL	CLAY Pale grey, low plasticity fines; laminated; with fine to coarse grained sand.	w< PL	VSt	2.00 2.20	D	2.0 to 2.2m: 1x Disturbed sample. 2.1 to 2.2m: ASS sample 26.
		2.6 [+17.7]			CL-CL	Sandy CLAY Blue-grey, low to medium plasticity fines; fine to coarse grained, sub-angular to sub-rounded sand.			2.30 2.50	D	2.3 to 2.5m: 1x Disturbed sample. 2.4 to 2.5m: ASS sample 27.
		[+17.4]				Termination Depth = 2.60m (Collapsing)					

DCP Test Results
Blows recorded per interval
0 20 40
Recorded Blows
0 1 0 1 1 1 1 1 1 1 1 1 1 1 1 0 1 1 1 0 1 1 2 5 2 2 2 3 2 4 4 6 5 6 4 3 4 5 5 5 3 4

TEST EXCAVATION LOG

Test Pit No.: **TPC70**

Sheet 1 of 1

Client: Main Roads Western Australia
Project: Bunbury Outer Ring Road Project
Geotechnical Investigation
Job No.: 61/37041

Coordinates: **E** 375 348, **N** 6302 782
Ground Surface Elevation: +20.3m AHD **Total Depth:** 3.0m
Commenced: 31-Oct-19 **Completed:** 31-Oct-19
Contractor: Picton Civil

Equipment: 14t wheeled excavator
Bucket Size (m): 0.4
Excavation Width (m): Not Recorded
Excavation Length (m): Not Recorded
Orientation/ Bearing: Not Recorded

Logged:	TF	31-Oct-19
Processed:	VC	26-Feb-20
Checked:		

Depth Scale (m)	Water	Depth (m)/ [Elev.]	Geological Unit	Graphic Log	Classification	Strata Description (type; colour; fines plasticity or particle characteristics; minor components; structure and/or origin)	Moisture Condition	Consistency/ Relative Density	Sample Type & Depth	Sample No.	Sample/Test Records & Comments
		0.2 [+20.1]	Topsoil		SP	TOPSOIL - SAND Grey, fine to coarse grained, sub-angular to sub-rounded, quartz sand; trace silt; trace organics (fine grined organics and rootlets).	D	VL			
			Bassendean Sand		SP	SAND Yellow-brown, fine to coarse grained, sub-angular to sub-rounded, quartz sand; trace silt; trace coarse gravel-sized nodules of weakly iron cemented sand.	M	MD-D	0.50 – 0.80	B	0.5 to 0.8m: 2x Bulk disturbed samples. 0.5 to 0.8m: ASS sample 28.
	▶	0.8 [+19.5]	Guildford Formation		SC	Clayey SAND Orange-grey, fine to coarse grained, sub-angular to sub-rounded sand; low pasticity fines.					0.8 to 0.9m: ASS sample 29.
1		1.0 [+19.3]			SM	Silty SAND Pale yellow-grey, fine to coarse grained, sub-angular to sub-rounded sand; low plasticity fines; with pockets of Sandy CLAY, mottled blue-grey and orange, medium plasticity fines; fine to coarse grained, sub-angular to sub-rounded sand.		D			1.4 to 1.5m: ASS sample 30.
		1.9 [+18.4]			CI	CLAY Mottled blue-grey and orange, medium plasticity fines; with fine to coarse grained, sub-angular to sub-rounded sand.	w< PL	MD-D St-VSt			2.4 to 2.5m: ASS sample 31.
2											
3		3.0 [+17.3]				Termination Depth = 3.00m (Target Depth)					

DCP Test Results
Blows recorded per interval
0 20 40 Recorded Blows
0 0 1 0 1 1 2 3 4 7 5 6 4 4 3 3 2 2 2 1 4 4 5 6 4 6 4 5 5 5 3 4 2 2 2 3 3 2 2

TEST EXCAVATION LOG

Test Pit No.: **TPC71**

Sheet 1 of 1

Client: Main Roads Western Australia
Project: Bunbury Outer Ring Road Project
Geotechnical Investigation
Job No.: 61/37041

Coordinates: **E** 375 346, **N** 6302 518
Ground Surface Elevation: +21.7m AHD **Total Depth:** 2.5m
Commenced: 01-Nov-19 **Completed:** 01-Nov-19
Contractor: Picton Civil

Equipment: 14t wheeled excavator
Excavation Width (m): Not Recorded
Excavation Length (m): Not Recorded
Bucket Size (m): 0.4
Orientation/ Bearing: Not Recorded

Logged:	TF	01-Nov-19
Processed:	VC	26-Feb-20
Checked:		

Depth Scale (m)	Water	Depth (m)/ [Elev.]	Geological Unit	Graphic Log	Classification	Strata Description (type; colour; fines plasticity or particle characteristics; minor components; structure and/or origin)	Moisture Condition	Consistency/ Relative Density	Sample Type & Depth	Sample No.	Sample/Test Records & Comments
0		0.3 [+21.5]	Topsoil		SP	TOPSOIL - SAND Grey, fine to coarse grained, sub-angular to sub-rounded, quartz sand; trace silt; trace organics (rootlets).	D	MD			
			Bassendean Sand		SP	SAND Pale yellow-brown, fine to coarse grained, sub-angular to sub-rounded sand; trace silt; trace fine grained, sub-angular gravel; trace organics (roots).	M		0.40 – 0.70	B	0.4 to 0.7m: 2x Bulk disturbed samples.
1	Groundwater Not Intersected					From 1.1m, yellow-brown; no gravel; no organics.			1.60 – 1.80	D	1.6 to 1.8m: 1x Disturbed sample.
2						From 2.2m, pale grey.	W		2.30 – 2.50	D	2.3 to 2.5m: 1x Disturbed sample. 2.3 to 2.4m: ASS sample 35.
		2.5 [+19.2]				Termination Depth = 2.50m (Collapsing)					
3											

PSP Test Results

Blows recorded per interval

0 20 40

Recorded Blows

1 0 1 1 1 1 2 1 2 2 2 1 1 1 0 1 1 1 3 2 2 4 3 3 4 3 2 3 3 2 3 3 2 2 3 2 2 4 3

TEST EXCAVATION LOG

Test Pit No.: **TPC72**

Sheet 1 of 1

Client: Main Roads Western Australia
Project: Bunbury Outer Ring Road Project
Geotechnical Investigation
Job No.: 61/37041

Coordinates: **E** 375 266, **N** 6302 198
Ground Surface Elevation: +20.7m AHD **Total Depth:** 2.5m
Commenced: 01-Nov-19 **Completed:** 01-Nov-19
Contractor: Picton Civil

Equipment: 14t wheeled excavator
Bucket Size (m): 0.4
Excavation Width (m): Not Recorded
Excavation Length (m): Not Recorded
Orientation/ Bearing: Not Recorded

Logged:	TF	01-Nov-19
Processed:	VC	26-Feb-20
Checked:		

Depth Scale (m)	Water	Depth (m)/ [Elev.]	Geological Unit	Graphic Log	Classification	Strata Description (type; colour; fines plasticity or particle characteristics; minor components; structure and/or origin)	Moisture Condition	Consistency/ Relative Density	Sample Type & Depth	Sample No.	Sample/Test Records & Comments
0		0.2 [+20.5]	Topsoil		SP	TOPSOIL - SAND Grey, fine to medium grained, sub-angular to sub-rounded, quartz sand; trace silt; trace organics (rootlets).	M	L-MD			
			Bassendean Sand		SP	SAND Brown, fine to medium grained, sub-angular to sub-rounded sand; trace silt.					
1	▸	1.0 [+19.7]	Guildford Formation		CH	Sandy CLAY Mottled orange-brown and grey, high plasticity fines; fine to coarse grained, sub-angular to angular sand.	w< PL	St-VSt	1.90 2.20	B	1.9 to 2.2m: 2x Bulk disturbed samples. 2.2 to 2.3m: ASS sample 33.
2		2.5 [+18.2]				Termination Depth = 2.50m (Refusal)					2.5m, refusal on volcanic rock.
3											

DCP Test Results

Blows recorded per interval

0 20 40

Recorded Blows

0 1 0 1 1 1 1 0 1 1 0 1 1 1 1 1 0 0 1 0 1 1 2 2 3 3 2 1 1 2

Refusal - Hammer bouncing

GENERAL LOG 20191018 BORR LOGS.GPJ GHDLIB.GDT 26/2/20

TEST EXCAVATION LOG

Test Pit No.: **TPC73**

Sheet 1 of 1

Client: Main Roads Western Australia
Project: Bunbury Outer Ring Road Project
Geotechnical Investigation
Job No.: 61/37041

Coordinates: **E** 375 148, **N** 6301 773
Ground Surface Elevation: +21.1m AHD **Total Depth:** 2.6m
Commenced: 31-Oct-19 **Completed:** 31-Oct-19
Contractor: Picton Civil

Equipment: 14t wheeled excavator
Excavation Width (m): Not Recorded
Excavation Length (m): Not Recorded
Bucket Size (m): 0.4
Orientation/ Bearing: Not Recorded

Logged:	TF	31-Oct-19
Processed:	VC	26-Feb-20
Checked:		

Depth Scale (m)	Water	Depth (m)/ [Elev.]	Geological Unit	Graphic Log	Classification	Strata Description (type; colour; fines plasticity or particle characteristics; minor components; structure and/or origin)	Moisture Condition	Consistency/ Relative Density	Sample Type & Depth	Sample No.	Sample/Test Records & Comments	PSP Test Results: Blows recorded per interval (0 / 20 / 40) — Recorded Blows	Depth Scale (m)
1	Groundwater Not Intersected	0.2 [+20.9]	Topsoil		SP	TOPSOIL - SAND Grey, fine to medium grained, sub-angular to sub-rounded, quartz sand; trace silt; trace organics (rootlets).	M	MD				1 1 1 1 1 1 1 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 1 1 2 1 2 1 2 1 2 1 2 1 2 2 1 1 2 2 2 2 2 2 2 2 2 2	1
			Bassendean Sand		SP	SAND Mottled pale yellow and grey, fine to coarse grained, sub-angular to sub-rounded, quartz sand; trace silt. From 0.7m, yellow-brown.			0.30 0.60	B	0.3 to 0.6m: 2x Bulk disturbed samples. 2.4 to 2.5m: ASS disturbed sample 32.		
2													2
		2.6 [+18.5]				Termination Depth = 2.60m (Collapsing)							
3													3

TEST EXCAVATION LOG

Test Pit No.: **TPC74**

Sheet 1 of 1

Client: Main Roads Western Australia
Project: Bunbury Outer Ring Road Project
Geotechnical Investigation
Job No.: 61/37041

Coordinates: **E** 374 804, **N** 6301 378
Ground Surface Elevation: +19.9m AHD **Total Depth:** 2.2m
Commenced: 01-Nov-19 **Completed:** 01-Nov-19
Contractor: Picton Civil

Equipment: 14t wheeled excavator
Bucket Size (m): 0.4
Excavation Width (m): Not Recorded
Excavation Length (m): Not Recorded
Orientation/ Bearing: Not Recorded

Logged:	TF	01-Nov-19
Processed:	VC	26-Feb-20
Checked:		

Depth Scale (m)	Water	Depth (m)/ [Elev.]	Geological Unit	Graphic Log	Classification	Strata Description (type; colour; fines plasticity or particle characteristics; minor components; structure and/or origin)	Moisture Condition	Consistency/ Relative Density	Sample Type & Depth	Sample No.	Sample/Test Records & Comments
0		0.3 [+19.7]	Topsoil		SP	TOPSOIL - SAND Grey, fine to medium grained, sub-angular to sub-rounded, quartz sand; trace silt; trace organics (rootlets).	M	L-MD			
			Bassendean Sand		SP	SAND Pale grey, fine to coarse grained, sub-angular to sub-rounded, quartz sand; trace silt.	D-M	MD	0.40 – 0.70	B	0.4 to 0.7m: 2x Bulk disturbed samples.
1		1.9 [+18.0]	CR		SP-SM	SAND Dark brown, fine to medium grained, sub-angular to sub-rounded sand; weakly iron cemented; with silt.			2.00 – 2.20	D	CR: Coffee Rock 2.0 to 2.2m: 1x Disturbed sample. 2.0 to 2.1m: ASS sample 34.
2		2.2 [+17.7]				Termination Depth = 2.20m (Collapsing)					
3											

PSP Test Results
Blows recorded per interval
0 20 40
Recorded Blows
1 0 1 0 1 1 1 1 1 1 1 1 1 1 2 1 1 1 2 1 2 2 2 1 3 2 3 3 3 2 3 2 2 2 2 2

APPENDIX D

Calibration certificates

AirMet Scientific P/L

Calibration Certificate

This document certifies that the instrument detailed has been calibrated to the parameters

Certificate Print Date: 17-Jun-2019
Calibration Date: 17-Jun-2019
Next Calibration Due: 17-Jun-2020

Call ID / Order No:
Job No / Pack No:

Customer: AMS SA Rental-ID 399986 **Serial No:** 15J101500
Description: Xylem ProDSS Handheld with GPS

Calibration Summary

Frequency: Yearly **Temp:** 0°C **As Found:** Out of Tolerance **Result:** Pass
Humidity: 0% **Certificate:**

Desc	As Found Actual	As Found Result	As Left (Cal Status) Actual	As Left (Cal Status) Result
PH4	3.95	Pass	4.0	Pass
PH7	6.9	Pass	6.99	Pass
Specific Conductivity	3048.0	Fail	2444.0	Pass
DO Zero	0.5	Pass	0.0	Pass
DO %	95.9	Pass	99.4	Pass
Turbidity 100	143.7	Fail	100.0	Pass
Turbidity 0	2.7	Fail	0.0	Pass

Standard Used

Equip ID	Description	Valid Until	Cert
WATSOL ORP	Zobell Solution	29/10/2019	312984
WATSOL CON	2760 µS/cm @25 degrees celcius	01/08/2019	315529
320612	PH4 (pH = 4.01 +/- 0.02 @ 25 deg)	29/10/2019	
WATSOL pH7	pH 7.0 @ 25 degrees celsius	29/10/2019	317272
WATSOL Turb	100 NTU	29/10/2019	306033

Completed By: Edwin Caronongan **Signed:**

eDoc V1R0

xylem Analytics

ProDSS Handheld Water Quality Meter

This instrument has been tested and calibrated to factory specifications, as detailed below:

Parameter	Standard	Result	Standard	Result	Standard	Result
Temperature	Control:	20.318 ± 0.05 °C	Instrument:	20.2	±0.2 °C ?	✓
Specific Conductivity	10mS /cm	10.003	Cell Constant:	5.14	QC Pass?	✓
Dissolved O_2	Saturated air	-	100.6 % @ 764.5 mmHg	100.6	QC Pass?	✓
Dissolved O_2	Zero check	0.2%	< 2% ?	✓	-	-
pH	7.01	7.01	10.03	10.03	4.00	4.00
pH mV	Offset: -50 to +50?	-9.2 ✓	-165 to -180 from offset?	-178.5 ✓	+165 to +180 from offset?	164.6 ✓
ORP (Zobell's)	234.7 mV @ 22.1 °C	234.7	Offset:	11.2	QC Pass?	✓
Depth	Zeroed in air @ — mmHg	NA	Check at: — m	—	± — m ?	—
Turbidity	0 FNU	0.00 ✓	124 FNU	124.01 ✓	QC Pass?	✓

Battery charge: 71 % Initial: DB

Please check that the following items are received and all items are returned. Please clean equipment before retuning.
Please note: A minimum $75 service/repair charge applies to any unclean or damaged items.

Item description	Sent	Received	Returned
Sensor guard	☑	☐	☐
Calibration/Storage cup	☑	☐	☐
Probe weight	☒	☐	☐
Charger wall block	☑	☐	☐
Charger wall block plug	☑	☐	☐
USB charging/download cable	☑	☐	☐
Thumb drive (manuals & cal certs)	☑	☐	☐
USB to Micro USB adapter	☑	☐	☐
Quick start guide	☒	☐	☐
4 sample bottles	☒	☐	☐
Carry case	☒	☐	☐
Handheld serial #:	18A103388	Rental equipment ID:	A1256
Cable serial #:	16E100902	Rental equipment ID:	A673

Rental booking # 1230187 Checked by: David Boorer Signed: [signature] Date: 10/9/19

xylem
Analytics

Calibration Standards

Standard	Type	Manufacturer	Lot #
1,000 µS/cm	Standard Conductivity Buffer	ACR	
10,000 µS/cm	Standard Conductivity Buffer	ACR	326395
50,000 µS/cm	Standard Conductivity Buffer	ACR	
4 pH	pH 4 Buffer	ACR	325418
7 pH	pH 7 Buffer	ACR	340193
10 pH	pH 10 Buffer	ACR	335400
ORP	Zobell Part A	ACR	326691
ORP	Zobell Part B	ACR	326895
DO Zero	Sodium Sulphite	Chem Supply	301762
Turbidity Zero	Deionised Water	ACR	330551
12.4/12.7 NTU	6072G Turbidity Standard	YSI	
124/126 NTU	6073G Turbidity Standard	YSI	19F19250134
1000/1010 NTU	6074G Turbidity Standard	YSI	
Chlorophyll Zero	Deionised Water	ACR	
Chlorophyll Span	Diluted Rhodamine WT	ACR	
BGA-PC Zero	Deionised Water	ACR	
BGA-PC Span	Diluted Rhodamine WT	ACR	
BGA-PE Zero	Deionised Water	ACR	
BGA-PE Span	Diluted Rhodamine WT	ACR	
1 mg/L Nitrate	Nitrate Standard	ACR	
10 mg/L Nitrate	Nitrate Standard	ACR	
100 mg/L Nitrate	Nitrate Standard	ACR	
1 mg/L Ammonium	Ammonium Standard	ACR	
10 mg/L Ammonium	Ammonium Standard	ACR	
100 mg/L Ammonium	Ammonium Standard	ACR	
Rhodamine Zero	Deionised Water	ACR	
Rhodamine Span	Diluted Rhodamine WT	ACR	

Multi Parameter Water Meter

Instrument YSI Pro DSS
Serial No. 16K103034

airmet

Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments
Battery	Charge Condition	✓	
	Fuses	✓	
	Capacity	✓	
	Recharge OK?	✓	
Switch/keypad	Operation	✓	
Display	Intensity	✓	
	Operation (segments)	✓	
Grill Filter	Condition	✓	
	Seal	✓	
PCB	Condition	✓	
Connectors	Condition	✓	
Sensor	1. pH/ORP	✓	
	2. Turbidity	✓	
	3. Conductivity	✓	
	4. D.O	✓	
	5. Temp	✓	
	6. Depth	x	
Alarms	Beeper		
	Settings		
Software	Version		
Data logger	Operation		
Download	Operation		
Other tests:			

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Sensor	Serial no	Standard Solutions	Certified	Solution Bottle Number	Instrument Reading
EC		Zero in Air			0.002mS/cm
EC		2.76mS		326685	2.76mS/cm
Temp					20.7
pH 4		pH 4.00		324985	4.00
pH 7		pH 7.00		324988	7.02
ORP		240mv @ 20°C		331622 / 330337	236.4
DO		Na^2SO^3 Zero		Holding previous cal	0.20%
DO 100%		100%		Holding previous cal	100%
Turbidity		0 NTU		Holding previous cal	0.3
Turbidity		1000 NTU		Holding previous cal	1012

Calibrated by: **Sebastian Moran**

Calibration date: **15/10/2019**

Next calibration due: **12/04/2020**

ECO Environmental

Environmental monitoring & sampling equipment Rentals and sales.

Tel: +61 8 9328 2900
fax: +61 8 9328 2677
eco@ecoenvironmental.com.au
www.ecoenvironmental.com.au
214 Lord St Perth WA 6000

EQUIPMENT INFORMATION

Instrument: YSIProDSS-1P

Serial Number: 15G100712 (Display)

EQUIPMENT CHECK	Enclosed	Comment
YSI Pro DSS Display	✔	
YSI 4 port Sonde	✔	
- YSI pH / ORP probe	✔	
- YSI-Turbidity Probe	✔	
- YSI Cond/Temp Probe	✔	
- YSI ODO Sensor	✔	
Flow Cell	✔	
Probe Guard & weight	✔	
Storage/Calibration Sleeve (with Gasket)	✔	
Charger & PC Cable	✔	
Instruction Manual & Field Sheets	✔	
Battery Charged 100%	✔	

SENSOR CALIBRATION DETAILS

		Calibration Undertaken		Accuracy	Pass	Fail
Temperature		Factory Calibrated		±0.2°C	✔	
Dissolved Oxygen	✔	100% Saturation		±2%	✔	
		Pressure Compensation		1019 hPa	✔	
Conductivity	✔	1288mS/cm		±0.5%	✔	
	✔	Check linearity at 1.4mS/cm		±0.5%	✔	
Salinity		Auto Calibrated		±1%	✔	
pH	✔	pH 7.00		± 0.2	✔	
	✔	pH 4.00		± 0.2	✔	
ORP	✔	229 mV at 25	°C	±20mV	✔	
Turbidity		0, 124 NTU / FNU Sonde – 15H101896		±0.3 NTU/FNU	✔	

This is to certify that where possible, this instrument has been calibrated in accordance with the manufacturer's calibration procedure as recommended in the instrument service manual.

ECO Standard Rental Terms & Conditions apply to all equipment calibrations.

Regards,

Tim Collins

ECO Environmental Equipment Specialist

Date: 07.11.2019

Multi Parameter Water Meter

Instrument YSI Pro DSS
Serial No. 15J101500

airmet

Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments
Battery	Charge Condition	✓	
	Fuses	✓	
	Capacity	✓	
	Recharge OK?	✓	
Switch/keypad	Operation	✓	
Display	Intensity	✓	
	Operation (segments)	✓	
Grill Filter	Condition	✓	
	Seal	✓	
PCB	Condition	✓	
Connectors	Condition	✓	
Sensor	1. pH/ORP	x	
	2. Turbidity	✓	
	3. Conductivity	✓	
	4. D.O	✓	
	5. Temp	✓	
	6. Depth	x	
Alarms	Beeper		
	Settings		
Software	Version		
Data logger	Operation		
Download	Operation		
Other tests:			

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Sensor	Value	Standard		Instrument Reading
Temperature			*Checked*	18.1 °C
EC	Zero	Air	*Checked*	0.001 mS/cm
EC	2.76mS/cm	326685	Calibrated	2.76 mS/cm
DO Zero	Zero	Sodium sulpite sol	*Checked*	0.1 %
DO 100%	100%	Water saturated air	Holding previous cal	100 %
Turbidity	Zero	Zero	Holding previous cal	0.3
Turbidity	1000 NTU	310308	Holding previous cal	1012

Calibrated by: **Sebastian Moran**

Calibration date: 12/12/2019

Next calibration due: 9/06/2020

Multi Parameter Water Meter

airmet

Air-Met Scientific Pty Ltd
1300 137 067

Instrument YSI Quatro Pro Plus
Serial No. **18J 104 338**

Item	Test	Pass	Comments
Battery	Capacity	✓	
Switch/keypad	Operation	✓	
Display	Intensity	✓	
	Operation (segments)	✓	
	Seal		
Connectors	Condition	✓	
Sensor	1. pH	✓	
	2. ORP in mV	✓	
	3. EC/Temp.	✓	
	4. D.O.	✓	
Alarms	Beeper		
Software	Version		
Data logger	Operation		
Download	Operation		
Other tests:			

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Sensor	Value	Standard		Instrument Reading
Temperature			*Checked*	25.5 °C
pH	pH 7	324988	Calibrated	7.00
pH	pH 4	342091	Calibrated	4.02
EC	Zero	Air	*Checked*	0.001 mS/cm
EC	2.76mS/cm	326685	Calibrated	2.76 mS/cm
ORP (mV)	240mV at 20°C	Zobell 335411 / 335412	Calibrated	231.2 mV
DO Zero	Zero	Sodium sulpite sol 5928	*Checked*	0 %
DO 100%	100%	Water saturated air	Calibrated	100 %

Calibrated by: **Reuben Priest**

Calibration date: **11-Dec-19**

Next calibration due 11-Jan-20

Multi Parameter Water Meter

Instrument **YSI Pro DSS**
Serial No. **18D102527**

airmet

Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments
Battery	Charge Condition	✓	
	Fuses	✓	
	Capacity	✓	
	Recharge OK?	✓	
Switch/keypad	Operation	✓	
Display	Intensity	✓	
	Operation (segments)	✓	
Grill Filter	Condition	✓	
	Seal	✓	
PCB	Condition	✓	
Connectors	Condition	✓	
Sensor	1. pH/ORP	✓	
	2. Turbidity	✓	
	3. Conductivity	✓	
	4. D.O	✓	
	5. Temp	✓	
	6. Depth	x	
Alarms	Beeper		
	Settings		
Software	Version		
Data logger	Operation		
Download	Operation		
Other tests:			

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Sensor	Serial no	Standard Solutions	Certified	Solution Bottle Number	Instrument Reading
EC		Zero in Air			0.002mS/cm
EC		2.76mS		326685	2.76mS/cm
Temp					24.6
pH 4		pH 4.00		324985	4.00
pH 7		pH 7.00		324988	7.02
ORP		240mv @ 20°C		331622 / 330337	231.1
DO		Na^2SO^3 Zero		Holding previous cal	1.5%
DO 100%		100%		Holding previous cal	100%
Turbidity		0 NTU		*Checked*	0.3
Turbidity		1000 NTU		*Checked* (310308)	1048

Calibrated by: **Sebastian Moran**

Calibration date: **15/01/2020**

Next calibration due: **13/07/2020**

APPENDIX E

Summary of results and laboratory certificates

Appendix E
Table E-1 Summary of Acid Sulfate Soil Results

					Field Parameters				ASS - pH	ASS - Acidity Trail		ASS - Potential Acidity		ASS - Acid Base Accounting			
					pH (Field)	pH-FOX	pH Difference (pHF - pHFOX)	Reaction Ratings*	pHKCl	Titratable Actual Acidity	Titratable Actual Acidity (sulfur units)	Chromium Reducible Sulfur	Chromium Reducible Sulphur (acidity units)	Net Acidity (acidity units)	Net Acidity (sulfur units)	Net Acidity (Sulfur Units) Minus ANC	Net Acidity (Acidity Units) Minus ANC
					pH Units	pH Units	pH Units	COMMENT	pH Units	mole H+/t	%S	%S	mole H+/t	mole H+/t	%S	% S	mole H+/t
EQL					0.1	0.1	0.1		0.1	2	0.003	0.005	3	10	0.02	0.02	10
WA DER 2015 ASS Criteria						**<4**			**<4**	**18**	**0.03**	**0.03**	**18**	**18**	**0.03**		
WA DER 2015 Bassendean Sand ASS Criteria						**<3**				**6**	**0.01**	**0.01**	**6**	**6**	**0.01**		
Location	**Sample Depth**	**Sampled Date**	**Field ID**	**Lab Report #**													
BORR MW02	0.5	24/07/2018	MW2_0.5	630927	6	4.3	1.7	2	-	-	-	-	-	-	-	-	-
	1	24/07/2018	MW2_1.0	630927	5.9	4.2	1.7	2	-	-	-	-	-	-	-	-	-
	1.5	24/07/2018	MW2_1.5	630927	5.1	4.1	1	2	-	-	-	-	-	-	-	-	-
	2	24/07/2018	MW2_2.0	630927	5	4.4	0.6	2	-	-	-	-	-	-	-	-	-
	2.5	24/07/2018	MW2_2.5	630927	5	4.6	0.4	2	-	-	-	-	-	-	-	-	-
	3	24/07/2018	MW2_3.0	630927	5.2	4.6	0.6	2	-	-	-	-	-	-	-	-	-
	3	24/07/2018	MW2_3.5	630927	5.5	5.3	0.2	2	-	-	-	-	-	-	-	-	-
	4	24/07/2018	MW2_4.0	630927	6.6	6.1	0.5	2	-	-	-	-	-	-	-	-	-
	4	24/07/2018	MW2_4.5	630927	6.9	7.6	-0.7	2	-	-	-	-	-	-	-	-	-
	5	24/07/2018	MW2_5.0	630927	7.2	6.9	0.3	2	-	-	-	-	-	-	-	-	-
	9	24/07/2018	MW2_9.0	630927	7.6	6.3	1.3	2	-	-	-	-	-	-	-	-	-
BORR MW04	0.5	3/09/2018	MW04_0.5	630927	6.9	**3.9**	3	3	-	-	-	-	-	-	-	-	-
	1	3/09/2018	MW04_1.0	630927	6.5	5.2	1.3	3	-	-	-	-	-	-	-	-	-
	1.5	3/09/2018	MW04_1.5	630927	7.1	6.7	0.4	2	-	-	-	-	-	-	-	-	-
	2	3/09/2018	MW04_2.0	630927	7.9	7	0.9	2	-	-	-	-	-	-	-	-	-
	2.5	3/09/2018	MW04_2.5	630927	8.6	7.1	1.5	2	-	-	-	-	-	-	-	-	-
	3	3/09/2018	MW04_3.0	630927	7.8	6.6	1.2	2	-	-	-	-	-	-	-	-	-
	3.5	3/09/2018	MW04_3.5	630927	7.5	6.7	0.8	2	-	-	-	-	-	-	-	-	-
	4	3/09/2018	MW04_4.0	630927	7.1	6.6	0.5	2	-	-	-	-	-	-	-	-	-
	4.5	3/09/2018	MW04_4.5	630927	7.2	6.8	0.4	2	-	-	-	-	-	-	-	-	-
	5	3/09/2018	MW04_5.0	630927	7.8	7.1	0.7	2	-	-	-	-	-	-	-	-	-
	12	3/09/2018	MW04_12.0	630927	9.5	9.1	0.4	4	-	-	-	-	-	-	-	-	-
BORR MW05	0.5	24/07/2018	MW5_0.5	630927	7.9	6.3	1.6	2	-	-	-	-	-	-	-	-	-
	1	24/07/2018	MW5_1.0	630927	7.7	6.2	1.5	2	-	-	-	-	-	-	-	-	-
	1.5	24/07/2018	MW5_1.5	630927	7.5	6.3	1.2	2	-	-	-	-	-	-	-	-	-
	2	24/07/2018	MW5_2.0	630927	7.5	6.2	1.3	2	-	-	-	-	-	-	-	-	-
	2.5	24/07/2018	MW5_2.5	630927	7.4	6.2	1.2	2	-	-	-	-	-	-	-	-	-
	3	24/07/2018	MW5_3.0	630927/ 697821	7.2	6	1.2	2	6.2	<2	<0.003	<0.005	<3	<10	<0.02	<0.02	<10
	3.5	24/07/2018	MW5_3.5	630927	7.1	6.1	1	2	-	-	-	-	-	-	-	-	-
	4	24/07/2018	MW5_4.0	630927	7.2	5.8	1.4	2	-	-	-	-	-	-	-	-	-
	4.5	24/07/2018	MW5_4.5	630927	6.9	6	0.9	2	-	-	-	-	-	-	-	-	-
	5	24/07/2018	MW5_5.0	630927/ 697821	7.1	6	1.1	2	6	<2	<0.003	<0.005	<3	<10	<0.02	<0.02	<10

Appendix E

Table E-1 Summary of Acid Sulfate Soil Results

Main Roads WA
Bunbury Outer Ring Road
BORR

					Field Paramete				ASS - pH	ASS - Acidity Trail		ASS - Potential Acidity		ASS - Acid Base Accounting			
					pH (Field)	pH-FOX	pH Difference (pHF - pHFOX)	Reaction Ratings*	pHKCl	Titratable Actual Acidity	Titratable Actual Acidity (sulfur units)	Chromium Reducible Sulfur	Chromium Reducible Sulphur (acidity units)	Net Acidity (acidity units)	Net Acidity (sulfur units)	Net Acidity (Sulfur Units) Minus ANC	Net Acidity (Acidity Units) Minus ANC
					pH Units	pH Units	pH Units	COMMENT	pH Units	mole H+/t	%S	%S	mole H+/t	mole H+/t	%S	% S	mole H+/t
EQL					0.1	0.1	0.1		0.1	2	0.003	0.005	3	10	0.02	0.02	10
WA DER 2015 ASS Criteria						**<4**			**<4**	**18**	**0.03**	**0.03**	**18**	**18**	**0.03**		
WA DER 2015 Bassendean Sand ASS Criteria						**<3**				**6**	**0.01**	**0.01**	**6**	**6**	**0.01**		
Location	**Sample Depth**	**Sampled Date**	**Field ID**	**Lab Report #**													
	8	24/07/2018	MW5_8.0	630927/ 697821	7.7	**2.4**	5.3	4	5.2	4	0.01	**0.092**	**57**	**61**	**0.1**	0.1	61
BORR MW06	0.5	17/07/2018	MW06_0.5	697821	6.6	5.7	0.9	2	-	-	-	-	-	-	-	-	-
	1	17/07/2018	MW06_1.0	699645/ 697821	6.4	5.2	1.2	2	6	<2	<0.003	<0.005	<3	<10	<0.02	<0.02	<10
	1.5	17/07/2018	MW06_1.5	697821	6.7	5.9	0.8	2	-	-	-	-	-	-	-	-	-
	2	17/07/2018	MW06_2.0	697821	6.7	5.8	0.9	2	-	-	-	-	-	-	-	-	-
	2.5	17/07/2018	MW06_2.5	697821	7.1	5.9	1.2	2	-	-	-	-	-	-	-	-	-
	3	17/07/2018	MW06_3.0	697821	6.8	5.9	0.9	2	-	-	-	-	-	-	-	-	-
	3.5	17/07/2018	MW06_3.5	697821/ 699645	6.5	5.7	0.8	2	6.2	<2	<0.003	<0.005	<3	<10	<0.02	<0.02	<10
	4	17/07/2018	MW06_4.0	697821	6.9	5.7	1.2	2	-	-	-	-	-	-	-	-	-
	4.5	17/07/2018	MW06_4.5	697821	6.8	5.6	1.2	2	-	-	-	-	-	-	-	-	-
	5	17/07/2018	MW06_5.0	697821	6.9	5.9	1	2	-	-	-	-	-	-	-	-	-
	5.5	17/07/2018	MW06_5.5	697821/ 699645	4.2	**3.4**	0.8	2	5.6	<2	<0.003	<0.005	<3	<10	<0.02	<0.02	<10
	6	17/07/2018	MW06_6.0	697821	3.7	**3.1**	0.6	2	-	-	-	-	-	-	-	-	-
	7	17/07/2018	MW06_7.0	697821	4.7	**3.6**	1.1	2	-	-	-	-	-	-	-	-	-
	8	17/07/2018	MW06_8.0	697821/ 699645	4.7	**3.5**	1.2	2	5.5	5.3	0.01	<0.005	<3	<10	<0.02	<0.02	<10
BORR MW07	1	23/07/2018	MW7_1.0	630927	6.5	4.5	2	2	-	-	-	-	-	-	-	-	-
	1.5	23/07/2018	MW7_1.5	630927	6.6	5.5	1.1	2	-	-	-	-	-	-	-	-	-
	2	23/07/2018	MW7_2.0	630927	6.6	5.7	0.9	2	-	-	-	-	-	-	-	-	-
	2.5	23/07/2018	MW07_2.5	697821/ 630927	6.2	5.3	0.9	2	6	<2	<0.003	<0.005	<3	<10	<0.02	<0.02	<10
	3	23/07/2018	MW7_3.0	630927	6	5.4	0.6	2	-	-	-	-	-	-	-	-	-
	3.5	23/07/2018	MW7_3.5	630927	6.2	5.3	0.9	2	-	-	-	-	-	-	-	-	-
	4	23/07/2018	MW7_4.0	630927	6.2	5.5	0.7	2	-	-	-	-	-	-	-	-	-
	4.5	23/07/2018	MW7_4.5	630927	6.1	5.5	0.6	2	-	-	-	-	-	-	-	-	-
	5	23/07/2018	MW7_5.0	630927/ 697821	6.1	5.5	0.6	2	5.9	<2	<0.003	<0.005	<3	<10	<0.02	<0.02	<10
	10	23/07/2018	MW7_10.0	697821/ 630927	6.7	5.8	0.9	2	5.9	<2	<0.003	<0.005	<3	<10	<0.02	<0.02	<10
BORR MW08	0.5	24/07/2018	MW08_0.5	697821/ 630927	7.2	5.5	1.7	2	6.3	<2	<0.003	<0.005	<3	<10	<0.02	<0.02	<10
	1	24/07/2018	MW8_1.0	630927	6.9	5.2	1.7	2	-	-	-	-	-	-	-	-	-
	1.5	24/07/2018	MW8_1.5	630927	6.5	6	0.5	2	-	-	-	-	-	-	-	-	-
	2	24/07/2018	MW08_2.0	697821/ 630927	6.8	6.1	0.7	2	6.1	<2	<0.003	<0.005	<3	<10	<0.02	<0.02	<10
	2.5	24/07/2018	MW8_2.5	630927	6.9	5.9	1	2	-	-	-	-	-	-	-	-	-
	3	24/07/2018	MW8_3.0	630927	6.7	5.9	0.8	2	-	-	-	-	-	-	-	-	-
	3.5	24/07/2018	MW8_3.5	630927	6.8	5.9	0.9	2	-	-	-	-	-	-	-	-	-
	4	24/07/2018	MW8_4.0	630927	6.7	5.9	0.8	2	-	-	-	-	-	-	-	-	-
	4.5	24/07/2018	MW8_4.5	630927	6.9	5.9	1	2	-	-	-	-	-	-	-	-	-

Appendix E

Table E-1 Summary of Acid Sulfate Soil Results

Main Roads WA
Bunbury Outer Ring Road
BORR

					Field Paramete				ASS - pH	ASS - Acidity Trail		ASS - Potential Acidity		ASS - Acid Base Accounting			
					pH (Field)	pH-FOX	pH Difference (pHF - pHFOX)	Reaction Ratings*	pHKCl	Titratable Actual Acidity	Titratable Actual Acidity (sulfur units)	Chromium Reducible Sulfur	Chromium Reducible Sulphur (acidity units)	Net Acidity (acidity units)	Net Acidity (sulfur units)	Net Acidity (Sulfur Units) Minus ANC	Net Acidity (Acidity Units) Minus ANC
					pH Units	pH Units	pH Units	COMMENT	pH Units	mole H+/t	%S	%S	mole H+/t	mole H+/t	%S	% S	mole H+/t
EQL					0.1	0.1	0.1		0.1	2	0.003	0.005	3	10	0.02	0.02	10
WA DER 2015 ASS Criteria						**<4**			**<4**	**18**	**0.03**	**0.03**	**18**	**18**	**0.03**		
WA DER 2015 Bassendean Sand ASS Criteria						**<3**				**6**	**0.01**	**0.01**	**6**	**6**	**0.01**		
Location	**Sample Depth**	**Sampled Date**	**Field ID**	**Lab Report #**													
	5	24/07/2018	MW8_5.0	630927	6.9	6	0.9	2	-	-	-	-	-	-	-	-	-
	13	24/07/2018	MW08_13.0	697821/ 630927	9.6	10	-0.4	4	9.4	<2	<0.003	<0.005	<3	<10	<0.02	<0.02	<10
BORR MW08a	0.5	17/07/2018	MW08a_0.5	699645/ 697821	4.4	**3.3**	1.1	2	5.6	3.4	0.01	<0.005	<3	<10	<0.02	<0.02	<10
	1	24/07/2018	MW08a_1.0	697821	6.8	5.4	1.4	2	-	-	-	-	-	-	-	-	-
	1.5	17/07/2018	MW08a_1.5	699645/ 697821	7	4.8	2.2	2	6	<2	<0.003	<0.005	<3	<10	<0.02	<0.02	<10
	2	24/07/2018	MW08a_2.0	697821	6.9	5.9	1	2	-	-	-	-	-	-	-	-	-
	2.5	24/07/2018	MW08a_2.5	697821	6.4	5.7	0.7	2	-	-	-	-	-	-	-	-	-
	3	24/07/2018	MW08a_3.0	697821	6.4	5.2	1.2	2	-	-	-	-	-	-	-	-	-
	3.5	17/07/2018	MW08a_3.5	699645/ 697821	6	**3.6**	2.4	2	5.6	2.6	<0.003	<0.005	<3	<10	<0.02	<0.02	<10
	4	24/07/2018	MW08a_4.0	697821	6.4	**3.5**	2.9	2	-	-	-	-	-	-	-	-	-
	4.5	24/07/2018	MW08a_4.5	697821	6.7	4.9	1.8	2	-	-	-	-	-	-	-	-	-
	5	17/07/2018	MW08a_5.0	699645/ 697821	6.7	**3.9**	2.8	2	6.2	<2	<0.003	<0.005	<3	<10	<0.02	<0.02	<10
	5.5	24/07/2018	MW08a_5.5	697821	6.7	**2.7**	4	2	-	-	-	-	-	-	-	-	-
	6	17/07/2018	MW08a_6.0	699645/ 697821	6.9	**2.8**	4.1	2	6	<2	<0.003	0.022	14	14	0.02	0.02	14
BORR MW09	0.5	25/07/2018	MW9_0.5	630927	6.3	7.7	-1.4	2	-	-	-	-	-	-	-	-	-
	1	25/07/2018	MW9_1.0	630927/ 697821	6.1	4.2	1.9	2	5.4	3.1	<0.003	<0.005	<3	<10	<0.02	<0.02	<10
	1.5	25/07/2018	MW9_1.5	630927	6.2	5.1	1.1	1	-	-	-	-	-	-	-	-	-
	2	25/07/2018	MW9_2.0	630927	6.4	5.1	1.3	1	-	-	-	-	-	-	-	-	-
	2.5	25/07/2018	MW9_2.5	630927/ 697821	6.5	5.5	1	2	5.8	<2	<0.003	<0.005	<3	<10	<0.02	<0.02	<10
	3	25/07/2018	MW9_3.0	630927	6.4	5.3	1.1	2	-	-	-	-	-	-	-	-	-
	3.5	25/07/2018	MW9_3.5	630927/ 697821	6.1	5.4	0.7	2	5.9	<2	<0.003	<0.005	<3	<10	<0.02	<0.02	<10
	4	25/07/2018	MW9_4.0	630927	6.7	5.7	1	2	-	-	-	-	-	-	-	-	-
	4.5	25/07/2018	MW9_4.5	630927	6.7	5.7	1	1	-	-	-	-	-	-	-	-	-
	5	25/07/2018	MW9_5.0	630927	6.8	5.8	1	2	-	-	-	-	-	-	-	-	-
	5.5	25/07/2018	MW9_5.5	630927/ 697821	6.4	5.7	0.7	2	5.8	<2	<0.003	<0.005	<3	<10	<0.02	<0.02	<10
BORR MW10	0.5	25/07/2018	MW10_0.5	630927	9.6	7.6	2	2	-	-	-	-	-	-	-	-	-
	1	25/07/2018	MW10_1.0	630927/ 697821	9.6	7.3	2.3	2	6.6	<2	<0.003	<0.005	<3	<10	<0.02	<0.02	<10
	1.5	25/07/2018	MW10_1.5	630927	7.9	6.5	1.4	2	-	-	-	-	-	-	-	-	-
	2	25/07/2018	MW10_2.0	630927/ 697821	6.9	6	0.9	2	5.7	6.3	0.01	<0.005	<3	<10	<0.02	<0.02	<10
	2.5	25/07/2018	MW10_2.5	630927	6.7	5.3	1.4	2	-	-	-	-	-	-	-	-	-
	3	25/07/2018	MW10_3.0	630927/ 697821	6.4	5.3	1.1	2	5.9	<2	<0.003	<0.005	<3	<10	<0.02	<0.02	<10
	3.5	25/07/2018	MW10_3.5	630927/ 697821	6.1	**2.5**	3.6	4	5.5	<2	<0.003	0.023	14	14	0.02	0.02	14
	4	25/07/2018	MW10_4.0	630927	7.7	**3**	4.7	4	-	-	-	-	-	-	-	-	-
BORR MW11	0.5	25/07/2018	MW11_0.5	630927/ 697821	7.3	4.8	2.5	2	6.1	<2	<0.003	<0.005	<3	<10	<0.02	<0.02	<10

