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ENGINEERING INFRASTRUCTURE & SERVICING STRATEGY

PROPOSED 216 DWELLING MANUFACTURED HOUSING ESTATE

LOT 2 DP 733507 & LOT 32 DP 1280863

104 & 120 CARRS DRIVE

YAMBA NSW 2464

FOR:

CLIFTON YAMBA LAND PTY LTD

AUGUST 2022

MANAGE DESIGN ENGINEER
Development & Construction Management ▪ Civil Design

1/64 Ballina Street
(PO Box 44)
Lennox Head NSW 2478
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Manage-Design-Engineer DOCUMENT CONTROL

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AUTHOR: Andrew Smith

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1.0 INTRODUCTION

Manage-Design-Engineer Pty Ltd (MDE) has been engaged by Clifton Yamba Land Pty Ltd ATF Yamba Land Trust to undertake Civil Engineering design & documentation in support of a Development Application over Lot 2 DP 733507 & Lot 32 DP 1280863 in Carrs Drive Yamba. The proposed development is for an over 55's Manufactured Housing Estate incorporating 216 dwelling houses, communal facilities and communal open space for retirement living. A copy of the proposed estate site plan is included in **Appendix A**.

The project will involve bulk earthworks, roadworks, stormwater drainage, sewer reticulation (both private and public works), water reticulation (both private and public works) and telecommunications & electrical reticulation to service the proposed dwellings and communal facilities.

This report outlines the proposed servicing strategy and required infrastructure to facilitate development of the site in accordance with the requirements of the DCP, the Local Government (Manufactured Home Estates, Caravan Parks, Camping Grounds and Moveable Dwellings) Regulation 2005 and other relevant local and Australian standards. This report should be read in conjunction with the Statement of Environmental Effects (SOEE) as well as other specialist consulting reports prepared by the project Geotechnical Engineer, Traffic Consultant, Flood Consultant and Environmental Consultant.

The property is currently bound to the north by a residential dwelling and an approved 193 Lot Manufactured Housing Estate, to the south by large lot residential allotments, to the east by Carrs Drive and to the west by Oyster Channel.

The figure below shows the location of the site in relation to the Yamba town center:

FIGURE 1 – Proposed Development Site

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2.0 SITE ACCESS

Site access will be gained via Carrs Drive, with the proposed site entrance location shown in the estate site plan in **Appendix A**. One gated point of ingress & egress will be provided for this estate.

In line with the DCP, it is anticipated that an upgrade to Carrs Drive will be required to raise the level of the pavement to the 1 in 20 Year ARI flood level as a minimum. This upgrade has been considered in the DA civil engineering design.

Reference is also made to Bitzios Consulting's Traffic Impact Assessment which was prepared for this proposed development. The TIA forms part of the SOEE and considers the access arrangement, access site distance requirements, refuse vehicle access and manoeuvrability, traffic impact on the existing road network and internal traffic movements for the proposed estate.

Internally, all roads will be a minimum 6m wide concrete pavement with the exception of a small 4m wide concrete laneway to service lots 43 & 44. Visitor parking has been provided throughout the estate in excess of that required under the Local Government Regulation 2005. Provision has also been made for Recreational Vehicle parking and storage at the western end of the development.

3.0 EARTHWORKS

The property at Lot 2 DP 733507 & Lot 32 DP 1280863 covers a total area of approximately 17.7 Ha with roughly 10 Ha of R1 General Residential zoned land and the balance consisting of C2 & C3 Environmental Management zones. The proposed development is located within the R1 portion of the site excluding the area comprising and adjacent to the existing Second Order stream that runs east to west primarily along the southern boundary of the property. As required by the Natural Resources Access Regulator, a riparian corridor of total 40m width must be provided for second order streams, which has been allowed for in the proposed development masterplan.

Despite historically being cleared and utilised for cattle grazing, the property has in recent years been allowed to revegetate with regrowth that now covers the majority of the site. This vegetation will need to be cleared and grubbed prior to any filling operation. A Biodiversity Development Assessment Report has been prepared by Ecosure ecological consultants to address the requirements of the Biodiversity Conservation Act in relation to the proposed clearing works. A copy of the BDAR assessment is included in the SOEE.

A geotechnical investigation was also undertaken in May 2022 by Geotech Investigations to confirm the existing site characteristics and identify any geotechnical constraints associated with filling and development of the site. A copy of the report is included as **Appendix B** which details under section 6.2.3 of that report the recommended procedures for placement of bulk fill.

These recommendations were taken into consideration in the design and documentation of the DA Bulk Earthworks plans which are provided in **Appendix C**. Fill depths in the order of 2m are required to raise the site above the 100 Yr ARI flood level and provide a development surface that will ensure all habitable dwellings can achieve a minimum floor level of RL3.0 for a slab on ground structure. All filling is to be undertaken under Level 1 Supervision and testing with all proposed fill materials to be assessed and approved for use by the appointed Level 1 Geotechnical Engineer.

Reference is also made to Precise Environmental's Acid Sulphate Soils Management Plan, also provided in **Appendix B**, which which will be implemented during the bulk earthworks phase of construction.

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3.0 STORMWATER DRAINGE AND MANAGEMENT

The existing site is very flat with slight grades to the west and south. Filling of the site in the order of 2m will enable a conventional stormwater pit and pipe network system be constructed to ensure adequate drainage and raise the finished surface level above the 1 in 100 year flood level. Under the Northern Rivers Design Guideline Table 3.1, the minor system is to cater for the 1 in 5 year rainfall event with the major system required to convey the 1 in 100 year flows.

All lots are provided with an inter allotment drainage pit or connection stub, with inter allotment drainage lines generally located in the rear of dwelling sites. These IAD drainage systems flow to the main drainage lines located within the roadway and which then discharge to a number of stormwater bio retention basins and buried infiltration tanks. Ultimately, development flows will discharge from the basins and tanks to the existing second order stream to the south and to the existing vegetated zone to the west before entering Oyster Channel at the far western boundary of the property.

Major system flows will be conveyed through the estate within the road reserve. The design relies on a V profile concrete pavement to provide the necessary flow paths and flow capacities to ensure all major flows are contained within the road reserve.

The DA stormwater drainage design has been included as **Appendix D** to this report. A separate site based Stormwater Management Plan that details the site stormwater detention and treatment strategy has been developed and should be referred to for details relating to stormwater quality and quantity management.

It is also acknowledged that the existing site is subject to flooding. BMT have been engaged by Clifton Yamba Land Pty Ltd to undertake a Flood Impact Assessment (FIA) for the proposed development to ensure compliance with the DCP. A copy of the FIA will be included in the SOEE.

4.0 WATER SUPPLY

The West Yamba Urban Release Area (WYURA), which incorporates the proposed development site, has historically not been serviced with a potable water supply sufficient to support development of the area. To allow development to occur and to ensure adequate supply of reticulated water to the West Yamba area, a Development Servicing Plan was completed by GHD in 2020, a copy of which is included in **Appendix E**.