Appendix E
Table E-1 Summary of Acid Sulfate Soil Results

Main Roads WA
Bunbury Outer Ring Road
BORR

					Field Paramete				ASS - pH	ASS - Acidity Trail		ASS - Potential Acidity		ASS - Acid Base Accounting			
					pH (Field)	pH-FOX	pH Difference (pHF - pHFOX)	Reaction Ratings*	pHKCl	Titratable Actual Acidity	Titratable Actual Acidity (sulfur units)	Chromium Reducible Sulfur	Chromium Reducible Sulphur (acidity units)	Net Acidity (acidity units)	Net Acidity (sulfur units)	Net Acidity (Sulfur Units) Minus ANC	Net Acidity (Acidity Units) Minus ANC
					pH Units	pH Units	pH Units	COMMENT	pH Units	mole H+/t	%S	%S	mole H+/t	mole H+/t	%S	% S	mole H+/t
EQL					0.1	0.1	0.1		0.1	2	0.003	0.005	3	10	0.02	0.02	10
WA DER 2015 ASS Criteria						**<4**			**<4**	**18**	**0.03**	**0.03**	**18**	**18**	**0.03**		
WA DER 2015 Bassendean Sand ASS Criteria						**<3**				**6**	**0.01**	**0.01**	**6**	**6**	**0.01**		
Location	**Sample Depth**	**Sampled Date**	**Field ID**	**Lab Report #**													
	1	25/07/2018	MW11_1.0	630927	7.2	5.6	1.6	2	-	-	-	-	-	-	-	-	-
	1.5	25/07/2018	MW11_1.5	630927	8.9	5.8	3.1	2	-	-	-	-	-	-	-	-	-
	2	25/07/2018	MW11_2.0	630927/ 697821	8.8	5.4	3.4	3	6.7	<2	<0.003	0.012	7.6	<10	<0.02	<0.02	<10
	2.5	25/07/2018	MW11_2.5	630927	7.4	6.7	0.7	2	-	-	-	-	-	-	-	-	-
	3	25/07/2018	MW11_3.0	630927	7.4	6.6	0.8	2	-	-	-	-	-	-	-	-	-
	3.5	25/07/2018	MW11_3.5	630927	8.3	7.2	1.1	2	-	-	-	-	-	-	-	-	-
	4	25/07/2018	MW11_4.0	630927/ 697821	8.5	7.7	0.8	2	6.1	2.6	<0.003	<0.005	<3	<10	<0.02	<0.02	<10
TP25.1	0.5	5/11/2019	TP56 #14	686571/ 697821	6.4	5.4	1	1	5.8	<2	<0.003	<0.005	<3	<10	<0.02	<0.02	<10
	1	5/11/2019	TP56 #15	686571/ 697821	6.1	5.4	0.7	1	5.9	<2	<0.003	<0.005	<3	<10	<0.02	<0.02	<10
	1.6	5/11/2019	TP56 #16	686571/ 697821	6.5	5.8	0.7	1	6.1	<2	<0.003	<0.005	<3	<10	<0.02	<0.02	<10
TPC49	0.6	5/11/2019	TP56 #19	686571/ 697821	5.7	4.6	1.1	3	5.4	5.5	0.01	<0.005	<3	<10	<0.02	<0.02	<10
	1.7	5/11/2019	TP56 #20	686571/ 697821	5.2	4.4	0.8	1	4.4	**43**	**0.07**	<0.005	<3	**43**	**0.07**	0.07	43
	2.5	5/11/2019	TP56 #21	686571/ 697821	5.5	4.5	1	1	4.5	**34**	**0.05**	<0.005	<3	**34**	**0.05**	0.05	34
TPC51	1.4	5/11/2019	TP56 #36	686571/ 697821	6.1	5.1	1	1	4.4	**30**	**0.05**	<0.005	<3	**30**	**0.05**	0.05	30
	2.3	5/11/2019	TP56 #37	686571/ 697821	6.9	4.8	2.1	2	4.5	**25**	**0.04**	<0.005	<3	**25**	**0.04**	0.04	25
TPC52	0.5	5/11/2019	TP56 #9	686571	7.6	6.2	1.4	2	-	-	-	-	-	-	-	-	-
	1.2	5/11/2019	TP56 #10	686571	7.6	6.4	1.2	1	-	-	-	-	-	-	-	-	-
TPC53	1.2	5/11/2019	TP56 #4	686571/ 697821	5.6	4.6	1	1	4.8	**76**	**0.12**	0.005	3.2	**79**	**0.13**	0.13	79
	1.4	5/11/2019	TP56 #5	686571/ 697821	5.9	4.7	1.2	2	5.1	**25**	**0.04**	<0.005	<3	**25**	**0.04**	0.04	25
	1.7	5/11/2019	TP56 #6	686571/ 697821	5.9	4.8	1.1	2	5	17	**0.03**	<0.005	<3	**17**	**0.03**	0.03	17
TPC54	0.4	5/11/2019	TP56 #7	686571/ 697821	5	4.7	0.3	1	5.8	<2	<0.003	<0.005	<3	<10	<0.02	<0.02	<10
	1.1	5/11/2019	TP56 #8	686571/ 697821	6.3	5.4	0.9	1	4.8	**34**	**0.05**	<0.005	<3	**34**	**0.05**	0.05	34
TPC55	0.4	5/11/2019	TP56 #11	686571/ 697821	6.8	6	0.8	1	6.1	2.3	<0.003	<0.005	<3	<10	<0.02	<0.02	<10
	1.2	5/11/2019	TP56 #12	686571	8.1	7.6	0.5	1	-	-	-	-	-	-	-	-	-
	1.5	5/11/2019	TP56 #13	686571	9.2	7.5	1.7	1	-	-	-	-	-	-	-	-	-
TPC56	0.4	5/11/2019	TP56 #1	686571/ 697821	5.3	4.7	0.6	2	6.1	<2	<0.003	<0.005	<3	<10	<0.02	<0.02	<10
	1.1	5/11/2019	TP56 #2	686571/ 697821	6.1	4.1	2	2	4.8	**36**	**0.06**	<0.005	<3	**36**	**0.06**	0.06	36
	1.5	5/11/2019	TP56 #3	686571/ 697821	7.1	4.4	2.7	3	5.1	**87**	**0.14**	<0.005	<3	**87**	**0.14**	0.14	87
TPC59	1	5/11/2019	TP56 #17	686571	8.1	6.1	2	2	-	-	-	-	-	-	-	-	-
TPC63	2	5/11/2019	TP56 #18	686571/ 697821	6.5	5.8	0.7	1	5.8	2.2	<0.003	<0.005	<3	<10	<0.02	<0.02	<10
TPC65	2	5/11/2019	TP56 #38	686571/ 697821	6.4	5.3	1.1	2	5.8	<2	<0.003	<0.005	<3	<10	<0.02	<0.02	<10
TPC68	0.8	5/11/2019	TP56 #22	686571/ 697821	6.6	5.2	1.4	1	5.6	3.5	0.01	<0.005	<3	<10	<0.02	<0.02	<10
	1.2	5/11/2019	TP56 #23	686571/ 697821	7.4	5.7	1.7	2	5.6	9.8	0.02	0.007	4.1	14	0.02	0.02	14
	1.6	5/11/2019	TP56 #24	686571	7.6	6.6	1	2	-	-	-	-	-	-	-	-	-

Appendix E

Table E-1 Summary of Acid Sulfate Soil Results

Main Roads WA
Bunbury Outer Ring Road
BORR

					Field Paramete				ASS - pH	ASS - Acidity Trail		ASS - Potential Acidity		ASS - Acid Base Accounting			
					pH (Field)	pH-FOX	pH Difference (pHF - pHFOX)	Reaction Ratings*	pHKCl	Titratable Actual Acidity	Titratable Actual Acidity (sulfur units)	Chromium Reducible Sulfur	Chromium Reducible Sulphur (acidity units)	Net Acidity (acidity units)	Net Acidity (sulfur units)	Net Acidity (Sulfur Units) Minus ANC	Net Acidity (Acidity Units) Minus ANC
					pH Units	pH Units	pH Units	COMMENT	pH Units	mole H+/t	%S	%S	mole H+/t	mole H+/t	%S	% S	mole H+/t
EQL					0.1	0.1	0.1		0.1	2	0.003	0.005	3	10	0.02	0.02	10
WA DER 2015 ASS Criteria						**<4**			**<4**	**18**	**0.03**	**0.03**	**18**	**18**	**0.03**		
WA DER 2015 Bassendean Sand ASS Criteria						**<3**				**6**	**0.01**	**0.01**	**6**	**6**	**0.01**		
Location	**Sample Depth**	**Sampled Date**	**Field ID**	**Lab Report #**													
	1.8	5/11/2019	TP56 #25	686571/ 697821	7.4	6.9	0.5	2	7.3	<2	<0.003	<0.005	<3	<10	<0.02	<0.02	<10
	2.1	5/11/2019	TP56 #26	686571	9.2	7.5	1.7	2	-	-	-	-	-	-	-	-	-
	2.4	5/11/2019	TP56 #27	686571	9.6	7.8	1.8	2	-	-	-	-	-	-	-	-	-
TPC70	0.5	25/07/2018	TP56#28	697821/ 686571	7.7	5.8	1.9	2	6.3	<2	<0.003	<0.005	<3	<10	<0.02	<0.02	<10
	0.8	5/11/2019	TP56 #29	686571	8.6	6.9	1.7	2	-	-	-	-	-	-	-	-	-
	1.4	5/11/2019	TP56 #30	686571	7.6	6.8	0.8	1	-	-	-	-	-	-	-	-	-
	2.4	5/11/2019	TP56 #31	686571	8.2	6.9	1.3	1	-	-	-	-	-	-	-	-	-
TPC71	2.3	5/11/2019	TP56 #35	686571/ 697821	6.1	5.3	0.8	1	5.7	<2	<0.003	<0.005	<3	<10	<0.02	<0.02	<10
TPC72	2.2	5/11/2019	TP56 #33	686571/ 697821	5.9	5.6	0.3	1	4.8	16	**0.03**	<0.005	<3	16	0.03	0.03	16
TPC73	2.4	5/11/2019	TP56 #32	686571/ 697821	6.4	5.6	0.8	1	5.9	<2	<0.003	<0.005	<3	<10	<0.02	<0.02	<10
TPC74	2	5/11/2019	TP56 #34	686571/ 697821	6.2	5.6	0.6	1	5.1	**35**	**0.06**	<0.005	<3	35	0.06	0.06	35
Statistical Summary																	
Number of Results					145	145	145	145	56	56	56	56	56	56	56	56	56
Number of Detects					145	145	145	145	56	24	19	6	6	16	16	16	16
Minimum Concentration					3.7	2.4	-1.4	1	4.4	<2	<0.003	<0.005	<3	<10	<0.02	<0.02	<10
Minimum Detect					3.7	2.4	-1.4	1	4.4	2.2	0.01	0.005	3.2	14	0.02	0.02	14
Maximum Concentration					9.6	10	5.3	4	9.4	87	0.14	0.092	57	87	0.14	0.14	87
Maximum Detect					9.6	10	5.3	4	9.4	87	0.14	0.092	57	87	0.14	0.14	87
Average Concentration					6.8	5.6	1.24	1.9	5.7	9.7	0.016	0.0051	3.1	14	0.023	0.023	14
Median Concentration					6.7	5.7	1	2	5.8	1	0.0015	0.0025	1.5	5	0.01	0.01	5
Standard Deviation					1.1	1.2	0.9	0.58	0.77	18	0.029	0.012	7.7	18	0.029	0.029	18

Definitions

LOR - Limits of Reporting
ASS - Acid Sulfate Soil
ASSDMP - Acid Sulfate Soil and Dewatering Management Plan
BDS - Bassendean Dune Sand criteria (>1,000m3 excavated)
DER - Western Australian Department of Environment Regulation
(now Department of Water and Environmental Regulation)
ND - No Detect
"-" - denotes not analysed
"#" - denotes RPD cannot be calculated based on LOR Value

Reaction Rate

1	No reaction to slight
2	Moderate reaction
3	Strong reaction with persistent froth
4	Extreme reaction

Appendix E
Table E-2 Summary of Groundwater Results

			Field Parameters								Inorganics			Acidity & Alkalinity					Major Ions					
			pH (Field)	Electrical conductivity (field)	Purge SWL (mbTOC) (field)	Dissolved Oxygen (Field)	DO (%S) (Field)	Redox (Field)	Temperature (Field)	TDS (Field)	pH (Lab)	Electrical conductivity (lab)	Total Dissolved Solids	Alkalinity (Carbonate as CaCO3)	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Hydroxide as CaCO3)	Alkalinity (total as CaCO3)	Acidity (as CaCO3)	Calcium (Filtered)	Magnesium (Filtered)	Potassium (Filtered)	Sodium (Filtered)	Chloride	Sulfate (Filtered)
			pH Units	µS/cm	mbTOC	mg/L	%S	mV	°C	mg/L	pH Units	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
EQL											0.01	1	10	1	1	1	1	1	1	1	1	1	1	1
DER 2014 Fresh Waters											**6.5-8.5**													
DER 2014 Non-potable Groundwater Use (NPUG) & 10x WHO 2008 TRH Values																							**250**	**1000**
WA DER 2015 ASS Criteria			**<5**								**<5**						**<30**	**40**						
Location	**Sample Date**	**Lab Report**																						
BORR MW04	21/08/2019	EP1908496	6.67	3403	3.985	0.56	6	-48.1	18.2	2210.59	7.29	3160	2080	<1	253	<1	253	31	150	49	5	429	**744**	166
	18/09/2019	EP1909602	6.77	3075	3.882	0.15	1.6	-94.7	17.9	1998	7.61	2890	1720	<1	246	<1	246	14	126	45	5	408	**800**	148
	28/10/2019	EP1911129	6.63	4334	4.095	0.32	3.5	-22.9	19.2	2816.7	7.19	3940	2410	<1	301	<1	301	26	170	65	4	577	**942**	233
	20/11/2019	EP1912321	6.59	4360	4.165	0.35	3.9	-32	18.8	2834	7.26	4080	2430	<1	310	<1	310	18	180	68	5	618	**1040**	262
	16/12/2019	EP1913499	6.68	4040	4.38	0.09	1	-63.7	19.2	2626	7.45	3760	2330	<1	264	<1	264	18	162	57	5	542	**931**	242
	20/01/2020	EP2000762	6.47	4536	4.6	0.09	0.9	-44.1	19.9	2941.7	7.04	4080	2450	<1	281	<1	281	20	181	65	5	585	**1140**	246
BORR MW05	21/08/2019	EP1908496	6.32	1015	5.709	0.64	7	-43	19.6	659.83	6.73	938	666	<1	68	<1	68	22	23	16	6	144	191	84
	19/09/2019	EP1909602	6.52	1071	19.8	0.2	2.2	-87.7	19.8	696	7.12	1030	576	<1	73	<1	73	11	22	15	6	160	**273**	105
	28/10/2019	EP1911129	6.54	1340	5.635	0.53	6	-47.9	20.8	880	6.8	1160	683	<1	79	<1	79	14	27	19	6	185	**262**	108
	20/11/2019	EP1912321	6.46	1311	5.689	0.3	3.3	-76.2	20.4	851	7.08	1140	722	<1	86	<1	86	12	27	19	7	196	**287**	117
	16/12/2019	EP1913499	6.67	1134	5.778	0.11	1.2	-82.4	20.7	737.1	7.26	1060	653	<1	77	<1	77	13	24	16	7	175	**261**	111
	20/01/2020	EP2000762	6.32	1237	5.8	0.37	4.3	-29.9	21.9	804.6	6.97	1140	654	<1	80	<1	80	28	24	17	7	178	**299**	116
BORR MW05	21/08/2019	EP1908496	6.26	501	5.341	1.47	16	-18.9	19.1	322.8	6.96	438	302	<1	49	<1	49	13	30	10	8	45	65	43
	18/09/2019	EP1909602	6.43	402.1	5.143	1.35	14.8	-26.4	19.7	262	7.08	384	273	<1	48	<1	48	11	26	10	7	42	66	44
	28/10/2019	EP1911129	7	927	5.311	0.38	4.3	-140.7	20.3	603	6.76	690	492	<1	71	<1	71	16	32	19	15	75	158	31
	20/11/2019	EP1912321	6.59	882	5.395	0.3	3.3	-78.6	20.1	571	6.74	605	466	<1	56	<1	56	16	41	14	10	52	149	40
	16/12/2019	EP1913499	6.38	846	5.505	0.09	1.1	-76.8	20.9	549.9	6.95	514	398	<1	44	<1	44	14	35	10	10	58	121	55
	20/01/2020	EP2000762	6.12	395.6	5.6	0.15	1.8	-65.8	22.1	257.1	6.88	370	260	<1	47	<1	47	13	19	5	7	46	55	40
BORR MW07	22/08/2019	EP1908496	6.2	933	-	5.22	56.3	105.4	18.9	606.41	6.84	513	386	<1	40	<1	40	20	13	12	3	69	84	78
	18/09/2019	EP1909602	6.28	508	-	6.92	76.3	83.6	20	330	6.71	576	474	<1	34	<1	34	22	15	13	3	66	115	89
BORR MW8a	22/08/2019	EP1908496	5.7	626	2.19	0.75	7.9	43.5	18	406.943	**6.1**	578	474	<1	40	<1	40	34	20	13	9	72	145	<10
	18/09/2019	EP1909602	5.82	530	2.073	0.15	1.6	-37.4	18.4	345	6.61	507	368	<1	46	<1	46	20	15	10	7	67	143	<20
	28/10/2019	EP1911129	6.05	585	5.72	0.39	4.1	-48.9	19	380.701	**6.19**	534	584	<1	48	<1	48	23	15	12	7	68	135	<10
	21/11/2019	EP1912321	5.95	621	3.088	0.29	3.1	-56.7	18.7	403	**6.36**	550	411	<1	48	<1	48	18	18	14	8	73	167	<10
	19/12/2019	EP1913643	5.98	602	3.333	0.08	0.9	-39.4	18.5	391.3	6.8	607	418	<1	58	<1	58	18	20	12	9	73	161	<20
	20/01/2020	EP2000762	5.58	600	3.5	0.05	0.7	-31.2	21	389.6	**6.31**	575	366	<1	44	<1	44	19	17	12	8	72	164	<20
BORR MW09	22/08/2019	EP1908496	5.61	403.7	3.356	3.8	40.1	157.6	18	262.58	6.59	430	280	<1	11	<1	**11**	9	34	8	10	36	91	31
	18/09/2019	EP1909602	5.91	401	3.14	3.89	41.3	136.8	18.2	262	6.63	393	258	<1	10	<1	**10**	7	27	5	9	33	95	34

Appendix E
Table E-2 Summary of Groundwater Results

			Field Parameters								Inorganics			Acidity & Alkalinity					Major Ions					
			pH (Field)	Electrical conductivity (field)	Purge SWL (mbTOC) (field)	Dissolved Oxygen (Field)	DO (%S) (Field)	Redox (Field)	Temperature (Field)	TDS (Field)	pH (Lab)	Electrical conductivity (lab)	Total Dissolved Solids	Alkalinity (Carbonate as CaCO3)	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Hydroxide as CaCO3)	Alkalinity (total as CaCO3)	Acidity (as CaCO3)	Calcium (Filtered)	Magnesium (Filtered)	Potassium (Filtered)	Sodium (Filtered)	Chloride	Sulfate (Filtered)
			pH Units	µS/cm	mbTOC	mg/L	%S	mV	°C	mg/L	pH Units	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
EQL											0.01	1	10	1	1	1	1	1	1	1	1	1	1	1
DER 2014 Fresh Waters											**6.5-8.5**													
DER 2014 Non-potable Groundwater Use (NPUG) & 10x WHO 2008 TRH Values																							**250**	**1000**
WA DER 2015 ASS Criteria			**<5**								**<5**						**<30**	**40**						
Location	**Sample Date**	**Lab Report**																						
	23/10/2019	EP1910998	6.07	300.8	3.161	3.87	41.4	178.2	18.5	194.52	6.8	271	164	<1	11	<1	**11**	6	17	3	5	23	44	36
	21/11/2019	EP1912321	5.92	213.4	3.423	3.59	38.4	51.6	19	139	6.62	192	116	<1	11	<1	**11**	7	12	3	5	17	26	26
	19/12/2019	EP1913643	6.07	216.3	3.443	1.69	18.8	70.6	20.6	140.56	6.82	215	138	<1	10	<1	**10**	7	12	3	5	18	28	36
	21/01/2020	EP2000762	6.06	242.4	3.7	1.88	21.4	78.9	21.6	158.1	6.68	210	93	<1	12	<1	**12**	8	11	2	5	21	26	38
BORR MW10	22/08/2019	EP1908496	5.72	631	1.361	0.67	6.8	13.8	16.4	407.29	**6.49**	516	382	<1	28	<1	**28**	28	15	15	6	52	96	57
	18/09/2019	EP1909602	6.09	450.3	1.375	0.16	1.7	-2.4	16.6	293	6.81	414	264	<1	39	<1	39	10	19	10	4	43	79	45
	23/10/2019	EP1910998	5.83	440.8	1.464	0.14	1.5	4.4	17.4	286.36	**6.49**	392	262	<1	22	<1	**22**	13	13	8	4	38	81	43
	21/11/2019	EP1912321	5.68	439.1	1.74	0.25	2.6	16	18.7	285	**6.38**	411	266	<1	21	<1	**21**	15	13	12	4	47	86	41
	19/12/2019	EP1913643	5.79	468.1	1.823	0.07	0.8	-8.1	19.6	304.27	6.54	465	288	<1	21	<1	**21**	16	13	11	5	51	92	54
	21/01/2020	EP2000762	5.67	510	2	0.27	3.1	-48.8	22	331.5	**6.19**	457	273	<1	16	<1	**16**	17	14	12	5	52	108	54
BORR MW11	21/08/2019	EP1908496	6.9	3934	1.251	1.07	11	45.4	16.3	2552.86	7.74	4150	2490	<1	535	<1	535	34	56	92	12	676	**896**	152
	19/09/2019	EP1909602	7.04	2494	1.392	0.69	7.2	-57.5	17.3	1627	7.23	2300	1570	<1	258	<1	258	24	21	38	7	419	**639**	89
	23/10/2019	EP1910998	6.93	13,072	0.983	0.57	6.3	32.4	17.9	3497.91	7.76	12,900	7430	<1	1400	<1	**1400**	**51**	90	245	18	2100	**3560**	11
	20/11/2019	EP1912321	6.91	20,925	1.462	0.61	7.1	60.1	18.9	13,601	7.67	19,600	12,700	<1	1860	<1	**1860**	36	127	428	28	4230	**6430**	20
	16/12/2019	EP1913643	7.21	23,917	1.557	0.19	2.2	-16.3	19.2	15,546	7.93	24,600	15,000	<1	1840	<1	**1840**	16	136	461	30	4830	**7660**	2
BORR MW12	21/08/2019	EP1908496	6	647	1.554	1.26	13	57.8	16.8	419.67	6.7	579	376	<1	28	<1	**28**	12	7	14	7	82	122	35
	18/09/2019	EP1909602	6.26	526	1.495	0.33	3.5	-2	17.7	342	6.79	494	285	<1	26	<1	**26**	13	6	11	6	73	122	36
	22/10/2019	EP1910866	6.19	560	1.646	0.19	2.1	-3.1	18.9	363.598	6.79	511	284	<1	28	<1	**28**	14	5	10	5	65	117	35
	20/11/2019	EP1912321	6.21	583	1.73	0.26	2.8	-16.2	18.8	379	6.77	506	331	<1	28	<1	**28**	16	5	13	6	80	132	37
	19/12/2019	EP1913643	6.46	534	1.911	0.09	1	-21.5	19.7	347.1	6.96	523	314	<1	26	<1	**26**	13	6	11	6	73	119	35
	22/01/2020	EP2000814	6.06	590	2.116	0.11	1.2	-49.8	21.9	382.52	6.78	534	314	<1	30	<1	**30**	9	5	12	6	78	129	38
BORR MW46	21/08/2019	EP1908496	6.25	235.8	3.585	4.89	52.6	93	18.7	153.18	6.78	216	234	<1	91	<1	91	19	34	2	<1	13	9	8
	19/09/2019	EP1909602	5.71	576	3.556	0.16	1.7	16.3	19.5	374	**5.77**	541	445	<1	7	<1	**7**	12	34	17	4	16	18	236
	24/10/2019	EP1910998	5.56	535	3.523	0.27	3	58	20.3	347.8	**5.97**	474	405	<1	8	<1	**8**	**73**	30	14	3	14	18	189
	20/11/2019	EP1912321	5.85	432.2	3.572	1.63	17.9	33.5	20.1	281	**6.07**	377	312	<1	17	<1	**17**	**40**	37	12	3	15	16	144
	19/12/2019	EP1913643	5.97	418.4	3.891	0.54	6.1	8.2	21	271.96	**6.28**	408	316	<1	14	<1	**14**	**46**	31	11	3	14	17	137
	21/01/2020	EP2000762	5.42	445.5	4.1	0.29	3.2	51.2	23.1	289.5	**5.78**	397	284	<1	7	<1	**7**	**49**	30	13	4	15	18	136
MR MW05	22/08/2019	EP1908496	5.62	23,681	2.428	0.62	7.1	58.9	17.5	5385.02	**6.43**	22,600	13,900	<1	130	<1	130	**78**	187	668	43	3760	**7320**	**1050**

Appendix E
Table E-2 Summary of Groundwater Results

			Field Parameters								Inorganics			Acidity & Alkalinity					Major Ions					
			pH (Field)	Electrical conductivity (field)	Purge SWL (mbTOC) (field)	Dissolved Oxygen (Field)	DO (%S) (Field)	Redox (Field)	Temperature (Field)	TDS (Field)	pH (Lab)	Electrical conductivity (lab)	Total Dissolved Solids	Alkalinity (Carbonate as CaCO3)	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Hydroxide as CaCO3)	Alkalinity (total as CaCO3)	Acidity (as CaCO3)	Calcium (Filtered)	Magnesium (Filtered)	Potassium (Filtered)	Sodium (Filtered)	Chloride	Sulfate (Filtered)
			pH Units	µS/cm	mbTOC	mg/L	%S	mV	°C	mg/L	pH Units	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
EQL											0.01	1	10	1	1	1	1	1	1	1	1	1	1	1
DER 2014 Fresh Waters											**6.5-8.5**													
DER 2014 Non-potable Groundwater Use (NPUG) & 10x WHO 2008 TRH Values																							**250**	**1000**
WA DER 2015 ASS Criteria			**<5**								**<5**						**<30**	**40**						
Location	**Sample Date**	**Lab Report**																						
	19/09/2019	EP1909602	5.79	22,813	2.547	0.16	1.8	-30.9	17.6	14,828	**6.47**	22,200	14,300	<1	125	<1	125	39	173	689	43	3870	**8600**	**1040**
	28/10/2019	EP1911129	5.3	23,746	2.231	0.45	5.3	-13.9	18.9	5435.52	**6.29**	19,900	15,300	<1	129	<1	129	**51**	170	680	38	3770	**7590**	960
	21/11/2019	EP1912321	5.61	22,500	2.393	0.18	2.1	-26	18.6	14,623	**6.25**	21,400	14,800	<1	125	<1	125	**46**	168	666	41	3770	**7470**	934
	19/12/2019	EP1913643	5.78	21,532	2.231	0.16	1.9	-43.5	18.5	13,996	**6.39**	22,200	13,600	<1	125	<1	125	**47**	162	603	41	3740	**7360**	884
	21/01/2020	EP2000762	5.55	25,192	2.53	0.13	1.5	-75.8	19.5	6371.2	**6.16**	23,100	14,900	<1	102	<1	102	35	178	730	84	3940	**7270**	**1010**
Statistical Summary																								
Number of Results			61	61	59	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61
Number of Detects			61	61	59	61	61	61	61	61	61	61	61	0	61	0	61	61	61	61	60	61	61	55
Minimum Concentration			5.3	213.4	0.983	0.05	0.7	-140.7	16.3	139	5.77	192	93	<1	7	<1	7	6	5	2	<1	13	9	2
Minimum Detect			5.3	213.4	0.983	0.05	0.7	ND	16.3	139	5.77	192	93	ND	7	ND	7	6	5	2	3	13	9	2
Maximum Concentration			7.21	25192	19.8	6.92	76.3	178.2	23.1	15546	7.93	24600	15300	<1	1860	<1	1860	78	187	730	84	4830	8600	1050
Maximum Detect			7.21	25192	19.8	6.92	76.3	178.2	23.1	15546	7.93	24600	15300	ND	1860	ND	1860	78	187	730	84	4830	8600	1050
Average Concentration			6.2	4171	3.5	0.93	10	-4.2	19	2137	6.8	3946	2553	0.5	163	0.5	163	23	55	101	11	675	1236	166
Median Concentration			6.09	621	3.356	0.32	3.5	-18.9	19	403	6.77	550	411	0.5	48	0.5	48	18	26	13	6	73	135	54
Standard Deviation			0.45	7645	2.6	1.4	16	64	1.5	3973	0.47	7314	4740	0	369	0	369	16	61	208	14	1339	2500	280

Appendix E
Table E-2 Summary of Groundwater Results

							Nutrients							Metals									
			Cations Total	Anions Total	Ionic Balance	Sulfide	Ammonium (as N)	Ammonia as N	Nitrogen (Total Oxidised) (as N)	Nitrogen (Total)	Reactive Phosphorus as P	Kjeldahl Nitrogen Total	Phosphorus (Total)	Aluminium	Aluminium (Filtered)	Arsenic (Filtered)	Cadmium (Filtered)	Chromium (III+VI) (Filtered)	Chromium (hexavalent)	Cobalt (Filtered)	Copper (Filtered)	Iron	Iron (Filtered)
			meq/L	meq/L	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
EQL			0.01	0.01	0.01	0.1	0.01	0.01	0.01	0.1	0.01	0.1	0.01	0.01	0.01	0.001	0.0001	0.001	0.01	0.001	0.001	0.05	0.05
DER 2014 Fresh Waters										**2**			**0.2**	**0.055**	**0.055**		**0.0002**		**0.001**		**0.0014**	**0.3**	
DER 2014 Non-potable Groundwater Use (NP														**0.2**	**0.2**	**0.1**	**0.02**		**0.5**		**20**	**0.3**	
WA DER 2015 ASS Criteria															**1**								
Location	**Sample Date**	**Lab Report**																					
BORR MW04	21/08/2019	EP1908496	30.3	29.5	1.35	<0.1	0.19	0.19	0.02	0.4	<0.01	0.4	**0.29**	**13.4**	<0.01	0.002	<0.0001	<0.001	-	<0.001	<0.001	**40.7**	5.2
	18/09/2019	EP1909602	27.9	30.6	4.62	<0.1	0.18	0.18	<0.01	**4.5**	<0.01	4.5	**0.52**	**4.63**	0.01	0.003	<0.0001	<0.001	-	<0.001	**0.008**	**16.5**	4.39
	28/10/2019	EP1911129	39	37.4	2.09	<0.1	0.27	0.27	<0.01	0.4	<0.01	0.4	0.08	**1.25**	0.01	0.002	<0.0001	<0.001	-	0.002	**0.01**	**7.94**	4.72
	20/11/2019	EP1912321	41.6	41	0.73	<0.1	0.23	0.23	<0.01	0.4	<0.01	0.4	0.12	**4.48**	<0.01	0.002	<0.0001	<0.001	-	0.002	**0.012**	**20.5**	4.8
	16/12/2019	EP1913499	36.5	36.6	0.13	<0.1	0.22	0.22	<0.01	0.3	<0.01	0.3	0.04	**0.8**	<0.01	0.002	<0.0001	<0.001	-	0.001	**0.007**	**9.91**	4.57
	20/01/2020	EP2000762	40	42.9	3.55	<0.1	0.21	0.21	<0.01	0.4	<0.01	0.4	0.11	**3.36**	0.01	0.002	<0.0001	<0.001	-	0.001	**0.01**	**22**	5.73
BORR MW05	21/08/2019	EP1908496	8.88	8.5	2.22	<0.1	0.02	0.02	<0.01	1.7	<0.01	1.7	0.12	**15.4**	**0.13**	<0.001	<0.0001	0.001	-	<0.001	**0.004**	**5.09**	0.86
	19/09/2019	EP1909602	9.44	11.3	9.14	0.2	0.07	0.07	<0.01	1.1	0.01	1.1	0.03	**1.09**	**0.09**	<0.001	<0.0001	<0.001	-	<0.001	**0.012**	**1.28**	0.9
	28/10/2019	EP1911129	11.1	11.2	0.48	<0.1	0.1	0.1	0.01	1.6	0.01	1.6	0.09	**6.63**	**0.09**	0.001	<0.0001	<0.001	-	<0.001	**0.008**	**3.63**	1.22
	20/11/2019	EP1912321	11.6	12.2	2.66	0.1	0.12	0.12	<0.01	1.1	0.02	1.1	0.02	**1.06**	**0.1**	0.001	<0.0001	0.001	-	<0.001	**0.011**	**2.03**	1.36
	16/12/2019	EP1913499	10.3	11.2	4.21	<0.1	0.09	0.09	<0.01	0.9	0.01	0.9	0.01	**1.46**	**0.08**	0.001	<0.0001	<0.001	-	<0.001	**0.006**	**1.51**	1
	20/01/2020	EP2000762	10.5	12.4	8.4	<0.1	0.11	0.11	0.02	1.1	<0.01	1.1	0.04	**2.25**	**0.1**	0.001	<0.0001	<0.001	-	<0.001	**0.01**	**1.87**	1.22
BORR MW05	21/08/2019	EP1908496	4.48	3.71	9.45	<0.1	0.13	0.13	0.56	1.3	<0.01	0.7	0.06	**2.41**	**0.14**	<0.001	<0.0001	<0.001	-	<0.001	**0.025**	**4.38**	2.38
	18/09/2019	EP1909602	4.13	3.74	4.95	<0.1	0.14	0.14	1.02	1.7	<0.01	0.7	0.03	**2.19**	**0.16**	<0.001	<0.0001	<0.001	-	<0.001	**0.009**	**6.47**	3.73
	28/10/2019	EP1911129	6.81	6.52	2.14	<0.1	0.42	0.42	0.2	**2.3**	<0.01	2.1	0.12	**3.17**	**0.08**	<0.001	<0.0001	0.001	-	<0.001	0.001	**32.3**	19.3
	20/11/2019	EP1912321	5.72	6.15	3.7	<0.1	0.29	0.29	0.14	1.7	<0.01	1.6	0.06	**3.86**	**0.15**	0.001	<0.0001	0.001	-	<0.001	**0.011**	**12.5**	5.02
	16/12/2019	EP1913499	5.35	5.44	0.83	<0.1	0.2	0.2	0.04	1	<0.01	1	0.02	**2.48**	**0.16**	0.001	<0.0001	0.001	-	<0.001	**0.002**	**6.18**	2.74
	20/01/2020	EP2000762	3.54	3.32	3.15	<0.1	0.1	0.1	<0.01	1.1	0.01	1.1	0.04	**2.9**	**0.69**	0.001	<0.0001	0.002	-	<0.001	**0.006**	**2.63**	1.51
BORR MW07	22/08/2019	EP1908496	4.71	4.79	0.82	<0.1	<0.01	<0.01	0.03	<0.1	<0.01	<0.1	0.09	**97**	**0.07**	<0.001	<0.0001	<0.001	-	<0.001	**0.012**	**49.3**	0.05
	18/09/2019	EP1909602	4.77	5.78	9.58	<0.1	<0.01	<0.01	0.07	0.8	<0.01	0.7	**0.37**	**25.2**	0.03	<0.001	<0.0001	<0.001	-	<0.001	**0.009**	**19.9**	0.06
BORR MW8a	22/08/2019	EP1908496	5.43	4.89	5.24	<0.1	0.23	0.23	<0.01	1.8	0.58	1.8	**0.82**	**7.92**	**0.3**	<0.001	<0.0001	0.001	-	<0.001	**0.012**	**3.1**	1.88
	18/09/2019	EP1909602	4.66	4.95	2.99	<0.1	0.2	0.2	<0.01	1.4	0.54	1.4	**0.58**	**3.47**	**0.34**	0.002	<0.0001	0.001	-	<0.001	**0.007**	**2.56**	1.8
	28/10/2019	EP1911129	4.87	4.77	1.1	<0.1	0.24	0.24	<0.01	**2.9**	0.46	2.9	**1.01**	**12.3**	**0.32**	0.002	<0.0001	0.001	-	<0.001	**0.011**	**4.91**	2.3
	21/11/2019	EP1912321	5.43	5.67	2.16	<0.1	0.29	0.29	<0.01	1.6	0.67	1.6	**0.67**	**5.16**	**0.24**	0.002	<0.0001	0.001	-	<0.001	**0.009**	**2.71**	2.1
	19/12/2019	EP1913643	5.39	5.7	2.79	<0.1	0.45	0.45	<0.01	1.9	1.03	1.9	**1.06**	**1.44**	**0.33**	<0.001	<0.0001	<0.001	-	<0.001	**0.01**	**1.21**	0.98
	20/01/2020	EP2000762	5.17	5.5	3.12	<0.1	0.11	0.11	<0.01	1.3	0.59	1.3	**0.59**	**1.33**	**0.29**	<0.001	<0.0001	0.001	-	<0.001	**0.007**	**2.09**	1.39
BORR MW09	22/08/2019	EP1908496	4.18	3.43	9.78	<0.1	<0.01	<0.01	0.73	0.9	<0.01	0.2	0.01	**1.81**	0.03	<0.001	<0.0001	<0.001	-	<0.001	**0.028**	**0.48**	<0.05
	18/09/2019	EP1909602	3.42	3.59	2.33	<0.1	<0.01	<0.01	0.91	1.2	<0.01	0.3	<0.01	**1.51**	0.02	<0.001	<0.0001	<0.001	-	<0.001	**0.014**	**0.41**	<0.05

Appendix E
Table E-2 Summary of Groundwater Results

							Nutrients							Metals									
			Cations Total	Anions Total	Ionic Balance	Sulfide	Ammonium (as N)	Ammonia as N	Nitrogen (Total Oxidised) (as N)	Nitrogen (Total)	Reactive Phosphorus as P	Kjeldahl Nitrogen Total	Phosphorus (Total)	Aluminium	Aluminium (Filtered)	Arsenic (Filtered)	Cadmium (Filtered)	Chromium (III+VI) (Filtered)	Chromium (hexavalent)	Cobalt (Filtered)	Copper (Filtered)	Iron	Iron (Filtered)
			meq/L	meq/L	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
EQL			0.01	0.01	0.01	0.1	0.01	0.01	0.01	0.1	0.01	0.1	0.01	0.01	0.01	0.001	0.0001	0.001	0.01	0.001	0.001	0.05	0.05
DER 2014 Fresh Waters										**2**			**0.2**	**0.055**	**0.055**		**0.0002**		**0.001**		**0.0014**	**0.3**	
DER 2014 Non-potable Groundwater Use (NP														**0.2**	**0.2**	**0.1**	**0.02**		**0.5**		**20**	**0.3**	
WA DER 2015 ASS Criteria															**1**								
Location	**Sample Date**	**Lab Report**																					
	23/10/2019	EP1910998	2.22	2.21	-	<0.1	<0.01	<0.01	2.69	**3.2**	<0.01	0.5	<0.02	**0.4**	0.04	<0.001	<0.0001	<0.001	-	<0.001	**0.011**	0.1	<0.05
	21/11/2019	EP1912321	1.71	1.66	1.56	<0.1	<0.01	<0.01	2.32	**2.9**	<0.01	0.6	<0.01	**0.18**	0.02	<0.001	<0.0001	<0.001	-	<0.001	**0.02**	<0.05	<0.05
	19/12/2019	EP1913643	1.76	1.74	0.5	<0.1	<0.01	0.01	1.07	1.3	<0.01	0.2	<0.01	0.05	0.02	<0.001	<0.0001	<0.001	-	<0.001	**0.014**	<0.05	<0.05
	21/01/2020	EP2000762	1.75	1.76	0.27	<0.1	<0.01	<0.01	0.6	0.8	<0.01	0.2	<0.01	**0.28**	0.04	<0.001	<0.0001	<0.001	-	<0.001	**0.014**	0.12	<0.05
BORR MW10	22/08/2019	EP1908496	4.4	4.45	0.63	<0.1	0.3	0.3	0.02	1.2	<0.01	1.2	0.06	**5.73**	**0.11**	0.001	<0.0001	0.002	-	<0.001	**0.011**	**7.22**	2.74
	18/09/2019	EP1909602	3.74	3.94	2.61	<0.1	0.18	0.18	0.18	0.9	<0.01	0.7	<0.01	**0.76**	**0.08**	<0.001	<0.0001	0.001	-	<0.001	**0.011**	**6.67**	2.66
	23/10/2019	EP1910998	3.06	3.62	8.34	<0.1	0.24	0.24	0.17	0.8	<0.01	0.6	<0.01	**0.96**	**0.07**	<0.001	<0.0001	<0.001	-	<0.001	**0.008**	**5.54**	2.93
	21/11/2019	EP1912321	3.78	3.7	1.12	<0.1	0.2	0.2	0.02	0.8	<0.01	0.8	<0.01	**0.92**	**0.08**	0.001	<0.0001	0.001	-	<0.001	**0.013**	**4.93**	3.5
	19/12/2019	EP1913643	3.9	4.14	2.97	<0.1	0.26	0.26	<0.01	0.6	<0.01	0.6	<0.01	**0.42**	**0.09**	0.001	<0.0001	0.001	-	<0.001	**0.009**	**4.12**	3.81
	21/01/2020	EP2000762	4.08	4.49	4.84	<0.1	0.27	0.27	<0.01	0.6	<0.01	0.6	<0.01	**0.7**	**0.1**	0.002	<0.0001	0.002	-	<0.001	**0.012**	**4.04**	3.27
BORR MW11	21/08/2019	EP1908496	40.1	39.1	1.2	<0.1	<0.01	<0.02	0.01	**2.3**	0.01	2.3	**0.76**	**7.21**	**0.06**	0.002	<0.0001	0.001	-	0.001	**0.025**	**35.1**	0.38
	19/09/2019	EP1909602	22.6	25	5.15	<0.1	<0.01	<0.01	<0.01	1.5	<0.01	1.5	**0.28**	**4.35**	0.04	0.004	<0.0001	0.002	-	<0.001	**0.009**	**11.6**	1.03
	23/10/2019	EP1910998	116	129	4.96	<0.1	<0.01	<0.01	<0.01	**4.2**	0.05	4.2	**0.33**	**2.52**	0.04	0.006	<0.0001	0.004	-	0.002	**0.01**	**13.2**	2.31
	20/11/2019	EP1912321	226	219	1.64	<0.1	<0.01	<0.01	0.01	**6.3**	0.05	6.3	0.15	**1.54**	**0.07**	0.007	<0.0001	0.007	-	0.002	**0.024**	**4.02**	1.4
	16/12/2019	EP1913643	256	253	0.53	<0.1	0.1	0.11	<0.01	**6.2**	0.07	6.2	0.17	**2.23**	0.05	0.009	**<0.0005**	0.006	-	<0.005	**0.01**	**4.78**	0.74
BORR MW12	21/08/2019	EP1908496	5.25	4.73	5.19	<0.1	0.19	0.19	1.36	**2.4**	<0.01	1	0.09	**0.83**	0.04	<0.001	<0.0001	<0.001	-	<0.001	**0.005**	**5.03**	1.98
	18/09/2019	EP1909602	4.53	4.71	1.91	<0.1	0.13	0.13	0.9	1.5	<0.01	0.6	0.03	**0.88**	0.03	0.001	<0.0001	<0.001	-	<0.001	**0.006**	**3.47**	1.44
	22/10/2019	EP1910866	4.16	4.59	4.85	<0.1	0.18	0.18	0.88	1.5	<0.01	0.6	0.01	**0.34**	0.02	<0.001	<0.0001	<0.001	-	<0.001	**0.007**	**3.49**	2.31
	20/11/2019	EP1912321	4.95	5.05	1	<0.1	0.2	0.2	0.26	0.7	<0.01	0.4	0.02	**1.05**	0.02	0.002	<0.0001	<0.001	-	<0.001	**0.015**	**5.19**	2.73
	19/12/2019	EP1913643	4.53	4.6	0.78	<0.1	0.19	0.19	1.06	1.4	<0.01	0.3	<0.01	**0.21**	0.02	0.002	<0.0001	<0.001	-	<0.001	<0.001	**2.9**	2.08
	22/01/2020	EP2000814	4.78	5.03	2.51	<0.1	0.2	0.2	0.47	0.8	<0.01	0.3	<0.01	**0.33**	<0.01	0.002	<0.0001	<0.001	-	<0.001	<0.001	**3.12**	2.33
BORR MW46	21/08/2019	EP1908496	2.43	2.24	4.03	<0.1	<0.01	<0.01	0.28	0.5	<0.01	0.2	0.01	**15.2**	**0.09**	<0.001	<0.0001	<0.001	-	0.001	**0.041**	**6.44**	0.38
	19/09/2019	EP1909602	6.22	5.56	5.63	<0.1	0.23	0.23	<0.01	0.6	<0.01	0.6	0.01	**10.7**	0.03	0.004	<0.0001	<0.001	-	0.005	**0.017**	**58.7**	43.4
	24/10/2019	EP1910998	5.34	4.6	7.45	<0.1	0.22	0.22	0.08	0.6	<0.01	0.5	0.01	**1.8**	0.02	0.004	<0.0001	<0.001	-	0.004	**0.012**	**55**	37.4
	20/11/2019	EP1912321	3.56	3.79	3.07	<0.1	0.2	0.2	0.26	0.8	<0.01	0.5	0.02	**5.22**	0.02	0.002	<0.0001	<0.001	-	0.004	**0.016**	**40.3**	27.1
	19/12/2019	EP1913643	3.14	3.61	7.02	<0.1	0.19	0.19	0.19	1.4	<0.01	1.2	<0.01	**3.2**	0.02	0.002	<0.0001	<0.001	-	0.004	**0.016**	**32.9**	26.8
	21/01/2020	EP2000762	3.32	3.48	2.32	<0.1	0.19	0.19	0.04	0.3	<0.01	0.3	<0.01	**2.48**	0.02	0.004	<0.0001	<0.001	-	0.004	**0.012**	**33.5**	31.4
MR MW05	22/08/2019	EP1908496	229	231	0.43	<0.1	0.23	0.23	<0.01	**2**	<0.01	2	0.09	**22.7**	**0.06**	0.016	0.0001	0.004	-	0.002	**0.013**	**46.6**	18.1

Appendix E
Table E-2 Summary of Groundwater Results

							Nutrients							Metals									
			Cations Total	Anions Total	Ionic Balance	Sulfide	Ammonium (as N)	Ammonia as N	Nitrogen (Total Oxidised) (as N)	Nitrogen (Total)	Reactive Phosphorus as P	Kjeldahl Nitrogen Total	Phosphorus (Total)	Aluminium	Aluminium (Filtered)	Arsenic (Filtered)	Cadmium (Filtered)	Chromium (III+VI) (Filtered)	Chromium (hexavalent)	Cobalt (Filtered)	Copper (Filtered)	Iron	Iron (Filtered)
			meq/L	meq/L	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
EQL			0.01	0.01	0.01	0.1	0.01	0.01	0.01	0.1	0.01	0.1	0.01	0.01	0.01	0.001	0.0001	0.001	0.01	0.001	0.001	0.05	0.05
DER 2014 Fresh Waters										**2**			**0.2**	**0.055**	**0.055**		**0.0002**		**0.001**		**0.0014**	**0.3**	
DER 2014 Non-potable Groundwater Use (NP														**0.2**	**0.2**	**0.1**	**0.02**		**0.5**		**20**	**0.3**	
WA DER 2015 ASS Criteria															**1**								
Location	**Sample Date**	**Lab Report**																					
	19/09/2019	EP1909602	235	267	6.37	<0.1	0.23	0.23	<0.01	1.3	<0.01	1.3	0.09	**7.07**	<0.05	0.01	**<0.0005**	<0.005	-	<0.005	**0.008**	**29.4**	19.4
	28/10/2019	EP1911129	229	237	1.56	<0.1	0.23	0.23	<0.01	1.1	0.01	1.1	0.12	**0.96**	<0.05	0.009	**<0.0005**	<0.005	-	<0.005	**<0.005**	**27.9**	23.6
	21/11/2019	EP1912321	228	233	0.96	<0.1	0.27	0.27	<0.01	0.9	<0.01	0.9	0.08	**3.39**	0.03	0.013	<0.0001	0.003	-	0.005	**0.004**	**26.6**	18.9
	19/12/2019	EP1913643	221	228	1.57	<0.1	0.24	0.24	<0.01	**2**	0.01	2	0.08	**3**	<0.05	0.009	**<0.0005**	<0.005	-	<0.005	**<0.005**	**24.5**	19.5
	21/01/2020	EP2000762	242	228	3.05	<0.1	0.37	0.37	<0.01	0.8	<0.01	0.8	0.07	**4.97**	0.02	0.01	<0.0001	0.002	-	0.006	**0.006**	**24**	17.3
Statistical Summary																							
Number of Results			61	61	60	61	61	61	61	61	61	61	61	61	61	61	61	61	1	61	61	61	61
Number of Detects			61	61	60	2	48	49	33	60	17	60	47	61	54	40	1	24	0	16	56	59	55
Minimum Concentration			1.71	1.66	0.13	<0.1	<0.01	<0.01	<0.01	<0.1	<0.01	<0.1	<0.01	0.05	<0.01	<0.001	<0.0001	<0.001	<0.02	<0.001	<0.001	<0.05	<0.05
Minimum Detect			1.71	1.66	0.13	0.1	0.02	0.01	0.01	0.3	0.01	0.2	0.01	0.05	0.01	0.001	0.0001	0.001	ND	0.001	0.001	0.1	0.05
Maximum Concentration			256	267	9.78	0.2	0.45	0.45	2.69	6.3	1.03	6.3	1.06	97	0.69	0.016	<0.0005	0.007	<0.02	0.006	0.041	58.7	43.4
Maximum Detect			256	267	9.78	0.2	0.45	0.45	2.69	6.3	1.03	6.3	1.06	97	0.69	0.016	0.0001	0.007	ND	0.006	0.041	58.7	43.4
Average Concentration			41	42	3.3	0.053	0.16	0.16	0.27	1.5	0.071	1.2	0.16	5.6	0.089	0.0026	0.000064	0.0012		0.0013	0.011	13	6.6
Median Concentration			5.34	5.44	2.635	0.05	0.19	0.19	0.01	1.2	0.005	0.8	0.06	2.41	0.04	0.001	0.00005	0.0005	0.01	0.0005	0.01	5.19	2.31
Standard Deviation			77	79	2.6	0.02	0.11	0.11	0.54	1.2	0.2	1.3	0.26	13	0.12	0.0034	0.00005	0.0013		0.0014	0.0071	15	10

Appendix E
Table E-2 Summary of Groundwater Results

									BTEXN							TRH - NEPM 2013							TRH - NEPM 1999					PAHs
			Lead (Filtered)	Manganese (Filtered)	Nickel (Filtered)	Selenium (Filtered)	Zinc (Filtered)	Benzene	Toluene	Ethylbenzene	Xylene (o)	Xylene (m & p)	Xylene Total	BTEX (Sum of Total) - Lab Calc	F1 (C6-C10 minus BTEX)	C6-C10 Fraction	F2 (>C10-C16 minus Naphthalene)	>C10-C16 Fraction	F3 (>C16-C34 Fraction)	F4 (>C34-C40 Fraction)	>C10-C40 (Sum of Total)	C6-C9 Fraction	C10-C14 Fraction	C15-C28 Fraction	C29-C36 Fraction	C10-C36 (Sum of Total)	Naphthalene
			mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL			0.001	0.001	0.001	0.01	0.005	1	2	2	2	2	2	1	20	20	100	100	100	100	100	20	50	100	50	50	5
DER 2014 Fresh Waters			**0.0034**	**1.9**	**0.011**	**0.005**	**0.008**	**950**			**350**																**16**
DER 2014 Non-potable Groundwater Use (NP			**0.1**	**5**	**0.2**	**0.1**	**3**	**10**	**25**	**3**			**20**				**1000**		**900**	**900**							
WA DER 2015 ASS Criteria																											
Location	**Sample Date**	**Lab Report**																									
BORR MW04	21/08/2019	EP1908496	<0.001	0.127	<0.001	**<0.01**	0.007	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	18/09/2019	EP1909602	<0.001	0.13	0.01	**<0.01**	**0.047**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	28/10/2019	EP1911129	<0.001	0.166	0.009	**<0.01**	**0.066**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	20/11/2019	EP1912321	<0.001	0.166	**0.014**	**<0.01**	**0.095**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	16/12/2019	EP1913499	<0.001	0.14	0.008	**<0.01**	**0.04**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	20/01/2020	EP2000762	<0.001	0.167	**0.011**	**<0.01**	**0.078**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
BORR MW05	21/08/2019	EP1908496	<0.001	0.014	0.005	**<0.01**	**0.068**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	19/09/2019	EP1909602	<0.001	0.012	**0.015**	**<0.01**	**0.046**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	28/10/2019	EP1911129	0.001	0.015	**0.013**	**<0.01**	**0.115**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	20/11/2019	EP1912321	0.001	0.014	**0.014**	**<0.01**	**0.072**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	16/12/2019	EP1913499	<0.001	0.011	0.01	**<0.01**	**0.064**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	20/01/2020	EP2000762	0.001	0.014	**0.013**	**<0.01**	**0.01**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
BORR MW05	21/08/2019	EP1908496	0.002	0.041	**0.014**	**<0.01**	**0.126**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	18/09/2019	EP1909602	0.003	0.064	0.008	**<0.01**	**0.061**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	28/10/2019	EP1911129	<0.001	0.326	0.001	**<0.01**	**0.01**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	20/11/2019	EP1912321	0.002	0.08	**0.018**	**<0.01**	**0.073**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	16/12/2019	EP1913499	<0.001	0.04	0.006	**<0.01**	**0.022**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	20/01/2020	EP2000762	0.001	0.027	0.003	**<0.01**	**0.04**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
BORR MW07	22/08/2019	EP1908496	<0.001	0.008	**0.013**	**<0.01**	**0.036**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	18/09/2019	EP1909602	<0.001	0.015	0.009	**<0.01**	**0.112**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
BORR MW8a	22/08/2019	EP1908496	<0.001	0.058	**0.015**	**<0.01**	**0.075**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	18/09/2019	EP1909602	<0.001	0.045	0.005	**<0.01**	**0.074**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	28/10/2019	EP1911129	<0.001	0.05	**0.012**	**<0.01**	**0.083**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	21/11/2019	EP1912321	0.001	0.054	**0.018**	**<0.01**	**0.085**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	19/12/2019	EP1913643	0.002	0.067	**0.016**	**<0.01**	**0.097**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	20/01/2020	EP2000762	<0.001	0.061	0.004	**<0.01**	**0.042**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
BORR MW09	22/08/2019	EP1908496	<0.001	0.003	**0.015**	**<0.01**	**0.118**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	18/09/2019	EP1909602	<0.001	0.003	0.008	**<0.01**	**0.12**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5

Appendix E
Table E-2 Summary of Groundwater Results

									BTEXN							TRH - NEPM 2013							TRH - NEPM 1999					PAHs
			Lead (Filtered)	Manganese (Filtered)	Nickel (Filtered)	Selenium (Filtered)	Zinc (Filtered)	Benzene	Toluene	Ethylbenzene	Xylene (o)	Xylene (m & p)	Xylene Total	BTEX (Sum of Total) - Lab Calc	F1 (C6-C10 minus BTEX)	C6-C10 Fraction	F2 (>C10-C16 minus Naphthalene)	>C10-C16 Fraction	F3 (>C16-C34 Fraction)	F4 (>C34-C40 Fraction)	>C10-C40 (Sum of Total)	C6-C9 Fraction	C10-C14 Fraction	C15-C28 Fraction	C29-C36 Fraction	C10-C36 (Sum of Total)	Naphthalene
			mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL			0.001	0.001	0.001	0.01	0.005	1	2	2	2	2	2	1	20	20	100	100	100	100	100	20	50	100	50	50	5
DER 2014 Fresh Waters			**0.0034**	**1.9**	**0.011**	**0.005**	**0.008**	**950**			**350**																**16**
DER 2014 Non-potable Groundwater Use (NP			**0.1**	**5**	**0.2**	**0.1**	**3**	**10**	**25**	**3**			**20**				**1000**		**900**	**900**							
WA DER 2015 ASS Criteria																											
Location	**Sample Date**	**Lab Report**																									
	23/10/2019	EP1910998	<0.001	0.002	0.009	**<0.01**	**0.055**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	21/11/2019	EP1912321	0.001	0.002	**0.017**	**<0.01**	**0.042**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	19/12/2019	EP1913643	0.001	0.004	**0.014**	**<0.01**	**0.06**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	21/01/2020	EP2000762	0.001	0.004	0.006	**<0.01**	**0.047**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
BORR MW10	22/08/2019	EP1908496	<0.001	0.014	**0.016**	**<0.01**	**0.066**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	18/09/2019	EP1909602	<0.001	0.013	0.009	**<0.01**	**0.053**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	23/10/2019	EP1910998	<0.001	0.01	0.007	**<0.01**	**0.074**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	21/11/2019	EP1912321	<0.001	0.012	**0.012**	**<0.01**	**0.055**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	19/12/2019	EP1913643	<0.001	0.013	0.01	**<0.01**	**0.055**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	21/01/2020	EP2000762	<0.001	0.015	**0.013**	**<0.01**	**0.073**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
BORR MW11	21/08/2019	EP1908496	<0.001	0.224	**0.02**	**<0.01**	**0.099**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	19/09/2019	EP1909602	<0.001	0.076	0.008	**<0.01**	**0.039**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	23/10/2019	EP1910998	0.001	0.59	**0.017**	**<0.01**	**0.09**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	20/11/2019	EP1912321	0.002	0.092	**0.041**	**<0.01**	**0.077**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	290	<100	290	<20	<50	210	120	330	<5
	16/12/2019	EP1913643	**<0.005**	0.246	**0.018**	**<0.05**	**0.404**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
BORR MW12	21/08/2019	EP1908496	<0.001	0.012	0.006	**<0.01**	**0.029**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	18/09/2019	EP1909602	<0.001	0.006	0.005	**<0.01**	**0.032**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	22/10/2019	EP1910866	<0.001	0.005	0.007	**<0.01**	**0.074**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	20/11/2019	EP1912321	0.001	0.004	0.01	**<0.01**	**0.043**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	19/12/2019	EP1913643	<0.001	0.001	<0.001	**<0.01**	<0.005	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	22/01/2020	EP2000814	<0.001	0.002	<0.001	**<0.01**	<0.005	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
BORR MW46	21/08/2019	EP1908496	0.002	0.084	**0.012**	**<0.01**	**0.104**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	19/09/2019	EP1909602	0.001	0.08	**0.012**	**<0.01**	**0.07**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	24/10/2019	EP1910998	<0.001	0.164	**0.012**	**<0.01**	**0.115**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	20/11/2019	EP1912321	0.001	0.075	**0.015**	**<0.01**	**0.07**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	19/12/2019	EP1913643	<0.001	0.085	**0.012**	**<0.01**	**0.062**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
	21/01/2020	EP2000762	<0.001	0.07	**0.012**	**<0.01**	**0.033**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
MR MW05	22/08/2019	EP1908496	0.002	0.186	**0.014**	**<0.01**	**0.119**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	230	<100	230	<20	<50	280	<50	280	<5

Appendix E
Table E-2 Summary of Groundwater Results

								BTEXN							TRH - NEPM 2013							TRH - NEPM 1999					PAHs
			Lead (Filtered)	Manganese (Filtered)	Nickel (Filtered)	Selenium (Filtered)	Zinc (Filtered)	Benzene	Toluene	Ethylbenzene	Xylene (o)	Xylene (m & p)	Xylene Total	BTEX (Sum of Total) - Lab Calc	F1 (C6-C10 minus BTEX)	C6-C10 Fraction	F2 (>C10-C16 minus Naphthalene)	>C10-C16 Fraction	F3 (>C16-C34 Fraction)	F4 (>C34-C40 Fraction)	>C10-C40 (Sum of Total)	C6-C9 Fraction	C10-C14 Fraction	C15-C28 Fraction	C29-C36 Fraction	C10-C36 (Sum of Total)	Naphthalene
			mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL			0.001	0.001	0.001	0.01	0.005	1	2	2	2	2	2	1	20	20	100	100	100	100	100	20	50	100	50	50	5
DER 2014 Fresh Waters			**0.0034**	**1.9**	**0.011**	**0.005**	**0.008**	**950**			**350**																**16**
DER 2014 Non-potable Groundwater Use (NP			**0.1**	**5**	**0.2**	**0.1**	**3**	**10**	**25**	**3**			**20**				**1000**		**900**	**900**							
WA DER 2015 ASS Criteria																											
Location	**Sample Date**	**Lab Report**																									
	19/09/2019	EP1909602	**<0.005**	0.198	0.009	**<0.05**	**0.052**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	160	<100	160	<20	<50	190	<50	190	<5
	28/10/2019	EP1911129	**<0.005**	0.189	0.007	**<0.05**	**0.068**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	100	<100	100	<20	<50	140	<50	140	<5
	21/11/2019	EP1912321	<0.001	0.189	0.006	**<0.01**	**0.031**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	140	<100	140	<20	<50	170	<50	170	<5
	19/12/2019	EP1913643	**<0.005**	0.18	**0.014**	**<0.05**	**0.069**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	240	<100	240	<20	<50	270	<50	270	<5
	21/01/2020	EP2000762	<0.001	0.225	**0.016**	**<0.01**	**0.057**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
Statistical Summary																											
Number of Results			61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61
Number of Detects			19	61	58	0	59	0	0	0	0	0	0	0	0	0	0	0	6	0	6	0	0	6	1	6	0
Minimum Concentration			<0.001	0.001	<0.001	<0.01	<0.005	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
Minimum Detect			0.001	0.001	0.001	ND	0.007	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	100	ND	100	ND	ND	140	120	140	ND
Maximum Concentration			<0.005	0.59	0.041	<0.05	0.404	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	290	<100	290	<20	<50	280	120	330	<5
Maximum Detect			0.003	0.59	0.041	ND	0.404	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	290	ND	290	ND	ND	280	120	330	ND
Average Concentration			0.00092	0.082	0.011	0.0063	0.069	0.5	1	1	1	1	1	0.5	10	10	50	50	64	50	64	10	25	66	27	45	2.5
Median Concentration			0.0005	0.05	0.012	0.005	0.066	0.5	1	1	1	1	1	0.5	10	10	50	50	50	50	50	10	25	50	25	25	2.5
Standard Deviation			0.00068	0.1	0.0062	0.005	0.053	0	0	0	0	0	0	0	0	0	0	0	48	0	48	0	0	51	12	65	0

Notes

DER 2014 Fresh Waters - SW Aust. Wetlands

Trigger values taken from ANZECC and ARMCANZ (2000), and adopted by DER (2014), and in the NEPM (2013).
Arsenic (V) and Chromium (VI) guideline value adopted for Arsenic (unspeciated) and Chromium (unspeciated).
Selenium value applies to a slightly-moderately disturbed system and a 95% level of protection (%species).
Nutrient values for South West Western Australian Wetland environments adopted from ANZECC/ ARMCANZ 2000 Freshwater and Marine Guidelines, Table 3.3.6

DER 2014 Short-term irrigation

Chloride concentrations may cause foliar damage in non tolerant species

DER 2015 ASS Criteria

Dissolved Aluminium value relates to water with a pH>6.5, no guideline is available for water pH<6.0

Appendix E
Table E-3 Summary of Surface Water Results

			Field Parameters								Inorganics			Acidity & Alkalinity					Major Ions						
			pH (Field)	Electrical conductivity (field)	Dissolved Oxygen (Field)	DO (%S) (Field)	Redox (Field)	Temperature (Field)	TDS (Field)	Turbidity (Field)(OLD)	pH (Lab)	Electrical conductivity (lab)	Total Dissolved Solids	Alkalinity (Carbonate as CaCO3)	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Hydroxide as CaCO3)	Alkalinity (total as CaCO3)	Acidity (as CaCO3)	Calcium (Filtered)	Magnesium (Filtered)	Potassium (Filtered)	Sodium (Filtered)	Chloride	Sulfate (Filtered)	Cations Total
			pH Units	µS/cm	mg/L	%S	mV	°C	mg/L	NTU	pH Units	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	meq/L
EQL											0.01	1	10	1	1	1	1	1	1	1	1	1	1	1	0.01
DER 2014 Fresh Waters											**6.5-8.5**														
DER 2014 Non-potable Groundwater Use (NPUG) & 10x WHO 2008 TRH Values																							**250**	**1000**	
WA DER 2015 ASS Criteria			**<5**								**<5**						**<30**	**40**							
Location	**Sample Date**	**Lab Report**																							
Southern 3	21/08/2019	EP1908496	7.76	1607	8.99	91.9	60.9	16.2	1044.25	4	7.94	1530	1030	<1	120	<1	120	9	23	31	11	254	**362**	95	15
	18/09/2019	EP1909602	7.17	2586	4.6	47.2	80.5	16.1	1680	2.12	7.56	2500	1580	<1	134	<1	134	12	30	50	15	407	**708**	140	23.7
	22/10/2019	EP1910866	7.3	3961	2.43	26.8	9.8	19.5	2573.7	-	7.85	3660	2160	<1	186	<1	186	10	32	71	23	614	**943**	146	34.7
	20/11/2019	EP1912321	8.62	6472	8.62	91.3	64.5	17.1	4206	22.5	8.14	6390	4040	<1	314	<1	314	5	59	131	43	1210	**1900**	173	67.4
Southern 4	21/08/2019	EP1908496	7.26	6148	6.95	69.6	140.6	14.5	3996.36	-	7.76	6230	3640	<1	121	<1	121	17	59	135	27	963	**1700**	103	56.6
	18/09/2019	EP1909602	7.24	5698	3.71	38.8	25.8	16.4	3702	2.84	7.7	5680	3560	<1	112	<1	112	10	52	125	23	920	**1680**	108	53.5
	22/10/2019	EP1910866	7.86	7083	8.6	97.3	96.9	20.3	1603.72	-	7.87	6570	3890	<1	129	<1	129	9	51	146	26	1070	**2030**	110	61.8
	20/11/2019	EP1912321	7.21	7975	1.52	17.1	9.6	19.6	5184	7.17	7.73	7490	5020	<1	164	<1	164	11	67	182	31	1340	**2130**	103	77.4
	19/12/2019	EP1913643	8.74	9528	5.83	71.1	19.9	23.7	6193.2	17.7	**8.56**	9630	5650	18	172	<1	190	<1	80	202	37	1600	**3080**	84	91.2
	22/01/2020	EP2000814	8.81	12,485	6.06	73	74.9	22.8	8118.9	30.3	**8.67**	11,400	7750	34	203	<1	237	<1	104	267	46	1960	**4270**	151	114
SW10	22/08/2019	EP1908496	7.12	1028	7.14	71.1	103.9	15.1	668.11	2.2	7.57	1160	769	<1	79	<1	79	9	45	28	35	130	**287**	38	11.1
	18/09/2019	EP1909602	7.18	771	6.73	72.4	63.4	18.8	501	2.15	7.55	748	550	<1	65	<1	65	9	30	17	17	92	206	14	7.33
SW11	21/08/2019	EP1908496	7.37	280.2	10.08	105	60.1	17.2	182.144	11	7.55	262	164	<1	57	<1	57	5	12	6	2	34	28	30	2.62
	18/09/2019	EP1909602	8.43	2786	14.73	167.7	81	21.8	181	7.14	7.02	348	269	<1	77	<1	77	27	9	6	2	42	54	10	2.82
Statistical Summary																									
Number of Results			14	14	14	14	14	14	14	11	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
Number of Detects			14	14	14	14	14	14	14	11	14	14	14	2	14	0	14	12	14	14	14	14	14	14	14
Minimum Concentration			7.12	280.2	1.52	17.1	9.6	14.5	181	2.12	7.02	262	164	<1	57	<1	57	<1	9	6	2	34	28	10	2.62
Minimum Detect			7.12	280.2	1.52	17.1	9.6	14.5	181	2.12	7.02	262	164	18	57	ND	57	5	9	6	2	34	28	10	2.62
Maximum Concentration			8.81	12485	14.73	167.7	140.6	23.7	8118.9	30.3	8.67	11400	7750	34	314	<1	314	27	104	267	46	1960	4270	173	114
Maximum Detect			8.81	12485	14.73	167.7	140.6	23.7	8118.9	30.3	8.67	11400	7750	34	314	ND	314	27	104	267	46	1960	4270	173	114
Average Concentration			7.7	4886	6.9	74	64	19	2845	9.9	7.8	4543	2862	4.1	138	0.5	142	9.6	47	100	24	760	1384	93	44
Median Concentration			7.335	4829.5	6.84	71.75	63.95	18	2126.85	7.14	7.745	4670	2860	0.5	125	0.5	125	9	48	98	24.5	767	1311.5	103	44.1
Standard Deviation			0.65	3646	3.4	38	38	2.9	2466	9.6	0.42	3606	2305	9.8	68	0	72	6.7	26	82	14	628	1257	52	36

Appendix E
Table E-3 Summary of Surface Water Results

						Nutrients							Metals										
				Anions Total	Ionic Balance	Sulfide	Ammonium (as N)	Ammonia as N	Nitrogen (Total Oxidised) (as N)	Nitrogen (Total)	Reactive Phosphorus as P	Kjeldahl Nitrogen Total	Phosphorus (Total)	Aluminium	Aluminium (Filtered)	Arsenic (Filtered)	Cadmium (Filtered)	Chromium (III+VI) (Filtered)	Cobalt (Filtered)	Copper (Filtered)	Iron	Iron (Filtered)	Lead (Filtered)	Manganese (Filtered)
				meq/L	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
EQL				0.01	0.01	0.1	0.01	0.01	0.01	0.1	0.01	0.1	0.01	0.01	0.01	0.001	0.0001	0.001	0.001	0.001	0.05	0.05	0.001	0.001
DER 2014 Fresh Waters										**2**			**0.2**	**0.055**	**0.055**		**0.0002**			**0.0014**	**0.3**		**0.0034**	**1.9**
DER 2014 Non-potable Groundwater Use (NP														**0.2**	**0.2**	**0.1**	**0.02**			**20**	**0.3**		**0.1**	**5**
WA DER 2015 ASS Criteria															**1**									
Location	**Sample Date**	**Lab Report**																						
Southern 3	21/08/2019	EP1908496	14.6	1.49	<0.1	0.02	0.02	0.02	**4.7**	0.07	4.7	**0.21**	**0.27**	**0.24**	<0.001	0.0001	0.001	<0.001	**0.019**	**0.85**	0.71	0.001	0.007
	18/09/2019	EP1909602	25.6	3.78	<0.1	0.02	0.02	<0.01	**3.8**	0.04	3.8	0.13	**0.07**	**0.07**	<0.001	<0.0001	<0.001	<0.001	**0.013**	**0.61**	0.45	<0.001	0.046
	22/10/2019	EP1910866	33.4	2.02	<0.1	<0.01	<0.01	0.01	**5.8**	0.78	5.8	**0.9**	**0.07**	**0.06**	0.001	<0.0001	<0.001	<0.001	**0.017**	**2.1**	1.42	<0.001	0.203
	20/11/2019	EP1912321	63.5	3.04	<0.1	0.16	0.18	<0.01	**8**	1.28	8	**1.66**	**0.58**	**0.06**	0.002	<0.0001	<0.001	0.001	**0.023**	**1.52**	0.62	0.002	0.479
Southern 4	21/08/2019	EP1908496	52.5	3.77	<0.1	0.17	0.17	0.08	**3.2**	0.09	3.1	0.16	**0.21**	**0.06**	0.001	<0.0001	0.001	<0.001	**0.022**	**0.43**	0.36	<0.001	0.041
	18/09/2019	EP1909602	51.9	1.53	<0.1	0.12	0.12	0.02	**3**	0.07	3	0.1	**0.24**	**0.08**	0.002	<0.0001	<0.001	<0.001	**0.023**	**0.75**	0.56	<0.001	0.079
	22/10/2019	EP1910866	62.1	0.29	<0.1	<0.01	<0.01	<0.01	**4.2**	<0.01	4.2	0.15	**0.14**	**0.06**	0.001	<0.0001	<0.001	<0.001	**0.015**	**0.67**	0.45	0.001	0.029
	20/11/2019	EP1912321	65.5	8.32	<0.1	<0.01	<0.01	<0.01	**3.9**	0.05	3.9	**0.25**	**0.19**	0.05	0.002	<0.0001	<0.001	<0.001	**0.018**	**0.66**	0.4	0.001	0.07
	19/12/2019	EP1913643	92.4	0.69	<0.1	0.02	0.03	<0.01	**7.1**	<0.01	7.1	**0.23**	**0.24**	**0.06**	0.002	<0.0001	<0.001	<0.001	**0.013**	**0.41**	0.14	0.001	0.036
	22/01/2020	EP2000814	128	6.09	<0.1	0.06	0.07	<0.01	**7.2**	<0.01	7.2	**0.26**	**0.21**	0.05	0.003	<0.0001	<0.001	<0.001	**0.014**	0.15	0.07	0.001	0.027
SW10	22/08/2019	EP1908496	10.5	2.94	<0.1	<0.01	<0.01	<0.01	**3.3**	0.5	3.3	**0.51**	**0.08**	**0.09**	<0.001	**0.0002**	<0.001	<0.001	**0.026**	**0.97**	0.91	0.002	0.012
	18/09/2019	EP1909602	7.4	0.46	<0.1	<0.01	<0.01	<0.01	**3.3**	0.65	3.3	**0.67**	**0.1**	**0.12**	<0.001	<0.0001	<0.001	<0.001	**0.015**	**1.05**	1.07	<0.001	0.011
SW11	21/08/2019	EP1908496	2.55	1.34	<0.1	<0.01	<0.01	<0.01	1	<0.01	1	0.02	**0.34**	**0.18**	<0.001	<0.0001	<0.001	<0.001	**0.022**	**0.52**	0.28	<0.001	0.004
	18/09/2019	EP1909602	3.27	7.37	<0.1	0.09	0.1	<0.01	**2**	0.01	2	0.05	**0.78**	**0.09**	0.001	<0.0001	<0.001	<0.001	**0.009**	**1.58**	0.51	<0.001	0.012
Statistical Summary																								
Number of Results			14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
Number of Detects			14	14	0	8	8	4	14	10	14	14	14	14	9	2	2	1	14	14	14	7	14	
Minimum Concentration			2.55	0.29	<0.1	<0.01	<0.01	<0.01	1	<0.01	1	0.02	0.07	0.05	<0.001	<0.0001	<0.001	<0.001	0.009	0.15	0.07	<0.001	0.004	
Minimum Detect			2.55	0.29	ND	0.02	0.02	0.01	1	0.01	1	0.02	0.07	0.05	0.001	0.0001	0.001	0.001	0.009	0.15	0.07	0.001	0.004	
Maximum Concentration			128	8.32	<0.1	0.17	0.18	0.08	8	1.28	8	1.66	0.78	0.24	0.003	0.0002	0.001	0.001	0.026	2.1	1.42	0.002	0.479	
Maximum Detect			128	8.32	ND	0.17	0.18	0.08	8	1.28	8	1.66	0.78	0.24	0.003	0.0002	0.001	0.001	0.026	2.1	1.42	0.002	0.479	
Average Concentration			44	3.1	0.05	0.049	0.053	0.013	4.3	0.25	4.3	0.38	0.25	0.091	0.0013	0.000064	0.00057	0.00054	0.018	0.88	0.57	0.00089	0.075	
Median Concentration			42.65	2.48	0.05	0.02	0.02	0.005	3.85	0.06	3.85	0.22	0.21	0.065	0.001	0.00005	0.0005	0.0005	0.0175	0.71	0.48	0.00075	0.0325	
Standard Deviation			37	2.6	0	0.061	0.064	0.02	2	0.4	2	0.44	0.2	0.055	0.0008	0.000041	0.00018	0.00013	0.0049	0.53	0.37	0.00053	0.13	

Appendix E
Table E-3 Summary of Surface Water Results

						BTEXN							TRH - NEPM 2013							TRH - NEPM 1999					PAHs				
			Nickel (Filtered)	Selenium (Filtered)	Zinc (Filtered)	Benzene	Toluene	Ethylbenzene	Xylene (o)	Xylene (m & p)	Xylene Total	BTEX (Sum of Total) - Lab Calc	F1 (C6-C10 minus BTEX)	C6-C10 Fraction	F2 (>C10-C16 minus Naphthalene)	>C10-C16 Fraction	F3 (>C16-C34 Fraction)	F4 (>C34-C40 Fraction)	>C10-C40 (Sum of Total)	C6-C9 Fraction	C10-C14 Fraction	C15-C28 Fraction	C29-C36 Fraction	C10-C36 (Sum of Total)	Naphthalene	Azinphos methyl	Bolstar (Sulprofos)	Bromophos-ethyl	Carbophenothion
			mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL			0.001	0.01	0.005	1	2	2	2	2	2	1	20	20	100	100	100	100	100	20	50	100	50	50	5	0.02	0.05	0.1	0.02
DER 2014 Fresh Waters			**0.011**	**0.005**	**0.008**	**950**			**350**																**16**				
DER 2014 Non-potable Groundwater Use (NP			**0.2**	**0.1**	**3**	**10**	**25**	**3**			**20**				**1000**		**900**	**900**								**300**	**100**		
WA DER 2015 ASS Criteria																													
Location	**Sample Date**	**Lab Report**																											
Southern 3	21/08/2019	EP1908496	0.01	**<0.01**	**0.075**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5	<0.02	<0.05	<0.1	<0.02
	18/09/2019	EP1909602	0.009	**<0.01**	**0.08**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5	<0.02	<0.05	<0.1	<0.02
	22/10/2019	EP1910866	**0.011**	**<0.01**	**0.099**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	150	<100	150	<20	<50	110	50	160	<5	<0.02	<0.05	<0.1	<0.02
	20/11/2019	EP1912321	**0.014**	**<0.01**	**0.066**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	430	<100	430	<20	<50	240	250	490	<5	<0.02	<0.05	<0.1	<0.02
Southern 4	21/08/2019	EP1908496	0.009	**<0.01**	**0.059**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	150	<100	150	<20	<50	120	<50	120	<5	<0.02	<0.05	<0.1	<0.02
	18/09/2019	EP1909602	**0.015**	**<0.01**	**0.126**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	130	<100	130	<20	<50	<100	<50	<50	<5	<0.02	<0.05	<0.1	<0.02
	22/10/2019	EP1910866	**0.012**	**<0.01**	**0.122**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	230	<100	230	<20	<50	180	60	240	<5	<0.02	<0.05	<0.1	<0.02
	20/11/2019	EP1912321	**0.012**	**<0.01**	**0.048**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	140	<100	140	<20	<50	120	<50	120	<5	<0.02	<0.05	<0.1	<0.02
	19/12/2019	EP1913643	**0.013**	**<0.01**	**0.139**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	160	<100	160	<20	<50	130	<50	130	<5	<0.02	<0.05	<0.1	<0.02
	22/01/2020	EP2000814	**0.016**	**<0.01**	**0.142**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	120	<100	120	<20	<50	100	<50	100	<5	<0.02	<0.05	<0.1	<0.02
SW10	22/08/2019	EP1908496	**0.016**	**<0.01**	**0.113**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5	<0.02	<0.05	<0.1	<0.02
	18/09/2019	EP1909602	**0.011**	**<0.01**	**0.105**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5	<0.02	<0.05	<0.1	<0.02
SW11	21/08/2019	EP1908496	**0.011**	**<0.01**	**0.054**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5	<0.02	<0.05	<0.1	<0.02
	18/09/2019	EP1909602	0.008	**<0.01**	**0.027**	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	130	<100	130	<20	<50	<100	<50	<50	<5	<0.02	<0.05	<0.1	<0.02