The servicing plan recommends that a trunk DN250 ring main be constructed which connects the existing DN375mm dia main in Harold Tory Drive to the existing DN375mm dia main in Yamba Road near the intersection with Golding Street. Staging of the construction of the ring main is mentioned in the report and is detailed in the WYURA Water Supply and Servicing Strategy by Hunter H20 (July 2020). That report stipulates that Stage 1 of the works would require the first 188m of DN250 ring main to be constructed within Carrs Drive to the intersection of Miles Street to facilitate the development of the Yamba Residential Subdivision (Sub2014/0016) property and the approved MHE estate on the corner of Miles Street and Carrs Drive (DA2018/0373).

In late 2021, Stage 1 of this servicing strategy was completed by Yamba Residential Subdivisions and Clifton Yamba Land Pty Ltd, the developer of the approved MHE estate. Further to this, Clifton Yamba Land Pty Ltd has extended the water infrastructure south of Miles Street with the construction of approximately 10m of 150mm dia main to provide a connection to the approved MHE estate. A copy of the design plans detailing those works are provided in **Appendix E**.

It is proposed that servicing of the 216 Dwelling MHE estate will require the extension of the existing 150mm dia main further south along Carrs Drive to the proposed connection point shown in MDE's Civil DA Plan set included in **Appendix D**. It is anticipated that the completion of the DN250 ring main via extension of the main along Miles Street and connecting back

into the existing 375mm dia main at Yamba Road, may not be necessary to adequately service the development at this stage. This assumption is made on the basis that the development of the Yamba Residential Subdivision site and the 193 Dwelling MHE Site on the corner of Miles Street and Carrs Drive are still under early stages of construction and therefor sufficient capacity would remain in the existing infrastructure without the need to complete the ring main. A detailed hydraulic assessment of the existing system capacity, taking into consideration the status of all development within Carrs Drive, will be required during the detailed design phase to confirm this assumption.

Internally, the proposed MHE estate will be serviced by a nominal 100mm dia reticulation main to provide both potable water services and fire fighting services to the estate. An internal water reticulation plan has been prepared in accordance with the requirements of the Northern Rivers Design Guide and the Local Government Regulation 2005 and is included in **Appendix D** of this report.

5.0 SEWERAGE RETICULATION

Sewerage infrastructure within the WYURA has historically not been available for servicing of properties in Carrs Drive. GHD were engaged by Clarence Valley Council in 2020 to also prepare a Development Servicing Plan for Sewerage Services for the WYURA to ensure adequate sewer servicing and facilitate development of the area. A copy of the DSP is included in **Appendix E**.

The DSP requires all developments within the release area to be serviced via a low pressure sewer systems that contribute to a trunk DN200 pressure main that discharges directly to the Yamba Sewage Treatment Plant. As such, the construction of the entire DN200 rising main from Carrs Drive to the treatment plant could not be staged and was required to be constructed prior to provision of sewer connections to new developments.

In early 2022, Yamba Residential Subdivisions and Clifton Yamba Land Pty Ltd together completed construction of the entire DN200 main on behalf of Clarence Valley Council. The DSP also identifies a section of Trunk DN120 rising main in Carrs Drive South of Miles Street. A portion of this main (approximately 140m) was constructed by Clifton Yamba Land Pty Ltd to provide a connection to their existing approved MHE development site on the corner of Carrs Drive and Miles Street.

It is proposed that servicing of the proposed MHE Development will be achieved through extension of the DN120 pressure main south along Carrs Drive.

MDE's Civil DA Plan set (**Appendix D**) includes a sewer servicing plan for the internal servicing of the estate. This plan details a combination of gravity sewers (typically back of lot) that discharge to proprietary Aquatec low pressure sewer wells located throughout the estate. A series of low pressure poly mains will then convey flows to a single point of discharge into the future DN120 trunk pressure main in Carrs Drive.

6.0 TELECOMMUNICATIONS & ELECTRICAL RETICULATION

A 'Before You Dig' search was undertaken to confirm the extent of existing communications and power infrastructure within close proximity to the proposed development site. A copy of the BYD plans are included in Appendix F. A search of NBN's rollout maps was also undertaken which confirmed the presence of NBN infrastructure within the area.

It is proposed that the MHE development be serviced with reticulated NBN communications infrastructure, as has been undertaken at the MHE development on the corner of Carrs Drive and Miles Street.

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Power for the estate will be provided from the existing overhead HV electrical infrastructure within Carrs Drive. It is proposed that a Padmount Transformer be constructed within the estate to service the development with underground LV electrical reticulation and street lighting.

7.0 CONCLUSION

A development application for a 216 Dwelling Manufactured Housing Estate is proposed for Lot 2 DP 733507 & Lot 32 DP 1280863 in Carrs Drive Yamba. The site sits within the West Yamba Urban Release Area and is one of a number of current and proposed developments within Carrs Drive.

This report has demonstrated that the site can be provisioned with all necessary services to facilitate the proposed development.

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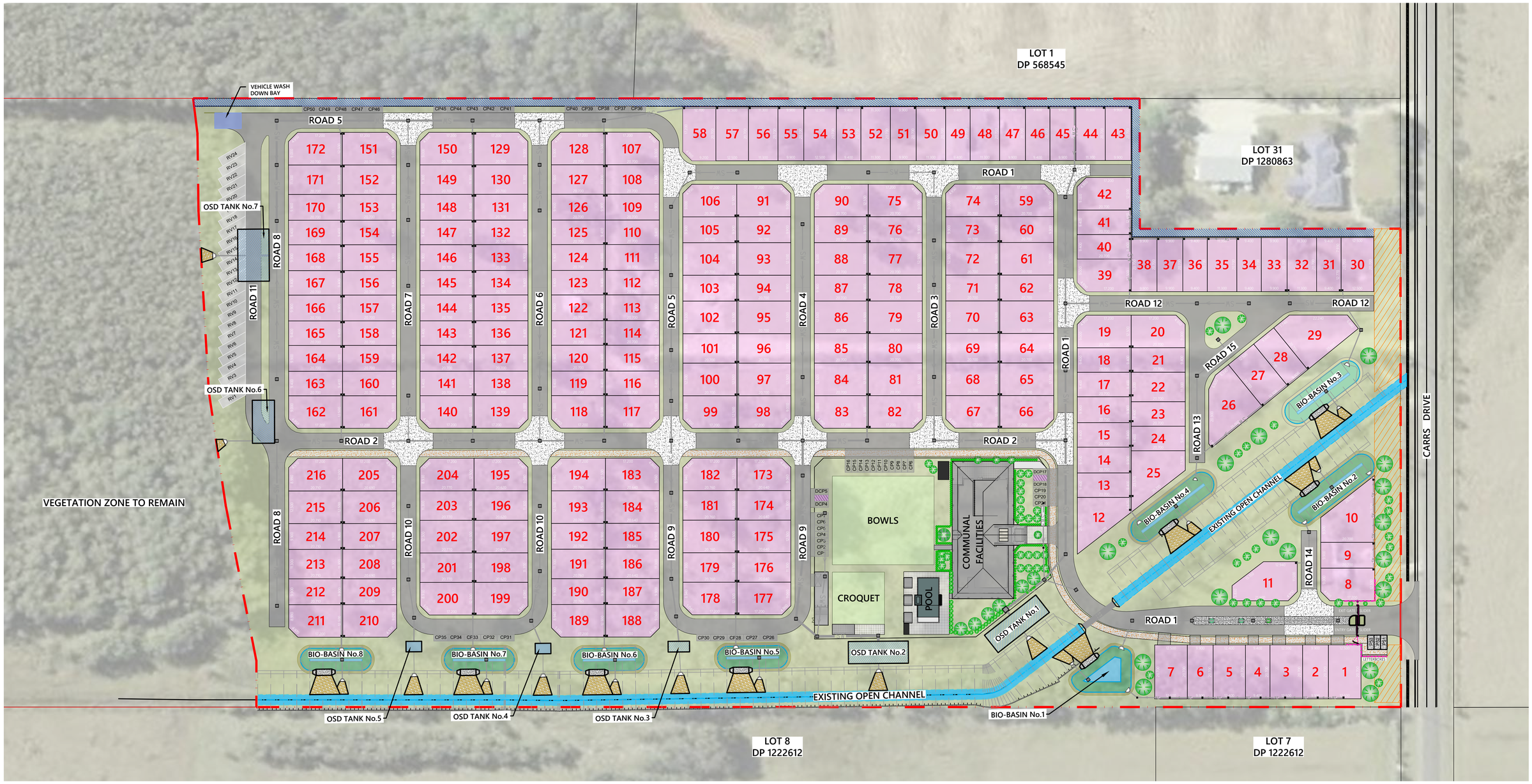
APPENDIX A – PROPOSED SITE PLAN