Statistical Summary

Number of Results	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
Number of Detects	14	0	14	0	0	0	0	0	0	0	0	0	0	0	0	9	0	9	0	0	7	3	7	0	0	0	0	0
Minimum Concentration	0.008	<0.01	0.027	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5	<0.02	<0.05	<0.1	<0.02
Minimum Detect	0.008	ND	0.027	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	120	ND	120	ND	ND	100	50	100	ND	ND	ND	ND	ND
Maximum Concentration	0.016	<0.01	0.142	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	430	<100	430	<20	<50	240	250	490	<5	<0.02	<0.05	<0.1	<0.02
Maximum Detect	0.016	ND	0.142	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	430	ND	430	ND	ND	240	250	490	ND	ND	ND	ND	ND
Average Concentration	0.012	0.005	0.09	0.5	1	1	1	1	1	0.5	10	10	50	50	135	50	135	10	25	96	45	110	2.5	0.01	0.025	0.05	0.01
Median Concentration	0.0115	0.005	0.0895	0.5	1	1	1	1	1	0.5	10	10	50	50	130	50	130	10	25	75	25	62.5	2.5	0.01	0.025	0.05	0.01
Standard Deviation	0.0026	0	0.036	0	0	0	0	0	0	0	0	0	0	0	101	0	101	0	0	59	60	129	0	0	0	0	0

Appendix E
Table E-3 Summary of Surface Water Results

			OP Pesticides																						
			Azinphos Ethyl	Chlorfenvinphos	Chlorpyrifos	Chlorpyrifos-methyl	Coumaphos	Demeton-O	Demeton-S	Demeton-S-methyl	Diazinon	Dichlorvos	Dimethoate	Disulfoton	EPN	Ethion	Ethoprop	Fenamiphos	Fenitrothion	Fensulfothion	Fenthion	Malathion	Methyl parathion	Mevinphos (Phosdrin)	Monocrotophos	Omethoate
			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL			0.02	0.02	0.02	0.2	0.01	0.02	0.02	0.02	0.01	0.2	0.02	0.05	0.05	0.02	0.01	0.01	2	0.01	0.05	0.02	0.5	0.02	0.02	0.01
DER 2014 Fresh Waters					**0.01**						**0.01**		**0.15**						**0.2**			**0.05**				
DER 2014 Non-potable Groundwater Use (NP				**20**	**100**						**40**	**50**	**70**	**40**		**40**	**10**	**5**	**70**		**70**	**700**	**7**	**60**		**10**
WA DER 2015 ASS Criteria																										
Location	**Sample Date**	**Lab Report**																								
Southern 3	21/08/2019	EP1908496	<0.02	<0.02	**<0.02**	<0.2	<0.01	<0.02	<0.02	<0.02	<0.01	<0.2	<0.02	<0.05	<0.05	<0.02	<0.01	<0.01	**<2**	<0.01	<0.05	<0.02	<0.5	<0.02	<0.02	<0.01
	18/09/2019	EP1909602	<0.02	<0.02	**<0.02**	<0.2	<0.01	<0.02	<0.02	<0.02	<0.01	<0.2	<0.02	<0.05	<0.05	<0.02	<0.01	<0.01	**<2**	<0.01	<0.05	<0.02	<0.5	<0.02	<0.02	<0.01
	22/10/2019	EP1910866	<0.02	<0.02	**<0.02**	<0.2	<0.01	<0.02	<0.02	<0.02	<0.01	<0.2	<0.02	<0.05	<0.05	<0.02	<0.01	<0.01	**<2**	<0.01	<0.05	<0.02	<0.5	<0.02	<0.02	<0.01
	20/11/2019	EP1912321	<0.02	<0.02	**<0.02**	<0.2	<0.01	<0.02	<0.02	<0.02	<0.01	<0.2	<0.02	<0.05	<0.05	<0.02	<0.01	<0.01	**<2**	<0.01	<0.05	<0.02	<0.5	<0.02	<0.02	<0.01
Southern 4	21/08/2019	EP1908496	<0.02	<0.02	**<0.02**	<0.2	<0.01	<0.02	<0.02	<0.02	<0.01	<0.2	<0.02	<0.05	<0.05	<0.02	<0.01	<0.01	**<2**	<0.01	<0.05	<0.02	<0.5	<0.02	<0.02	<0.01
	18/09/2019	EP1909602	<0.02	<0.02	**<0.02**	<0.2	<0.01	<0.02	<0.02	<0.02	<0.01	<0.2	<0.02	<0.05	<0.05	<0.02	<0.01	<0.01	**<2**	<0.01	<0.05	<0.02	<0.5	<0.02	<0.02	<0.01
	22/10/2019	EP1910866	<0.02	<0.02	**<0.02**	<0.2	<0.01	<0.02	<0.02	<0.02	<0.01	<0.2	<0.02	<0.05	<0.05	<0.02	<0.01	<0.01	**<2**	<0.01	<0.05	<0.02	<0.5	<0.02	<0.02	<0.01
	20/11/2019	EP1912321	<0.02	<0.02	**<0.02**	<0.2	<0.01	<0.02	<0.02	<0.02	<0.01	<0.2	<0.02	<0.05	<0.05	<0.02	<0.01	<0.01	**<2**	<0.01	<0.05	<0.02	<0.5	<0.02	<0.02	<0.01
	19/12/2019	EP1913643	<0.02	<0.02	**<0.02**	<0.2	<0.01	<0.02	<0.02	<0.02	<0.01	<0.2	<0.02	<0.05	<0.05	<0.02	<0.01	<0.01	**<2**	<0.01	<0.05	<0.02	<0.5	<0.02	<0.02	<0.01
	22/01/2020	EP2000814	<0.02	<0.02	**<0.02**	<0.2	<0.01	<0.02	<0.02	<0.02	<0.01	<0.2	<0.02	<0.05	<0.05	<0.02	<0.01	<0.01	**<2**	<0.01	<0.05	<0.02	<0.5	<0.02	<0.02	<0.01
SW10	22/08/2019	EP1908496	<0.02	<0.02	**<0.02**	<0.2	<0.01	<0.02	<0.02	<0.02	<0.01	<0.2	<0.02	<0.05	<0.05	<0.02	<0.01	<0.01	**<2**	<0.01	<0.05	<0.02	<0.5	<0.02	<0.02	<0.01
	18/09/2019	EP1909602	<0.02	<0.02	**<0.02**	<0.2	<0.01	<0.02	<0.02	<0.02	<0.01	<0.2	<0.02	<0.05	<0.05	<0.02	<0.01	<0.01	**<2**	<0.01	<0.05	<0.02	<0.5	<0.02	<0.02	<0.01
SW11	21/08/2019	EP1908496	<0.02	<0.02	**<0.02**	<0.2	<0.01	<0.02	<0.02	<0.02	<0.01	<0.2	<0.02	<0.05	<0.05	<0.02	<0.01	<0.01	**<2**	<0.01	<0.05	<0.02	<0.5	<0.02	<0.02	<0.01
	18/09/2019	EP1909602	<0.02	<0.02	**<0.02**	<0.2	<0.01	<0.02	<0.02	<0.02	<0.01	<0.2	<0.02	<0.05	<0.05	<0.02	<0.01	<0.01	**<2**	<0.01	<0.05	<0.02	<0.5	<0.02	<0.02	<0.01

Statistical Summary

Number of Results	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
Number of Detects	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration	<0.02	<0.02	<0.02	<0.2	<0.01	<0.02	<0.02	<0.02	<0.01	<0.2	<0.02	<0.05	<0.05	<0.02	<0.01	<0.01	<2	<0.01	<0.05	<0.02	<0.5	<0.02	<0.02	<0.01
Minimum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	<0.02	<0.02	<0.02	<0.2	<0.01	<0.02	<0.02	<0.02	<0.01	<0.2	<0.02	<0.05	<0.05	<0.02	<0.01	<0.01	<2	<0.01	<0.05	<0.02	<0.5	<0.02	<0.02	<0.01
Maximum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration	0.01	0.01	0.01	0.1	0.005	0.01	0.01	0.01	0.005	0.1	0.01	0.025	0.025	0.01	0.005	0.005	1	0.005	0.025	0.01	0.25	0.01	0.01	0.005
Median Concentration	0.01	0.01	0.01	0.1	0.005	0.01	0.01	0.01	0.005	0.1	0.01	0.025	0.025	0.01	0.005	0.005	1	0.005	0.025	0.01	0.25	0.01	0.01	0.005
Standard Deviation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Appendix E
Table E-3 Summary of Surface Water Results

													Pesticides				Herbicides
			Parathion	Phorate	Pirimphos-ethyl	Pirimiphos-methyl	Profenofos	Prothiofos	Ronnel	Sulfotepp	Terbufos	Trichloronate	Tetrachlorvinphos	Demeton-O & Demeton-S	Temephos	Trichlorfon	Triazophos	Glyphosate
			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL			0.2	0.1	0.01	0.01	0.01	0.1	10	0.005	0.01	0.5	0.01	0.02	0.02	0.02	0.005	10
DER 2014 Fresh Waters			**0.004**															**370**
DER 2014 Non-potable Groundwater Use (NP			**200**			**900**	**3**				**9**				**4000**	**70**		**10000**
WA DER 2015 ASS Criteria																		
Location	**Sample Date**	**Lab Report**																
Southern 3	21/08/2019	EP1908496	**<0.2**	<0.1	<0.01	<0.01	<0.01	<0.1	<10	<0.005	<0.01	<0.5	<0.01	<0.02	<0.02	<0.02	<0.005	<10
	18/09/2019	EP1909602	**<0.2**	<0.1	<0.01	<0.01	<0.01	<0.1	<10	<0.005	<0.01	<0.5	<0.01	<0.02	<0.02	<0.02	<0.005	<10
	22/10/2019	EP1910866	**<0.2**	<0.1	<0.01	<0.01	<0.01	<0.1	<10	<0.005	<0.01	<0.5	<0.01	<0.02	<0.02	<0.02	<0.005	<10
	20/11/2019	EP1912321	**<0.2**	<0.1	<0.01	<0.01	<0.01	<0.1	<10	<0.005	<0.01	<0.5	<0.01	<0.02	<0.02	<0.02	<0.005	<10
Southern 4	21/08/2019	EP1908496	**<0.2**	<0.1	<0.01	<0.01	<0.01	<0.1	<10	<0.005	<0.01	<0.5	<0.01	<0.02	<0.02	<0.02	<0.005	<10
	18/09/2019	EP1909602	**<0.2**	<0.1	<0.01	<0.01	<0.01	<0.1	<10	<0.005	<0.01	<0.5	<0.01	<0.02	<0.02	<0.02	<0.005	<10
	22/10/2019	EP1910866	**<0.2**	<0.1	<0.01	<0.01	<0.01	<0.1	<10	<0.005	<0.01	<0.5	<0.01	<0.02	<0.02	<0.02	<0.005	<10
	20/11/2019	EP1912321	**<0.2**	<0.1	<0.01	<0.01	<0.01	<0.1	<10	<0.005	<0.01	<0.5	<0.01	<0.02	<0.02	<0.02	<0.005	<10
	19/12/2019	EP1913643	**<0.2**	<0.1	<0.01	<0.01	<0.01	<0.1	<10	<0.005	<0.01	<0.5	<0.01	<0.02	<0.02	<0.02	<0.005	<10
	22/01/2020	EP2000814	**<0.2**	<0.1	<0.01	<0.01	<0.01	<0.1	<10	<0.005	<0.01	<0.5	<0.01	<0.02	<0.02	<0.02	<0.005	<10
SW10	22/08/2019	EP1908496	**<0.2**	<0.1	<0.01	<0.01	<0.01	<0.1	<10	<0.005	<0.01	<0.5	<0.01	<0.02	<0.02	<0.02	<0.005	<10
	18/09/2019	EP1909602	**<0.2**	<0.1	<0.01	<0.01	<0.01	<0.1	<10	<0.005	<0.01	<0.5	<0.01	<0.02	<0.02	<0.02	<0.005	<10
SW11	21/08/2019	EP1908496	**<0.2**	<0.1	<0.01	<0.01	<0.01	<0.1	<10	<0.005	<0.01	<0.5	<0.01	<0.02	<0.02	<0.02	<0.005	<10
	18/09/2019	EP1909602	**<0.2**	<0.1	<0.01	<0.01	<0.01	<0.1	<10	<0.005	<0.01	<0.5	<0.01	<0.02	<0.02	<0.02	<0.005	<10

Statistical Summary

Number of Results	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
Number of Detects	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration	<0.2	<0.1	<0.01	<0.01	<0.01	<0.1	<10	<0.005	<0.01	<0.5	<0.01	<0.02	<0.02	<0.02	<0.005	<10
Minimum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	<0.2	<0.1	<0.01	<0.01	<0.01	<0.1	<10	<0.005	<0.01	<0.5	<0.01	<0.02	<0.02	<0.02	<0.005	<10
Maximum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration	0.1	0.05	0.005	0.005	0.005	0.05	5	0.0025	0.005	0.25	0.005	0.01	0.01	0.01	0.0025	5
Median Concentration	0.1	0.05	0.005	0.005	0.005	0.05	5	0.0025	0.005	0.25	0.005	0.01	0.01	0.01	0.0025	5
Standard Deviation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Notes

DER 2014 Fresh Waters - SW Aust. Wetlands
Trigger values taken from ANZECC and ARMCANZ (2000), and adopted by DER (2014), and in the NEPM (2013). Arsenic (V) and Chromium (VI) guideline value adopted for Arsenic (unspeciated) and Chromium (unspeciated). Selenium value applies to a slightly-moderately disturbed system and a 95% level of protection (%species). Nutrient values for South West Western Australian Wetland environments adopted from ANZECC/ ARMCANZ 2000 Freshwater and Marine Guidelines, Table 3.3.6.

DER 2014 Short-term irrigation
Chloride concentrations may cause foliar damage in non tolerant species

DER 2015 ASS Criteria
Dissolved Aluminium value relates to water with a pH>6.5, no guideline is available for water pH<6.0

			Acidity & Alkalinity					Major Ions										Nutrients						
			Alkalinity (Carbonate as CaCO3)	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Hydroxide as CaCO3)	Alkalinity (total as CaCO3)	Acidity (as CaCO3)	Calcium (filtered)	Magnesium (filtered)	Potassium (filtered)	Sodium (filtered)	Chloride	Sulfate (filtered)	Cations Total	Anions Total	Ionic Balance	Sulfide	Ammonium (as N)	Ammonia as N	Nitrogen (Total Oxidised) (as N)	Nitrogen (Total)	Reactive Phosphorus as P	Kjeldahl Nitrogen Total	Phosphorus (Total)
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	meq/L	meq/L	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
EQL			1	1	1	1	1	1	1	1	1	1	1	0.01	0.01	0.01	0.1	0.01	0.01	0.01	0.1	0.01	0.1	0.01
Date	**Field ID**	**Lab Report**																						
21/08/2019	BORR_MW04	EP1908496	<1	253	<1	253	31	150	49	5	429	744	166	30.3	29.5	1.35	<0.1	0.19	0.19	0.02	0.4	<0.01	0.4	0.29
21/08/2019	FD03	EP1908496	<1	250	<1	250	30	158	50	5	438	733	167	31.2	29.1	3.36	<0.1	0.19	0.19	<0.01	0.3	<0.01	0.3	0.24
RPD			0	1	0	1	3	5	2	0	2	1	1	3	1	**85**	0	0	0	67	29	0	29	19
19/12/2019	BORRMW12	EP1913643	<1	26	<1	26	13	6	11	6	73	119	35	4.53	4.60	0.78	<0.1	0.19	0.19	1.06	1.4	<0.01	0.3	<0.01
19/12/2019	FD03	EP1913643	<1	26	<1	26	12	6	11	6	73	119	34	4.53	4.58	0.56	<0.1	0.21	0.21	1.09	1.5	<0.01	0.4	<0.01
RPD			0	0	0	0	8	0	0	0	0	0	3	0	0	**33**	0	10	10	3	7	0	29	0
19/12/2019	BORRMW12	EP1913643	<1	26	<1	26	13	6	11	6	73	119	35	4.53	4.60	0.78	<0.1	0.19	0.19	1.06	1.4	<0.01	0.3	<0.01
19/12/2019	FS01	695412				30	<10					150							0.22	1.2	1.2		<0.2	
RPD						14	26					23							15	12	15		40	
20/01/2020	BORR_MW05	EP2000762	<1	80	<1	80	28	24	17	7	178	299	116	10.5	12.4	8.40	<0.1	0.11	0.11	0.02	1.1	<0.01	1.1	0.04
20/01/2020	FD01	EP2000762	<1	79	<1	79	13	26	17	7	177	298	115	10.6	12.4	7.86	<0.1	0.10	0.10	<0.01	1.1	<0.01	1.1	0.05
RPD			0	1	0	1	**73**	8	0	0	1	0	1	1	0	7	0	10	10	67	0	0	0	22
22/01/2020	BORR_MW12	EP2000814	<1	30	<1	30	9	5	12	6	78	129	38	4.78	5.03	2.51	<0.1	0.20	0.20	0.47	0.8	<0.01	0.3	<0.01
22/01/2020	FD03	EP2000814	<1	30	<1	30	9	6	11	6	80	127	38	4.84	4.97	1.38	<0.1	0.18	0.18	0.58	1.0	<0.01	0.4	<0.01
RPD			0	0	0	0	0	18	9	0	3	2	0	1	1	**58**	0	11	11	21	22	0	29	0
22/01/2020	BORR_MW12	EP2000814	<1	30	<1	30	9	5	12	6	78	129	38	4.78	5.03	2.51	<0.1	0.20	0.20	0.47	0.8	<0.01	0.3	<0.01
22/01/2020	FS01	698442				41	11					120							0.27	0.69	1.09		0.4	
RPD						31	20					7							30	**38**	31		29	

***RPDs have only been considered where a concentration is greater than 1 times the EQL.**
****Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: 81 (1 - 10 x EQL); 50 (10 - 30 x EQL); 30 (> 30 x EQL))**
*****Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory**

				Metals														BTEXN						
			Alkalinity (Carbonate as CaCO3)	Aluminium	Aluminium (filtered)	Arsenic (filtered)	Cadmium (filtered)	Chromium (III+VI) (filtered)	Cobalt (filtered)	Copper (filtered)	Iron	Iron (filtered)	Lead (filtered)	Manganese (filtered)	Nickel (filtered)	Selenium (filtered)	Zinc (filtered)	Benzene	Toluene	Ethylbenzene	Xylene (o)	Xylene (m & p)	Xylene Total	BTEX (Sum of Total) - Lab Calc
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL			1	0.01	0.01	0.001	0.0001	0.001	0.001	0.001	0.05	0.05	0.001	0.001	0.001	0.001	0.005	1	1	1	1	2	2	1
Date	**Field ID**	**Lab Report**																						
21/08/2019	BORR_MW04	EP1908496	<1	13.4	<0.01	0.002	<0.0001	<0.001	<0.001	<0.001	40.7	5.20	<0.001	0.127	<0.001	<0.01	0.007	<1	<2	<2	<2	<2	<2	<1
21/08/2019	FD03	EP1908496	<1	10.3	0.02	0.003	0.0001	<0.001	0.001	0.007	33.9	5.71	<0.001	0.136	0.013	<0.01	0.098	<1	<2	<2	<2	<2	<2	<1
RPD			0	26	67	40	0	0	0	**150**	18	9	0	7	**171**	0	**173**	0	0	0	0	0	0	0
19/12/2019	BORRMW12	EP1913643	<1	0.21	0.02	0.002	<0.0001	<0.001	<0.001	<0.001	2.90	2.08	<0.001	0.001	<0.001	<0.01	<0.005	<1	<2	<2	<2	<2	<2	<1
19/12/2019	FD03	EP1913643	<1	0.23	0.02	0.002	<0.0001	<0.001	<0.001	<0.001	2.97	2.37	<0.001	0.002	<0.001	<0.01	<0.005	<1	<2	<2	<2	<2	<2	<1
RPD			0	9	0	0	0	0	0	0	2	13	0	67	0	0	0	0	0	0	0	0	0	0
19/12/2019	BORRMW12	EP1913643	<1	0.21	0.02	0.002	<0.0001	<0.001	<0.001	<0.001	2.90	2.08	<0.001	0.001	<0.001	<0.01	<0.005	<1	<2	<2	<2	<2	<2	<1
19/12/2019	FS01	695412		0.15	<0.05	0.002	<0.0002	<0.001			2.6	2.6		<0.005	<0.001	<0.001	<0.005	<1	<1	<1	<1	<2	<3	
RPD				33	0	0	0	0			11	22		0	0	0	0	0	0	0	0	0	0	
20/01/2020	BORR_MW05	EP2000762	<1	2.25	0.10	0.001	<0.0001	<0.001	<0.001	0.010	1.87	1.22	0.001	0.014	0.013	<0.01	0.010	<1	<2	<2	<2	<2	<2	<1
20/01/2020	FD01	EP2000762	<1	2.31	0.09	0.001	<0.0001	<0.001	<0.001	0.013	1.90	1.18	0.002	0.014	0.012	<0.01	0.009	<1	<2	<2	<2	<2	<2	<1
RPD			0	3	11	0	0	0	0	26	2	3	67	0	8	0	11	0	0	0	0	0	0	0
22/01/2020	BORR_MW12	EP2000814	<1	0.33	<0.01	0.002	<0.0001	<0.001	<0.001	<0.001	3.12	2.33	<0.001	0.002	<0.001	<0.01	<0.005	<1	<2	<2	<2	<2	<2	<1
22/01/2020	FD03	EP2000814	<1	0.28	0.02	0.002	<0.0001	<0.001	<0.001	<0.001	2.96	2.16	<0.001	0.004	<0.001	<0.01	<0.005	<1	<2	<2	<2	<2	<2	<1
RPD			0	16	67	0	0	0	0	0	5	8	0	67	0	0	0	0	0	0	0	0	0	0
22/01/2020	BORR_MW12	EP2000814	<1	0.33	<0.01	0.002	<0.0001	<0.001	<0.001	<0.001	3.12	2.33	<0.001	0.002	<0.001	<0.01	<0.005	<1	<2	<2	<2	<2	<2	<1
22/01/2020	FS01	698442		0.18	<0.05	0.002	<0.0002	<0.001			3.3	2.5		<0.005	<0.001	<0.001	<0.005	<1	<1	<1	<1	<2	<3	
RPD				**59**	0	0	0	0			6	7		0	0	0	0	0	0	0	0	0	0	

***RPDs have only been considered where a concentration is greater than 1 times the EQL.**
****Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: 81 (1 - 10 x EQL); 50 (10 - 30 x EQL); 30 (> 30 x EQL))**
*****Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory**

				TRH - NEPM 2013							TRH - NEPM 1999						PAHs
			Alkalinity (Carbonate as CaCO3)	F1 (C6-C10 minus BTEX)	C6-C10 Fraction	F2 (>C10-C16 minus Naphthalene)	>C10-C16 Fraction	F3 (>C16-C34 Fraction)	F4 (>C34-C40 Fraction)	>C10-C40 (Sum of Total)	C6-C9 Fraction	C10-C14 Fraction	C15-C28 Fraction	C29-C36 Fraction	C10-C36 (Sum of Total)	Naphthalene
			mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL			1	20	20	50	50	100	100	100	20	50	100	50	50	5
Date	**Field ID**	**Lab Report**														
21/08/2019	BORR_MW04	EP1908496	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
21/08/2019	FD03	EP1908496	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
RPD			0	0	0	0	0	0	0	0	0	0	0	0	0	0
19/12/2019	BORRMW12	EP1913643	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
19/12/2019	FD03	EP1913643	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
RPD			0	0	0	0	0	0	0	0	0	0	0	0	0	0
19/12/2019	BORRMW12	EP1913643	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
19/12/2019	FS01	695412		<20	<20	<50	<50	<100	<100	<100	<20	<50	<100	<100	<100	
RPD				0	0	0	0	0	0	0	0	0	0	0	0	
20/01/2020	BORR_MW05	EP2000762	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
20/01/2020	FD01	EP2000762	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
RPD			0	0	0	0	0	0	0	0	0	0	0	0	0	0
22/01/2020	BORR_MW12	EP2000814	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
22/01/2020	FD03	EP2000814	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
RPD			0	0	0	0	0	0	0	0	0	0	0	0	0	0
22/01/2020	BORR_MW12	EP2000814	<1	<20	<20	<100	<100	<100	<100	<100	<20	<50	<100	<50	<50	<5
22/01/2020	FS01	698442		<20	<20	<50	<50	<100	<100	<100	<20	<50	<100	<100	<100	
RPD				0	0	0	0	0	0	0	0	0	0	0	0	

***RPDs have only been considered where a concentration is greater than 1 times the EQL.**
****Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: 81 (1 - 10 x EQL); 50 (10 - 30 x EQL); 30 (> 30 x EQL))**
*****Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory**

GHD Pty Ltd WA
999 Hay Street Perth
Perth
WA 6004

Attention: **Louise Cockerton**

Report **630927-S**
Project name BORR
Project ID 6137041
Received Date Nov 30, 2018

Client Sample ID			**QA17**	**S10_0.5**	**S10_1.0**	**S10_1.5**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**P18-De01707**	**P18-De01708**	**P18-De01709**	**P18-De01710**
Date Sampled			**Sep 26, 2018**	**Sep 26, 2018**	**Sep 26, 2018**	**Sep 26, 2018**
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	4.7	5.5	5.6	6.9
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	3.5	3.6	3.4	5.5
Reaction Ratings*[S05]		comment	2.0	2.0	2.0	2.0

Client Sample ID			**S10_2.0**	**S10_2.5**	**S10_3.0**	**S10_3.5**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**P18-De01711**	**P18-De01712**	**P18-De01713**	**P18-De01714**
Date Sampled			**Sep 26, 2018**	**Sep 26, 2018**	**Sep 26, 2018**	**Sep 26, 2018**
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	7.0	7.3	8.1	8.5
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	4.9	5.2	4.0	2.8
Reaction Ratings*[S05]		comment	2.0	2.0	2.0	4.0

Client Sample ID			**S10_4.0**	**S02_0.5**	**S02_1.1**	**S02_1.5**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**P18-De01715**	**P18-De01716**	**P18-De01717**	**P18-De01718**
Date Sampled			**Sep 26, 2018**	**Sep 26, 2018**	**Sep 26, 2018**	**Sep 26, 2018**
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	8.6	6.1	4.7	4.7
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	4.5	4.0	3.7	3.7
Reaction Ratings*[S05]		comment	2.0	2.0	2.0	2.0

Client Sample ID			S02_2.0	S01_0.5	S01_1.0	S01_1.5
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			P18-De01719	P18-De01720	P18-De01721	P18-De01722
Date Sampled			Sep 26, 2018	Sep 03, 2018	Sep 03, 2018	Sep 03, 2018
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	5.4	6.6	5.8	8.0
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	4.1	3.9	4.8	7.4
Reaction Ratings*[S05]		comment	2.0	3.0	2.0	2.0

Client Sample ID			S01_2.0	S01_2.5	S01_3.0	S01_3.5
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			P18-De01723	P18-De01724	P18-De01725	P18-De01726
Date Sampled			Sep 03, 2018	Sep 03, 2018	Sep 03, 2018	Sep 03, 2018
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	8.2	8.4	8.0	7.8
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	7.8	7.5	7.3	6.7
Reaction Ratings*[S05]		comment	2.0	2.0	2.0	2.0

Client Sample ID			S01_4.0	S01_4.5	S01_5.0	S01_5.5
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			P18-De01727	P18-De01728	P18-De01729	P18-De01730
Date Sampled			Sep 03, 2018	Sep 03, 2018	Sep 03, 2018	Sep 03, 2018
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	8.4	8.8	9.7	9.5
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	7.2	8.6	9.1	8.9
Reaction Ratings*[S05]		comment	2.0	4.0	4.0	4.0

Client Sample ID			S01_6.0	S01_6.5	S01_7.0	MW04_0.5
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			P18-De01731	P18-De01732	P18-De01733	P18-De01734
Date Sampled			Sep 03, 2018	Sep 03, 2018	Sep 03, 2018	Sep 03, 2018
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	8.0	8.5	8.8	6.9
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	3.5	2.9	3.3	3.9
Reaction Ratings*[S05]		comment	2.0	2.0	2.0	3.0

Client Sample ID			MW04_1.0	MW04_1.5	MW04_2.0	MW04_2.5
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			P18-De01735	P18-De01736	P18-De01737	P18-De01738
Date Sampled			Sep 03, 2018	Sep 03, 2018	Sep 03, 2018	Sep 03, 2018
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	6.5	7.1	7.9	8.6
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	5.2	6.7	7.0	7.1
Reaction Ratings*[S05]		comment	3.0	2.0	2.0	2.0

Client Sample ID			MW04_3.0	MW04_3.5	MW04_4.0	MW04_4.5
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			P18-De01739	P18-De01740	P18-De01741	P18-De01742
Date Sampled			Sep 03, 2018	Sep 03, 2018	Sep 03, 2018	Sep 03, 2018
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	7.8	7.5	7.1	7.2
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	6.6	6.7	6.6	6.8
Reaction Ratings*[S05]		comment	2.0	2.0	2.0	2.0

Client Sample ID			MW04_5.0	MW04_12.0	S04_0.5	S04_1.5
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			P18-De01743	P18-De01744	P18-De01745	P18-De01746
Date Sampled			Sep 03, 2018	Sep 03, 2018	Sep 04, 2018	Sep 04, 2018
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	7.8	9.5	6.4	6.3
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	7.1	9.1	4.8	5.2
Reaction Ratings*[S05]		comment	2.0	4.0	2.0	2.0

Client Sample ID			S04_2.0	S04_2.5	S04_3.0	S04_3.5
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			P18-De01747	P18-De01748	P18-De01749	P18-De01750
Date Sampled			Sep 04, 2018	Sep 04, 2018	Sep 04, 2018	Sep 04, 2018
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	7.1	7.6	8.5	8.4
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	7.9	6.5	6.7	8.1
Reaction Ratings*[S05]		comment	4.0	2.0	4.0	4.0

Client Sample ID			S04_4.0	S04_4.5	S04_5.0	S04_5.5
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			P18-De01751	P18-De01752	P18-De01753	P18-De01754
Date Sampled			Sep 04, 2018	Sep 04, 2018	Sep 04, 2018	Sep 04, 2018
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	8.9	8.3	7.5	6.7
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	8.0	7.5	7.5	4.5
Reaction Ratings*[S05]		comment	4.0	4.0	4.0	2.0

Client Sample ID			QA12	QA13	MW7_1.0	MW7_1.5
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			P18-De01755	P18-De01756	P18-De01757	P18-De01758
Date Sampled			Sep 03, 2018	Sep 04, 2018	Jul 23, 2018	Jul 23, 2018
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	6.5	6.3	6.5	6.6
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	4.5	4.7	4.5	5.5
Reaction Ratings*[S05]		comment	2.0	2.0	2.0	2.0

Client Sample ID			MW7_2.0	MW7_2.5	MW7_3.0	MW7_3.5
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			P18-De01759	P18-De01760	P18-De01761	P18-De01762
Date Sampled			Jul 23, 2018	Jul 23, 2018	Jul 23, 2018	Jul 23, 2018
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	6.6	6.2	6.0	6.2
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	5.7	5.3	5.4	5.3
Reaction Ratings*[S05]		comment	2.0	2.0	2.0	2.0

Client Sample ID			MW7_4.0	MW7_4.5	MW7_5.0	MW7_10.0
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			P18-De01763	P18-De01764	P18-De01765	P18-De01766
Date Sampled			Jul 23, 2018	Jul 23, 2018	Jul 23, 2018	Jul 23, 2018
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	6.2	6.1	6.1	6.7
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	5.5	5.5	5.5	5.8
Reaction Ratings*[S05]		comment	2.0	2.0	2.0	2.0

Client Sample ID			MW2_0.5	MW2_1.0	MW2_1.5	MW2_2.0
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			P18-De01767	P18-De01768	P18-De01769	P18-De01770
Date Sampled			Jul 24, 2018	Jul 24, 2018	Jul 24, 2018	Jul 24, 2018
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	6.0	5.9	5.1	5.0
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	4.3	4.2	4.1	4.4
Reaction Ratings*[S05]		comment	2.0	2.0	2.0	2.0

Client Sample ID			MW2_2.5	MW2_3.0	MW2_3.5	MW2_4.0
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			P18-De01771	P18-De01772	P18-De01773	P18-De01774
Date Sampled			Jul 24, 2018	Jul 24, 2018	Jul 24, 2018	Jul 24, 2018
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	5.0	5.2	5.5	6.6
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	4.6	4.6	5.3	6.1
Reaction Ratings*[S05]		comment	2.0	2.0	2.0	2.0

Client Sample ID			MW2_4.5	MW2_5.0	MW2_9.0	MW5_0.5
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			P18-De01775	P18-De01776	P18-De01777	P18-De01778
Date Sampled			Jul 24, 2018	Jul 24, 2018	Jul 24, 2018	Jul 24, 2018
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	6.9	7.2	7.6	7.9
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	7.6	6.9	6.3	6.3
Reaction Ratings*[S05]		comment	2.0	2.0	2.0	2.0

Client Sample ID			MW5_1.0	MW5_1.5	MW5_2.0	MW5_2.5
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			P18-De01779	P18-De01780	P18-De01781	P18-De01782
Date Sampled			Jul 24, 2018	Jul 24, 2018	Jul 24, 2018	Jul 24, 2018
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	7.7	7.5	7.5	7.4
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	6.2	6.3	6.2	6.2
Reaction Ratings*[S05]		comment	2.0	2.0	2.0	2.0

Client Sample ID			MW5_3.0	MW5_3.5	MW5_4.0	MW5_4.5
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			P18-De01783	P18-De01784	P18-De01785	P18-De01786
Date Sampled			Jul 24, 2018	Jul 24, 2018	Jul 24, 2018	Jul 24, 2018
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	7.2	7.1	7.2	6.9
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	6.0	6.1	5.8	6.0
Reaction Ratings*[S05]		comment	2.0	2.0	2.0	2.0

Client Sample ID			MW5_5.0	MW5_8.0	MW8_0.5	MW8_1.0
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			P18-De01787	P18-De01788	P18-De01789	P18-De01790
Date Sampled			Jul 24, 2018	Jul 24, 2018	Jul 24, 2018	Jul 24, 2018
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	7.1	7.7	7.2	6.9
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	6.0	2.4	5.5	5.2
Reaction Ratings*[S05]		comment	2.0	4.0	2.0	2.0

Client Sample ID			MW8_1.5	MW8_2.0	MW8_2.5	MW8_3.0
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			P18-De01791	P18-De01792	P18-De01793	P18-De01794
Date Sampled			Jul 24, 2018	Jul 24, 2018	Jul 24, 2018	Jul 24, 2018
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	6.5	6.8	6.9	6.7
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	6.0	6.1	5.9	5.9
Reaction Ratings*[S05]		comment	2.0	2.0	2.0	2.0

Client Sample ID			MW8_3.5	MW8_4.0	MW8_4.5	MW8_5.0
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			P18-De01795	P18-De01796	P18-De01797	P18-De01798
Date Sampled			Jul 24, 2018	Jul 24, 2018	Jul 24, 2018	Jul 24, 2018
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	6.8	6.7	6.9	6.9
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	5.9	5.9	5.9	6.0
Reaction Ratings*[S05]		comment	2.0	2.0	2.0	2.0

Client Sample ID			MW8_13.0	MW9_0.5	MW9_1.0	MW9_1.5
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			P18-De01799	P18-De01800	P18-De01801	P18-De01802
Date Sampled			Jul 24, 2018	Jul 25, 2018	Jul 25, 2018	Jul 25, 2018
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	9.6	6.3	6.1	6.2
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	10	7.7	4.2	5.1
Reaction Ratings*[S05]		comment	4.0	2.0	2.0	1.0

Client Sample ID			MW9_2.0	MW9_2.5	MW9_3.0	MW9_3.5
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			P18-De01803	P18-De01804	P18-De01805	P18-De01806
Date Sampled			Jul 25, 2018	Jul 25, 2018	Jul 25, 2018	Jul 25, 2018
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	6.4	6.5	6.4	6.1
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	5.1	5.5	5.3	5.4
Reaction Ratings*[S05]		comment	1.0	2.0	2.0	2.0

Client Sample ID			MW9_4.0	MW9_4.5	MW9_5.0	MW9_5.5
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			P18-De01807	P18-De01808	P18-De01809	P18-De01810
Date Sampled			Jul 25, 2018	Jul 25, 2018	Jul 25, 2018	Jul 25, 2018
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	6.7	6.7	6.8	6.4
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	5.7	5.7	5.8	5.7
Reaction Ratings*[S05]		comment	2.0	1.0	2.0	2.0

Client Sample ID			MW10_0.5	MW10_1.0	MW10_1.5	MW10_2.0
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			P18-De01811	P18-De01812	P18-De01813	P18-De01814
Date Sampled			Jul 25, 2018	Jul 25, 2018	Jul 25, 2018	Jul 25, 2018
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	9.6	9.6	7.9	6.9
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	7.6	7.3	6.5	6.0
Reaction Ratings*[S05]		comment	2.0	2.0	2.0	2.0

Client Sample ID			MW10_2.5	MW10_3.0	MW10_3.5	MW10_4.0
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins | mgt Sample No.			P18-De01815	P18-De01816	P18-De01817	P18-De01818
Date Sampled			Jul 25, 2018	Jul 25, 2018	Jul 25, 2018	Jul 25, 2018
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	6.7	6.4	6.1	7.7
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	5.3	5.3	2.5	3.0
Reaction Ratings*[S05]		comment	2.0	2.0	4.0	4.0

Client Sample ID			MW11_0.5	MW11_1.0	MW11_1.5	MW11_2.0
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**P18-De01819**	**P18-De01820**	**P18-De01821**	**P18-De01822**
Date Sampled			**Jul 25, 2018**	**Jul 25, 2018**	**Jul 25, 2018**	**Jul 25, 2018**
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	7.3	7.2	8.9	8.8
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	4.8	5.6	5.8	5.4
Reaction Ratings*[S05]		comment	2.0	2.0	2.0	3.0

Client Sample ID			MW11_2.5	MW11_3.0	MW11_3.5	MW11_4.0
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins | mgt Sample No.			**P18-De01823**	**P18-De01824**	**P18-De01825**	**P18-De01826**
Date Sampled			**Jul 25, 2018**	**Jul 25, 2018**	**Jul 25, 2018**	**Jul 25, 2018**
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	7.4	7.4	8.3	8.5
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	6.7	6.6	7.2	7.7
Reaction Ratings*[S05]		comment	2.0	2.0	2.0	2.0

Client Sample ID			S04_1.0
Sample Matrix			**Soil**
Eurofins | mgt Sample No.			**P18-De01922**
Date Sampled			**Sep 26, 2018**
Test/Reference	LOR	Unit	
Acid Sulfate Soils Field pH Test			
pH-F (Field pH test)*	0.1	pH Units	6.4
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	5.2
Reaction Ratings*[S05]		comment	2.0

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results (regarding both quality and NATA accreditation).