SITE PLAN

SCALE 1:750

LEGEND

- DEVELOPMENT BOUNDARY
- INTERNAL LOT BOUNDARY
- BIO - BASIN TOP
- CHANNEL TOP OF BANK
- CHANNEL CENTRE LINE
- PROPOSED STORMWATER DRAINAGE
- RETAINING WALL
- STORMWATER DRAINAGE PIT
- HEADWALL
- PROPOSED MHE ALLOTMENT
- NEW INTERNAL CONCRETE ROAD PAVEMENT
- NEW INTERNAL CONCRETE INTERSECTION TREATMENTS & DRIVEWAYS
- NEW 2.5m WIDE SHARED PATH WITHIN SITE BOUNDARY
- MHE BOUNDARY SETBACK 3m WIDE 'NO BUILD ZONE'
- MHE BOUNDARY SETBACK 10m WIDE 'NO BUILD ZONE'
- VISITOR AND RECREATIONAL VEHICLE PARKING
- SCOUR PROTECTION
- BIO-BASIN BREM
- BIO-BASIN GRASSED AREA
- BIO-BASIN WEIR
- BIO-BASIN FLOOR
- GRASSED AREA

PLANS TO BE PRINTED IN COLOUR

PRELIMINARY PLANS FOR DA PURPOSES ONLY NOT FOR CONSTRUCTION

20 10 0 10 20 30 40
Horizontal Scale 1:750 (A1)
1:1500 (A3)

ISSUE	DESCRIPTION	DATE
0	ISSUED FOR DEVELOPMENT APPLICATION	08.09.2022

DESIGNED: T.RYDEN | DATE: SEPT 2022
DRAWN: A.SCHMID | SCALE: AS SHOWN
SURVEYING: | SHEET SIZE: A1

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MDE Manage Design Engineer

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CLIENT: CLIFTON YAMBA LAND PTY LTD

TITLE: 110 & 120 CARRS DRIVE, YAMBA
DEVELOPMENT APPLICATION CIVIL WORKS PLANS

CLIFTON YAMBA

PROJECT: PROPOSED MHE DEVELOPMENT
110 & 120 CARRS DRIVE
YAMBA, NSW 2464
LOT 2 DP733507 & LOT 32 DP128863

DA CIVIL DRAWING

DRAWING TITLE: SITE PLAN

DWG No: D02 | SHEET: 02 OF 45 | REV: 0

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APPENDIX B – SITE GEOTECHNICAL INVESTIGATION REPORT & ACID SULPHATE SOILS MANAGEMENT PLAN

REPORT ON

PRFELIMINARY GEOTECHNICAL INVESTIGATION

FOR

PROPOSED MANUFACTURED HOUSING ESTATE AT

CARRS DRIVE, YAMBA, NSW

DESCRIBED AS LOT 2 ON DP 733507

PREPARED FOR

CLIFTON YAMBA LANDPTY LTD

ATF YAMBA LAND TRUST

PROJECT REF: GI 5952-b

DATE: 20 MAY 2022

DRILLING ENVIRONMENTAL GEOTECHNICAL

P: 07 5523 3979
F: 07 5523 3981
E: admin@geotechinvestigations.com
www.geotechinvestigations.com

Geotech Investigations Pty Ltd ACN:154555478
OFFICE: Unit 3 / 42 Machinery Drive
Tweed Heads South NSW 2486
POSTAL: PO Box 6885
Tweed Heads South NSW 2486

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Prepared for	Clifton Yamba Land Pty Ltd ATF Yamba Land Trust

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Revision A	Andrew Smith andrew@md-engineer.com.au	Email

This document was prepared in accordance with the scope of services described in Geotech Investigations Pty Ltd proposal and trading conditions as agreed with the client. This report is issued for the specific client, project and purpose(s) as described in the report, and should not be used or relied upon for other projects or purposes on the site or other sites.

The undersigned, for and on behalf of Geotechnical Investigations Pty Ltd, confirm that this document and all attached drawings, logs, and test results prepared by Geotech Investigations Pty Ltd have been checked and reviewed for errors, omissions and inaccuracies.

Yours faithfully
For and on behalf of
Geotech Investigations Pty Ltd

Andrew O'Carroll *BEng (Civil),*
Geotechnical Engineer

James Walle *RPEQ (15701), RPEng (Civil), BEng (Civil)*
Senior Geotechnical Engineer

DRILLING ENVIRONMENTAL GEOTECHNICAL

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Appendix C: Borehole Profiles BH 1 to BH 4
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1. INTRODUCTION

As requested by Clifton Yamba Land Pty Ltd ATF Yamba Land Trust, Geotech Investigations Pty Ltd (GI) has completed a preliminary geotechnical investigation for the proposed Manufactured Housing Estate at Carrs Road, Yamba, NSW described as Lot 2 on DP 733507.

1.1 Scope of Works

It is understood the purpose of the investigation is to provide a broadscale investigation of the subject site to highlight if any significant geotechnical constraints are likely to be encountered as part of the future development. The report was aimed to assist the proposed owner / developer in their Due Diligence (DD) stage and not provide design advice for the construction / design stage of the development.

The investigation was limited due to access constraints of the majority of the site.

The scope of the geotechnical services provided by GI was directed towards evaluating the following items. The report was to detail information regarding the project, site, and investigation, and provide comments on:-

1) General
    - Summary of subsurface conditions, topsoil depths and groundwater.
    - Present results of laboratory tests, if any.
    - Highlight anticipated construction difficulties.
2) Earthworks
    - Site preparation required prior to the placement of fill.
    - Topsoil stripping depths.
    - Filling procedures.
    - Comments on soft soils and possible preloading requirements.
3) Broadscale Foundation Recommendations
    - Broadscale high-level footing recommendations.
    - Broadscale Typical Site Classification in accordance with AS2870-2011.

2. PROPOSED DEVELOPMENT

The following documents have been provided to GI to assist with the investigation:-

- Concept Plan by Manage Design Engineer Pty Ltd (MDE), referenced: Concept Plan DWG No: SK03 Rev: 6 dated 12 May 2022, attached as Appendix A.

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Based on the concept site plans, refer Figure 1, and discussions with MDE representatives, the proposed development is to include the following:-

- Clearing and preparation of part of the site to allow for bulk filling, mostly towards the eastern half.
- Bulk fill to achieve design levels between RL 3.4 to 3.6 m Australian Height Datum (AHD) indicating up 2 to 2.5 m of fill is required.
- Construction of a 'Riparian Corridor' (20 m in width) entering the central portion of the eastern front boundary and traversing towards the western boundary.
- A series of internal roads and entrances will be required as part of the development along with associated Civil infrastructure.
- The construction of lightly loaded, typically single level residential type buildings.

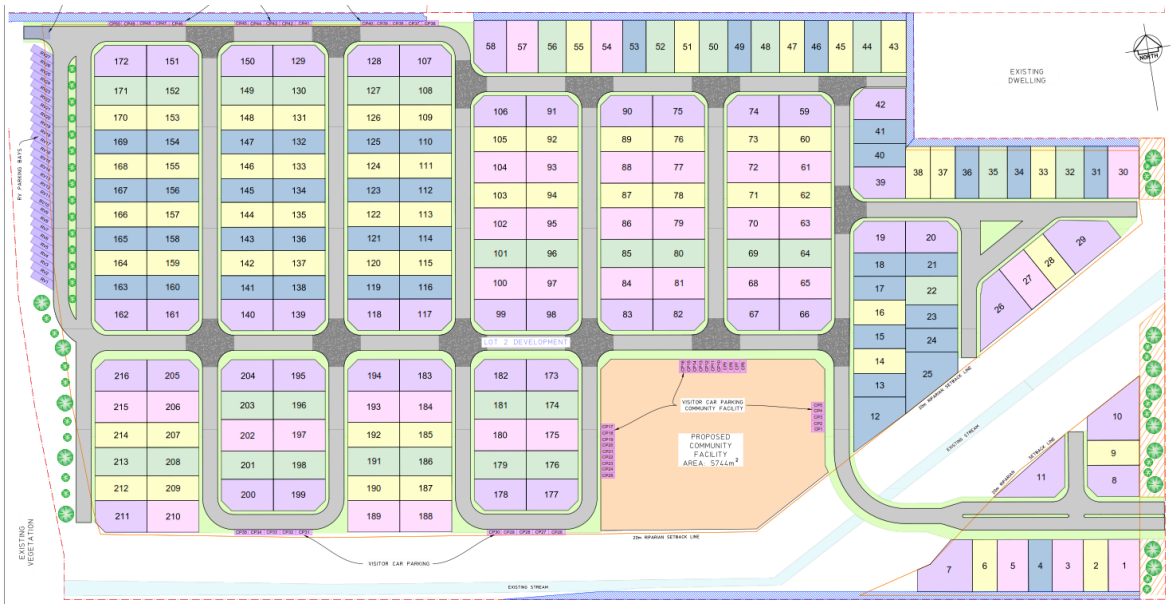

Figure 1 – Concept Site Plan

3. SITE DESCRIPTION

The subject site which is approximately 16 ha in overall area is located on the western side of Carrs Drive, approximately 1.2 km south of the intersection with Yamba Road. The site and surrounds are typically low-lying alluvial floodplains with the western boundary backing onto Oyster Channel, forming part of the tributaries of the Clarence River.

The majority of the site is covered with vegetation consisting recent regrowth and some matured trees, shrubs and grasses. The eastern area abutting the road frontage comprised maintained grass with an existing dwelling and gardens.

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Drainage was considered poor across the majority of areas observed during the site investigations.

Pictures of the site are shown below in Figures 2 to 4.

Figure 2: Looking west to existing dwelling

Figure 3: Looking south along the front eastern boundary

Figure 4: Looking north along the front eastern boundary

4. FIELD WORK METHODOLOGY

Fieldwork was initially undertaken on the 1st July 2021, and comprised the drilling and sampling of two (2) boreholes, designated BH 1 to BH 2, using a vehicle mounted auger rig using spiral flight auguring techniques to termination between 2.8 m. Dynamic Cone Penetrometer tests (DCPs) were completed adjacent to each borehole to provide an estimate of the relative density of the sands encountered.

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Additional fieldwork was then undertaken on the 6th and 7th of July 2021 and comprised the drilling and sampling of two (2) deep boreholes, designated BH 3 to BH 4. The boreholes were carried out using a truck mounted hydraulic drilling rig with spiral flight auguring techniques to approximately 1.5 m depth, then mud circulation drilling to the terminated depths between 10.9 m and 12.4 m. Standard Penetrometer Tests (SPTs) were completed within each borehole to provide an estimate of the relative density of the sands encountered. The approximate locations of the boreholes are shown on the attached Site Plan S01 in Appendix B along with GPS co-ordinates provided on the attached engineering logs in Appendix C.

This investigation has been carried out in accordance with AS 1726 – 2017[1] in terms of soil description, with the fieldwork supervised by an experienced geotechnical engineer, who positioned and logged the boreholes. At the completion of drilling, the boreholes were backfilled with drill spoil.

5. GEOTECHNICAL CONDITIONS

5.1 Regional Geology

The Geological Survey of NSW, 1:100,000 series Grafton Area shows the site to be located over quaternary aged Pleistocene tidal-delta Plains, which typically comprise *'silt, sands, shells, indurated sands and minor clays'.*

5.2 Subsurface Conditions

The results of the fieldwork are summarised in Table 1 below with more detailed descriptions presented on the Engineering Logs attached in Appendix C, along with explanatory notes.