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Acid Sulfate Soils Field pH Test	Perth	Dec 04, 2018	7 Day

- Method: LTM-GEN- 7060 Determination of field pH (pHF) and field pH peroxide (pHFOX) tests

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NATA # 1261 Site # 18217

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NATA # 1261
Site # 23736

Company Name: GHD Pty Ltd WA
Address: 999 Hay Street Perth
Perth
WA 6004

Project Name: BORR
Project ID: 6137041

Order No.:
Report #: 630927
Phone: 08 6222 8222
Fax: 08 9429 6555

Received: Nov 30, 2018 1:43 PM
Due: Dec 4, 2018
Priority: 2 Day
Contact Name: Louise Cockerton

Eurofins | mgt Analytical Services Manager : Robert Johnston

Sample Detail						Acid Sulfate Soils Field pH Test
Melbourne Laboratory - NATA Site # 1254 & 14271						
Sydney Laboratory - NATA Site # 18217						
Brisbane Laboratory - NATA Site # 20794						
Perth Laboratory - NATA Site # 23736						X
External Laboratory						
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**	
1	QA17	Sep 26, 2018		Soil	P18-De01707	X
2	S10_0.5	Sep 26, 2018		Soil	P18-De01708	X
3	S10_1.0	Sep 26, 2018		Soil	P18-De01709	X
4	S10_1.5	Sep 26, 2018		Soil	P18-De01710	X
5	S10_2.0	Sep 26, 2018		Soil	P18-De01711	X
6	S10_2.5	Sep 26, 2018		Soil	P18-De01712	X
7	S10_3.0	Sep 26, 2018		Soil	P18-De01713	X
8	S10_3.5	Sep 26, 2018		Soil	P18-De01714	X
9	S10_4.0	Sep 26, 2018		Soil	P18-De01715	X

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Melbourne Laboratory - NATA Site # 1254 & 14271						
Sydney Laboratory - NATA Site # 18217						
Brisbane Laboratory - NATA Site # 20794						
Perth Laboratory - NATA Site # 23736						X
10	S02_0.5	Sep 26, 2018		Soil	P18-De01716	X
11	S02_1.1	Sep 26, 2018		Soil	P18-De01717	X
12	S02_1.5	Sep 26, 2018		Soil	P18-De01718	X
13	S02_2.0	Sep 26, 2018		Soil	P18-De01719	X
14	S01_0.5	Sep 03, 2018		Soil	P18-De01720	X
15	S01_1.0	Sep 03, 2018		Soil	P18-De01721	X
16	S01_1.5	Sep 03, 2018		Soil	P18-De01722	X
17	S01_2.0	Sep 03, 2018		Soil	P18-De01723	X
18	S01_2.5	Sep 03, 2018		Soil	P18-De01724	X
19	S01_3.0	Sep 03, 2018		Soil	P18-De01725	X
20	S01_3.5	Sep 03, 2018		Soil	P18-De01726	X
21	S01_4.0	Sep 03, 2018		Soil	P18-De01727	X

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Brisbane Laboratory - NATA Site # 20794						
Perth Laboratory - NATA Site # 23736						X
22	S01_4.5	Sep 03, 2018		Soil	P18-De01728	X
23	S01_5.0	Sep 03, 2018		Soil	P18-De01729	X
24	S01_5.5	Sep 03, 2018		Soil	P18-De01730	X
25	S01_6.0	Sep 03, 2018		Soil	P18-De01731	X
26	S01_6.5	Sep 03, 2018		Soil	P18-De01732	X
27	S01_7.0	Sep 03, 2018		Soil	P18-De01733	X
28	MW04_0.5	Sep 03, 2018		Soil	P18-De01734	X
29	MW04_1.0	Sep 03, 2018		Soil	P18-De01735	X
30	MW04_1.5	Sep 03, 2018		Soil	P18-De01736	X
31	MW04_2.0	Sep 03, 2018		Soil	P18-De01737	X
32	MW04_2.5	Sep 03, 2018		Soil	P18-De01738	X
33	MW04_3.0	Sep 03, 2018		Soil	P18-De01739	X

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Company Name: GHD Pty Ltd WA
Address: 999 Hay Street Perth
Perth
WA 6004

Project Name: BORR
Project ID: 6137041

Order No.:
Report #: 630927
Phone: 08 6222 8222
Fax: 08 9429 6555

Received: Nov 30, 2018 1:43 PM
Due: Dec 4, 2018
Priority: 2 Day
Contact Name: Louise Cockerton

Eurofins | mgt Analytical Services Manager : Robert Johnston

Sample Detail						Acid Sulfate Soils Field pH Test
Melbourne Laboratory - NATA Site # 1254 & 14271						
Sydney Laboratory - NATA Site # 18217						
Brisbane Laboratory - NATA Site # 20794						
Perth Laboratory - NATA Site # 23736						X
34	MW04_3.5	Sep 03, 2018		Soil	P18-De01740	X
35	MW04_4.0	Sep 03, 2018		Soil	P18-De01741	X
36	MW04_4.5	Sep 03, 2018		Soil	P18-De01742	X
37	MW04_5.0	Sep 03, 2018		Soil	P18-De01743	X
38	MW04_12.0	Sep 03, 2018		Soil	P18-De01744	X
39	S04_0.5	Sep 04, 2018		Soil	P18-De01745	X
40	S04_1.5	Sep 04, 2018		Soil	P18-De01746	X
41	S04_2.0	Sep 04, 2018		Soil	P18-De01747	X
42	S04_2.5	Sep 04, 2018		Soil	P18-De01748	X
43	S04_3.0	Sep 04, 2018		Soil	P18-De01749	X
44	S04_3.5	Sep 04, 2018		Soil	P18-De01750	X
45	S04_4.0	Sep 04, 2018		Soil	P18-De01751	X

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Sydney Laboratory - NATA Site # 18217						
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Perth Laboratory - NATA Site # 23736						X
46	S04_4.5	Sep 04, 2018		Soil	P18-De01752	X
47	S04_5.0	Sep 04, 2018		Soil	P18-De01753	X
48	S04_5.5	Sep 04, 2018		Soil	P18-De01754	X
49	QA12	Sep 03, 2018		Soil	P18-De01755	X
50	QA13	Sep 04, 2018		Soil	P18-De01756	X
51	MW7_1.0	Jul 23, 2018		Soil	P18-De01757	X
52	MW7_1.5	Jul 23, 2018		Soil	P18-De01758	X
53	MW7_2.0	Jul 23, 2018		Soil	P18-De01759	X
54	MW7_2.5	Jul 23, 2018		Soil	P18-De01760	X
55	MW7_3.0	Jul 23, 2018		Soil	P18-De01761	X
56	MW7_3.5	Jul 23, 2018		Soil	P18-De01762	X
57	MW7_4.0	Jul 23, 2018		Soil	P18-De01763	X

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Sydney Laboratory - NATA Site # 18217						
Brisbane Laboratory - NATA Site # 20794						
Perth Laboratory - NATA Site # 23736						X
58	MW7_4.5	Jul 23, 2018		Soil	P18-De01764	X
59	MW7_5.0	Jul 23, 2018		Soil	P18-De01765	X
60	MW7_10.0	Jul 23, 2018		Soil	P18-De01766	X
61	MW2_0.5	Jul 24, 2018		Soil	P18-De01767	X
62	MW2_1.0	Jul 24, 2018		Soil	P18-De01768	X
63	MW2_1.5	Jul 24, 2018		Soil	P18-De01769	X
64	MW2_2.0	Jul 24, 2018		Soil	P18-De01770	X
65	MW2_2.5	Jul 24, 2018		Soil	P18-De01771	X
66	MW2_3.0	Jul 24, 2018		Soil	P18-De01772	X
67	MW2_3.5	Jul 24, 2018		Soil	P18-De01773	X
68	MW2_4.0	Jul 24, 2018		Soil	P18-De01774	X
69	MW2_4.5	Jul 24, 2018		Soil	P18-De01775	X

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Melbourne Laboratory - NATA Site # 1254 & 14271						
Sydney Laboratory - NATA Site # 18217						
Brisbane Laboratory - NATA Site # 20794						
Perth Laboratory - NATA Site # 23736						X
70	MW2_5.0	Jul 24, 2018		Soil	P18-De01776	X
71	MW2_9.0	Jul 24, 2018		Soil	P18-De01777	X
72	MW5_0.5	Jul 24, 2018		Soil	P18-De01778	X
73	MW5_1.0	Jul 24, 2018		Soil	P18-De01779	X
74	MW5_1.5	Jul 24, 2018		Soil	P18-De01780	X
75	MW5_2.0	Jul 24, 2018		Soil	P18-De01781	X
76	MW5_2.5	Jul 24, 2018		Soil	P18-De01782	X
77	MW5_3.0	Jul 24, 2018		Soil	P18-De01783	X
78	MW5_3.5	Jul 24, 2018		Soil	P18-De01784	X
79	MW5_4.0	Jul 24, 2018		Soil	P18-De01785	X
80	MW5_4.5	Jul 24, 2018		Soil	P18-De01786	X
81	MW5_5.0	Jul 24, 2018		Soil	P18-De01787	X

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Sydney Laboratory - NATA Site # 18217						
Brisbane Laboratory - NATA Site # 20794						
Perth Laboratory - NATA Site # 23736						X
82	MW5_8.0	Jul 24, 2018		Soil	P18-De01788	X
83	MW8_0.5	Jul 24, 2018		Soil	P18-De01789	X
84	MW8_1.0	Jul 24, 2018		Soil	P18-De01790	X
85	MW8_1.5	Jul 24, 2018		Soil	P18-De01791	X
86	MW8_2.0	Jul 24, 2018		Soil	P18-De01792	X
87	MW8_2.5	Jul 24, 2018		Soil	P18-De01793	X
88	MW8_3.0	Jul 24, 2018		Soil	P18-De01794	X
89	MW8_3.5	Jul 24, 2018		Soil	P18-De01795	X
90	MW8_4.0	Jul 24, 2018		Soil	P18-De01796	X
91	MW8_4.5	Jul 24, 2018		Soil	P18-De01797	X
92	MW8_5.0	Jul 24, 2018		Soil	P18-De01798	X
93	MW8_13.0	Jul 24, 2018		Soil	P18-De01799	X

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Sydney Laboratory - NATA Site # 18217						
Brisbane Laboratory - NATA Site # 20794						
Perth Laboratory - NATA Site # 23736						X
94	MW9_0.5	Jul 25, 2018		Soil	P18-De01800	X
95	MW9_1.0	Jul 25, 2018		Soil	P18-De01801	X
96	MW9_1.5	Jul 25, 2018		Soil	P18-De01802	X
97	MW9_2.0	Jul 25, 2018		Soil	P18-De01803	X
98	MW9_2.5	Jul 25, 2018		Soil	P18-De01804	X
99	MW9_3.0	Jul 25, 2018		Soil	P18-De01805	X
100	MW9_3.5	Jul 25, 2018		Soil	P18-De01806	X
101	MW9_4.0	Jul 25, 2018		Soil	P18-De01807	X
102	MW9_4.5	Jul 25, 2018		Soil	P18-De01808	X
103	MW9_5.0	Jul 25, 2018		Soil	P18-De01809	X
104	MW9_5.5	Jul 25, 2018		Soil	P18-De01810	X
105	MW10_0.5	Jul 25, 2018		Soil	P18-De01811	X

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Sydney Laboratory - NATA Site # 18217						
Brisbane Laboratory - NATA Site # 20794						
Perth Laboratory - NATA Site # 23736						X
106	MW10_1.0	Jul 25, 2018		Soil	P18-De01812	X
107	MW10_1.5	Jul 25, 2018		Soil	P18-De01813	X
108	MW10_2.0	Jul 25, 2018		Soil	P18-De01814	X
109	MW10_2.5	Jul 25, 2018		Soil	P18-De01815	X
110	MW10_3.0	Jul 25, 2018		Soil	P18-De01816	X
111	MW10_3.5	Jul 25, 2018		Soil	P18-De01817	X
112	MW10_4.0	Jul 25, 2018		Soil	P18-De01818	X
113	MW11_0.5	Jul 25, 2018		Soil	P18-De01819	X
114	MW11_1.0	Jul 25, 2018		Soil	P18-De01820	X
115	MW11_1.5	Jul 25, 2018		Soil	P18-De01821	X
116	MW11_2.0	Jul 25, 2018		Soil	P18-De01822	X
117	MW11_2.5	Jul 25, 2018		Soil	P18-De01823	X

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Melbourne Laboratory - NATA Site # 1254 & 14271						
Sydney Laboratory - NATA Site # 18217						
Brisbane Laboratory - NATA Site # 20794						
Perth Laboratory - NATA Site # 23736						X
118	MW11_3.0	Jul 25, 2018		Soil	P18-De01824	X
119	MW11_3.5	Jul 25, 2018		Soil	P18-De01825	X
120	MW11_4.0	Jul 25, 2018		Soil	P18-De01826	X
121	S04_1.0	Sep 26, 2018		Soil	P18-De01922	X
Test Counts						121

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per kilogram

mg/L: milligrams per litre

ug/L: micrograms per litre

ppm: Parts per million

ppb: Parts per billion

%: Percentage

org/100mL: Organisms per 100 millilitres

NTU: Nephelometric Turbidity Units

MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	Quality Systems Manual ver 5.1 US Department of Defense
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 50-150%-Phenols & PFASs

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.1 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling.Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " -" in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
Acid Sulfate Soils Field pH Test				Result 1	Result 2	RPD			
pH-F (Field pH test)*	P18-De01707	CP	pH Units	4.7	4.7	pass	30%	Pass	
pH-FOX (Field pH Peroxide test)*	P18-De01707	CP	pH Units	3.5	3.4	pass	30%	Pass	
Reaction Ratings*	P18-De01707	CP	comment	2.0	2.0	pass	30%	Pass	
Duplicate									
Acid Sulfate Soils Field pH Test				Result 1	Result 2	RPD			
pH-F (Field pH test)*	P18-De01717	CP	pH Units	4.7	4.7	pass	30%	Pass	
pH-FOX (Field pH Peroxide test)*	P18-De01717	CP	pH Units	3.7	3.6	pass	30%	Pass	
Reaction Ratings*	P18-De01717	CP	comment	2.0	2.0	pass	30%	Pass	
Duplicate									
Acid Sulfate Soils Field pH Test				Result 1	Result 2	RPD			
pH-F (Field pH test)*	P18-De01727	CP	pH Units	8.4	8.3	pass	30%	Pass	
pH-FOX (Field pH Peroxide test)*	P18-De01727	CP	pH Units	7.2	7.2	pass	30%	Pass	
Reaction Ratings*	P18-De01727	CP	comment	2.0	2.0	pass	30%	Pass	
Duplicate									
Acid Sulfate Soils Field pH Test				Result 1	Result 2	RPD			
pH-F (Field pH test)*	P18-De01737	CP	pH Units	7.9	8.0	pass	30%	Pass	
pH-FOX (Field pH Peroxide test)*	P18-De01737	CP	pH Units	7.0	7.0	pass	30%	Pass	
Reaction Ratings*	P18-De01737	CP	comment	2.0	2.0	pass	30%	Pass	
Duplicate									
Acid Sulfate Soils Field pH Test				Result 1	Result 2	RPD			
pH-F (Field pH test)*	P18-De01747	CP	pH Units	7.1	7.2	pass	30%	Pass	
pH-FOX (Field pH Peroxide test)*	P18-De01747	CP	pH Units	7.9	8.2	pass	30%	Pass	
Reaction Ratings*	P18-De01747	CP	comment	4.0	4.0	pass	30%	Pass	
Duplicate									
Acid Sulfate Soils Field pH Test				Result 1	Result 2	RPD			
pH-F (Field pH test)*	P18-De01757	CP	pH Units	6.5	6.6	pass	30%	Pass	
pH-FOX (Field pH Peroxide test)*	P18-De01757	CP	pH Units	4.5	4.3	pass	30%	Pass	
Reaction Ratings*	P18-De01757	CP	comment	2.0	2.0	pass	30%	Pass	
Duplicate									
Acid Sulfate Soils Field pH Test				Result 1	Result 2	RPD			
pH-F (Field pH test)*	P18-De01767	CP	pH Units	6.0	5.9	pass	30%	Pass	
pH-FOX (Field pH Peroxide test)*	P18-De01767	CP	pH Units	4.3	4.3	pass	30%	Pass	
Reaction Ratings*	P18-De01767	CP	comment	2.0	2.0	pass	30%	Pass	
Duplicate									
Acid Sulfate Soils Field pH Test				Result 1	Result 2	RPD			
pH-F (Field pH test)*	P18-De01777	CP	pH Units	7.6	7.6	pass	30%	Pass	
pH-FOX (Field pH Peroxide test)*	P18-De01777	CP	pH Units	6.3	6.2	pass	30%	Pass	
Reaction Ratings*	P18-De01777	CP	comment	2.0	2.0	pass	30%	Pass	
Duplicate									
Acid Sulfate Soils Field pH Test				Result 1	Result 2	RPD			
pH-F (Field pH test)*	P18-De01787	CP	pH Units	7.1	7.0	pass	30%	Pass	
pH-FOX (Field pH Peroxide test)*	P18-De01787	CP	pH Units	6.0	6.1	pass	30%	Pass	
Reaction Ratings*	P18-De01787	CP	comment	2.0	2.0	pass	30%	Pass	
Duplicate									
Acid Sulfate Soils Field pH Test				Result 1	Result 2	RPD			
pH-F (Field pH test)*	P18-De01797	CP	pH Units	6.9	6.8	pass	30%	Pass	
pH-FOX (Field pH Peroxide test)*	P18-De01797	CP	pH Units	5.9	5.9	pass	30%	Pass	
Reaction Ratings*	P18-De01797	CP	comment	2.0	2.0	pass	30%	Pass	

Duplicate									
Acid Sulfate Soils Field pH Test				Result 1	Result 2	RPD			
pH-F (Field pH test)*	P18-De01807	CP	pH Units	6.7	6.7	pass	30%	Pass	
pH-FOX (Field pH Peroxide test)*	P18-De01807	CP	pH Units	5.7	5.7	pass	30%	Pass	
Reaction Ratings*	P18-De01807	CP	comment	2.0	2.0	pass	30%	Pass	
Duplicate									
Acid Sulfate Soils Field pH Test				Result 1	Result 2	RPD			
pH-F (Field pH test)*	P18-De01817	CP	pH Units	6.1	6.2	pass	30%	Pass	
pH-FOX (Field pH Peroxide test)*	P18-De01817	CP	pH Units	2.5	2.4	pass	30%	Pass	
Reaction Ratings*	P18-De01817	CP	comment	4.0	4.0	pass	30%	Pass	
Duplicate									
Acid Sulfate Soils Field pH Test				Result 1	Result 2	RPD			
pH-F (Field pH test)*	P18-De01922	CP	pH Units	6.4	6.3	pass	30%	Pass	
pH-FOX (Field pH Peroxide test)*	P18-De01922	CP	pH Units	5.2	5.3	pass	30%	Pass	
Reaction Ratings*	P18-De01922	CP	comment	2.0	2.0	pass	30%	Pass	

Comments

Eurofins | mgt accreditation number 1261, corporate site 1254 is currently in progress of a controlled transition to a new custom built location at 6 Monterey Road, Dandenong South, Victoria 3175. All results on this report denoted as being performed by Eurofins | mgt 2-5 Kingston Town Close, Oakleigh Victoria 3166 corporate site 1254, will have been performed on either Oakleigh or new Dandenong South site.

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	N/A
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
S05	Field Screen uses the following fizz rating to classify the rate the samples reacted to the peroxide: 1.0; No reaction to slight. 2.0; Moderate reaction. 3.0; Strong reaction with persistent froth. 4.0; Extreme reaction.

Authorised By

Robert Johnston Analytical Services Manager

Glenn Jackson
General Manager

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

GHD Pty Ltd WA
999 Hay Street Perth
Perth
WA 6004

Attention: **Ryan Walker**

Report **686571-S**
Project name BORR
Project ID 6137041
Received Date Nov 05, 2019

Client Sample ID			**TP56 #1**	**TP56 #2**	**TP56 #3**	**TP56 #4**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins Sample No.			**P19-No07371**	**P19-No07372**	**P19-No07373**	**P19-No07374**
Date Sampled			**Nov 05, 2019**	**Nov 05, 2019**	**Nov 05, 2019**	**Nov 05, 2019**
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	5.3	6.1	7.1	5.6
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	4.7	4.1	4.4	4.6
Reaction Ratings*[S05]		comment	2.0	2.0	3.0	1.0

Client Sample ID			**TP56 #5**	**TP56 #6**	**TP56 #7**	**TP56 #8**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins Sample No.			**P19-No07375**	**P19-No07376**	**P19-No07377**	**P19-No07378**
Date Sampled			**Nov 05, 2019**	**Nov 05, 2019**	**Nov 05, 2019**	**Nov 05, 2019**
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	5.9	5.9	5.0	6.3
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	4.7	4.8	4.7	5.4
Reaction Ratings*[S05]		comment	2.0	2.0	1.0	1.0

Client Sample ID			**TP56 #9**	**TP56 #10**	**TP56 #11**	**TP56 #12**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins Sample No.			**P19-No07379**	**P19-No07380**	**P19-No07381**	**P19-No07382**
Date Sampled			**Nov 05, 2019**	**Nov 05, 2019**	**Nov 05, 2019**	**Nov 05, 2019**
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	7.6	7.6	6.8	8.1
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	6.2	6.4	6.0	7.6
Reaction Ratings*[S05]		comment	2.0	1.0	1.0	1.0

Client Sample ID			TP56 #13	TP56 #14	TP56 #15	TP56 #16
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			P19-No07383	P19-No07384	P19-No07385	P19-No07386
Date Sampled			Nov 05, 2019	Nov 05, 2019	Nov 05, 2019	Nov 05, 2019
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	9.2	6.4	6.1	6.5
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	7.5	5.4	5.4	5.8
Reaction Ratings*[S05]		comment	1.0	1.0	1.0	1.0

Client Sample ID			TP56 #17	TP56 #18	TP56 #19	TP56 #20
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			P19-No07387	P19-No07388	P19-No07389	P19-No07390
Date Sampled			Nov 05, 2019	Nov 05, 2019	Nov 05, 2019	Nov 05, 2019
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	8.1	6.5	5.7	5.2
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	6.1	5.8	4.6	4.4
Reaction Ratings*[S05]		comment	2.0	1.0	3.0	1.0

Client Sample ID			TP56 #21	TP56 #22	TP56 #23	TP56 #24
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			P19-No07391	P19-No07392	P19-No07393	P19-No07394
Date Sampled			Nov 05, 2019	Nov 05, 2019	Nov 05, 2019	Nov 05, 2019
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	5.5	6.6	7.4	7.6
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	4.5	5.2	5.7	6.6
Reaction Ratings*[S05]		comment	1.0	1.0	2.0	2.0

Client Sample ID			TP56 #25	TP56 #26	TP56 #27	TP56 #28
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			P19-No07395	P19-No07396	P19-No07397	P19-No07398
Date Sampled			Nov 05, 2019	Nov 05, 2019	Nov 05, 2019	Nov 05, 2019
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	7.4	9.2	9.6	7.7
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	6.9	7.5	7.8	5.8
Reaction Ratings*[S05]		comment	2.0	2.0	2.0	2.0

Client Sample ID			TP56 #29	TP56 #30	TP56 #31	TP56 #32
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			P19-No07399	P19-No07400	P19-No07401	P19-No07402
Date Sampled			Nov 05, 2019	Nov 05, 2019	Nov 05, 2019	Nov 05, 2019
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	8.6	7.6	8.2	6.4
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	6.9	6.8	6.9	5.6
Reaction Ratings*[S05]		comment	2.0	1.0	1.0	1.0

Client Sample ID			TP56 #33	TP56 #34	TP56 #35	TP56 #36
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			P19-No07403	P19-No07404	P19-No07405	P19-No07406
Date Sampled			Nov 05, 2019	Nov 05, 2019	Nov 05, 2019	Nov 05, 2019
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	5.9	6.2	6.1	6.1
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	5.6	5.6	5.3	5.1
Reaction Ratings*[S05]		comment	1.0	1.0	1.0	1.0

Client Sample ID			TP56 #37	TP56 #38
Sample Matrix			Soil	Soil
Eurofins Sample No.			P19-No07407	P19-No07408
Date Sampled			Nov 05, 2019	Nov 05, 2019
Test/Reference	LOR	Unit		
Acid Sulfate Soils Field pH Test				
pH-F (Field pH test)*	0.1	pH Units	6.9	6.4
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	4.8	5.3
Reaction Ratings*[S05]		comment	2.0	2.0

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Acid Sulfate Soils Field pH Test	Perth	Nov 06, 2019	7 Days

- Method: LTM-GEN- 7060 Determination of field pH (pHF) and field pH peroxide (pHFOX) tests

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NATA # 1261
Site # 23736

Company Name: GHD Pty Ltd WA
Address: 999 Hay Street Perth
Perth
WA 6004

Project Name: BORR
Project ID: 6137041

Order No.:
Report #: 686571
Phone: 08 6222 8222
Fax: 08 9429 6555

Received: Nov 5, 2019 3:20 PM
Due: Nov 7, 2019
Priority: 2 Day
Contact Name: Ryan Walker

Eurofins Analytical Services Manager : Robert Johnston

Sample Detail						Acid Sulfate Soils Field pH Test
Melbourne Laboratory - NATA Site # 1254 & 14271						
Sydney Laboratory - NATA Site # 18217						
Brisbane Laboratory - NATA Site # 20794						
Perth Laboratory - NATA Site # 23736						X
External Laboratory						
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**	
1	TP56 #1	Nov 05, 2019		Soil	P19-No07371	X
2	TP56 #2	Nov 05, 2019		Soil	P19-No07372	X
3	TP56 #3	Nov 05, 2019		Soil	P19-No07373	X
4	TP56 #4	Nov 05, 2019		Soil	P19-No07374	X
5	TP56 #5	Nov 05, 2019		Soil	P19-No07375	X
6	TP56 #6	Nov 05, 2019		Soil	P19-No07376	X
7	TP56 #7	Nov 05, 2019		Soil	P19-No07377	X
8	TP56 #8	Nov 05, 2019		Soil	P19-No07378	X
9	TP56 #9	Nov 05, 2019		Soil	P19-No07379	X

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Sydney Laboratory - NATA Site # 18217						
Brisbane Laboratory - NATA Site # 20794						
Perth Laboratory - NATA Site # 23736						X
10	TP56 #10	Nov 05, 2019		Soil	P19-No07380	X
11	TP56 #11	Nov 05, 2019		Soil	P19-No07381	X
12	TP56 #12	Nov 05, 2019		Soil	P19-No07382	X
13	TP56 #13	Nov 05, 2019		Soil	P19-No07383	X
14	TP56 #14	Nov 05, 2019		Soil	P19-No07384	X
15	TP56 #15	Nov 05, 2019		Soil	P19-No07385	X
16	TP56 #16	Nov 05, 2019		Soil	P19-No07386	X
17	TP56 #17	Nov 05, 2019		Soil	P19-No07387	X
18	TP56 #18	Nov 05, 2019		Soil	P19-No07388	X
19	TP56 #19	Nov 05, 2019		Soil	P19-No07389	X
20	TP56 #20	Nov 05, 2019		Soil	P19-No07390	X
21	TP56 #21	Nov 05, 2019		Soil	P19-No07391	X

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Sample Detail						Acid Sulfate Soils Field pH Test
Melbourne Laboratory - NATA Site # 1254 & 14271						
Sydney Laboratory - NATA Site # 18217						
Brisbane Laboratory - NATA Site # 20794						
Perth Laboratory - NATA Site # 23736						X
22	TP56 #22	Nov 05, 2019		Soil	P19-No07392	X
23	TP56 #23	Nov 05, 2019		Soil	P19-No07393	X
24	TP56 #24	Nov 05, 2019		Soil	P19-No07394	X
25	TP56 #25	Nov 05, 2019		Soil	P19-No07395	X
26	TP56 #26	Nov 05, 2019		Soil	P19-No07396	X
27	TP56 #27	Nov 05, 2019		Soil	P19-No07397	X
28	TP56 #28	Nov 05, 2019		Soil	P19-No07398	X
29	TP56 #29	Nov 05, 2019		Soil	P19-No07399	X
30	TP56 #30	Nov 05, 2019		Soil	P19-No07400	X
31	TP56 #31	Nov 05, 2019		Soil	P19-No07401	X
32	TP56 #32	Nov 05, 2019		Soil	P19-No07402	X
33	TP56 #33	Nov 05, 2019		Soil	P19-No07403	X

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Company Name:	GHD Pty Ltd WA	**Order No.:**	
Address:	999 Hay Street Perth Perth WA 6004	**Report #:**	686571
		Phone:	08 6222 8222
		Fax:	08 9429 6555
Project Name:	BORR		
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Received:	Nov 5, 2019 3:20 PM
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Contact Name:	Ryan Walker

Eurofins Analytical Services Manager : Robert Johnston

Sample Detail						Acid Sulfate Soils Field pH Test
Melbourne Laboratory - NATA Site # 1254 & 14271						
Sydney Laboratory - NATA Site # 18217						
Brisbane Laboratory - NATA Site # 20794						
Perth Laboratory - NATA Site # 23736						X
34	TP56 #34	Nov 05, 2019		Soil	P19-No07404	X
35	TP56 #35	Nov 05, 2019		Soil	P19-No07405	X
36	TP56 #36	Nov 05, 2019		Soil	P19-No07406	X
37	TP56 #37	Nov 05, 2019		Soil	P19-No07407	X
38	TP56 #38	Nov 05, 2019		Soil	P19-No07408	X
Test Counts						38

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Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer, that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per kilogram

mg/L: milligrams per litre

ug/L: micrograms per litre

ppm: Parts per million

ppb: Parts per billion

%: Percentage

org/100mL: Organisms per 100 millilitres

NTU: Nephelometric Turbidity Units

MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.3
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 20-130% Phenols & 50-150% PFASs

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.3 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling.Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " -" in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
Acid Sulfate Soils Field pH Test				Result 1	Result 2	RPD			
pH-F (Field pH test)*	P19-No07380	CP	pH Units	7.6	7.7	pass	30%	Pass	
pH-FOX (Field pH Peroxide test)*	P19-No07380	CP	pH Units	6.4	6.6	pass	30%	Pass	
Reaction Ratings*	P19-No07380	CP	comment	1.0	1.0	pass	30%	Pass	
Duplicate									
Acid Sulfate Soils Field pH Test				Result 1	Result 2	RPD			
pH-F (Field pH test)*	P19-No07389	CP	pH Units	5.7	5.8	pass	30%	Pass	
pH-FOX (Field pH Peroxide test)*	P19-No07389	CP	pH Units	4.6	4.6	pass	30%	Pass	
Reaction Ratings*	P19-No07389	CP	comment	3.0	3.0	pass	30%	Pass	
Duplicate									
Acid Sulfate Soils Field pH Test				Result 1	Result 2	RPD			
pH-F (Field pH test)*	P19-No07399	CP	pH Units	8.6	8.5	pass	30%	Pass	
pH-FOX (Field pH Peroxide test)*	P19-No07399	CP	pH Units	6.9	7.0	pass	30%	Pass	
Reaction Ratings*	P19-No07399	CP	comment	2.0	2.0	pass	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	N/A
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	N/A
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
S05	Field Screen uses the following fizz rating to classify the rate the samples reacted to the peroxide: 1.0; No reaction to slight. 2.0; Moderate reaction. 3.0; Strong reaction with persistent froth. 4.0; Extreme reaction.

Authorised By

Robert Johnston Analytical Services Manager

Glenn Jackson
General Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

GHD Pty Ltd WA
999 Hay Street Perth
Perth
WA 6004

Attention: **Louise Cockerton**

Report **697821-S**
Project name BORR
Project ID 6137041
Received Date Jan 17, 2020

Client Sample ID			**MW9_1.0**	**MW9_2.5**	**MW9_3.5**	**MW9_5.5**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins Sample No.			**P20-Ja18743**	**P20-Ja18744**	**P20-Ja18745**	**P20-Ja18746**
Date Sampled			**Jul 25, 2018**	**Jul 25, 2018**	**Jul 25, 2018**	**Jul 25, 2018**
Test/Reference	LOR	Unit				
Extraneous Material						
<2mm Fraction	0.005	g	45	32	52	48
>2mm Fraction	0.005	g	< 0.005	< 0.005	< 0.005	< 0.005
Analysed Material	0.1	%	100	100	100	100
Extraneous Material	0.1	%	< 0.1	< 0.1	< 0.1	< 0.1
Chromium Suite (Minus ANC- WA)						
CRS suite WA (-ANC) - Liming Rate	1	kg CaCO3/t	< 1	< 1	< 1	< 1
CRS suite WA (-ANC) - Net Acidity (Acidity Units)	10	mol H+/t	< 10	< 10	< 10	< 10
CRS Suite WA (-ANC) - Net Acidity (Sulfur Units)	0.02	% S	< 0.02	< 0.02	< 0.02	< 0.02
pH-KCL	0.1	pH Units	5.4	5.8	5.9	5.8
Acid trail - Titratable Actual Acidity	2	mol H+/t	3.1	< 2	< 2	< 2
sulfidic - TAA equiv. S% pyrite	0.003	% pyrite S	< 0.003	< 0.003	< 0.003	< 0.003
Chromium Reducible Sulfur[S04]	0.005	% S	< 0.005	< 0.005	< 0.005	< 0.005
Chromium Reducible Sulfur -acidity units	3	mol H+/t	< 3	< 3	< 3	< 3
Sulfur - KCl Extractable	0.02	% S	n/a	n/a	n/a	n/a
HCl Extractable Sulfur Correction Factor	1	factor	2.0	2.0	2.0	2.0
HCl Extractable Sulfur	0.02	% S	n/a	n/a	n/a	n/a
Net Acid soluble sulfur	0.02	% S	n/a	n/a	n/a	n/a
Net Acid soluble sulfur - acidity units	10	mol H+/t	n/a	n/a	n/a	n/a
Net Acid soluble sulfur - equivalent S% pyrite[S02]	0.02	% S	n/a	n/a	n/a	n/a
Acid Neutralising Capacity (ANCbt)	0.01	% CaCO3	n/a	n/a	n/a	n/a
Acid Neutralising Capacity - acidity (a-ANCbt)	2	mol H+/t	n/a	n/a	n/a	n/a
Acid Neutralising Capacity - equivalent S% pyrite (s-ANCbt)[S03]	0.02	% S	n/a	n/a	n/a	n/a
ANC Fineness Factor		factor	1.5	1.5	1.5	1.5
CRS Suite - Net Acidity (Sulfur Units)	0.02	% S	< 0.02	< 0.02	< 0.02	< 0.02
CRS Suite - Net Acidity (Acidity Units)	10	mol H+/t	< 10	< 10	< 10	< 10
CRS Suite - Liming Rate[S01]	1	kg CaCO3/t	< 1	< 1	< 1	< 1
% Moisture	1	%	3.1	3.7	14	14

Client Sample ID			MW10_1.0	MW10_2.0	MW10_3.0	MW10_3.5
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			P20-Ja18747	P20-Ja18748	P20-Ja18749	P20-Ja18750
Date Sampled			Jul 25, 2018	Jul 25, 2018	Jul 25, 2018	Jul 25, 2018
Test/Reference	LOR	Unit				
Extraneous Material						
<2mm Fraction	0.005	g	38	41	34	50
>2mm Fraction	0.005	g	< 0.005	< 0.005	< 0.005	< 0.005
Analysed Material	0.1	%	100	100	100	100
Extraneous Material	0.1	%	< 0.1	< 0.1	< 0.1	< 0.1
Chromium Suite (Minus ANC- WA)						
CRS suite WA (-ANC) - Liming Rate	1	kg CaCO3/t	< 1	< 1	< 1	1.1
CRS suite WA (-ANC) - Net Acidity (Acidity Units)	10	mol H+/t	< 10	< 10	< 10	14
CRS Suite WA (-ANC) - Net Acidity (Sulfur Units)	0.02	% S	< 0.02	< 0.02	< 0.02	0.02
pH-KCL	0.1	pH Units	6.6	5.7	5.9	5.5
Acid trail - Titratable Actual Acidity	2	mol H+/t	< 2	6.3	< 2	< 2
sulfidic - TAA equiv. S% pyrite	0.003	% pyrite S	< 0.003	0.010	< 0.003	< 0.003
Chromium Reducible Sulfur[S04]	0.005	% S	< 0.005	< 0.005	< 0.005	0.023
Chromium Reducible Sulfur -acidity units	3	mol H+/t	< 3	< 3	< 3	14
Sulfur - KCl Extractable	0.02	% S	n/a	n/a	n/a	n/a
HCl Extractable Sulfur Correction Factor	1	factor	2.0	2.0	2.0	2.0
HCl Extractable Sulfur	0.02	% S	n/a	n/a	n/a	n/a
Net Acid soluble sulfur	0.02	% S	n/a	n/a	n/a	n/a
Net Acid soluble sulfur - acidity units	10	mol H+/t	n/a	n/a	n/a	n/a
Net Acid soluble sulfur - equivalent S% pyrite[S02]	0.02	% S	n/a	n/a	n/a	n/a
Acid Neutralising Capacity (ANCbt)	0.01	% CaCO3	0.34	n/a	n/a	n/a
Acid Neutralising Capacity - acidity (a-ANCbt)	2	mol H+/t	68	n/a	n/a	n/a
Acid Neutralising Capacity - equivalent S% pyrite (s-ANCbt)[S03]	0.02	% S	0.11	n/a	n/a	n/a
ANC Fineness Factor		factor	1.5	1.5	1.5	1.5
CRS Suite - Net Acidity (Sulfur Units)	0.02	% S	< 0.02	< 0.02	< 0.02	0.02
CRS Suite - Net Acidity (Acidity Units)	10	mol H+/t	< 10	< 10	< 10	14
CRS Suite - Liming Rate[S01]	1	kg CaCO3/t	< 1	< 1	< 1	1.1
% Moisture	1	%	11	13	14	14

Client Sample ID			MW11_0.5	MW11_2.0	TP56#1	TP56#2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			P20-Ja18751	P20-Ja18752	P20-Ja18753	P20-Ja18754
Date Sampled			Jul 25, 2018	Jul 25, 2018	Nov 05, 2019	Nov 05, 2019
Test/Reference	LOR	Unit				
Extraneous Material						
<2mm Fraction	0.005	g	34	54	80	78
>2mm Fraction	0.005	g	< 0.005	< 0.005	< 0.005	< 0.005
Analysed Material	0.1	%	100	100	100	100
Extraneous Material	0.1	%	< 0.1	< 0.1	< 0.1	< 0.1
Chromium Suite (Minus ANC- WA)						
CRS suite WA (-ANC) - Liming Rate	1	kg CaCO3/t	< 1	< 1	< 1	2.7
CRS suite WA (-ANC) - Net Acidity (Acidity Units)	10	mol H+/t	< 10	< 10	< 10	36
CRS Suite WA (-ANC) - Net Acidity (Sulfur Units)	0.02	% S	< 0.02	< 0.02	< 0.02	0.06
pH-KCL	0.1	pH Units	6.1	6.7	6.1	4.8
Acid trail - Titratable Actual Acidity	2	mol H+/t	< 2	< 2	< 2	36
sulfidic - TAA equiv. S% pyrite	0.003	% pyrite S	< 0.003	< 0.003	< 0.003	0.060
Chromium Reducible Sulfur[S04]	0.005	% S	< 0.005	0.012	< 0.005	< 0.005

Client Sample ID			MW11_0.5	MW11_2.0	TP56#1	TP56#2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			P20-Ja18751	P20-Ja18752	P20-Ja18753	P20-Ja18754
Date Sampled			Jul 25, 2018	Jul 25, 2018	Nov 05, 2019	Nov 05, 2019
Test/Reference	LOR	Unit				
Chromium Suite (Minus ANC- WA)						
Chromium Reducible Sulfur -acidity units	3	mol H+/t	< 3	7.6	< 3	< 3
Sulfur - KCl Extractable	0.02	% S	n/a	n/a	n/a	n/a
HCl Extractable Sulfur Correction Factor	1	factor	2.0	2.0	2.0	2.0
HCl Extractable Sulfur	0.02	% S	n/a	n/a	n/a	n/a
Net Acid soluble sulfur	0.02	% S	n/a	n/a	n/a	n/a
Net Acid soluble sulfur - acidity units	10	mol H+/t	n/a	n/a	n/a	n/a
Net Acid soluble sulfur - equivalent S% pyrite[S02]	0.02	% S	n/a	n/a	n/a	n/a
Acid Neutralising Capacity (ANCbt)	0.01	% CaCO3	n/a	0.23	n/a	n/a
Acid Neutralising Capacity - acidity (a-ANCbt)	2	mol H+/t	n/a	45	n/a	n/a
Acid Neutralising Capacity - equivalent S% pyrite (s-ANCbt)[S03]	0.02	% S	n/a	0.07	n/a	n/a
ANC Fineness Factor		factor	1.5	1.5	1.5	1.5
CRS Suite - Net Acidity (Sulfur Units)	0.02	% S	< 0.02	< 0.02	< 0.02	0.06
CRS Suite - Net Acidity (Acidity Units)	10	mol H+/t	< 10	< 10	< 10	36
CRS Suite - Liming Rate[S01]	1	kg CaCO3/t	< 1	< 1	< 1	2.7
% Moisture	1	%	14	9.9	16	17

Client Sample ID			TP56#3	TP56#4	TP56#5	TP56#6
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			P20-Ja18755	P20-Ja18756	P20-Ja18757	P20-Ja18758
Date Sampled			Nov 05, 2019	Nov 05, 2019	Nov 05, 2019	Nov 05, 2019
Test/Reference	LOR	Unit				
Extraneous Material						
<2mm Fraction	0.005	g	52	56	69	72
>2mm Fraction	0.005	g	< 0.005	< 0.005	< 0.005	< 0.005
Analysed Material	0.1	%	100	100	100	100
Extraneous Material	0.1	%	< 0.1	< 0.1	< 0.1	< 0.1
Chromium Suite (Minus ANC- WA)						
CRS suite WA (-ANC) - Liming Rate	1	kg CaCO3/t	6.6	5.9	1.9	1.3
CRS suite WA (-ANC) - Net Acidity (Acidity Units)	10	mol H+/t	87	79	25	17
CRS Suite WA (-ANC) - Net Acidity (Sulfur Units)	0.02	% S	0.14	0.13	0.04	0.03
pH-KCL	0.1	pH Units	5.1	4.8	5.1	5.0
Acid trail - Titratable Actual Acidity	2	mol H+/t	87	76	25	17
sulfidic - TAA equiv. S% pyrite	0.003	% pyrite S	0.14	0.12	0.040	0.030
Chromium Reducible Sulfur[S04]	0.005	% S	< 0.005	0.005	< 0.005	< 0.005
Chromium Reducible Sulfur -acidity units	3	mol H+/t	< 3	3.2	< 3	< 3
Sulfur - KCl Extractable	0.02	% S	n/a	n/a	n/a	n/a
HCl Extractable Sulfur Correction Factor	1	factor	2.0	2.0	2.0	2.0
HCl Extractable Sulfur	0.02	% S	n/a	n/a	n/a	n/a
Net Acid soluble sulfur	0.02	% S	n/a	n/a	n/a	n/a
Net Acid soluble sulfur - acidity units	10	mol H+/t	n/a	n/a	n/a	n/a
Net Acid soluble sulfur - equivalent S% pyrite[S02]	0.02	% S	n/a	n/a	n/a	n/a
Acid Neutralising Capacity (ANCbt)	0.01	% CaCO3	n/a	n/a	n/a	n/a
Acid Neutralising Capacity - acidity (a-ANCbt)	2	mol H+/t	n/a	n/a	n/a	n/a
Acid Neutralising Capacity - equivalent S% pyrite (s-ANCbt)[S03]	0.02	% S	n/a	n/a	n/a	n/a
ANC Fineness Factor		factor	1.5	1.5	1.5	1.5

Client Sample ID			TP56#3	TP56#4	TP56#5	TP56#6
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			P20-Ja18755	P20-Ja18756	P20-Ja18757	P20-Ja18758
Date Sampled			Nov 05, 2019	Nov 05, 2019	Nov 05, 2019	Nov 05, 2019
Test/Reference	LOR	Unit				
Chromium Suite (Minus ANC- WA)						
CRS Suite - Net Acidity (Sulfur Units)	0.02	% S	0.14	0.13	0.04	0.03
CRS Suite - Net Acidity (Acidity Units)	10	mol H+/t	87	79	25	17
CRS Suite - Liming Rate[S01]	1	kg CaCO3/t	6.6	5.9	1.9	1.3
% Moisture	1	%	25	20	19	18

Client Sample ID			TP56#7	TP56#8	TP56#11	TP56#14
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			P20-Ja18759	P20-Ja18760	P20-Ja18761	P20-Ja18762
Date Sampled			Nov 05, 2019	Nov 05, 2019	Nov 05, 2019	Nov 05, 2019
Test/Reference	LOR	Unit				
Extraneous Material						
<2mm Fraction	0.005	g	68	78	91	78
>2mm Fraction	0.005	g	< 0.005	< 0.005	< 0.005	< 0.005
Analysed Material	0.1	%	100	100	100	100
Extraneous Material	0.1	%	< 0.1	< 0.1	< 0.1	< 0.1
Chromium Suite (Minus ANC- WA)						
CRS suite WA (-ANC) - Liming Rate	1	kg CaCO3/t	< 1	2.6	< 1	< 1
CRS suite WA (-ANC) - Net Acidity (Acidity Units)	10	mol H+/t	< 10	34	< 10	< 10
CRS Suite WA (-ANC) - Net Acidity (Sulfur Units)	0.02	% S	< 0.02	0.05	< 0.02	< 0.02
pH-KCL	0.1	pH Units	5.8	4.8	6.1	5.8
Acid trail - Titratable Actual Acidity	2	mol H+/t	< 2	34	2.3	< 2
sulfidic - TAA equiv. S% pyrite	0.003	% pyrite S	< 0.003	0.050	< 0.003	< 0.003
Chromium Reducible Sulfur[S04]	0.005	% S	< 0.005	< 0.005	< 0.005	< 0.005
Chromium Reducible Sulfur -acidity units	3	mol H+/t	< 3	< 3	< 3	< 3
Sulfur - KCl Extractable	0.02	% S	n/a	n/a	n/a	n/a
HCl Extractable Sulfur Correction Factor	1	factor	2.0	2.0	2.0	2.0
HCl Extractable Sulfur	0.02	% S	n/a	n/a	n/a	n/a
Net Acid soluble sulfur	0.02	% S	n/a	n/a	n/a	n/a
Net Acid soluble sulfur - acidity units	10	mol H+/t	n/a	n/a	n/a	n/a
Net Acid soluble sulfur - equivalent S% pyrite[S02]	0.02	% S	n/a	n/a	n/a	n/a
Acid Neutralising Capacity (ANCbt)	0.01	% CaCO3	n/a	n/a	n/a	n/a
Acid Neutralising Capacity - acidity (a-ANCbt)	2	mol H+/t	n/a	n/a	n/a	n/a
Acid Neutralising Capacity - equivalent S% pyrite (s-ANCbt)[S03]	0.02	% S	n/a	n/a	n/a	n/a
ANC Fineness Factor		factor	1.5	1.5	1.5	1.5
CRS Suite - Net Acidity (Sulfur Units)	0.02	% S	< 0.02	0.05	< 0.02	< 0.02
CRS Suite - Net Acidity (Acidity Units)	10	mol H+/t	< 10	34	< 10	< 10
CRS Suite - Liming Rate[S01]	1	kg CaCO3/t	< 1	2.6	< 1	< 1
% Moisture	1	%	5.5	19	13	3.0

Client Sample ID			TP56#15	TP56#16	TP56#18	TP56#19
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			P20-Ja18763	P20-Ja18764	P20-Ja18765	P20-Ja18766
Date Sampled			Nov 05, 2019	Nov 05, 2019	Nov 05, 2019	Nov 05, 2019
Test/Reference	LOR	Unit				
Extraneous Material						
<2mm Fraction	0.005	g	77	68	58	65
>2mm Fraction	0.005	g	< 0.005	< 0.005	< 0.005	< 0.005
Analysed Material	0.1	%	100	100	100	100
Extraneous Material	0.1	%	< 0.1	< 0.1	< 0.1	< 0.1
Chromium Suite (Minus ANC- WA)						
CRS suite WA (-ANC) - Liming Rate	1	kg CaCO3/t	< 1	< 1	< 1	< 1
CRS suite WA (-ANC) - Net Acidity (Acidity Units)	10	mol H+/t	< 10	< 10	< 10	< 10
CRS Suite WA (-ANC) - Net Acidity (Sulfur Units)	0.02	% S	< 0.02	< 0.02	< 0.02	< 0.02
pH-KCL	0.1	pH Units	5.9	6.1	5.8	5.4
Acid trail - Titratable Actual Acidity	2	mol H+/t	< 2	< 2	2.2	5.5
sulfidic - TAA equiv. S% pyrite	0.003	% pyrite S	< 0.003	< 0.003	< 0.003	0.010
Chromium Reducible Sulfur[S04]	0.005	% S	< 0.005	< 0.005	< 0.005	< 0.005
Chromium Reducible Sulfur -acidity units	3	mol H+/t	< 3	< 3	< 3	< 3
Sulfur - KCl Extractable	0.02	% S	n/a	n/a	n/a	n/a
HCl Extractable Sulfur Correction Factor	1	factor	2.0	2.0	2.0	2.0
HCl Extractable Sulfur	0.02	% S	n/a	n/a	n/a	n/a
Net Acid soluble sulfur	0.02	% S	n/a	n/a	n/a	n/a
Net Acid soluble sulfur - acidity units	10	mol H+/t	n/a	n/a	n/a	n/a
Net Acid soluble sulfur - equivalent S% pyrite[S02]	0.02	% S	n/a	n/a	n/a	n/a
Acid Neutralising Capacity (ANCbt)	0.01	% CaCO3	n/a	n/a	n/a	n/a
Acid Neutralising Capacity - acidity (a-ANCbt)	2	mol H+/t	n/a	n/a	n/a	n/a
Acid Neutralising Capacity - equivalent S% pyrite (s-ANCbt)[S03]	0.02	% S	n/a	n/a	n/a	n/a
ANC Fineness Factor		factor	1.5	1.5	1.5	1.5
CRS Suite - Net Acidity (Sulfur Units)	0.02	% S	< 0.02	< 0.02	< 0.02	< 0.02
CRS Suite - Net Acidity (Acidity Units)	10	mol H+/t	< 10	< 10	< 10	< 10
CRS Suite - Liming Rate[S01]	1	kg CaCO3/t	< 1	< 1	< 1	< 1
% Moisture	1	%	4.9	15	< 1	5.8

Client Sample ID			TP56#20	TP56#21	TP56#22	TP56#23
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			P20-Ja18767	P20-Ja18768	P20-Ja18769	P20-Ja18770
Date Sampled			Nov 05, 2019	Nov 05, 2019	Nov 05, 2019	Nov 05, 2019
Test/Reference	LOR	Unit				
Extraneous Material						
<2mm Fraction	0.005	g	58	54	58	56
>2mm Fraction	0.005	g	< 0.005	< 0.005	< 0.005	< 0.005
Analysed Material	0.1	%	100	100	100	100
Extraneous Material	0.1	%	< 0.1	< 0.1	< 0.1	< 0.1
Chromium Suite (Minus ANC- WA)						
CRS suite WA (-ANC) - Liming Rate	1	kg CaCO3/t	3.2	2.6	< 1	1.0
CRS suite WA (-ANC) - Net Acidity (Acidity Units)	10	mol H+/t	43	34	< 10	14
CRS Suite WA (-ANC) - Net Acidity (Sulfur Units)	0.02	% S	0.07	0.05	< 0.02	0.02
pH-KCL	0.1	pH Units	4.4	4.5	5.6	5.6
Acid trail - Titratable Actual Acidity	2	mol H+/t	43	34	3.5	9.8
sulfidic - TAA equiv. S% pyrite	0.003	% pyrite S	0.070	0.050	0.010	0.020
Chromium Reducible Sulfur[S04]	0.005	% S	< 0.005	< 0.005	< 0.005	0.007

Client Sample ID			TP56#20	TP56#21	TP56#22	TP56#23
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			P20-Ja18767	P20-Ja18768	P20-Ja18769	P20-Ja18770
Date Sampled			Nov 05, 2019	Nov 05, 2019	Nov 05, 2019	Nov 05, 2019
Test/Reference	LOR	Unit				
Chromium Suite (Minus ANC- WA)						
Chromium Reducible Sulfur -acidity units	3	mol H+/t	< 3	< 3	< 3	4.1
Sulfur - KCl Extractable	0.02	% S	< 0.02	< 0.02	n/a	n/a
HCl Extractable Sulfur Correction Factor	1	factor	2.0	2.0	2.0	2.0
HCl Extractable Sulfur	0.02	% S	< 0.02	< 0.02	n/a	n/a
Net Acid soluble sulfur	0.02	% S	< 0.02	< 0.02	n/a	n/a
Net Acid soluble sulfur - acidity units	10	mol H+/t	< 10	< 10	n/a	n/a
Net Acid soluble sulfur - equivalent S% pyrite[S02]	0.02	% S	< 0.02	< 0.02	n/a	n/a
Acid Neutralising Capacity (ANCbt)	0.01	% CaCO3	n/a	n/a	n/a	n/a
Acid Neutralising Capacity - acidity (a-ANCbt)	2	mol H+/t	n/a	n/a	n/a	n/a
Acid Neutralising Capacity - equivalent S% pyrite (s-ANCbt)[S03]	0.02	% S	n/a	n/a	n/a	n/a
ANC Fineness Factor		factor	1.5	1.5	1.5	1.5
CRS Suite - Net Acidity (Sulfur Units)	0.02	% S	0.07	0.05	< 0.02	0.02
CRS Suite - Net Acidity (Acidity Units)	10	mol H+/t	43	34	< 10	14
CRS Suite - Liming Rate[S01]	1	kg CaCO3/t	3.2	2.6	< 1	1.0
% Moisture	1	%	16	14	17	14

Client Sample ID			TP56#25	TP56#32	TP56#33	TP56#34
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			P20-Ja18771	P20-Ja18772	P20-Ja18773	P20-Ja18774
Date Sampled			Nov 05, 2019	Nov 05, 2019	Nov 05, 2019	Nov 05, 2019
Test/Reference	LOR	Unit				
Extraneous Material						
<2mm Fraction	0.005	g	39	56	36	58
>2mm Fraction	0.005	g	< 0.005	< 0.005	6.3	< 0.005
Analysed Material	0.1	%	100	100	85	100
Extraneous Material	0.1	%	< 0.1	< 0.1	15	< 0.1
Chromium Suite (Minus ANC- WA)						
CRS suite WA (-ANC) - Liming Rate	1	kg CaCO3/t	< 1	< 1	1.2	2.6
CRS suite WA (-ANC) - Net Acidity (Acidity Units)	10	mol H+/t	< 10	< 10	16	35
CRS Suite WA (-ANC) - Net Acidity (Sulfur Units)	0.02	% S	< 0.02	< 0.02	0.03	0.06
pH-KCL	0.1	pH Units	7.3	5.9	4.8	5.1
Acid trail - Titratable Actual Acidity	2	mol H+/t	< 2	< 2	16	35
sulfidic - TAA equiv. S% pyrite	0.003	% pyrite S	< 0.003	< 0.003	0.030	0.060
Chromium Reducible Sulfur[S04]	0.005	% S	< 0.005	< 0.005	< 0.005	< 0.005
Chromium Reducible Sulfur -acidity units	3	mol H+/t	< 3	< 3	< 3	< 3
Sulfur - KCl Extractable	0.02	% S	n/a	n/a	n/a	n/a
HCl Extractable Sulfur Correction Factor	1	factor	2.0	2.0	2.0	2.0
HCl Extractable Sulfur	0.02	% S	n/a	n/a	n/a	n/a
Net Acid soluble sulfur	0.02	% S	n/a	n/a	n/a	n/a
Net Acid soluble sulfur - acidity units	10	mol H+/t	n/a	n/a	n/a	n/a
Net Acid soluble sulfur - equivalent S% pyrite[S02]	0.02	% S	n/a	n/a	n/a	n/a
Acid Neutralising Capacity (ANCbt)	0.01	% CaCO3	0.75	n/a	n/a	n/a
Acid Neutralising Capacity - acidity (a-ANCbt)	2	mol H+/t	150	n/a	n/a	n/a
Acid Neutralising Capacity - equivalent S% pyrite (s-ANCbt)[S03]	0.02	% S	0.24	n/a	n/a	n/a
ANC Fineness Factor		factor	1.5	1.5	1.5	1.5

Client Sample ID			TP56#25	TP56#32	TP56#33	TP56#34
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			P20-Ja18771	P20-Ja18772	P20-Ja18773	P20-Ja18774
Date Sampled			Nov 05, 2019	Nov 05, 2019	Nov 05, 2019	Nov 05, 2019
Test/Reference	LOR	Unit				
Chromium Suite (Minus ANC- WA)						
CRS Suite - Net Acidity (Sulfur Units)	0.02	% S	< 0.02	< 0.02	0.03	0.06
CRS Suite - Net Acidity (Acidity Units)	10	mol H+/t	< 10	< 10	16	35
CRS Suite - Liming Rate[S01]	1	kg CaCO3/t	< 1	< 1	1.2	2.6
% Moisture	1	%	31	6.2	31	16

Client Sample ID			TP56#35	TP56#36	TP56#37	TP56#38
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			P20-Ja18775	P20-Ja18776	P20-Ja18777	P20-Ja18778
Date Sampled			Nov 05, 2019	Nov 05, 2019	Nov 05, 2019	Nov 05, 2019
Test/Reference	LOR	Unit				
Extraneous Material						
<2mm Fraction	0.005	g	71	88	70	64
>2mm Fraction	0.005	g	< 0.005	< 0.005	< 0.005	< 0.005
Analysed Material	0.1	%	100	100	100	100
Extraneous Material	0.1	%	< 0.1	< 0.1	< 0.1	< 0.1
Chromium Suite (Minus ANC- WA)						
CRS suite WA (-ANC) - Liming Rate	1	kg CaCO3/t	< 1	2.2	1.9	< 1
CRS suite WA (-ANC) - Net Acidity (Acidity Units)	10	mol H+/t	< 10	30	25	< 10
CRS Suite WA (-ANC) - Net Acidity (Sulfur Units)	0.02	% S	< 0.02	0.05	0.04	< 0.02
pH-KCL	0.1	pH Units	5.7	4.4	4.5	5.8
Acid trail - Titratable Actual Acidity	2	mol H+/t	< 2	30	25	< 2
sulfidic - TAA equiv. S% pyrite	0.003	% pyrite S	< 0.003	0.050	0.040	< 0.003
Chromium Reducible Sulfur[S04]	0.005	% S	< 0.005	< 0.005	< 0.005	< 0.005
Chromium Reducible Sulfur -acidity units	3	mol H+/t	< 3	< 3	< 3	< 3
Sulfur - KCl Extractable	0.02	% S	n/a	< 0.02	< 0.02	n/a
HCl Extractable Sulfur Correction Factor	1	factor	2.0	2.0	2.0	2.0
HCl Extractable Sulfur	0.02	% S	n/a	< 0.02	< 0.02	n/a
Net Acid soluble sulfur	0.02	% S	n/a	< 0.02	< 0.02	n/a
Net Acid soluble sulfur - acidity units	10	mol H+/t	n/a	< 10	< 10	n/a
Net Acid soluble sulfur - equivalent S% pyrite[S02]	0.02	% S	n/a	< 0.02	< 0.02	n/a
Acid Neutralising Capacity (ANCbt)	0.01	% CaCO3	n/a	n/a	n/a	n/a
Acid Neutralising Capacity - acidity (a-ANCbt)	2	mol H+/t	n/a	n/a	n/a	n/a
Acid Neutralising Capacity - equivalent S% pyrite (s-ANCbt)[S03]	0.02	% S	n/a	n/a	n/a	n/a
ANC Fineness Factor		factor	1.5	1.5	1.5	1.5
CRS Suite - Net Acidity (Sulfur Units)	0.02	% S	< 0.02	0.05	0.04	< 0.02
CRS Suite - Net Acidity (Acidity Units)	10	mol H+/t	< 10	30	25	< 10
CRS Suite - Liming Rate[S01]	1	kg CaCO3/t	< 1	2.2	1.9	< 1
% Moisture	1	%	8.5	14	23	1.6

Client Sample ID			MW5_3.0	MW5_5.0	MW5_8.0	MW06_0.5
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			P20-Ja18779	P20-Ja18780	P20-Ja18781	P20-Ja18782
Date Sampled			Jul 24, 2018	Jul 24, 2018	Jul 24, 2018	Jul 17, 2018
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	-	-	-	6.6
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	-	-	-	5.7
Reaction Ratings*[S05]		comment	-	-	-	2.0
Extraneous Material						
<2mm Fraction	0.005	g	51	44	68	-
>2mm Fraction	0.005	g	< 0.005	< 0.005	1.9	-
Analysed Material	0.1	%	100	100	97	-
Extraneous Material	0.1	%	< 0.1	< 0.1	2.7	-
Chromium Suite (Minus ANC- WA)						
CRS suite WA (-ANC) - Liming Rate	1	kg CaCO3/t	< 1	< 1	4.6	-
CRS suite WA (-ANC) - Net Acidity (Acidity Units)	10	mol H+/t	< 10	< 10	61	-
CRS Suite WA (-ANC) - Net Acidity (Sulfur Units)	0.02	% S	< 0.02	< 0.02	0.10	-
pH-KCL	0.1	pH Units	6.2	6.0	5.2	-
Acid trail - Titratable Actual Acidity	2	mol H+/t	< 2	< 2	4.0	-
sulfidic - TAA equiv. S% pyrite	0.003	% pyrite S	< 0.003	< 0.003	0.010	-
Chromium Reducible Sulfur[S04]	0.005	% S	< 0.005	< 0.005	0.092	-
Chromium Reducible Sulfur -acidity units	3	mol H+/t	< 3	< 3	57	-
Sulfur - KCl Extractable	0.02	% S	n/a	n/a	n/a	-
HCl Extractable Sulfur Correction Factor	1	factor	2.0	2.0	2.0	-
HCl Extractable Sulfur	0.02	% S	n/a	n/a	n/a	-
Net Acid soluble sulfur	0.02	% S	n/a	n/a	n/a	-
Net Acid soluble sulfur - acidity units	10	mol H+/t	n/a	n/a	n/a	-
Net Acid soluble sulfur - equivalent S% pyrite[S02]	0.02	% S	n/a	n/a	n/a	-
Acid Neutralising Capacity (ANCbt)	0.01	% CaCO3	n/a	n/a	n/a	-
Acid Neutralising Capacity - acidity (a-ANCbt)	2	mol H+/t	n/a	n/a	n/a	-
Acid Neutralising Capacity - equivalent S% pyrite (s-ANCbt)[S03]	0.02	% S	n/a	n/a	n/a	-
ANC Fineness Factor		factor	1.5	1.5	1.5	-
CRS Suite - Net Acidity (Sulfur Units)	0.02	% S	< 0.02	< 0.02	0.10	-
CRS Suite - Net Acidity (Acidity Units)	10	mol H+/t	< 10	< 10	61	-
CRS Suite - Liming Rate[S01]	1	kg CaCO3/t	< 1	< 1	4.6	-
% Moisture	1	%	< 1	< 1	12	-

Client Sample ID			MW06_1.0	MW06_1.5	MW06_2.0	MW06_2.5
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			P20-Ja18783	P20-Ja18784	P20-Ja18785	P20-Ja18786
Date Sampled			Jul 17, 2018	Jul 17, 2018	Jul 17, 2018	Jul 17, 2018
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	6.4	6.7	6.7	7.1
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	5.2	5.9	5.8	5.9
Reaction Ratings*[S05]		comment	2.0	2.0	2.0	2.0

Client Sample ID			MW06_3.0	MW06_3.5	MW06_4.0	MW06_4.5
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			P20-Ja18787	P20-Ja18788	P20-Ja18789	P20-Ja18790
Date Sampled			Jul 17, 2018	Jul 17, 2018	Jul 17, 2018	Jul 17, 2018
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	6.8	6.5	6.9	6.8
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	5.9	5.7	5.7	5.6
Reaction Ratings*[S05]		comment	2.0	2.0	2.0	2.0

Client Sample ID			MW06_5.0	MW06_5.5	MW06_6.0	MW06_7.0
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			P20-Ja18791	P20-Ja18792	P20-Ja18793	P20-Ja18794
Date Sampled			Jul 17, 2018	Jul 17, 2018	Jul 17, 2018	Jul 17, 2018
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	6.9	4.2	3.7	4.7
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	5.9	3.4	3.1	3.6
Reaction Ratings*[S05]		comment	2.0	2.0	2.0	2.0

Client Sample ID			MW06_8.0	MW07_2.5	MW07_5.0	MW07_10.0
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			P20-Ja18795	P20-Ja18796	P20-Ja18797	P20-Ja18798
Date Sampled			Jul 17, 2018	Jul 23, 2018	Jul 23, 2018	Jul 23, 2018
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	4.7	-	-	-
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	3.5	-	-	-
Reaction Ratings*[S05]		comment	2.0	-	-	-
Extraneous Material						
<2mm Fraction	0.005	g	-	48	48	52
>2mm Fraction	0.005	g	-	< 0.005	< 0.005	4.4
Analysed Material	0.1	%	-	100	100	92
Extraneous Material	0.1	%	-	< 0.1	< 0.1	7.9
Chromium Suite (Minus ANC- WA)						
CRS suite WA (-ANC) - Liming Rate	1	kg CaCO3/t	-	< 1	< 1	< 1
CRS suite WA (-ANC) - Net Acidity (Acidity Units)	10	mol H+/t	-	< 10	< 10	< 10
CRS Suite WA (-ANC) - Net Acidity (Sulfur Units)	0.02	% S	-	< 0.02	< 0.02	< 0.02
pH-KCL	0.1	pH Units	-	6.0	5.9	5.9
Acid trail - Titratable Actual Acidity	2	mol H+/t	-	< 2	< 2	< 2
sulfidic - TAA equiv. S% pyrite	0.003	% pyrite S	-	< 0.003	< 0.003	< 0.003
Chromium Reducible Sulfur[S04]	0.005	% S	-	< 0.005	< 0.005	< 0.005
Chromium Reducible Sulfur -acidity units	3	mol H+/t	-	< 3	< 3	< 3
Sulfur - KCl Extractable	0.02	% S	-	n/a	n/a	n/a
HCl Extractable Sulfur Correction Factor	1	factor	-	2.0	2.0	2.0
HCl Extractable Sulfur	0.02	% S	-	n/a	n/a	n/a
Net Acid soluble sulfur	0.02	% S	-	n/a	n/a	n/a
Net Acid soluble sulfur - acidity units	10	mol H+/t	-	n/a	n/a	n/a
Net Acid soluble sulfur - equivalent S% pyrite[S02]	0.02	% S	-	n/a	n/a	n/a
Acid Neutralising Capacity (ANCbt)	0.01	% CaCO3	-	n/a	n/a	n/a
Acid Neutralising Capacity - acidity (a-ANCbt)	2	mol H+/t	-	n/a	n/a	n/a
Acid Neutralising Capacity - equivalent S% pyrite (s-ANCbt)[S03]	0.02	% S	-	n/a	n/a	n/a

Client Sample ID			MW06_8.0	MW07_2.5	MW07_5.0	MW07_10.0
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			P20-Ja18795	P20-Ja18796	P20-Ja18797	P20-Ja18798
Date Sampled			Jul 17, 2018	Jul 23, 2018	Jul 23, 2018	Jul 23, 2018
Test/Reference	LOR	Unit				
Chromium Suite (Minus ANC- WA)						
ANC Fineness Factor		factor	-	1.5	1.5	1.5
CRS Suite - Net Acidity (Sulfur Units)	0.02	% S	-	< 0.02	< 0.02	< 0.02
CRS Suite - Net Acidity (Acidity Units)	10	mol H+/t	-	< 10	< 10	< 10
CRS Suite - Liming Rate[S01]	1	kg CaCO3/t	-	< 1	< 1	< 1
% Moisture	1	%	-	< 1	1.8	12

Client Sample ID			MW08_0.5	MW08_2.0	MW08_13.0	MW08a_0.5
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			P20-Ja18799	P20-Ja18800	P20-Ja18801	P20-Ja18802
Date Sampled			Jul 24, 2018	Jul 24, 2018	Jul 24, 2018	Jul 24, 2018
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	-	-	-	4.4
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	-	-	-	3.3
Reaction Ratings*[S05]		comment	-	-	-	2.0
Extraneous Material						
<2mm Fraction	0.005	g	56	52	51	-
>2mm Fraction	0.005	g	< 0.005	< 0.005	< 0.005	-
Analysed Material	0.1	%	100	100	100	-
Extraneous Material	0.1	%	< 0.1	< 0.1	< 0.1	-
Chromium Suite (Minus ANC- WA)						
CRS suite WA (-ANC) - Liming Rate	1	kg CaCO3/t	< 1	< 1	< 1	-
CRS suite WA (-ANC) - Net Acidity (Acidity Units)	10	mol H+/t	< 10	< 10	< 10	-
CRS Suite WA (-ANC) - Net Acidity (Sulfur Units)	0.02	% S	< 0.02	< 0.02	< 0.02	-
pH-KCL	0.1	pH Units	6.3	6.1	9.4	-
Acid trail - Titratable Actual Acidity	2	mol H+/t	< 2	< 2	< 2	-
sulfidic - TAA equiv. S% pyrite	0.003	% pyrite S	< 0.003	< 0.003	< 0.003	-
Chromium Reducible Sulfur[S04]	0.005	% S	< 0.005	< 0.005	< 0.005	-
Chromium Reducible Sulfur -acidity units	3	mol H+/t	< 3	< 3	< 3	-
Sulfur - KCl Extractable	0.02	% S	n/a	n/a	n/a	-
HCl Extractable Sulfur Correction Factor	1	factor	2.0	2.0	2.0	-
HCl Extractable Sulfur	0.02	% S	n/a	n/a	n/a	-
Net Acid soluble sulfur	0.02	% S	n/a	n/a	n/a	-
Net Acid soluble sulfur - acidity units	10	mol H+/t	n/a	n/a	n/a	-
Net Acid soluble sulfur - equivalent S% pyrite[S02]	0.02	% S	n/a	n/a	n/a	-
Acid Neutralising Capacity (ANCbt)	0.01	% CaCO3	n/a	n/a	0.43	-
Acid Neutralising Capacity - acidity (a-ANCbt)	2	mol H+/t	n/a	n/a	87	-
Acid Neutralising Capacity - equivalent S% pyrite (s-ANCbt)[S03]	0.02	% S	n/a	n/a	0.14	-
ANC Fineness Factor		factor	1.5	1.5	1.5	-
CRS Suite - Net Acidity (Sulfur Units)	0.02	% S	< 0.02	< 0.02	< 0.02	-
CRS Suite - Net Acidity (Acidity Units)	10	mol H+/t	< 10	< 10	< 10	-
CRS Suite - Liming Rate[S01]	1	kg CaCO3/t	< 1	< 1	< 1	-
% Moisture	1	%	2.0	3.4	14	-

Client Sample ID			MW08a_1.0	MW08a_1.5	MW08a_2.0	MW08a_2.5
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			P20-Ja18803	P20-Ja18804	P20-Ja18805	P20-Ja18806
Date Sampled			Jul 24, 2018	Jul 24, 2018	Jul 24, 2018	Jul 24, 2018
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	6.8	7.0	6.9	6.4
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	5.4	4.8	5.9	5.7
Reaction Ratings*[S05]		comment	2.0	2.0	2.0	2.0

Client Sample ID			MW08a_3.0	MW08a_3.5	MW08a_4.0	MW08a_4.5
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			P20-Ja18807	P20-Ja18808	P20-Ja18809	P20-Ja18810
Date Sampled			Jul 24, 2018	Jul 24, 2018	Jul 24, 2018	Jul 24, 2018
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	6.4	6.0	6.4	6.7
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	5.2	3.6	3.5	4.9
Reaction Ratings*[S05]		comment	2.0	2.0	2.0	2.0

Client Sample ID			MW08a_5.0	MW08a_5.5	MW08a_6.0	MW11_4.0
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			P20-Ja18811	P20-Ja18812	P20-Ja18813	P20-Ja18952
Date Sampled			Jul 24, 2018	Jul 24, 2018	Jul 24, 2018	Jul 25, 2018
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	6.7	6.7	6.9	-
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	3.9	2.7	2.8	-
Reaction Ratings*[S05]		comment	2.0	2.0	2.0	-
Extraneous Material						
<2mm Fraction	0.005	g	-	-	-	21
>2mm Fraction	0.005	g	-	-	-	< 0.005
Analysed Material	0.1	%	-	-	-	100
Extraneous Material	0.1	%	-	-	-	< 0.1
Chromium Suite (Minus ANC- WA)						
CRS suite WA (-ANC) - Liming Rate	1	kg CaCO3/t	-	-	-	< 1
CRS suite WA (-ANC) - Net Acidity (Acidity Units)	10	mol H+/t	-	-	-	< 10
CRS Suite WA (-ANC) - Net Acidity (Sulfur Units)	0.02	% S	-	-	-	< 0.02
pH-KCL	0.1	pH Units	-	-	-	6.1
Acid trail - Titratable Actual Acidity	2	mol H+/t	-	-	-	2.6
sulfidic - TAA equiv. S% pyrite	0.003	% pyrite S	-	-	-	< 0.003
Chromium Reducible Sulfur[S04]	0.005	% S	-	-	-	< 0.005
Chromium Reducible Sulfur -acidity units	3	mol H+/t	-	-	-	< 3
Sulfur - KCl Extractable	0.02	% S	-	-	-	n/a
HCl Extractable Sulfur Correction Factor	1	factor	-	-	-	2.0
HCl Extractable Sulfur	0.02	% S	-	-	-	n/a
Net Acid soluble sulfur	0.02	% S	-	-	-	n/a
Net Acid soluble sulfur - acidity units	10	mol H+/t	-	-	-	n/a
Net Acid soluble sulfur - equivalent S% pyrite[S02]	0.02	% S	-	-	-	n/a
Acid Neutralising Capacity (ANCbt)	0.01	% CaCO3	-	-	-	n/a
Acid Neutralising Capacity - acidity (a-ANCbt)	2	mol H+/t	-	-	-	n/a
Acid Neutralising Capacity - equivalent S% pyrite (s-ANCbt)[S03]	0.02	% S	-	-	-	n/a

Client Sample ID			MW08a_5.0	MW08a_5.5	MW08a_6.0	MW11_4.0
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			P20-Ja18811	P20-Ja18812	P20-Ja18813	P20-Ja18952
Date Sampled			Jul 24, 2018	Jul 24, 2018	Jul 24, 2018	Jul 25, 2018
Test/Reference	LOR	Unit				
Chromium Suite (Minus ANC- WA)						
ANC Fineness Factor		factor	-	-	-	1.5
CRS Suite - Net Acidity (Sulfur Units)	0.02	% S	-	-	-	< 0.02
CRS Suite - Net Acidity (Acidity Units)	10	mol H+/t	-	-	-	< 10
CRS Suite - Liming Rate[S01]	1	kg CaCO3/t	-	-	-	< 1
% Moisture	1	%	-	-	-	39

Client Sample ID			TP56#28
Sample Matrix			Soil
Eurofins Sample No.			P20-Ja20249
Date Sampled			Jul 25, 2018
Test/Reference	LOR	Unit	
Extraneous Material			
<2mm Fraction	0.005	g	78
>2mm Fraction	0.005	g	< 0.005
Analysed Material	0.1	%	100
Extraneous Material	0.1	%	< 0.1
Chromium Suite (Minus ANC- WA)			
CRS suite WA (-ANC) - Liming Rate	1	kg CaCO3/t	< 1
CRS suite WA (-ANC) - Net Acidity (Acidity Units)	10	mol H+/t	< 10
CRS Suite WA (-ANC) - Net Acidity (Sulfur Units)	0.02	% S	< 0.02
pH-KCL	0.1	pH Units	6.3
Acid trail - Titratable Actual Acidity	2	mol H+/t	< 2
sulfidic - TAA equiv. S% pyrite	0.003	% pyrite S	< 0.003
Chromium Reducible Sulfur[S04]	0.005	% S	< 0.005
Chromium Reducible Sulfur -acidity units	3	mol H+/t	< 3
Sulfur - KCl Extractable	0.02	% S	n/a
HCl Extractable Sulfur Correction Factor	1	factor	2.0
HCl Extractable Sulfur	0.02	% S	n/a
Net Acid soluble sulfur	0.02	% S	n/a
Net Acid soluble sulfur - acidity units	10	mol H+/t	n/a
Net Acid soluble sulfur - equivalent S% pyrite[S02]	0.02	% S	n/a
Acid Neutralising Capacity (ANCbt)	0.01	% CaCO3	n/a
Acid Neutralising Capacity - acidity (a-ANCbt)	2	mol H+/t	n/a
Acid Neutralising Capacity - equivalent S% pyrite (s-ANCbt)[S03]	0.02	% S	n/a
ANC Fineness Factor		factor	1.5
CRS Suite - Net Acidity (Sulfur Units)	0.02	% S	< 0.02
CRS Suite - Net Acidity (Acidity Units)	10	mol H+/t	< 10
CRS Suite - Liming Rate[S01]	1	kg CaCO3/t	< 1
% Moisture	1	%	13

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Acid Sulfate Soils Field pH Test	Perth	Jan 21, 2020	7 Days
- Method: LTM-GEN- 7060 Determination of field pH (pHF) and field pH peroxide (pHFOX) tests			
% Moisture	Perth	Jan 23, 2020	14 Days
- Method: LTM-GEN-7080 Moisture			
Extraneous Material	Brisbane	Jan 24, 2020	6 Week
- Method: LTM-GEN-7050/7070			
Chromium Suite (Minus ANC- WA)	Brisbane	Jan 25, 2020	6 Week
- Method: LTM-GEN-7070			

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Project Name: BORR
Project ID: 6137041

Order No.:
Report #: 697821
Phone: 08 6222 8222
Fax: 08 9429 6555

Received: Jan 17, 2020 7:14 PM
Due: Jan 28, 2020
Priority: 5 Day
Contact Name: Louise Cockerton

Eurofins Analytical Services Manager : Robert Johnston

Sample Detail						% Moisture	Acid Sulfate Soils Field pH Test	Chromium Suite (Minus ANC- WA)
Melbourne Laboratory - NATA Site # 1254 & 14271								
Sydney Laboratory - NATA Site # 18217								
Brisbane Laboratory - NATA Site # 20794								X
Perth Laboratory - NATA Site # 23736						X	X	
External Laboratory								
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**			
1	MW9_1.0	Jul 25, 2018		Soil	P20-Ja18743	X		X
2	MW9_2.5	Jul 25, 2018		Soil	P20-Ja18744	X		X
3	MW9_3.5	Jul 25, 2018		Soil	P20-Ja18745	X		X
4	MW9_5.5	Jul 25, 2018		Soil	P20-Ja18746	X		X
5	MW10_1.0	Jul 25, 2018		Soil	P20-Ja18747	X		X
6	MW10_2.0	Jul 25, 2018		Soil	P20-Ja18748	X		X
7	MW10_3.0	Jul 25, 2018		Soil	P20-Ja18749	X		X
8	MW10_3.5	Jul 25, 2018		Soil	P20-Ja18750	X		X
9	MW11_0.5	Jul 25, 2018		Soil	P20-Ja18751	X		X
10	MW11_2.0	Jul 25, 2018		Soil	P20-Ja18752	X		X

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Melbourne Laboratory - NATA Site # 1254 & 14271								
Sydney Laboratory - NATA Site # 18217								
Brisbane Laboratory - NATA Site # 20794								X
Perth Laboratory - NATA Site # 23736						X	X	
11	TP56#1	Nov 05, 2019		Soil	P20-Ja18753	X		X
12	TP56#2	Nov 05, 2019		Soil	P20-Ja18754	X		X
13	TP56#3	Nov 05, 2019		Soil	P20-Ja18755	X		X
14	TP56#4	Nov 05, 2019		Soil	P20-Ja18756	X		X
15	TP56#5	Nov 05, 2019		Soil	P20-Ja18757	X		X
16	TP56#6	Nov 05, 2019		Soil	P20-Ja18758	X		X
17	TP56#7	Nov 05, 2019		Soil	P20-Ja18759	X		X
18	TP56#8	Nov 05, 2019		Soil	P20-Ja18760	X		X
19	TP56#11	Nov 05, 2019		Soil	P20-Ja18761	X		X
20	TP56#14	Nov 05, 2019		Soil	P20-Ja18762	X		X
21	TP56#15	Nov 05, 2019		Soil	P20-Ja18763	X		X
22	TP56#16	Nov 05, 2019		Soil	P20-Ja18764	X		X
23	TP56#18	Nov 05, 2019		Soil	P20-Ja18765	X		X

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Melbourne Laboratory - NATA Site # 1254 & 14271								
Sydney Laboratory - NATA Site # 18217								
Brisbane Laboratory - NATA Site # 20794								X
Perth Laboratory - NATA Site # 23736						X	X	
24	TP56#19	Nov 05, 2019		Soil	P20-Ja18766	X		X
25	TP56#20	Nov 05, 2019		Soil	P20-Ja18767	X		X
26	TP56#21	Nov 05, 2019		Soil	P20-Ja18768	X		X
27	TP56#22	Nov 05, 2019		Soil	P20-Ja18769	X		X
28	TP56#23	Nov 05, 2019		Soil	P20-Ja18770	X		X
29	TP56#25	Nov 05, 2019		Soil	P20-Ja18771	X		X
30	TP56#32	Nov 05, 2019		Soil	P20-Ja18772	X		X
31	TP56#33	Nov 05, 2019		Soil	P20-Ja18773	X		X
32	TP56#34	Nov 05, 2019		Soil	P20-Ja18774	X		X
33	TP56#35	Nov 05, 2019		Soil	P20-Ja18775	X		X
34	TP56#36	Nov 05, 2019		Soil	P20-Ja18776	X		X
35	TP56#37	Nov 05, 2019		Soil	P20-Ja18777	X		X
36	TP56#38	Nov 05, 2019		Soil	P20-Ja18778	X		X

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Melbourne Laboratory - NATA Site # 1254 & 14271								
Sydney Laboratory - NATA Site # 18217								
Brisbane Laboratory - NATA Site # 20794								X
Perth Laboratory - NATA Site # 23736						X	X	
37	MW5_3.0	Jul 24, 2018		Soil	P20-Ja18779	X		X
38	MW5_5.0	Jul 24, 2018		Soil	P20-Ja18780	X		X
39	MW5_8.0	Jul 24, 2018		Soil	P20-Ja18781	X		X
40	MW06_0.5	Jul 17, 2018		Soil	P20-Ja18782		X	
41	MW06_1.0	Jul 17, 2018		Soil	P20-Ja18783		X	
42	MW06_1.5	Jul 17, 2018		Soil	P20-Ja18784		X	
43	MW06_2.0	Jul 17, 2018		Soil	P20-Ja18785		X	
44	MW06_2.5	Jul 17, 2018		Soil	P20-Ja18786		X	
45	MW06_3.0	Jul 17, 2018		Soil	P20-Ja18787		X	
46	MW06_3.5	Jul 17, 2018		Soil	P20-Ja18788		X	
47	MW06_4.0	Jul 17, 2018		Soil	P20-Ja18789		X	
48	MW06_4.5	Jul 17, 2018		Soil	P20-Ja18790		X	
49	MW06_5.0	Jul 17, 2018		Soil	P20-Ja18791		X	

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Melbourne Laboratory - NATA Site # 1254 & 14271								
Sydney Laboratory - NATA Site # 18217								
Brisbane Laboratory - NATA Site # 20794								X
Perth Laboratory - NATA Site # 23736						X	X	
50	MW06_5.5	Jul 17, 2018		Soil	P20-Ja18792		X	
51	MW06_6.0	Jul 17, 2018		Soil	P20-Ja18793		X	
52	MW06_7.0	Jul 17, 2018		Soil	P20-Ja18794		X	
53	MW06_8.0	Jul 17, 2018		Soil	P20-Ja18795		X	
54	MW07_2.5	Jul 23, 2018		Soil	P20-Ja18796	X		X
55	MW07_5.0	Jul 23, 2018		Soil	P20-Ja18797	X		X
56	MW07_10.0	Jul 23, 2018		Soil	P20-Ja18798	X		X
57	MW08_0.5	Jul 24, 2018		Soil	P20-Ja18799	X		X
58	MW08_2.0	Jul 24, 2018		Soil	P20-Ja18800	X		X
59	MW08_13.0	Jul 24, 2018		Soil	P20-Ja18801	X		X
60	MW08a_0.5	Jul 24, 2018		Soil	P20-Ja18802		X	
61	MW08a_1.0	Jul 24, 2018		Soil	P20-Ja18803		X	
62	MW08a_1.5	Jul 24, 2018		Soil	P20-Ja18804		X	

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Melbourne Laboratory - NATA Site # 1254 & 14271								
Sydney Laboratory - NATA Site # 18217								
Brisbane Laboratory - NATA Site # 20794								X
Perth Laboratory - NATA Site # 23736						X	X	
63	MW08a_2.0	Jul 24, 2018		Soil	P20-Ja18805		X	
64	MW08a_2.5	Jul 24, 2018		Soil	P20-Ja18806		X	
65	MW08a_3.0	Jul 24, 2018		Soil	P20-Ja18807		X	
66	MW08a_3.5	Jul 24, 2018		Soil	P20-Ja18808		X	
67	MW08a_4.0	Jul 24, 2018		Soil	P20-Ja18809		X	
68	MW08a_4.5	Jul 24, 2018		Soil	P20-Ja18810		X	
69	MW08a_5.0	Jul 24, 2018		Soil	P20-Ja18811		X	
70	MW08a_5.5	Jul 24, 2018		Soil	P20-Ja18812		X	
71	MW08a_6.0	Jul 24, 2018		Soil	P20-Ja18813		X	
72	MW11_4.0	Jul 25, 2018		Soil	P20-Ja18952	X		X
73	TP56#28	Jul 25, 2018		Soil	P20-Ja20249	X		X
Test Counts						47	26	47