Table 1: Summary of Subsurface Conditions *(depth below existing surface level)* (2)

Material Descriptions	BH 1 (m)	BH 2 (m)	BH 3 (m)	BH 4 (m)
Alluvial "Topsoil"(1)				
- Sandy CLAY	0 to 0.2	0 to 0.3	0 to 0.2	NE
Alluvial				
- Firm / stiff CLAY	0.2 to 0.3	0.3 to 0.5	0.2 to 0.3	NE
- Loose or worse (SPT 'N' < 10) SAND	2.3 to 2.8	1.0 to 2.8	1.0 to 5.5	0 to 5.4
- Medium Dense (SPT 10 < 'N' < 30) SAND	0.3 to 2.3	0.5 to 1.0	0.3 to 1.0	5.4 to 7.0
	NE	NE	5.5 to 11.1	NE
- Dense (SPT 30 < 'N' < 50) SAND	NE	NE	11.1 to 12.4	NE
- Very Dense (SPT 'N' > 50) SAND	NE	NE	NE	7.0 to 10.9
Terminated Depth (m)	2.8	2.8	12.4	10.9

Notes: NE – Not Encountered (1) Topsoil is described as soils containing vegetation

(2) Strengths were estimated and guessed in some occasions, refer to engineering logs for more details.

[1] Australian Standard AS 1726-2017 *'Geotechnical site investigations'*, Standards Australia

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5.3 Groundwater

Groundwater seepage was observed during augering at depths between 0.5 m and 1.2 m below the existing surface levels, as detailed below in Table 2.

Table 2: Summary of Subsurface Conditions *(depth below existing surface level)*

Groundwater	BH 1 (m)	BH 2 (m)	BH 3 (m)	BH 4 (m)
Depth Below Surface Level	0.6	0.5	0.6	1.2

It should be noted that groundwater is affected by climatic conditions, soil permeability and tidal effects, and will therefore vary over time. Where groundwater is critical, it is suggested that a groundwater monitoring well be installed, and levels monitored over a period of time to identify variations prior to excavations.

6. RESULTS AND RECOMMENDATIONS

6.1 Key Geotechnical Constraints

Some of the key geotechnical constraints outlined within this report are summarised below:-

- Ground preparation works.
- The presence of shallow groundwater.
- Site trafficability.
- Variable depth of existing topsoil.

6.2 Earthworks

6.2.1 Summary of Earthworks

Earthworks are understood to involve:-

- Clearing and preparation of the front 450 m (approximately) of the site to allow for bulk filling to achieve estimated design levels of up to RL 3.6 m AHD. This will require bulk fill of up to about 2 to 2.5 m. Should additional earthworks of greater than +/- 1 m be proposed, this office must be contacted to provide further advice.
- Construction of a 'Riparian Corridor' (20 m in width). Although details are not known, it is anticipated that the corridor will comprise excavations and some surface batter shaping.
- A series of internal roads and entrances will be required as part of the development along with associated Civil infrastructure.

6.2.2 Topsoil Stripping and Subgrade Preparation

Based on the recent boreholes completed by GI, the stripping depth over the site will typically be in the order of 100 to 200 mm. The variation will result from a combination of surface vegetation and

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in particular the root regrowth of the specific plants / trees, drainage and the weather conditions prior to the site strip.

It was noted and observed during the investigations that an alluvial soft to firm clay layer typically between 100 mm and 500 mm in thickness is located below the organic type topsoil. In conjunction with the shallow water table encountered, it is anticipated that the exposed alluvial clay layer will not be suitable to pass a 'test roll' and cause trafficability issues during construction. Therefore, GI suggests that a 'bridging layer' be considered over the alluvial clay layer as part of the earthwork's methodology, as detailed below in Section 6.2.3. This will have both environmental and cost benefits by reducing the extent of disturbance to the natural ground and limiting both the export and import volumes of structural fill required.

Furthermore, haul roads and areas of high plant traffic (i.e. turn-around and egress / ingress areas) will most likely require a crushed rock or similar layer placed to assist with high traffic movement on the exposed clay.

6.2.3 Bulk Filling Operations

Generally, all earthworks are to be carried out in accordance with AS 3798 – 2007[2]. The following earthworks procedures can be used as a preliminary guide for placing fill to support the bulk fill:-

- Following clearing and grubbing, strip site of organic / deleterious materials. Any building remnants or uncontrolled fill also will be required to be stripped.

  HOLD POINT # 1: Strip inspection required by GI.

- Placement and compaction of a 500 mm layer of clean sand material spanning the alluvial clay subgrade.

- **HOLD POINT # 2:** A test roll completed on the 'bridging layer' in the presence of a suitably qualified Geotechnical Engineer prior to additional fill being placed which will identify any further weak spots.

- Fill material should comprise similar properties to the site's natural soils and surrounding environment, hence it is recommended that **clean cohesionless sands** are used as bulk fill materials. This can often be more expensive upfront, however construction costs of placement (thicker layers) and compaction along with foundation costs of the houses / structures can often offset these initial costs and should be considered where possible. Alternative fill materials can be considered and specified by the design engineer.

- Fill material should be placed in layers not exceeding 250 mm loose thickness, however is dependent on fill material and compaction equipment. Typically for residential type developments in accordance with AS 3798, non-cohesionless material should be compacted to achieve a minimum 95% Maximum Dry Density (MDD) based on the Standard compaction

[2] Australian Standard AS 3798-2007 *'Guidelines on earthworks for residential and commercial developments'*, Standards Australia

DRILLING ENVIRONMENTAL GEOTECHNICAL

test and material moisture controlled to within +/- 2% of Optimum Moisture Content (OMC) and cohesionless material compacted to 70 % Density Index or 98 % standard compaction.

- Compaction should be tested as per AS 3798 – 2007 Table 8.1 by a NATA accredited soils laboratory.
- All fill must be inspected and tested in accordance with Level 1 guidelines as set out in AS 3798.

6.2.4 Groundwater Control

As identified above in Section 5.3, groundwater seepage and anticipated standing groundwater was encountered at shallow depths (i.e. typically around 0.6 m depth below existing surface levels).

The groundwater will rise and fluctuate depending on tidal influences and rain events at the site and it is expected that the groundwater could rise to surface level at times of flooding, which needs to be considered in both the detailed design and construction phase of the project. The activities and problems associated with groundwater include:-

- Where excavations (such as service trenches) are proposed to extend near or below the water table, suitable methods of excavation and localised dewatering needs to be considered.
- Temporary retention (such as 'shore-boxes') will be required where excavations of the groundwater is required.
- Fill placement in areas within 0.5 to 1.0 m of the groundwater (at the time of placement). Fill areas may pump the groundwater into the placed fill causing heaving and compaction difficulties.

6.3 Temporary and Long Term Batter Slopes

The riparian zone is anticipated to be positioned at the 'natural' surface level (i.e. requiring no new fill), with long term batter slopes anticipated. Long term batter slopes of the 'controlled' fill sands above the ground water should be sloped at 1V:4H minimum for a maximum vertical height of 3 m. Steeper batter slopes for various fill materials can be considered.

Some slumping and erosion of the batter face may occur and to minimise this risk, compaction must extend past the final batter slope and be trimmed back to compacted material. The batter must also be protected from erosion with scour protection using suitable vegetation.

Temporary batter slopes (1 week in dry conditions) of the bulk fill and natural soils above the ground water may be based on 1V:1H for a maximum vertical height of 1.5 m. GI must be notified for any deeper trench excavations.