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer, that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per kilogram

mg/L: milligrams per litre

ug/L: micrograms per litre

ppm: Parts per million

ppb: Parts per billion

%: Percentage

org/100mL: Organisms per 100 millilitres

NTU: Nephelometric Turbidity Units

MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.3
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 20-130% Phenols & 50-150% PFASs

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.3 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling.Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " -" in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
LCS - % Recovery									
Chromium Suite (Minus ANC- WA)									
pH-KCL			%	100			80-120	Pass	
Acid trail - Titratable Actual Acidity			%	92			80-120	Pass	
Chromium Reducible Sulfur			%	95			80-120	Pass	
Acid Neutralising Capacity (ANCbt)			%	101			80-120	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
				Result 1	Result 2	RPD			
% Moisture	P20-Ja18743	CP	%	3.1	3.7	19	30%	Pass	
Duplicate									
Chromium Suite (Minus ANC- WA)				Result 1	Result 2	RPD			
CRS suite WA (-ANC) - Liming Rate	P20-Ja18752	CP	kg CaCO3/t	< 1	< 1	<1	30%	Pass	
CRS suite WA (-ANC) - Net Acidity (Acidity Units)	P20-Ja18752	CP	mol H+/t	< 10	< 10	<1	30%	Pass	
CRS Suite WA (-ANC) - Net Acidity (Sulfur Units)	P20-Ja18752	CP	% S	< 0.02	< 0.02	<1	30%	Pass	
pH-KCL	P20-Ja18752	CP	pH Units	6.7	6.7	<1	30%	Pass	
Acid trail - Titratable Actual Acidity	P20-Ja18752	CP	mol H+/t	< 2	< 2	<1	30%	Pass	
sulfidic - TAA equiv. S% pyrite	P20-Ja18752	CP	% pyrite S	< 0.003	< 0.003	<1	30%	Pass	
Chromium Reducible Sulfur	P20-Ja18752	CP	% S	0.012	0.014	15	30%	Pass	
Chromium Reducible Sulfur -acidity units	P20-Ja18752	CP	mol H+/t	7.6	8.9	15	30%	Pass	
Sulfur - KCl Extractable	P20-Ja18752	CP	% S	n/a	n/a	n/a	30%	Pass	
Net Acid soluble sulfur	P20-Ja18752	CP	% S	n/a	n/a	n/a	30%	Pass	
Net Acid soluble sulfur - acidity units	P20-Ja18752	CP	mol H+/t	n/a	n/a	n/a	30%	Pass	
Net Acid soluble sulfur - equivalent S% pyrite	P20-Ja18752	CP	% S	n/a	n/a	n/a	30%	Pass	
Acid Neutralising Capacity (ANCbt)	P20-Ja18752	CP	% CaCO3	0.23	0.24	6.0	30%	Pass	
Acid Neutralising Capacity - equivalent S% pyrite (s-ANCbt)	P20-Ja18752	CP	% S	0.07	0.08	6.0	30%	Pass	
ANC Fineness Factor	P20-Ja18752	CP	factor	1.5	1.5	<1	30%	Pass	
CRS Suite - Net Acidity (Sulfur Units)	P20-Ja18752	CP	% S	< 0.02	< 0.02	<1	30%	Pass	
CRS Suite - Net Acidity (Acidity Units)	P20-Ja18752	CP	mol H+/t	< 10	< 10	<1	30%	Pass	
CRS Suite - Liming Rate	P20-Ja18752	CP	kg CaCO3/t	< 1	< 1	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
% Moisture	P20-Ja18753	CP	%	16	17	4.0	30%	Pass	
Duplicate									
Chromium Suite (Minus ANC- WA)				Result 1	Result 2	RPD			
CRS suite WA (-ANC) - Liming Rate	P20-Ja18762	CP	kg CaCO3/t	< 1	< 1	<1	30%	Pass	
CRS suite WA (-ANC) - Net Acidity (Acidity Units)	P20-Ja18762	CP	mol H+/t	< 10	< 10	<1	30%	Pass	
CRS Suite WA (-ANC) - Net Acidity (Sulfur Units)	P20-Ja18762	CP	% S	< 0.02	< 0.02	<1	30%	Pass	
pH-KCL	P20-Ja18762	CP	pH Units	5.8	5.8	<1	30%	Pass	
Acid trail - Titratable Actual Acidity	P20-Ja18762	CP	mol H+/t	< 2	< 2	<1	30%	Pass	
sulfidic - TAA equiv. S% pyrite	P20-Ja18762	CP	% pyrite S	< 0.003	< 0.003	<1	30%	Pass	
Chromium Reducible Sulfur	P20-Ja18762	CP	% S	< 0.005	< 0.005	<1	30%	Pass	
Chromium Reducible Sulfur -acidity units	P20-Ja18762	CP	mol H+/t	< 3	< 3	<1	30%	Pass	

Duplicate									
Chromium Suite (Minus ANC- WA)				Result 1	Result 2	RPD			
Sulfur - KCl Extractable	P20-Ja18762	CP	% S	n/a	n/a	n/a	30%	Pass	
Net Acid soluble sulfur	P20-Ja18762	CP	% S	n/a	n/a	n/a	30%	Pass	
Net Acid soluble sulfur - acidity units	P20-Ja18762	CP	mol H+/t	n/a	n/a	n/a	30%	Pass	
Net Acid soluble sulfur - equivalent S% pyrite	P20-Ja18762	CP	% S	n/a	n/a	n/a	30%	Pass	
Acid Neutralising Capacity (ANCbt)	P20-Ja18762	CP	% CaCO3	n/a	n/a	n/a	30%	Pass	
Acid Neutralising Capacity - equivalent S% pyrite (s-ANCbt)	P20-Ja18762	CP	% S	n/a	n/a	n/a	30%	Pass	
ANC Fineness Factor	P20-Ja18762	CP	factor	1.5	1.5	<1	30%	Pass	
CRS Suite - Net Acidity (Sulfur Units)	P20-Ja18762	CP	% S	< 0.02	< 0.02	<1	30%	Pass	
CRS Suite - Net Acidity (Acidity Units)	P20-Ja18762	CP	mol H+/t	< 10	< 10	<1	30%	Pass	
CRS Suite - Liming Rate	P20-Ja18762	CP	kg CaCO3/t	< 1	< 1	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
% Moisture	P20-Ja18763	CP	%	4.9	3.9	23	30%	Pass	
Duplicate									
Chromium Suite (Minus ANC- WA)				Result 1	Result 2	RPD			
CRS suite WA (-ANC) - Liming Rate	P20-Ja18772	CP	kg CaCO3/t	< 1	< 1	<1	30%	Pass	
CRS suite WA (-ANC) - Net Acidity (Acidity Units)	P20-Ja18772	CP	mol H+/t	< 10	< 10	<1	30%	Pass	
CRS Suite WA (-ANC) - Net Acidity (Sulfur Units)	P20-Ja18772	CP	% S	< 0.02	< 0.02	<1	30%	Pass	
pH-KCL	P20-Ja18772	CP	pH Units	5.9	5.9	<1	30%	Pass	
Acid trail - Titratable Actual Acidity	P20-Ja18772	CP	mol H+/t	< 2	< 2	<1	30%	Pass	
sulfidic - TAA equiv. S% pyrite	P20-Ja18772	CP	% pyrite S	< 0.003	< 0.003	<1	30%	Pass	
Chromium Reducible Sulfur	P20-Ja18772	CP	% S	< 0.005	< 0.005	<1	30%	Pass	
Chromium Reducible Sulfur -acidity units	P20-Ja18772	CP	mol H+/t	< 3	< 3	<1	30%	Pass	
Sulfur - KCl Extractable	P20-Ja18772	CP	% S	n/a	n/a	n/a	30%	Pass	
Net Acid soluble sulfur	P20-Ja18772	CP	% S	n/a	n/a	n/a	30%	Pass	
Net Acid soluble sulfur - acidity units	P20-Ja18772	CP	mol H+/t	n/a	n/a	n/a	30%	Pass	
Net Acid soluble sulfur - equivalent S% pyrite	P20-Ja18772	CP	% S	n/a	n/a	n/a	30%	Pass	
Acid Neutralising Capacity (ANCbt)	P20-Ja18772	CP	% CaCO3	n/a	n/a	n/a	30%	Pass	
Acid Neutralising Capacity - equivalent S% pyrite (s-ANCbt)	P20-Ja18772	CP	% S	n/a	n/a	n/a	30%	Pass	
ANC Fineness Factor	P20-Ja18772	CP	factor	1.5	1.5	<1	30%	Pass	
CRS Suite - Net Acidity (Sulfur Units)	P20-Ja18772	CP	% S	< 0.02	< 0.02	<1	30%	Pass	
CRS Suite - Net Acidity (Acidity Units)	P20-Ja18772	CP	mol H+/t	< 10	< 10	<1	30%	Pass	
CRS Suite - Liming Rate	P20-Ja18772	CP	kg CaCO3/t	< 1	< 1	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
% Moisture	P20-Ja18773	CP	%	31	31	1.0	30%	Pass	
Duplicate									
Acid Sulfate Soils Field pH Test				Result 1	Result 2	RPD			
pH-F (Field pH test)*	P20-Ja18782	CP	pH Units	6.6	6.5	pass	30%	Pass	
pH-FOX (Field pH Peroxide test)*	P20-Ja18782	CP	pH Units	5.7	5.6	pass	30%	Pass	
Reaction Ratings*	P20-Ja18782	CP	comment	2.0	2.0	pass	30%	Pass	
Duplicate									
Acid Sulfate Soils Field pH Test				Result 1	Result 2	RPD			
pH-F (Field pH test)*	P20-Ja18792	CP	pH Units	4.2	4.2	pass	30%	Pass	
pH-FOX (Field pH Peroxide test)*	P20-Ja18792	CP	pH Units	3.4	3.5	pass	30%	Pass	
Reaction Ratings*	P20-Ja18792	CP	comment	2.0	2.0	pass	30%	Pass	

Duplicate									
Chromium Suite (Minus ANC- WA)				Result 1	Result 2	RPD			
CRS suite WA (-ANC) - Liming Rate	P20-Ja18796	CP	kg CaCO3/t	< 1	< 1	<1	30%	Pass	
CRS suite WA (-ANC) - Net Acidity (Acidity Units)	P20-Ja18796	CP	mol H+/t	< 10	< 10	<1	30%	Pass	
CRS Suite WA (-ANC) - Net Acidity (Sulfur Units)	P20-Ja18796	CP	% S	< 0.02	< 0.02	<1	30%	Pass	
pH-KCL	P20-Ja18796	CP	pH Units	6.0	6.0	<1	30%	Pass	
Acid trail - Titratable Actual Acidity	P20-Ja18796	CP	mol H+/t	< 2	< 2	<1	30%	Pass	
sulfidic - TAA equiv. S% pyrite	P20-Ja18796	CP	% pyrite S	< 0.003	< 0.003	<1	30%	Pass	
Chromium Reducible Sulfur	P20-Ja18796	CP	% S	< 0.005	< 0.005	<1	30%	Pass	
Chromium Reducible Sulfur -acidity units	P20-Ja18796	CP	mol H+/t	< 3	< 3	<1	30%	Pass	
Sulfur - KCl Extractable	P20-Ja18796	CP	% S	n/a	n/a	n/a	30%	Pass	
Net Acid soluble sulfur	P20-Ja18796	CP	% S	n/a	n/a	n/a	30%	Pass	
Net Acid soluble sulfur - acidity units	P20-Ja18796	CP	mol H+/t	n/a	n/a	n/a	30%	Pass	
Net Acid soluble sulfur - equivalent S% pyrite	P20-Ja18796	CP	% S	n/a	n/a	n/a	30%	Pass	
Acid Neutralising Capacity (ANCbt)	P20-Ja18796	CP	% CaCO3	n/a	n/a	n/a	30%	Pass	
Acid Neutralising Capacity - equivalent S% pyrite (s-ANCbt)	P20-Ja18796	CP	% S	n/a	n/a	n/a	30%	Pass	
ANC Fineness Factor	P20-Ja18796	CP	factor	1.5	1.5	<1	30%	Pass	
CRS Suite - Net Acidity (Sulfur Units)	P20-Ja18796	CP	% S	< 0.02	< 0.02	<1	30%	Pass	
CRS Suite - Net Acidity (Acidity Units)	P20-Ja18796	CP	mol H+/t	< 10	< 10	<1	30%	Pass	
CRS Suite - Liming Rate	P20-Ja18796	CP	kg CaCO3/t	< 1	< 1	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
% Moisture	P20-Ja18797	CP	%	1.8	1.8	2.0	30%	Pass	
Duplicate									
Acid Sulfate Soils Field pH Test				Result 1	Result 2	RPD			
pH-F (Field pH test)*	P20-Ja18808	CP	pH Units	6.0	6.0	pass	30%	Pass	
pH-FOX (Field pH Peroxide test)*	P20-Ja18808	CP	pH Units	3.6	3.6	pass	30%	Pass	
Reaction Ratings*	P20-Ja18808	CP	comment	2.0	2.0	pass	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	N/A
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
S01	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'
S02	Retained Acidity is Reported when the pHKCl is less than pH 4.5
S03	Acid Neutralising Capacity is only required if the pHKCl if greater than or equal to pH 6.5
S04	Acid Sulfate Soil Samples have a 24 hour holding time unless frozen or dried within that period
S05	Field Screen uses the following fizz rating to classify the rate the samples reacted to the peroxide: 1.0; No reaction to slight. 2.0; Moderate reaction. 3.0; Strong reaction with persistent froth. 4.0; Extreme reaction.

Authorised By

Robert Johnston	Analytical Services Manager
Myles Clark	Senior Analyst-SPOCAS (QLD)
Rhys Thomas	Senior Analyst-SPOCAS (WA)

Glenn Jackson
General Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

GHD Pty Ltd WA
999 Hay Street Perth
Perth
WA 6004

Attention: **Ryan Walker**

Report **699645-S**
Project name BORR
Project ID 6137041
Received Date Jan 30, 2020

Client Sample ID			**MW06_1**	**MW06_3.5**	**MW06_5.5**	**MW06_8.0**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins Sample No.			**P20-Ja33023**	**P20-Ja33024**	**P20-Ja33025**	**P20-Ja33026**
Date Sampled			**Jul 17, 2018**	**Jul 17, 2018**	**Jul 17, 2018**	**Jul 17, 2018**
Test/Reference	LOR	Unit				
Extraneous Material						
<2mm Fraction	0.005	g	31	45	36	59
>2mm Fraction	0.005	g	< 0.005	0.75	< 0.005	< 0.005
Analysed Material	0.1	%	100	98	100	100
Extraneous Material	0.1	%	< 0.1	1.6	< 0.1	< 0.1
Chromium Suite (Minus ANC- WA)						
CRS suite WA (-ANC) - Liming Rate	1	kg CaCO3/t	< 1	< 1	< 1	< 1
CRS suite WA (-ANC) - Net Acidity (Acidity Units)	10	mol H+/t	< 10	< 10	< 10	< 10
CRS Suite WA (-ANC) - Net Acidity (Sulfur Units)	0.02	% S	< 0.02	< 0.02	< 0.02	< 0.02
pH-KCL	0.1	pH Units	6.0	6.2	5.6	5.5
Acid trail - Titratable Actual Acidity	2	mol H+/t	< 2	< 2	< 2	5.3
sulfidic - TAA equiv. S% pyrite	0.003	% pyrite S	< 0.003	< 0.003	< 0.003	0.010
Chromium Reducible Sulfur[S04]	0.005	% S	< 0.005	< 0.005	< 0.005	< 0.005
Chromium Reducible Sulfur -acidity units	3	mol H+/t	< 3	< 3	< 3	< 3
Sulfur - KCl Extractable	0.02	% S	n/a	n/a	n/a	n/a
HCl Extractable Sulfur Correction Factor	1	factor	2.0	2.0	2.0	2.0
HCl Extractable Sulfur	0.02	% S	n/a	n/a	n/a	n/a
Net Acid soluble sulfur	0.02	% S	n/a	n/a	n/a	n/a
Net Acid soluble sulfur - acidity units	10	mol H+/t	n/a	n/a	n/a	n/a
Net Acid soluble sulfur - equivalent S% pyrite[S02]	0.02	% S	n/a	n/a	n/a	n/a
Acid Neutralising Capacity (ANCbt)	0.01	% CaCO3	n/a	n/a	n/a	n/a
Acid Neutralising Capacity - acidity (a-ANCbt)	2	mol H+/t	n/a	n/a	n/a	n/a
Acid Neutralising Capacity - equivalent S% pyrite (s-ANCbt)[S03]	0.02	% S	n/a	n/a	n/a	n/a
ANC Fineness Factor		factor	1.5	1.5	1.5	1.5
CRS Suite - Net Acidity (Sulfur Units)	0.02	% S	< 0.02	< 0.02	< 0.02	< 0.02
CRS Suite - Net Acidity (Acidity Units)	10	mol H+/t	< 10	< 10	< 10	< 10
CRS Suite - Liming Rate[S01]	1	kg CaCO3/t	< 1	< 1	< 1	< 1
% Moisture	1	%	4.4	2.9	13	14

Client Sample ID			MW08a_0.5	MW08a_1.5	MW08a_3.5	MW08a_5.0
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			P20-Ja33027	P20-Ja33028	P20-Ja33029	P20-Ja33030
Date Sampled			Jul 17, 2018	Jul 17, 2018	Jul 17, 2018	Jul 17, 2018
Test/Reference	LOR	Unit				
Extraneous Material						
<2mm Fraction	0.005	g	48	51	60	57
>2mm Fraction	0.005	g	< 0.005	< 0.005	< 0.005	< 0.005
Analysed Material	0.1	%	100	100	100	100
Extraneous Material	0.1	%	< 0.1	< 0.1	< 0.1	< 0.1
Chromium Suite (Minus ANC- WA)						
CRS suite WA (-ANC) - Liming Rate	1	kg CaCO3/t	< 1	< 1	< 1	< 1
CRS suite WA (-ANC) - Net Acidity (Acidity Units)	10	mol H+/t	< 10	< 10	< 10	< 10
CRS Suite WA (-ANC) - Net Acidity (Sulfur Units)	0.02	% S	< 0.02	< 0.02	< 0.02	< 0.02
pH-KCL	0.1	pH Units	5.6	6.0	5.6	6.2
Acid trail - Titratable Actual Acidity	2	mol H+/t	3.4	< 2	2.6	< 2
sulfidic - TAA equiv. S% pyrite	0.003	% pyrite S	0.010	< 0.003	< 0.003	< 0.003
Chromium Reducible Sulfur[S04]	0.005	% S	< 0.005	< 0.005	< 0.005	< 0.005
Chromium Reducible Sulfur -acidity units	3	mol H+/t	< 3	< 3	< 3	< 3
Sulfur - KCl Extractable	0.02	% S	n/a	n/a	n/a	n/a
HCl Extractable Sulfur Correction Factor	1	factor	2.0	2.0	2.0	2.0
HCl Extractable Sulfur	0.02	% S	n/a	n/a	n/a	n/a
Net Acid soluble sulfur	0.02	% S	n/a	n/a	n/a	n/a
Net Acid soluble sulfur - acidity units	10	mol H+/t	n/a	n/a	n/a	n/a
Net Acid soluble sulfur - equivalent S% pyrite[S02]	0.02	% S	n/a	n/a	n/a	n/a
Acid Neutralising Capacity (ANCbt)	0.01	% CaCO3	n/a	n/a	n/a	n/a
Acid Neutralising Capacity - acidity (a-ANCbt)	2	mol H+/t	n/a	n/a	n/a	n/a
Acid Neutralising Capacity - equivalent S% pyrite (s-ANCbt)[S03]	0.02	% S	n/a	n/a	n/a	n/a
ANC Fineness Factor		factor	1.5	1.5	1.5	1.5
CRS Suite - Net Acidity (Sulfur Units)	0.02	% S	< 0.02	< 0.02	< 0.02	< 0.02
CRS Suite - Net Acidity (Acidity Units)	10	mol H+/t	< 10	< 10	< 10	< 10
CRS Suite - Liming Rate[S01]	1	kg CaCO3/t	< 1	< 1	< 1	< 1
% Moisture	1	%	5.1	6.5	17	18

Client Sample ID			MW08a_6.0
Sample Matrix			Soil
Eurofins Sample No.			P20-Ja33031
Date Sampled			Jul 17, 2018
Test/Reference	LOR	Unit	
Extraneous Material			
<2mm Fraction	0.005	g	66
>2mm Fraction	0.005	g	< 0.005
Analysed Material	0.1	%	100
Extraneous Material	0.1	%	< 0.1
Chromium Suite (Minus ANC- WA)			
CRS suite WA (-ANC) - Liming Rate	1	kg CaCO3/t	1.0
CRS suite WA (-ANC) - Net Acidity (Acidity Units)	10	mol H+/t	14
CRS Suite WA (-ANC) - Net Acidity (Sulfur Units)	0.02	% S	0.02
pH-KCL	0.1	pH Units	6.0
Acid trail - Titratable Actual Acidity	2	mol H+/t	< 2
sulfidic - TAA equiv. S% pyrite	0.003	% pyrite S	< 0.003
Chromium Reducible Sulfur[S04]	0.005	% S	0.022

Client Sample ID			MW08a_6.0
Sample Matrix			**Soil**
Eurofins Sample No.			**P20-Ja33031**
Date Sampled			**Jul 17, 2018**
Test/Reference	LOR	Unit	
Chromium Suite (Minus ANC- WA)			
Chromium Reducible Sulfur -acidity units	3	mol H+/t	14
Sulfur - KCl Extractable	0.02	% S	n/a
HCl Extractable Sulfur Correction Factor	1	factor	2.0
HCl Extractable Sulfur	0.02	% S	n/a
Net Acid soluble sulfur	0.02	% S	n/a
Net Acid soluble sulfur - acidity units	10	mol H+/t	n/a
Net Acid soluble sulfur - equivalent S% pyrite[S02]	0.02	% S	n/a
Acid Neutralising Capacity (ANCbt)	0.01	% CaCO3	n/a
Acid Neutralising Capacity - acidity (a-ANCbt)	2	mol H+/t	n/a
Acid Neutralising Capacity - equivalent S% pyrite (s-ANCbt)[S03]	0.02	% S	n/a
ANC Fineness Factor		factor	1.5
CRS Suite - Net Acidity (Sulfur Units)	0.02	% S	0.02
CRS Suite - Net Acidity (Acidity Units)	10	mol H+/t	14
CRS Suite - Liming Rate[S01]	1	kg CaCO3/t	1.0
% Moisture	1	%	18

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Extraneous Material	Brisbane	Feb 04, 2020	6 Week
- Method: LTM-GEN-7050/7070			
Chromium Suite (Minus ANC- WA)	Brisbane	Feb 03, 2020	6 Week
- Method: LTM-GEN-7070 Chromium Reducible Sulfur Suite			
% Moisture	Perth	Jan 31, 2020	14 Days
- Method: LTM-GEN-7080 Moisture			

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35 O'Rorke Road
Penrose, Auckland 1061
Phone : +64 9 526 45 51
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43 Detroit Drive
Rolleston, Christchurch 7675
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Company Name: GHD Pty Ltd WA
Address: 999 Hay Street Perth
Perth
WA 6004

Project Name: BORR
Project ID: 6137041

Order No.:
Report #: 699645
Phone: 08 6222 8222
Fax: 08 9429 6555

Received: Jan 30, 2020 1:52 PM
Due: Feb 6, 2020
Priority: 5 Day
Contact Name: Ryan Walker

Eurofins Analytical Services Manager : Robert Johnston

Sample Detail						Moisture Set	Chromium Suite (Minus ANC- WA)
Melbourne Laboratory - NATA Site # 1254 & 14271							
Sydney Laboratory - NATA Site # 18217							
Brisbane Laboratory - NATA Site # 20794							X
Perth Laboratory - NATA Site # 23736						X	
External Laboratory							
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**		
1	MW06_1	Jul 17, 2018		Soil	P20-Ja33023	X	X
2	MW06_3.5	Jul 17, 2018		Soil	P20-Ja33024	X	X
3	MW06_5.5	Jul 17, 2018		Soil	P20-Ja33025	X	X
4	MW06_8.0	Jul 17, 2018		Soil	P20-Ja33026	X	X
5	MW08a_0.5	Jul 17, 2018		Soil	P20-Ja33027	X	X
6	MW08a_1.5	Jul 17, 2018		Soil	P20-Ja33028	X	X
7	MW08a_3.5	Jul 17, 2018		Soil	P20-Ja33029	X	X
8	MW08a_5.0	Jul 17, 2018		Soil	P20-Ja33030	X	X
9	MW08a_6.0	Jul 17, 2018		Soil	P20-Ja33031	X	X
Test Counts						9	9

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer, that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per kilogram
mg/L: milligrams per litre
ug/L: micrograms per litre
ppm: Parts per million
ppb: Parts per billion
%: Percentage
org/100mL: Organisms per 100 millilitres
NTU: Nephelometric Turbidity Units
MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.3
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 20-130% Phenols & 50-150% PFASs

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.3 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling.Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " -" in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
LCS - % Recovery							
Chromium Suite (Minus ANC- WA)							
pH-KCL	%	101			80-120	Pass	
Acid trail - Titratable Actual Acidity	%	87			80-120	Pass	
Chromium Reducible Sulfur	%	100			80-120	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
Chromium Suite (Minus ANC- WA)				Result 1	Result 2	RPD			
CRS suite WA (-ANC) - Liming Rate	P20-Ja33030	CP	kg CaCO3/t	< 1	< 1	<1	30%	Pass	
CRS suite WA (-ANC) - Net Acidity (Acidity Units)	P20-Ja33030	CP	mol H+/t	< 10	< 10	<1	30%	Pass	
CRS Suite WA (-ANC) - Net Acidity (Sulfur Units)	P20-Ja33030	CP	% S	< 0.02	< 0.02	<1	30%	Pass	
pH-KCL	P20-Ja33030	CP	pH Units	6.2	6.2	<1	30%	Pass	
Acid trail - Titratable Actual Acidity	P20-Ja33030	CP	mol H+/t	< 2	< 2	<1	30%	Pass	
sulfidic - TAA equiv. S% pyrite	P20-Ja33030	CP	% pyrite S	< 0.003	< 0.003	<1	30%	Pass	
Chromium Reducible Sulfur	P20-Ja33030	CP	% S	< 0.005	< 0.005	<1	30%	Pass	
Chromium Reducible Sulfur -acidity units	P20-Ja33030	CP	mol H+/t	< 3	< 3	<1	30%	Pass	
Sulfur - KCl Extractable	P20-Ja33030	CP	% S	n/a	n/a	n/a	30%	Pass	
Net Acid soluble sulfur	P20-Ja33030	CP	% S	n/a	n/a	n/a	30%	Pass	
Net Acid soluble sulfur - acidity units	P20-Ja33030	CP	mol H+/t	n/a	n/a	n/a	30%	Pass	
Net Acid soluble sulfur - equivalent S% pyrite	P20-Ja33030	CP	% S	n/a	n/a	n/a	30%	Pass	
Acid Neutralising Capacity (ANCbt)	P20-Ja33030	CP	% CaCO3	n/a	n/a	n/a	30%	Pass	
Acid Neutralising Capacity - equivalent S% pyrite (s-ANCbt)	P20-Ja33030	CP	% S	n/a	n/a	n/a	30%	Pass	
ANC Fineness Factor	P20-Ja33030	CP	factor	1.5	1.5	<1	30%	Pass	
CRS Suite - Net Acidity (Sulfur Units)	P20-Ja33030	CP	% S	< 0.02	< 0.02	<1	30%	Pass	
CRS Suite - Net Acidity (Acidity Units)	P20-Ja33030	CP	mol H+/t	< 10	< 10	<1	30%	Pass	
CRS Suite - Liming Rate	P20-Ja33030	CP	kg CaCO3/t	< 1	< 1	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
% Moisture	P20-Ja33030	CP	%	18	18	4.0	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
S01	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'
S02	Retained Acidity is Reported when the pHKCl is less than pH 4.5
S03	Acid Neutralising Capacity is only required if the pHKCl if greater than or equal to pH 6.5
S04	Acid Sulfate Soil Samples have a 24 hour holding time unless frozen or dried within that period

Authorised By

Robert Johnston	Analytical Services Manager
Myles Clark	Senior Analyst-SPOCAS (QLD)

Glenn Jackson
General Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

Enviro Sample WA

From: Robert Johnston
Sent: Friday, 30 November 2018 1:43 PM
To: Enviro Sample WA
Subject: 5 DAY: ASS Screening Analysis

Received E.R. 30/11/18
630927

ADDITIONAL ANALYSIS – 5 DAY TAT

From: Ryan Walker [mailto:Ryan.Walker@ghd.com]
Sent: Friday, 30 November 2018 1:23 PM
To: Robert Johnston
Cc: Enviro Sample WA; Louise Cockerton
Subject: ASS Screening Analysis

Hi Rob,

Please find COC for ASS screening analysis of samples currently at your laboratory (corresponding sample receipts are attached).

If you have any queries, feel free to give me a call.

Cheers,

Ryan Walker
BEng (Hons)
Environmental Engineer

GHD
Proudly employee owned
T: +61 8 6222 8536 | M: +61 (0)429 946 138 | E: Ryan.Walker@ghd.com
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Connect

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

GHD
Level 10, 999 Hay Street, Perth WA 6000 | PO Box 3106, Perth WA 6832 | Reception Ph: 08 6222 8222

Project No. *(as set up in ESdat)* 6137041	**Site Name** *(as set up in ESdat)* BORR
Laboratory Quote No. National Price List for GHD	**Turnaround Time**
Job Manager (Invoice) & GHD accounts louise.cockerton@ghd.com AP-FSS@ghd.com	**Email Address (Results)** ryan.walker@ghd.com louise.cockerton@ghd.com

Laboratory: Eurofins MGT
Address: 2/91 Leach Hwy, Kewdale 6105
Laboratory Contact: Sample Receipt

GHD Sample ID	Lab Sample ID	Date	Time	Sample Matrix S-Soil/ SL-Sludge/ W-Water/ A-Air	Container: Type B-Bottle/J-Jar/V-Vial/Bag/G-Glass/P-Plastic	Container: Preservative Unpreserved/ HCl/ H2SO4/HNO3/Other	Container: No	Analyses: HOLD	Analyses: pHF and pHFox	Remarks
QA17		26-Sep-18		S	Bag	-	1	X	X	Samples chilled on collection. Hold all samples. Do not dispose.
S10_0.5		26-Sep-18		S	Bag	-	1	X	X	Sample from batch 620037
S10_1.0		26-Sep-18		S	Bag	-	1	X	X	Sample from batch 620037
S10_1.5		26-Sep-18		S	Bag	-	1	X	X	Sample from batch 620037
S10_2.0		26-Sep-18		S	Bag	-	1	X	X	Sample from batch 620037
S10_2.5		26-Sep-18		S	Bag	-	1	X	X	Sample from batch 620037
S10_3.0		26-Sep-18		S	Bag	-	1	X	X	Sample from batch 620037
S10_3.5		26-Sep-18		S	Bag	-	1	X	X	Sample from batch 620037
S10_4.0		26-Sep-18		S	Bag	-	1	X	X	Sample from batch 620037
S02_0.5		26-Sep-18		S	Bag	-	1	X	X	Sample from batch 620037
S02_1.1		26-Sep-18		S	Bag	-	1	X	X	Sample from batch 620037
S02_1.5		26-Sep-18		S	Bag	-	1	X	X	Sample from batch 620037
S02_2.0		26-Sep-18		S	Bag	-	1	X	X	Sample from batch 620037
S01_0.5		3-Sep-18		S	Bag	-	1	X	X	Sample from batch 618125
S01_1.0		3-Sep-18		S	Bag	-	1	X	X	Sample from batch 618125
S01_1.5		3-Sep-18		S	Bag	-	1	X	X	Sample from batch 618125
S01_2.0		3-Sep-18		S	Bag	-	1	X	X	Sample from batch 618125
S01_2.5		3-Sep-18		S	Bag	-	1	X	X	Sample from batch 618125
S01_3.0		3-Sep-18		S	Bag	-	1	X	X	Sample from batch 618125
S01_3.5		3-Sep-18		S	Bag	-	1	X	X	Sample from batch 618125

PG34 39

Sampled by: A. Wallace / S Paull		Date/Time: Various	
Received by: E. Rowley	Date/Time: ~~3/12/18~~ 30/11/18, 1343	Relinquished by: R Walker	Date/Time: 30 November 2018
		Rebatched by:	Date/Time: 630927

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

GHD
Level 10, 999 Hay Street, Perth WA 6000 | PO Box 3106, Perth WA 6832 | Reception Ph: 08 6222 8222

Project No. *(as set up in ESdat)* 6137041	**Site Name** *(as set up in ESdat)* BORR
Laboratory Quote No. National Price List for GHD	**Turnaround Time**
Job Manager (Invoice) & GHD accounts louise.cockerton@ghd.com AP-FSS@ghd.com	**Email Address (Results)** ryan.walker@ghd.com louise.cockerton@ghd.com

Laboratory: Eurofins MGT
Address: 2/91 Leach Hwy, Kewdale 6105
Laboratory Contact: Sample Receipt

GHD Sample ID	Lab Sample ID	Date	Time	Sample Matrix S-Soil/ SL-Sludge/ W-Water/ A-Air	Container: Type B-Bottle/J-Jar/V-Vial/Bag/G Glass/P-Plastic	Container: Preservative Unpreserved/ HCl/ H2SO4/HNO3/Other	Container: No	Analyses: HOLD	Analyses: pHF and pHFox	Remarks
S01_4.0		3-Sep-18		S	Bag	-	1	X	X	Samples chilled on collection. Hold all samples. Do not dispose. Sample from batch 618125
S01_4.5		3-Sep-18		S	Bag	-	1	X	X	Sample from batch 618125
S01_5.0		3-Sep-18		S	Bag	-	1	X	X	Sample from batch 618125
S01_5.5		3-Sep-18		S	Bag	-	1	X	X	Sample from batch 618125
S01_6.0		3-Sep-18		S	Bag	-	1	X	X	Sample from batch 618125
S01_6.5		3-Sep-18		S	Bag	-	1	X	X	Sample from batch 618125
S01_7.0		3-Sep-18		S	Bag	-	1	X	X	Sample from batch 618125
MW04_0.5		3-Sep-18		S	Bag	-	1	X	X	Sample from batch 618125
MW04_1.0		3-Sep-18		S	Bag	-	1	X	X	Sample from batch 618125
MW04_1.0		3-Sep-18		S	Bag	-	1	X	X	Sample from batch 618125
MW04_1.5		3-Sep-18		S	Bag	-	1	X	X	Sample from batch 618125
MW04_2.0		3-Sep-18		S	Bag	-	1	X	X	Sample from batch 618125
MW04_2.5		3-Sep-18		S	Bag	-	1	X	X	Sample from batch 618125
MW04_3.0		3-Sep-18		S	Bag	-	1	X	X	Sample from batch 618125
MW04_3.5		3-Sep-18		S	Bag	-	1	X	X	Sample from batch 618125
MW04_4.0		3-Sep-18		S	Bag	-	1	X	X	Sample from batch 618125
MW04_4.5		3-Sep-18		S	Bag	-	1	X	X	Sample from batch 618125
MW04_5.0		3-Sep-18		S	Bag	-	1	X	X	Sample from batch 618125
MW04_12.0		3-Sep-18		S	Bag	-	1	X	X	Sample from batch 618125
S04_0.5		4-Sep-18		S	Bag	-	1	X	X	Sample from batch 618125

Sampled by: A. Wallace / S Paull	Date/Time: Various	Relinquished by: R Walker	Date/Time: 30 November 2018
Received by: E. Rowley	Date/Time: 3/11/18 1943	Rebatched by:	Date/Time:

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

GHD
Level 10, 999 Hay Street, Perth WA 6000 | PO Box 3106, Perth WA 6832 | Reception Ph: 08 6222 8222

Project No. *(as set up in ESdat)* 6137041	**Site Name** *(as set up in ESdat)* BORR
Laboratory Quote No. National Price List for GHD	**Turnaround Time**
Job Manager (Invoice) & GHD accounts louise.cockerton@ghd.com AP-FSS@ghd.com	**Email Address (Results)** ryan.walker@ghd.com louise.cockerton@ghd.com

Laboratory: Eurofins MGT
Address: 2/91 Leach Hwy, Kewdale 6105
Laboratory Contact: Sample Receipt

GHD Sample ID	Lab Sample ID	Date	Time	Sample Matrix S-Soil/ SL-Sludge/ W-Water/ A-Air	Container: Type B-Bottle/J-Jar/V-Vial/Bag/G Glass/P-Plastic	Container: Preservative Unpreserved/ HCl/ H2SO4/HNO3/Other	Container: No	Analyses: HOLD	Analyses: pHF and pHFox	Remarks
S04_1.0		4-Sep-18		S	Bag	-	1	X	X	Sample from batch 618125
S04_1.5		4-Sep-18		S	Bag	-	1	X	X	Sample from batch 618125
S04_2.0		4-Sep-18		S	Bag	-	1	X	X	Sample from batch 618125
S04_2.5		4-Sep-18		S	Bag	-	1	X	X	Sample from batch 618125
S04_3.0		4-Sep-18		S	Bag	-	1	X	X	Sample from batch 618125
S04_3.5		4-Sep-18		S	Bag	-	1	X	X	Sample from batch 618125
S04_4.0		4-Sep-18		S	Bag	-	1	X	X	Sample from batch 618125
S04_4.5		4-Sep-18		S	Bag	-	1	X	X	Sample from batch 618125
S04_5.0		4-Sep-18		S	Bag	-	1	X	X	Sample from batch 618125
S04_5.5		4-Sep-18		S	Bag	-	1	X	X	Sample from batch 618125
QA12		3-Sep-18		S	Bag	-	1	X	X	Sample from batch 618125
QA13		4-Sep-18		S	Bag	-	1	X	X	Sample from batch 618125
MW7_1.0		23-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW7_1.5		23-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW7_2.0		23-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW7_2.5		23-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW7_3.0		23-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW7_3.5		23-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW7_4.0		23-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW7_4.5		23-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143

Samples chilled on collection.
Hold all samples.
Do not dispose.