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6.4 Site Settlements

Based on the subsurface investigation, the development area is underlain with a thin layer of clay and very loose to loose sands grading to medium dense then dense (or better) sands extending to approximately 10.9 to 12.4 m depth where the deeper boreholes were terminated. The upper stratum comprised a medium dense alluvial sand layer in some of the boreholes, however this was subject to variation between the testing locations.

Settlements of sands is relatively immediate as a result of surcharge loads. Considering the depth of fill to be placed over the site, the resultant settlements of the underlying alluvial sands would be considered negligible (less than 20 to 30 mm). These settlements will occur as the layers of fill surcharge is placed and will not impact the developments infrastructure or future structures. The fill material type / quality and compaction effort of the fill material will have some impact on these structures and will need to be considered in the design. GI can be contacted for further advice if required.

6.5 Broadscale Foundation Recommendations

6.5.1 Broadscale Indicative Shrink-Swell Movements and Site Classification

Following the placement of fill material, the allotments will be classified as **'Class P'** in accordance with the provisions of AS 2870. However, as the proposed new fill material is to be placed and compacted as 'controlled' fill, the sites may be reclassified.

A Site Classification is provided to allow the determination of appropriate footing sizes and slab details to be designed, and is based on the soil profile, the soil reactivity, and the climatic conditions at the site. The soil profile is identified by the site investigation drilling and in-situ testing, while the soil reactivity is determined from laboratory testing to provide the Shrink-Swell Index (I_{SS}). On the majority of sites, this information is used to calculate the characteristic surface movement (y_S), which is an estimation of the amount of movement at the surface of the site, subject to normal seasonal wetting and drying.

Following the proposed bulk earthworks, the subsurface materials will likely comprise recently placed **clean sand fill** (i.e. inert materials), and as such, shrink-swell movements will be minimal. Considering potential settlements due to self-weight of the fill and the surcharge from the individual dwellings, the allotments will most likely be reclassified as 'Class S' (slightly reactive) or 'Class M' (moderately reactive) in accordance with AS 2870. Additional geotechnical investigations will be required following the completion of the 'controlled' fill building platform/s.

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6.5.2 Indicative High-Level Footings

Generally, provided the new fill has been placed in accordance with Section 6, the preliminary footing design for footings found in the compacted 'controlled' sands may typically be based on an allowable bearing pressure of 100 kPa. However, this will be dependent on the extent of fill material and strength of the underlying alluvial soils following the completion of the earthworks.

Additional geotechnical investigations will be required following the completion of the 'controlled' fill building platform/s for site specific footing recommendations.

7. LIMITS OF INVESTIGATION

This report has been written with the express intent of providing subsurface information for due diligence purposes, or as otherwise directed by the client and/or other members of the consulting team. Sub-surface conditions relevant to construction works should be assessed by contractors who can make interpretation of the factual data provided as engineering logs and test results, and perform any additional tests as necessary for their own purposes.

There are always some variations in sub-surface conditions across a site that cannot be defined even by exhaustive investigation. Hence, it is unlikely that the measurements and values obtained from sampling and testing during the investigation will represent the extremes of conditions which exist within the site.

Should conditions exposed at the site during excavation vary significantly from the interpretation provided in this report, based on the project specific factors cited in the introductory scope of the report, GI must be informed and have the opportunity to review any of the findings of this report.

The investigation was very limited due to the restricted access of a large portion of the site.

Further, sub-surface conditions, including groundwater levels, can change over time. This should be borne in mind, particularly if the report is used after a protracted delay.

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APPENDIX A

CONCEPTUAL SITE PLANS BY MDE

DRILLING
ENVIRONMENTAL
GEOTECHNICAL

10 5 0 10 20 30 40
Horizontal Scale 1:600 (A1)
1:1200 (A3)

PLANS TO BE PRINTED IN COLOUR

PRELIMINARY FOR SITE PLANNING PURPOSES ONLY
NOT FOR CONSTRUCTION

REVISION 6 - MASTERPLAN YAMBA 2 & 3

12th MAY 2022

AMEND LOT WIDTH TO ADD AN ADDITIONAL 2 LOTS

MIX OF PRODUCT

- LOTS 9.4m WIDTH = 42 LOTS (20%)
- LOTS 9.9m WIDTH = 58 LOTS (26%)
- LOTS 11.3m WIDTH = 32 LOTS (15%)
- LOTS 12.5m WIDTH = 84 LOTS (39%)

27 x RV / CARAVAN STORAGE BAYS
50 x VISITOR CAR PARKING

ALL DWELLING ENTITLEMENTS DEPTHS AT 20.70m

SITE YIELD = 216 LOTS

LEGEND

- CADASTRAL BOUNDARY
- NEW INTERNAL CONCRETE ROAD PAVEMENT
- NEW INTERNAL CONCRETE INTERSECTION TREATMENTS & DRIVEWAYS
- NEW 2.5m WIDE SHARED PATH WITHIN SITE BOUNDARY
- MHE BOUNDARY SETBACK 3m WIDE 'NO BUILD ZONE'
- MHE BOUNDARY SETBACK 10m WIDE 'NO BUILD ZONE'
- PROPOSED MHE ALLOTMENT 9.4m LOT WIDTH
- PROPOSED MHE ALLOTMENT 9.9m LOT WIDTH
- PROPOSED MHE ALLOTMENT 11.3m LOT WIDTH
- PROPOSED MHE ALLOTMENT 12.5m LOT WIDTH
- PROPOSED MHE ALLOTMENT 12.5m LOT WIDTH CORNER SITE
- PROPOSED NEW COMMUNITY FACILITY AREA

ISSUE	DESCRIPTION	DATE
6	MASTERPLAN LAYOUT RE-ISSUED FOR CLIENT REVIEW	12.05.2022
5	MASTERPLAN LAYOUT RE-ISSUED FOR CLIENT REVIEW	11.05.2022
4	MASTERPLAN LAYOUT RE-ISSUED FOR CLIENT REVIEW	02.05.2022
3	MASTERPLAN LAYOUT RE-ISSUED FOR CLIENT REVIEW	07.12.2021
2	MASTERPLAN LAYOUT RE-ISSUED FOR CLIENT REVIEW	18.08.2021
1	MASTERPLAN LAYOUT RE-ISSUED FOR CLIENT REVIEW	23.07.2021
0	MASTERPLAN LAYOUT ISSUED FOR CLIENT REVIEW	28.06.2021

DESIGNED: T.RYDEN
DRAWN: A.SCHMID
SURVEYING:
DATE: MAY 2022
SCALE: AS SHOWN
SHEET SIZE: A1

NOT FOR CONSTRUCTION

MANAGE-DESIGN-ENGINEER PTY LTD
PROJECT MANAGEMENT-CIVIL ENGINEERING-DESIGN-SURVEYING
SUITE 1, 64 BALLINA STREET, LENNOX HEAD NSW 2478
PO Box 44 LENNOX HEAD NSW 2478
www.mde-engineer.com.au
ABN: 88 607 109 357

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CLIENT: CLIFTON YAMBA LAND PTY LTD

TITLE: PROPOSED MANUFACTURED HOUSING ESTATE

PROJECT: CARRS DRIVE
YAMBA NSW
LOT 2 DP733507

CIVIL DRAWING

DRAWING TITLE: CONCEPT PLAN
MDE ADDITIONAL LOTS - YAMBA 2-3 URBAN DESIGN

DWG No: SK03 SHEET: 1 OF 1 REV: 6

APPENDIX B

SITE PLAN S01

DRILLING
ENVIRONMENTAL
GEOTECHNICAL

SITE IMAGE

LOCALITY IMAGE

Locality Image courtesy of
Google Earth & NSW Globe

NORTH

GeoTech INVESTIGATIONS PTY LTD

Unit 3 / 42 Machinery Drive
PO Box 6885
Tweed Heads South NSW 2486
PH: 0755 233 979
FAX: 0755 233 981
EMAIL: admin@geotechinvestigations.com
WEB: www.geotechinvestigations.com

CLIENT: CLIFTON YAMBA LAND PTY LTD

PROJECT: NO.120 CARRS ROAD YAMBA

DRAWING REF: S01: SITE PLAN

LEGEND:
Borehole and Dynamic Cone Penetrometer Locat i on

Site Plan provided by Google Earth Image

APPROXIMATE NORTH

NORTH

DATE: 06.07.2021

OUR REF / JOB No.: GI 5952-a sp

DRAWN BY: DC

Drawing not to scale.
Printed dimensions only.

DRILLING
ENVIRONMENTAL
GEOTECHNICAL

APPENDIX C

BOREHOLE PROFILES BH 1 TO BH 4
GEOTECHNICAL REPORT STANDARD NOTES

GEOTECH INVESTIGATIONS PTY LTD

Unit 3/42 Machinery Drive, Tweed Heads South NSW 2486
Ph: 0755 233 979 Fax: 0755 233 981

ENGINEERING LOG – BOREHOLE PROFILE

GPS:	E:	532118	S:	6742966

CLIENT: CLIFTON YAMBA LAND PTY LTD ATF YAMBA LAND TRUST	**BOREHOLE I.D. :** BH 1
PROJECT: NO.120 CARRS DRIVE, YAMBA (LOT 2 ON DP 733507)	**JOB No.:** GI 5952-a
EQUIPMENT TYPE: GT-10 / **HOLE DIAMETER:** 110mm	**PAGE:** 1 of 1

Method	Water	Depth (m)	Graphic Log	Material Description	Consistency / Rel. Density	Sample / Test	DCP Blows / 100mm	Structure and additional observation
AD	▼	0.5		(CH) Sandy CLAY: High plasticity, Fine sand, Wet (w>wp), Dark grey	F		1 1 1	ALLUVIUM
				(CH) Sandy CLAY: High plasticity, Fine sand, Wet (w>wp), Grey			2 2 3	
		1.0		(SP) SAND: Fine sand, Trace of silt, Wet, Pale grey	MD		3 4 5 10 10 10 12 10 10 8 6 6	
		1.5		(SM) Silty SAND: Fine sand, Moist, Grey				
		2.0			L		5 3 3 3 3 3 3 3 3 4 4 4	
		2.5						
		3.0						
		3.5						
		4.0						
		4.5						

BH 1 TERMINATED AT 2.8m – LIMIT OF INVESTIGATION

METHOD		WEATHERING		CONSISTENCY / DENSITY / ROCK STRENGTH				SAMPLES / TESTS	
AD	Auger Drilling	EW	Extremely	VS	Very Soft	D	Dense	U( )	Undisturbed (size in mm)
C	Casing	HW	Highly	S	Soft	VD	Very Dense	D	Disturbed
MS	Mud Support	DW	Distinctly	F	Firm	Fb	Friable	BS	Bulk Sample
NMLC	Rock Coring	MW	Moderately	St	Stiff	ELw	Extremely Low	DCP	Dynamic Cone Penetrometer
RR	Rock Roller	SW	Slightly	VSt	Very Stiff	VLw	Very Low	SPT	Standard Penetrometer Test
TC	Tri Cone	F	Fresh	Hd	Hard	Lw	Low	N	Number of blows for SPT / 300mm
WB	Wash Bore			VL	Very Loose	M	Medium	VS	Vane Shear
WATER				L	Loose	H	High	A	Acid Sulfate Sample
▼	Water Level			MD	Medium Dense	VH	Very High	PP	Pocket Penetrometer (kPa)
►	Water Seepage								

Logged By:	DAW	Date:	01/07/21	Checked By:	AOC	Date:	7/7/21

GEOTECH INVESTIGATIONS PTY LTD

Unit 3/42 Machinery Drive, Tweed Heads South NSW 2486
Ph: 0755 233 979 Fax: 0755 233 981

ENGINEERING LOG – BOREHOLE PROFILE

GPS:	E:	532082	S:	6743014

CLIENT: CLIFTON YAMBA LAND PTY LTD ATF YAMBA LAND TRUST	**BOREHOLE I.D. :** BH 2
PROJECT: NO.120 CARRS DRIVE, YAMBA (LOT 2 ON DP 733507)	**JOB No.:** GI 5952-a
EQUIPMENT TYPE: GT-10 / **HOLE DIAMETER:** 110mm	**PAGE:** 1 of 1

Method	Water	Depth (m)	Graphic Log	Material Description	Consistency / Rel. Density	Sample / Test	DCP Blows / 100mm	Structure and additional observation
AD	▼	0.5		(CH) Sandy CLAY: High plasticity, Fine sand, Wet (w>wp), Dark grey	F		1 1 1	ALLUVIUM
				(CH) Sandy CLAY: High plasticity, Fine sand, Wet (w>wp), Grey			2 2	
		1.0		(SP) SAND: Fine sand, Trace of silt, Wet, Pale grey	MD		3 3 4 4 5	
		1.5		(SM) Silty SAND: Fine sand, Moist, Grey	L		4 4 3 3 3 3 3 3 3 3 3 3 2 2 2 2 3 3 4 4	
		2.0						
		2.5						
		3.0						
		3.5						
		4.0						
		4.5						

BH 2 TERMINATED AT 2.8m – LIMIT OF INVESTIGATION

METHOD		WEATHERING		CONSISTENCY / DENSITY / ROCK STRENGTH				SAMPLES / TESTS	
AD	Auger Drilling	EW	Extremely	VS	Very Soft	D	Dense	U( )	Undisturbed (size in mm)
C	Casing	HW	Highly	S	Soft	VD	Very Dense	D	Disturbed
MS	Mud Support	DW	Distinctly	F	Firm	Fb	Friable	BS	Bulk Sample
NMLC	Rock Coring	MW	Moderately	St	Stiff	ELw	Extremely Low	DCP	Dynamic Cone Penetrometer
RR	Rock Roller	SW	Slightly	VSt	Very Stiff	VLw	Very Low	SPT	Standard Penetrometer Test
TC	Tri Cone	F	Fresh	Hd	Hard	Lw	Low	N	Number of blows for SPT / 300mm
WB	Wash Bore			VL	Very Loose	M	Medium	VS	Vane Shear
WATER				L	Loose	H	High	A	Acid Sulfate Sample
▼	Water Level			MD	Medium Dense	VH	Very High	PP	Pocket Penetrometer (kPa)
►	Water Seepage								