MW7 0.5

Sampled by: A. Wallace / S Paull	Date/Time: Various	Relinquished by: R Walker	Date/Time: 30 November 2018
Received by: E. Rowley	Date/Time: 30/11/18 1343	Rebatched by:	Date/Time:

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

GHD
Level 10, 999 Hay Street
Perth WA 6000

PO Box 3106
Perth WA 6832

Reception Ph: 08 6222 8222

Project No. *(as set up in ESdat)* 6137041	**Site Name** *(as set up in ESdat)* BORR
Laboratory Quote No. National Price List for GHD	**Turnaround Time**
Job Manager (Invoice) & GHD accounts louise.cockerton@ghd.com AP-FSS@ghd.com	**Email Address (Results)** ryan.walker@ghd.com louise.cockerton@ghd.com

Laboratory: Eurofins MGT
Address: 2/91 Leach Hwy, Kewdale 6105
Laboratory Contact: Sample Receipt

GHD Sample ID	Lab Sample ID	Date	Time	Sample Matrix S-Soil/ SL-Sludge/ W-Water/ A-Air	Container Type B-Bottle/J-Jar/V-Vial/Bag/G-Glass/P-Plastic	Container Preservative Unpreserved/ HCl/ H2SO4/HNO3/Other	Container No	Analyses HOLD	Analyses pHF and pHFox	Remarks
MW7_5.0		23-Jul-18		S	Bag	-	1	X	X	Samples chilled on collection. Hold all samples. Do not dispose. Sample from batch 618143
MW7_10.0		23-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW2_0.5		24-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW2_1.0		24-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW2_1.5		24-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW2_2.0		24-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW2_2.5		24-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW2_3.0		24-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW2_3.5		24-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW2_4.0		24-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW2_4.5		24-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW2_5.0		24-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW2_9.0		24-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW5_0.5		24-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW5_1.0		24-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW5_1.5		24-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW5_2.0		24-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW5_2.5		24-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW5_3.0		24-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW5_3.5		24-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143

Sampled by: A. Wallace / S Paull		Date/Time: Various	
Received by: E. Rowley		Date/Time: 30/11/18 1343	
Relinquished by: R Walker		Date/Time: 30 November 2018	
Rebatched by:		Date/Time:	

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

GHD
Level 10, 999 Hay Street, Perth WA 6000 | PO Box 3106, Perth WA 6832 | Reception Ph: 08 6222 8222

Project No. *(as set up in ESdat)* 6137041	**Site Name** *(as set up in ESdat)* BORR
Laboratory Quote No. National Price List for GHD	**Turnaround Time**
Job Manager (Invoice) & GHD accounts louise.cockerton@ghd.com AP-FSS@ghd.com	**Email Address (Results)** ryan.walker@ghd.com louise.cockerton@ghd.com

Laboratory: Eurofins MGT
Address: 2/91 Leach Hwy, Kewdale 6105
Laboratory Contact: Sample Receipt

GHD Sample ID	Lab Sample ID	Date	Time	Sample Matrix S-Soil/ SL-Sludge/ W-Water/ A-Air	Container: Type B-Bottle/J-Jar/V-Vial/Bag/G-Glass/P-Plastic	Container: Preservative Unpreserved/ HCl/ H2SO4/HNO3/Other	Container: No	Analyses: HOLD	Analyses: pHF and pHFox	Remarks
MW5_4.0		24-Jul-18		S	Bag	-	1	X	X	Samples chilled on collection. Hold all samples. Do not dispose. Sample from batch 618143
MW5_4.5		24-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW5_5.0		24-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW5_8.0		24-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW8_0.5		24-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW8_1.0		24-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW8_1.5		24-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW8_2.0		24-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW8_2.5		24-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW8_3.0		24-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW8_3.5		24-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW8_4.0		24-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW8_4.5		24-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW8_5.0		24-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW8_13.0		24-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW9_0.5		25-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW9_1.0		25-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW9_1.5		25-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW9_2.0		25-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW9_2.5		25-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143

Sampled by: A. Wallace / S Paull	Date/Time: Various	Relinquished by: R Walker	Date/Time: 30 November 2018
Received by: E. Rowley	Date/Time: 30/11/18 1343	Rebatched by:	Date/Time:

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

GHD
Level 10, 999 Hay Street, Perth WA 6000 | PO Box 3106, Perth WA 6832 | Reception Ph: 08 6222 8222

Project No. *(as set up in ESdat)* 6137041	**Site Name** *(as set up in ESdat)* BORR
Laboratory Quote No. National Price List for GHD	**Turnaround Time**
Job Manager (Invoice) & GHD accounts louise.cockerton@ghd.com AP-FSS@ghd.com	**Email Address (Results)** ryan.walker@ghd.com louise.cockerton@ghd.com

Laboratory: Eurofins MGT
Address: 2/91 Leach Hwy, Kewdale 6105
Laboratory Contact: Sample Receipt

GHD Sample ID	Lab Sample ID	Date	Time	Sample Matrix S-Soil/ SL-Sludge/ W-Water/ A-Air	Container Type B-Bottle/J-Jar/V-Vial/Bag/G Glass/P-Plastic	Container Preservative Unpreserved/ HCl/ H2SO4/HNO3/Other	Container No	Analyses HOLD	Analyses pHF and pHFox	Remarks
MW9_3.0		25-Jul-18		S	Bag	-	1	X	X	Samples chilled on collection. Hold all samples. Do not dispose. Sample from batch 618143
MW9_3.5		25-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW9_4.0		25-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW9_4.5		25-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW9_5.0		25-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW9_5.5		25-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW10_0.5		25-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW10_1.0		25-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW10_1.5		25-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW10_2.0		25-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW10_2.5		25-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW10_3.0		25-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW10_3.5		25-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW10_4.0		25-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW11_0.5		25-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW11_1.0		25-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW11_1.5		25-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW11_2.0		25-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW11_2.5		25-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW11_3.0		25-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143

Sampled by: A. Wallace / S Paull	Date/Time: Various	Relinquished by: R Walker	Date/Time: 30 November 2018
Received by: E-Rowley	Date/Time: 30/11/18 1343	Rebatched by:	Date/Time:

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

GHD
Level 10, 999 Hay Street
Perth WA 6000
PO Box 3106
Perth WA 6832
Reception Ph: 08 6222 8222

Project No. *(as set up in ESdat)* 6137041	**Site Name** *(as set up in ESdat)* BORR
Laboratory Quote No. National Price List for GHD	**Turnaround Time**
Job Manager (Invoice) & GHD accounts louise.cockerton@ghd.com AP-FSS@ghd.com	**Email Address (Results)** ryan.walker@ghd.com louise.cockerton@ghd.com

Laboratory: Eurofins MGT
Address: 2/91 Leach Hwy, Kewdale 6105
Laboratory Contact: Sample Receipt

GHD Sample ID	Lab Sample ID	Date	Time	Sample Matrix S-Soil/ SL-Sludge/ W-Water/ A-Air	Container Type B-Bottle/J-Jar/V-Vial/Bag/G-Glass/P-Plastic	Container Preservative Unpreserved/ HCl/ H2SO4/HNO3/Other	Container No	Analyses HOLD	Analyses pHF and pHFox	Remarks
MW11_3.5		25-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143
MW11_4.0		25-Jul-18		S	Bag	-	1	X	X	Sample from batch 618143

Samples chilled on collection.
Hold all samples.
Do not dispose.

Sampled by: A. Wallace / S Paull	Date/Time: Various	Relinquished by: R Walker	Date/Time: 30 November 2018
Received by: E-Rowley	Date/Time: 30/11/18 1343	Rebatched by:	Date/Time:

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Site # 1254 & 14271

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Lane Cove West NSW 2066
Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

Brisbane
1/21 Smallwood Place
Murarrie QLD 4172
Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

Perth
2/91 Leach Highway
Kewdale WA 6105
Phone : +61 8 9251 9600
NATA # 1261 Site # 23736

ABN – 50 005 085 521 e.mail : EnviroSales@eurofins.com web : www.eurofins.com.au

Sample Receipt Advice

Company name:	**GHD Pty Ltd WA**
Contact name:	Louise Cockerton
Project name:	BORR
Project ID:	6137041
COC number:	Not provided
Turn around time:	2 Day
Date/Time received:	Nov 30, 2018 1:43 PM
Eurofins reference:	**630927**

Sample information

☑ A detailed list of analytes logged into our LIMS, is included in the attached summary table.

☑ All samples have been received as described on the above COC.

☑ COC has been completed correctly.

☑ Attempt to chill was evident.

☑ Appropriately preserved sample containers have been used.

☑ All samples were received in good condition.

☑ Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.

☑ Appropriate sample containers have been used.

☒ Split sample sent to requested external lab.

☒ Some samples have been subcontracted.

N/A Custody Seals intact (if used).

Contact notes

If you have any questions with respect to these samples please contact:

Robert Johnston on Phone : or by e.mail: envirosamplevic@eurofins.com

Results will be delivered electronically via e.mail to Louise Cockerton - louise.cockerton@ghd.com.

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

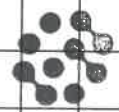
GHD
Level 10, 999 Hay Street, Perth WA 6000
PO Box 3106, Perth WA 6832
Reception Ph: 08 6222 8222

Page 1 of 3

Project No. *(as set up in ESdat)* 6137041	**Site Name** *(as set up in ESdat)* BORR
Laboratory Quote No. National Price List for GHD	**Turnaround Time** Standard (5 day)
Job Manager (Invoice) & GHD accounts ryan.walker@ghd.com AP-FSS@ghd.com	**Email Address (Results)** ryan.walker@ghd.com louise.cockerton@ghd.com

Laboratory: Eurofins MGT
Address: 2/91 Leach Hwy, Kewdale 6105
Laboratory Contact: Sample Receipt

GHD Sample ID	Lab Sample ID	Date	Time	Sample Matrix S-Soil/ SL-Sludge/ W-Water/ A-Air	Container: Type B-Bottle/J-Jar/V-Vial/Bag/G-Glass/P-Plastic	Container: Preservative Unpreserved/ HCl/ H2SO4/HNO3/Other	Container: No	Analyses: ASS Screening: pHF and pHFOX	Analyses: HOLD	Remarks
TP56 #1				S	Bag	-	1	✓		Samples chilled on collection and subsequently frozen DO NOT DISPOSE SAMPLES
TP56 #2				S	Bag	-	1	✓		
TP56 #3				S	Bag	-	1	✓		
TP53 #4				S	Bag	-	1	✓		
TP53 #5				S	Bag	-	1	✓		
TP53 #6				S	Bag	-	1	✓		
TP54 #8				S	Bag	-	1	✓		
TP52 #9				S	Bag	-	1	✓		
TP52 #10				S	Bag	-	1	✓		
TP55 #11				S	Bag	-	1	✓		
TP55 #12				S	Bag	-	1	✓		
TP55 #13				S	Bag	-	1	✓		
TP25.1 #14				S	Bag	-	1	✓		
TP25.1 #15				S	Bag	-	1	✓		
TP25.1 #16				S	Bag	-	1	✓		
TP59 #17				S	Bag	-	1	✓		
TP54 #17				S	Bag	-	1	✓		586571



Date/Time: 5/11/A 15:20
Temp: 1.5 1.5 1.3 1.3
Final Temp: 4.5°C

Sampled by: Various		Relinquished by: Ryan Walker	Date/Time: 5/11/19
Received by: Rob Johnston Eurofins	Date/Time: 5/11/A 15:20	Relinquished by:	Date/Time:

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

GHD
Level 10, 999 Hay Street, Perth WA 6000 | PO Box 3106, Perth WA 6832 | Reception Ph: 08 6222 8222

Project No. *(as set up in ESdat)* 6137041	**Site Name** *(as set up in ESdat)* BORR
Laboratory Quote No. National Price List for GHD	**Turnaround Time** Standard (5 day)
Job Manager (Invoice) & GHD accounts ryan.walker@ghd.com; AP-FSS@ghd.com	**Email Address (Results)** ryan.walker@ghd.com; louise.cockerton@ghd.com

Laboratory: Eurofins MGT
Address: 2/91 Leach Hwy, Kewdale 6105
Laboratory Contact: Sample Receipt

GHD Sample ID	Lab Sample ID	Date	Time	Sample Matrix S-Soil/ SL-Sludge/ W-Water/ A-Air	Container: Type B-Bottle/J-Jar/V-Vial/Bag/G-Glass/P-Plastic	Container: Preservative Unpreserved/ HCl/ H2SO4/HNO3/Other	Container: No	Analyses: ASS Screening: pHF and pHFOX	Analyses: HOLD	Remarks
TP63 #18				S	Bag	-	1	✓		Samples chilled on collection and subsequently frozen DO NOT DISPOSE SAMPLES
TP49 #19				S	Bag	-	1	✓		
TP49 #20				S	Bag	-	1	✓		
TP49 #21				S	Bag	-	1	✓		
TP68 #22				S	Bag	-	1	✓		
TP68 #23				S	Bag	-	1	✓		
TP68 #24				S	Bag	-	1	✓		
TP68 #25				S	Bag	-	1	✓		
TP68 #26				S	Bag	-	1	✓		
TP68 #27				S	Bag	-	1	✓		
TP70 #28				S	Bag	-	1	✓		
TP70 #29				S	Bag	-	1	✓		
TP70 #30				S	Bag	-	1	✓		
TP70 #31				S	Bag	-	1	✓		
TP73 #32				S	Bag	-	1	✓		
TP72 #33				S	Bag	-	1	✓		
TP74 #34				S	Bag	-	1	✓		686571

Sampled by: Various	Date/Time:	Relinquished by: Ryan Walker	Date/Time: 5/11/19
Received by: Rob Johnston Eurofins	Date/Time: 5/11/19 15:20	Relinquished by:	Date/Time:

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

GHD
Level 10, 999 Hay Street Perth WA 6000
PO Box 3106 Perth WA 6832
Reception Ph: 08 6222 8222

Project No. *(as set up in ESdat)* 6137041	**Site Name** *(as set up in ESdat)* BORR
Laboratory Quote No. National Price List for GHD	**Turnaround Time** Standard (5 day)
Job Manager (Invoice) & GHD accounts ryan.walker@ghd.com AP-FSS@ghd.com	**Email Address (Results)** ryan.walker@ghd.com louise.cockerton@ghd.com

Laboratory:	Eurofins MGT
Address:	2/91 Leach Hwy, Kewdale 6105
Laboratory Contact:	Sample Receipt

GHD Sample ID	Lab Sample ID	Date	Time	Sample Matrix S-Soil/ SL-Sludge/ W-Water/ A-Air	Container: Type B-Bottle/J-Jar/V-Vial/Bag/G-Glass/P-Plastic	Container: Preservative Unpreserved/ HCl/ H2SO4/HNO3/Other	Container: No	Analyses: ASS Screening: pHF and pHFOX	Analyses: HOLD	Remarks
TP71 #35				S	Bag	-	1	✓		Samples chilled on collection and subsequently frozen DO NOT DISPOSE SAMPLES
TP51 #36				S	Bag	-	1	✓		
TP61 #37				S	Bag	-	1	✓		
TP65 #38				S	Bag	-	1	✓		

686571

Sampled by: Various	Date/Time:	Relinquished by: Ryan Walker	Date/Time: 5/11/19
Received by: Rob Johnston Eurofins	Date/Time: 5/11/19 1512	Relinquished by:	Date/Time:

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NATA # 1261 Site # 18217

Brisbane
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NATA # 1261 Site # 20794

Perth
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Kewdale WA 6105
Phone : +61 8 9251 9600
NATA # 1261 Site # 23736

ABN – 50 005 085 521 e.mail : EnviroSales@eurofins.com web : www.eurofins.com.au

Sample Receipt Advice

Company name:	**GHD Pty Ltd WA**
Contact name:	Ryan Walker
Project name:	BORR
Project ID:	6137041
COC number:	Not provided
Turn around time:	2 Day
Date/Time received:	Nov 5, 2019 3:20 PM
Eurofins reference:	**686571**

Sample information

☑ A detailed list of analytes logged into our LIMS, is included in the attached summary table.

☑ All samples have been received as described on the above COC.

☑ COC has been completed correctly.

N/A Attempt to chill was evident.

☑ Appropriately preserved sample containers have been used.

☑ All samples were received in good condition.

☑ Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.

☑ Appropriate sample containers have been used.

☒ Split sample sent to requested external lab.

☒ Some samples have been subcontracted.

N/A Custody Seals intact (if used).

Contact notes

If you have any questions with respect to these samples please contact:

Robert Johnston on Phone : or by e.mail: RobertJohnston@eurofins.com

Results will be delivered electronically via e.mail to Ryan Walker - ryan.walker@ghd.com.

Robert Johnston

Caitlyn Gibson #697821

From: Robert Johnston
Sent: Friday, 17 January 2020 7:14 PM
To: #AU06_EnviroSampleWA
Subject: 5 DAY: Rebatch Request (Various Work Orders): BORR South 6137041
Attachments: 6137041-ASSrebatchRequest-17.01.2020.pdf; 6137041-ASSrebatchRequest-17.01.2020.xlsx

ADDITIONAL ANALYSIS – 5 DAY TAT

From: Louise Cockerton [mailto:Louise.Cockerton@ghd.com]
Sent: Friday, 17 January 2020 3:11 PM
To: Robert Johnston
Subject: Rebatch Request (Various Work Orders): BORR South 6137041

Rob

Managed to find the IDs. Will need the lab report updating and correcting but I've managed to complete the rebatch request anyway.

Please find attached the rebatch request – can you let me know ASAP if any of these samples are NOT available, they were at the lab just before Christmas.

Thanks

Louise Cockerton
Technical Lead Acid Sulfate Soil
Senior Environmental Scientist

GHD
Proudly employee owned
T: +61 8 6222 8212 | M: +61 (0)422 993 607 | E: louise.cockerton@ghd.com
Level 10, 999 Hay Street, Perth WA 6000 Australia | www.ghd.com

Connect

From: Louise Cockerton
Sent: Friday, 17 January 2020 2:49 PM
To: 'Robert Johnston' <RobertJohnston@eurofins.com>
Subject: Eurofins No. 686571
Importance: High

Hey Rob,

Caitlyn Gibson
#697821

Sample Code	Depth	Date/Time	Field ID	Lab Report Number	Additonal analysis request	
					pH field screen (non NATA)	CRS Suite
P18-De01778	0.5 - 0.5	24/07/2018	MW5_0.5	630927		
P18-De01779	1 - 1	24/07/2018	MW5_1.0	630927		
P18-De01800	0.5 - 0.5	25/07/2018	MW9_0.5	630927		
P18-De01801	1 - 1	25/07/2018	MW9_1.0	630927		X
P18-De01802	1.5 - 1.5	25/07/2018	MW9_1.5	630927		
P18-De01803	2 - 2	25/07/2018	MW9_2.0	630927		
P18-De01804	2.5 - 2.5	25/07/2018	MW9_2.5	630927		X
P18-De01805	3 - 3	25/07/2018	MW9_3.0	630927		
P18-De01806	3.5 - 3.5	25/07/2018	MW9_3.5	630927		X
P18-De01807	4 - 4	25/07/2018	MW9_4.0	630927		
P18-De01808	4.5 - 4.5	25/07/2018	MW9_4.5	630927		
P18-De01809	5 - 5	25/07/2018	MW9_5.0	630927		
P18-De01810	5.5 - 5.5	25/07/2018	MW9_5.5	630927		X
P18-De01811	0.5 - 0.5	25/07/2018	MW10_0.5	630927		
P18-De01812	1 - 1	25/07/2018	MW10_1.0	630927		X
P18-De01813	1.5 - 1.5	25/07/2018	MW10_1.5	630927		
P18-De01814	2 - 2	25/07/2018	MW10_2.0	630927		X
P18-De01815	2.5 - 2.5	25/07/2018	MW10_2.5	630927		
P18-De01816	3 - 3	25/07/2018	MW10_3.0	630927		X
P18-De01817	3.5 - 3.5	25/07/2018	MW10_3.5	630927		X
P18-De01818	4 - 4	25/07/2018	MW10_4.0	630927		
P18-De01819	0.5 - 0.5	25/07/2018	MW11_0.5	630927		X
P18-De01820	1 - 1	25/07/2018	MW11_1.0	630927		
P18-De01821	1.5 - 1.5	25/07/2018	MW11_1.5	630927		
P18-De01822	2 - 2	25/07/2018	MW11_2.0	630927		X
P18-De01823	2.5 - 2.5	25/07/2018	MW11_2.5	630927		
P18-De01824	3 - 3	25/07/2018	MW11_3.0	630927		
P18-De01825	3.5 - 3.5	25/07/2018	MW11_3.5	630927		
P18-De01826	4 - 4	25/07/2018	MW11_4.0	630927		X
P19-No07371	TPC56	5/11/2019	TP56 #1	686571		X
P19-No07372	TPC56	5/11/2019	TP56 #2	686571		X
P19-No07373	TPC56	5/11/2019	TP56 #3	686571		X
P19-No07374	TPC53	5/11/2019	TP56 #4	686571		X
P19-No07375	TPC53	5/11/2019	TP56 #5	686571		X
P19-No07376	TPC53	5/11/2019	TP56 #6	686571		X
P19-No07377	TPC54	5/11/2019	TP56 #7	686571		X
P19-No07378	TPC54	5/11/2019	TP56 #8	686571		X
P19-No07379	TPC52	5/11/2019	TP56 #9	686571		
P19-No07380	TPC52	5/11/2019	TP56 #10	686571		
P19-No07381	TPC55	5/11/2019	TP56 #11	686571		X
P19-No07382	TPC55	5/11/2019	TP56 #12	686571		
P19-No07383	TPC55	5/11/2019	TP56 #13	686571		
P19-No07384	TP25.1	5/11/2019	TP56 #14	686571		X
P19-No07385	TP25.1	5/11/2019	TP56 #15	686571		X
P19-No07386	TP25.1	5/11/2019	TP56 #16	686571		X
P19-No07387	TPC59	5/11/2019	TP56 #17	686571		
P19-No07388	TPC63	5/11/2019	TP56 #18	686571		X
P19-No07389	TPC49	5/11/2019	TP56 #19	686571		X
P19-No07390	TPC49	5/11/2019	TP56 #20	686571		X
P19-No07391	TPC49	5/11/2019	TP56 #21	686571		X
P19-No07392	TPC68	5/11/2019	TP56 #22	686571		X
P19-No07393	TPC68	5/11/2019	TP56 #23	686571		X
P19-No07394	TPC68	5/11/2019	TP56 #24	686571		
P19-No07395	TPC68	5/11/2019	TP56 #25	686571		X
P19-No07396	TPC68	5/11/2019	TP56 #26	686571		
P19-No07397	TPC68	5/11/2019	TP56 #27	686571		
P19-No07398	TPC70	5/11/2019	TP56 #28	686571		X
P19-No07399	TPC70	5/11/2019	TP56 #29	686571		
P19-No07400	TPC70	5/11/2019	TP56 #30	686571		
P19-No07401	TPC70	5/11/2019	TP56 #31	686571		
P19-No07402	TPC73	5/11/2019	TP56 #32	686571		X
P19-No07403	TPC72	5/11/2019	TP56 #33	686571		X
P19-No07404	TPC74	5/11/2019	TP56 #34	686571		X
P19-No07405	TPC71	5/11/2019	TP56 #35	686571		X
P19-No07406	TPC51	5/11/2019	TP56 #36	686571		X
P19-No07407	TPC51	5/11/2019	TP56 #37	686571		X
P19-No07408	TPC65	5/11/2019	TP56 #38	686571		X

Caitlyn Gibson
#697821

Sample Code	Depth	Date/Time	Field ID	Lab Report Number	Additonal analysis request	
					pH field screen (non NATA)	CRS Suite
P18-De01778	0.5 - 0.5	24/07/2018	MW5_0.5	630927		
P18-De01779	1 - 1	24/07/2018	MW5_1.0	630927		
P18-De01780	1.5 - 1.5	24/07/2018	MW5_1.5	630927		
P18-De01781	2 - 2	24/07/2018	MW5_2.0	630927		
P18-De01782	2.5 - 2.5	24/07/2018	MW5_2.5	630927		
P18-De01783	3 - 3	24/07/2018	MW5_3.0	630927		X
P18-De01784	3.5 - 3.5	24/07/2018	MW5_3.5	630927		
P18-De01785	4 - 4	24/07/2018	MW5_4.0	630927		
P18-De01786	4.5 - 4.5	24/07/2018	MW5_4.5	630927		
P18-De01787	5 - 5	24/07/2018	MW5_5.0	630927		X
P18-De01788	8 - 8	24/07/2018	MW5_8.0	630927		X
Samples are on hold in the freezer with no analysis to date		17-Jul-18	MW06_0.5	609411	X	
		17-Jul-18	MW06_1	609411	X	
		17-Jul-18	MW06_1.5	609411	X	
		17-Jul-18	MW06_2	609411	X	
		17-Jul-18	MW06_2.5	609411	X	
		17-Jul-18	MW06_3	609411	X	
		17-Jul-18	MW06_3.5	609411	X	
		17-Jul-18	MW06_4	609411	X	
		17-Jul-18	MW06_4.5	609411	X	
		17-Jul-18	MW06_5	609411	X	
		17-Jul-18	MW06_5.5	609411	X	
		17-Jul-18	MW06_6	609411	X	
		17-Jul-18	MW06_7	609411	X	
		17-Jul-18	MW06_8	609411	X	
P18-De01757	1 - 1	23/07/2018	MW7_1.0	630927		
P18-De01758	1.5 - 1.5	23/07/2018	MW7_1.5	630927		
P18-De01759	2 - 2	23/07/2018	MW7_2.0	630927		
P18-De01760	2.5 - 2.5	23/07/2018	MW7_2.5	630927		X
P18-De01761	3 - 3	23/07/2018	MW7_3.0	630927		
P18-De01762	3.5 - 3.5	23/07/2018	MW7_3.5	630927		
P18-De01763	4 - 4	23/07/2018	MW7_4.0	630927		
P18-De01764	4.5 - 4.5	23/07/2018	MW7_4.5	630927		
P18-De01765	5 - 5	23/07/2018	MW7_5.0	630927		X
P18-De01766	10 - 10	23/07/2018	MW7_10.0	630927		X
P18-De01789	0.5 - 0.5	24/07/2018	MW8_0.5	630927		X
P18-De01790	1 - 1	24/07/2018	MW8_1.0	630927		
P18-De01791	1.5 - 1.5	24/07/2018	MW8_1.5	630927		
P18-De01792	2 - 2	24/07/2018	MW8_2.0	630927		X
P18-De01793	2.5 - 2.5	24/07/2018	MW8_2.5	630927		
P18-De01794	3 - 3	24/07/2018	MW8_3.0	630927		
P18-De01795	3.5 - 3.5	24/07/2018	MW8_3.5	630927		
P18-De01796	4 - 4	24/07/2018	MW8_4.0	630927		
P18-De01797	4.5 - 4.5	24/07/2018	MW8_4.5	630927		
P18-De01798	5 - 5	24/07/2018	MW8_5.0	630927		
P18-De01799	13 - 13	24/07/2018	MW8_13.0	630927		X
Samples are on hold in the freezer with no analysis to date			MW08a_0.5	618125	X	
			MW08a_1.0	618125	X	
			MW08a_1.5	618125	X	
			MW08a_2.0	618125	X	
			MW08a_2.5	618125	X	
			MW08a_3.0	618125	X	
			MW08a_3.5	618125	X	
			MW08a_4.0	618125	X	
			MW08a_4.5	618125	X	
			MW08a_5.0	618125	X	
			MW08a_5.5	618125	X	
			MW08a_6.0	618125	X	

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Brisbane
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Murarrie QLD 4172
Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

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Kewdale WA 6105
Phone : +61 8 9251 9600
NATA # 1261 Site # 23736

ABN – 50 005 085 521 e.mail : EnviroSales@eurofins.com web : www.eurofins.com.au

Sample Receipt Advice

Company name:	**GHD Pty Ltd WA**
Contact name:	Louise Cockerton
Project name:	BORR
Project ID:	6137041
COC number:	Not provided
Turn around time:	5 Day
Date/Time received:	Jan 17, 2020 7:14 PM
Eurofins reference:	**697821**

Sample information

☑ A detailed list of analytes logged into our LIMS, is included in the attached summary table.

☑ All samples have been received as described on the above COC.

☑ COC has been completed correctly.

☑ Attempt to chill was evident.

☑ Appropriately preserved sample containers have been used.

☑ All samples were received in good condition.

☑ Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.

☑ Appropriate sample containers have been used.

☒ Split sample sent to requested external lab.

☒ Some samples have been subcontracted.

N/A Custody Seals intact (if used).

Contact notes

If you have any questions with respect to these samples please contact:

Robert Johnston on Phone : or by e.mail: RobertJohnston@eurofins.com

Results will be delivered electronically via e.mail to Louise Cockerton - louise.cockerton@ghd.com.

#AU06_EnviroSampleWA

From: Andrew Black
Sent: Thursday, 30 January 2020 1:52 PM
To: #AU06_EnviroSampleWA
Subject: FW: Eurofins Test Results - Report 697821 : Site BORR (6137041)
Attachments: 6137041-ASSrebatchRequest-30.01.2020.pdf

Caitlyn Gibson CR
Eurofins 31/1/20
#699645

Importance: High

Follow Up Flag: Follow up
Flag Status: Completed

Additional re-batch thanks team

Andrew Black
Phone: +61 410 220 750
Email: AndrewBlack@eurofins.com

From: Louise Cockerton [mailto:Louise.Cockerton@ghd.com]
Sent: Thursday, 30 January 2020 4:49 PM
To: Robert Johnston
Subject: RE: Eurofins Test Results - Report 697821 : Site BORR (6137041)

EXTERNAL EMAIL*

Rob,

Rebatch request attached.

Thanks,

Louise Cockerton
Technical Lead Acid Sulfate Soil
Senior Environmental Scientist

GHD
Proudly employee owned
T: +61 8 6222 8212 | M: +61 (0)422 993 607 | E: louise.cockerton@ghd.com
Level 10, 999 Hay Street, Perth WA 6000 Australia | www.ghd.com

Connect

Caitlyn Cockerton
Eurofins 31/1/20
#699645

From: RobertJohnston@eurofins.com <RobertJohnston@eurofins.com>
Sent: Wednesday, 22 January 2020 7:14 PM
To: Louise Cockerton <Louise.Cockerton@ghd.com>
Cc: Ryan Walker <Ryan.Walker@ghd.com>
Subject: Eurofins Test Results - Report 697821 : Site BORR (6137041)

Hi Louise and Ryan,

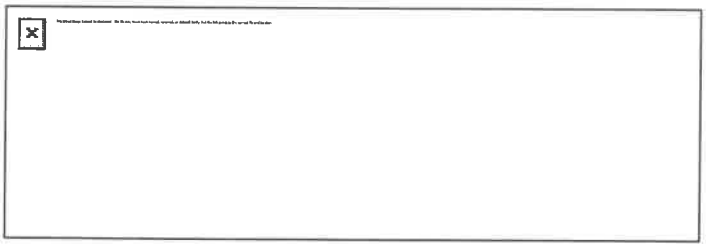
Please find attached ASS pH results for BORR (6137041).

Kind Regards,

Robert Johnston
Analytical Services Manager, WA

Eurofins | Environment Testing
Unit 2, 91 Leach Highway
KEWDALE WA 6105
AUSTRALIA
Phone: +61 (0)8 9251 9605
Mobile: +61 (0)4 2357 9286

Email: RobertJohnston@Eurofins.com
Website: environment.eurofins.com.au



EnviroNote 1079 - PFAS Fingerprinting
EnviroNote 1080 - Total Organofluorine Analysis & PFAS Investigations

Cathryn Gibson
Quotation 31/1/20
#699645

Sample Code	Depth	Date/Time	Field ID	Lab Report Number	Additonal analysis request		
					pH field screen (non NATA)	CRS Suite	CRS Suite
P18-De01778	0.5 - 0.5	24/07/2018	MW5_0.5	630927			
P18-De01779	1 - 1	24/07/2018	MW5_1.0	630927			
P18-De01780	1.5 - 1.5	24/07/2018	MW5_1.5	630927			
P18-De01781	2 - 2	24/07/2018	MW5_2.0	630927			
P18-De01782	2.5 - 2.5	24/07/2018	MW5_2.5	630927			
P18-De01783	3 - 3	24/07/2018	MW5_3.0	630927		X	
P18-De01784	3.5 - 3.5	24/07/2018	MW5_3.5	630927			
P18-De01785	4 - 4	24/07/2018	MW5_4.0	630927			
P18-De01786	4.5 - 4.5	24/07/2018	MW5_4.5	630927			
P18-De01787	5 - 5	24/07/2018	MW5_5.0	630927		X	
P18-De01788	8 - 8	24/07/2018	MW5_8.0	630927		X	
Samples are on hold in the freezer with no analysis to date		17-Jul-18	MW06_0.5	609411	X		
		17-Jul-18	MW06_1	609411	X		X
		17-Jul-18	MW06_1.5	609411	X		
		17-Jul-18	MW06_2	609411	X		
		17-Jul-18	MW06_2.5	609411	X		
		17-Jul-18	MW06_3	609411	X		
		17-Jul-18	MW06_3.5	609411	X		X
		17-Jul-18	MW06_4	609411	X		
		17-Jul-18	MW06_4.5	609411	X		
		17-Jul-18	MW06_5	609411	X		
		17-Jul-18	MW06_5.5	609411	X		X
		17-Jul-18	MW06_6	609411	X		
		17-Jul-18	MW06_7	609411	X		
		17-Jul-18	MW06_8	609411	X		X
P18-De01757	1 - 1	23/07/2018	MW7_1.0	630927			
P18-De01758	1.5 - 1.5	23/07/2018	MW7_1.5	630927			
P18-De01759	2 - 2	23/07/2018	MW7_2.0	630927			
P18-De01760	2.5 - 2.5	23/07/2018	MW7_2.5	630927		X	
P18-De01761	3 - 3	23/07/2018	MW7_3.0	630927			
P18-De01762	3.5 - 3.5	23/07/2018	MW7_3.5	630927			
P18-De01763	4 - 4	23/07/2018	MW7_4.0	630927			
P18-De01764	4.5 - 4.5	23/07/2018	MW7_4.5	630927			
P18-De01765	5 - 5	23/07/2018	MW7_5.0	630927		X	
P18-De01766	10 - 10	23/07/2018	MW7_10.0	630927		X	
P18-De01789	0.5 - 0.5	24/07/2018	MW8_0.5	630927		X	
P18-De01790	1 - 1	24/07/2018	MW8_1.0	630927			
P18-De01791	1.5 - 1.5	24/07/2018	MW8_1.5	630927			
P18-De01792	2 - 2	24/07/2018	MW8_2.0	630927		X	
P18-De01793	2.5 - 2.5	24/07/2018	MW8_2.5	630927			
P18-De01794	3 - 3	24/07/2018	MW8_3.0	630927			
P18-De01795	3.5 - 3.5	24/07/2018	MW8_3.5	630927			
P18-De01796	4 - 4	24/07/2018	MW8_4.0	630927			
P18-De01797	4.5 - 4.5	24/07/2018	MW8_4.5	630927			
P18-De01798	5 - 5	24/07/2018	MW8_5.0	630927			
P18-De01799	13 - 13	24/07/2018	MW8_13.0	630927		X	
Samples are on hold in the freezer with no analysis to date			MW08a_0.5	618125	X		X
			MW08a_1.0	618125	X		
			MW08a_1.5	618125	X		X
			MW08a_2.0	618125	X		
			MW08a_2.5	618125	X		
			MW08a_3.0	618125	X		
			MW08a_3.5	618125	X		X
			MW08a_4.0	618125	X		
			MW08a_4.5	618125	X		
			MW08a_5.0	618125	X		X
			MW08a_5.5	618125	X		
			MW08a_6.0	618125	X		X

Caitlyn Gibson
Eurofins 31/1/20
#699645

Sample Code	Depth	Date/Time	Field ID	Lab Report Number	Additonal analysis request		
					pH field screen (non NATA)	CRS Suite	CRS Suite
P18-De01778	0.5 - 0.5	24/07/2018	MW5_0.5	630927			
P18-De01779	1 - 1	24/07/2018	MW5_1.0	630927			
P18-De01800	0.5 - 0.5	25/07/2018	MW9_0.5	630927			
P18-De01801	1 - 1	25/07/2018	MW9_1.0	630927		X	
P18-De01802	1.5 - 1.5	25/07/2018	MW9_1.5	630927			
P18-De01803	2 - 2	25/07/2018	MW9_2.0	630927			
P18-De01804	2.5 - 2.5	25/07/2018	MW9_2.5	630927		X	
P18-De01805	3 - 3	25/07/2018	MW9_3.0	630927			
P18-De01806	3.5 - 3.5	25/07/2018	MW9_3.5	630927		X	
P18-De01807	4 - 4	25/07/2018	MW9_4.0	630927			
P18-De01808	4.5 - 4.5	25/07/2018	MW9_4.5	630927			
P18-De01809	5 - 5	25/07/2018	MW9_5.0	630927			
P18-De01810	5.5 - 5.5	25/07/2018	MW9_5.5	630927		X	
P18-De01811	0.5 - 0.5	25/07/2018	MW10_0.5	630927			
P18-De01812	1 - 1	25/07/2018	MW10_1.0	630927		X	
P18-De01813	1.5 - 1.5	25/07/2018	MW10_1.5	630927			
P18-De01814	2 - 2	25/07/2018	MW10_2.0	630927		X	
P18-De01815	2.5 - 2.5	25/07/2018	MW10_2.5	630927			
P18-De01816	3 - 3	25/07/2018	MW10_3.0	630927		X	
P18-De01817	3.5 - 3.5	25/07/2018	MW10_3.5	630927		X	
P18-De01818	4 - 4	25/07/2018	MW10_4.0	630927			
P18-De01819	0.5 - 0.5	25/07/2018	MW11_0.5	630927		X	
P18-De01820	1 - 1	25/07/2018	MW11_1.0	630927			
P18-De01821	1.5 - 1.5	25/07/2018	MW11_1.5	630927			
P18-De01822	2 - 2	25/07/2018	MW11_2.0	630927		X	
P18-De01823	2.5 - 2.5	25/07/2018	MW11_2.5	630927			
P18-De01824	3 - 3	25/07/2018	MW11_3.0	630927			
P18-De01825	3.5 - 3.5	25/07/2018	MW11_3.5	630927			
P18-De01826	4 - 4	25/07/2018	MW11_4.0	630927		X	
P19-No07371	TPC56	5/11/2019	TP56 #1	686571		X	
P19-No07372	TPC56	5/11/2019	TP56 #2	686571		X	
P19-No07373	TPC56	5/11/2019	TP56 #3	686571		X	
P19-No07374	TPC53	5/11/2019	TP56 #4	686571		X	
P19-No07375	TPC53	5/11/2019	TP56 #5	686571		X	
P19-No07376	TPC53	5/11/2019	TP56 #6	686571		X	
P19-No07377	TPC54	5/11/2019	TP56 #7	686571		X	
P19-No07378	TPC54	5/11/2019	TP56 #8	686571		X	
P19-No07379	TPC52	5/11/2019	TP56 #9	686571			
P19-No07380	TPC52	5/11/2019	TP56 #10	686571			
P19-No07381	TPC55	5/11/2019	TP56 #11	686571		X	
P19-No07382	TPC55	5/11/2019	TP56 #12	686571			
P19-No07383	TPC55	5/11/2019	TP56 #13	686571			
P19-No07384	TP25.1	5/11/2019	TP56 #14	686571		X	
P19-No07385	TP25.1	5/11/2019	TP56 #15	686571		X	
P19-No07386	TP25.1	5/11/2019	TP56 #16	686571		X	
P19-No07387	TPC59	5/11/2019	TP56 #17	686571			
P19-No07388	TPC63	5/11/2019	TP56 #18	686571		X	
P19-No07389	TPC49	5/11/2019	TP56 #19	686571		X	
P19-No07390	TPC49	5/11/2019	TP56 #20	686571		X	
P19-No07391	TPC49	5/11/2019	TP56 #21	686571		X	
P19-No07392	TPC68	5/11/2019	TP56 #22	686571		X	
P19-No07393	TPC68	5/11/2019	TP56 #23	686571		X	
P19-No07394	TPC68	5/11/2019	TP56 #24	686571			
P19-No07395	TPC68	5/11/2019	TP56 #25	686571		X	
P19-No07396	TPC68	5/11/2019	TP56 #26	686571			
P19-No07397	TPC68	5/11/2019	TP56 #27	686571			
P19-No07398	TPC70	5/11/2019	TP56 #28	686571		X	
P19-No07399	TPC70	5/11/2019	TP56 #29	686571			
P19-No07400	TPC70	5/11/2019	TP56 #30	686571			
P19-No07401	TPC70	5/11/2019	TP56 #31	686571			
P19-No07402	TPC73	5/11/2019	TP56 #32	686571		X	
P19-No07403	TPC72	5/11/2019	TP56 #33	686571		X	
P19-No07404	TPC74	5/11/2019	TP56 #34	686571		X	
P19-No07405	TPC71	5/11/2019	TP56 #35	686571		X	
P19-No07406	TPC51	5/11/2019	TP56 #36	686571		X	
P19-No07407	TPC51	5/11/2019	TP56 #37	686571		X	
P19-No07408	TPC65	5/11/2019	TP56 #38	686571		X	

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NATA # 1261 Site # 18217

Brisbane
1/21 Smallwood Place
Murarrie QLD 4172
Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

Perth
2/91 Leach Highway
Kewdale WA 6105
Phone : +61 8 9251 9600
NATA # 1261 Site # 23736

ABN – 50 005 085 521 e.mail : EnviroSales@eurofins.com web : www.eurofins.com.au

Sample Receipt Advice

Company name:	**GHD Pty Ltd WA**
Contact name:	Ryan Walker
Project name:	BORR
Project ID:	6137041
COC number:	Not provided
Turn around time:	5 Day
Date/Time received:	Jan 30, 2020 1:52 PM
Eurofins reference:	**699645**

Sample information

☑ A detailed list of analytes logged into our LIMS, is included in the attached summary table.

☑ All samples have been received as described on the above COC.

☑ COC has been completed correctly.

☑ Attempt to chill was evident.

☑ Appropriately preserved sample containers have been used.

☑ All samples were received in good condition.

☑ Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.

☑ Appropriate sample containers have been used.

☒ Split sample sent to requested external lab.

☒ Some samples have been subcontracted.

N/A Custody Seals intact (if used).

Contact notes

If you have any questions with respect to these samples please contact:

Robert Johnston on Phone : or by e.mail: RobertJohnston@eurofins.com

Results will be delivered electronically via e.mail to Ryan Walker - ryan.walker@ghd.com.

APPENDIX F

Checklists

Supervisor / Dewatering Manager:

DEWATERING FIELD RECORD SHEET

Date	Time	Flow rate (L/s)	Daily Total Volume of Dewatering Effluent (kL)	Water Quality Meter Calibrated?	Monitoring Point 1 (Before Treatment)				Monitoring point 2 (After Treatment)				kg of Lime used	Aeration/Settlement Tank in use? Inc geotextile fabric?	Discharge Location	Comments (filtered for acidity/alkalinity) / observations (colour, sediment load, odour)
					pH	EC (µS/cm)	TTA (mg/L)	TTAlk (mg/L)	pH	EC (µS/cm)	TTA (mg/L)	TTAlk (mg/L)				
Dewatering effluent pH is to remain >pH 6 and acidity is to be below 40 mg/L. If water quality falls 'outside' the aforementioned criteria, the Superintentendent's Representative (Water Corporation) and the nominated Environmental Consultant should be notified immediately.																

GROUNDWATER WELL FIELD MONITORING RECORD

Date	Time	Sampler	Well ID	Total Depth of Well (m TOC)	Depth to Water Level (m TOC)	Water Column (m)	Purge Volume (L) *	pH	EC (µS/cm)	Total titratable acidity (mg/L)	Total Alkalinity (mg/L)	Comments: Condition of headworks, requirement for filtering and observations noted (colour, sediment load, odour)

Notes:

* Litres to purge = Water column (m) x 6

m TOC denotes measurements to be taken from top of the PVC casing

Contractor:	**Acid Sulfate Soil Stockpile Report**

	Comments	**Onsite Person Responsible**
Stockpile #		
Stockpile Location		
Where has the material come from?		
When was it first excavated?		
What is the volume of the stockpile?		
How much ag-lime is needed?		
What date was it treated / mixed?		
What date was it tested?		
Where has it been used for backfill?		

BORR
Team

Australian Government

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mainroads
WESTERN AUSTRALIA

BUNBURY OUTER RING ROAD | PLANNING AND DEVELOPMENT