Logged By:	DAW	Date:	01/07/21	Checked By:	AOC	Date:	7/7/21

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Unit 3/42 Machinery Drive, Tweed Heads South NSW 2486
Ph: 0755 233 979 Fax: 0755 233 981

ENGINEERING LOG – BOREHOLE PROFILE

GPS:	E:	532135	S:	6742977

CLIENT: CLIFTON YAMBA LAND PTY LTD ATF YAMBA LAND TRUST	**BOREHOLE I.D.:** BH 3
PROJECT: NO.120 CARRS DRIVE, YAMBA (LOT 2 ON DP 733507)	**JOB No.:** GI 5952-A
EQUIPMENT TYPE: EXPLORA85 / **HOLE DIAMETER:** 110mm	**PAGE:** 1 of 3

Method	Water	Depth (m)	Graphic Log	Material Description	Consistency / Rel. Density	Sample / Test	DCP Blows / 100mm	Structure and additional observation
AD to 1.5 m then MS (RR)	▼	0.5		(CH) Sandy CLAY: High plasticity, Fine sand, Wet (w>wp), Dark grey				ALLUVIUM
				(CH) Sandy CLAY: High plasticity, Fine sand, Wet (w>wp), Grey				
		1.0		(SP) SAND: Fine sand, Trace of silt, Wet, Pale grey	MD			
		1.5		(SP) SAND: Fine to medium sand, Trace of silt, Wet, Pale grey mottled grey	L	SPT 1.5 3,2,3 N=5		
		2.0						
		2.5						
		3.0		(SP) SAND: Fine to medium sand, Trace of silt, Trace of shell grit throughout, Wet, Pale grey mottled grey	VL/L	SPT 3.0 1,-,1 N=1		
		3.5						
		4.0						
		4.5				SPT 4.5 -,-,2 N=2		
		5.0						
		5.5		(SP) SAND: Fine to medium sand, Trace of silt, Wet, Brown	MD			

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Unit 3/42 Machinery Drive, Tweed Heads South NSW 2486
Ph: 0755 233 979 Fax: 0755 233 981

ENGINEERING LOG – BOREHOLE PROFILE

CLIENT: CLIFTON YAMBA LAND PTY LTD ATF YAMBA LAND TRUST	**BOREHOLE I.D.:** BH 3
PROJECT: NO.120 CARRS DRIVE, YAMBA (LOT 2 ON DP 733507)	**JOB No.:** GI 5952-A
EQUIPMENT TYPE: EXPLORA85 / **HOLE DIAMETER:** 110mm	**PAGE:** 2 of 3

Method	Water	Depth (m)	Graphic Log	Material Description	Consistency / Rel. Density	Sample / Test	DCP Blows / 100mm	Structure and additional observation
MS (RR)		6.0		(SP) SAND: Fine to medium sand, Trace of silt, Wet, Brown	MD	SPT 6.0 1,13,17 N=20		ALLUVIUM
		7.0		(SP) SAND: Fine to medium sand, Trace of silt, Wet, Brown mottled orange		SPT 7.5 5,11,13 N=24		
		9.0		(SP) SAND: Fine to medium sand, Trace of silt, Wet, Pale brown		SPT 9.0 7,17,0 N=17		
		10.5				SPT 10.5 9,17,21 N=35		
		11.0		(SP) SAND: Fine to medium sand, Trace of silt, Wet, Brown mottled orange	D			

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Unit 3/42 Machinery Drive, Tweed Heads South NSW 2486
Ph: 0755 233 979 Fax: 0755 233 981

ENGINEERING LOG – BOREHOLE PROFILE

CLIENT: CLIFTON YAMBA LAND PTY LTD ATF YAMBA LAND TRUST		**BOREHOLE I.D. :** BH 3
PROJECT: NO.120 CARRS DRIVE, YAMBA (LOT 2 ON DP 733507)		**JOB No.:** GI 5952-A
EQUIPMENT TYPE: EXPLORA 85	**HOLE DIAMETER:** 110mm	**PAGE:** 3 of 3

Method	Water	Depth (m)	Graphic Log	Material Description	Consistency / Rel. Density	Sample / Test	DCP Blows / 100mm	Structure and additional observation
MS (RR)		11.5 12.0 12.45		(SP) SAND: Fine to medium sand, Trace of silt, Wet, Brown mottled orange	D	SPT 12.0 11,17,23 N=40		ALLUVIUM
		13.0 13.5 14.0 14.5 15.0 15.5 16.0						

BH 3 TERMINATED AT 12.45m – LIMIT OF INVESTIGATION

METHOD		WEATHERING		CONSISTENCY / DENSITY / ROCK STRENGTH				SAMPLES / TESTS	
AD	Auger Drilling	EW	Extremely	VS	Very Soft	D	Dense	U( )	Undisturbed (size in mm)
RR	Rock Roller	HW	Highly	S	Soft	VD	Very Dense	D	Disturbed
MS	Mud Support	DW	Distinctly	F	Firm	Fb	Friable	BS	Bulk Sample
NMLC	Rock Coring	MW	Moderately	St	Stiff	ELw	Extremely Low	DCP	Dynamic Cone Penetrometer
WB	Wash Bore	SW	Slightly	VSt	Very Stiff	VLw	Very Low	SPT	Standard Penetrometer Test
WATER		F	Fresh	Hd	Hard	Lw	Low	N	Number of blows for SPT / 300mm
▼	Water Level			VL	Very Loose	M	Medium	VS	Vane Shear
▶	Water Seepage			L	Loose	H	High	A	Acid Sulfate Sample
»–	Partial Loss			MD	Medium Dense	VH	Very High	PP	Pocket Penetrometer (kPa)
–«	Complete Loss								

Logged By:	JW	**Date:**	06/07/21	**Checked By:**	AOC	**Date:**	7/7/21

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Unit 3/42 Machinery Drive, Tweed Heads South NSW 2486
Ph: 0755 233 979 Fax: 0755 233 981

ENGINEERING LOG – BOREHOLE PROFILE

GPS:	E:	531912	S:	6743140

CLIENT: CLIFTON YAMBA LAND PTY LTD ATF YAMBA LAND TRUST	**BOREHOLE I.D. :** BH 4
PROJECT: NO.120 CARRS DRIVE, YAMBA (LOT 2 ON DP 733507)	**JOB No.:** GI 5952-a
EQUIPMENT TYPE: EXPLORA85 / **HOLE DIAMETER:** 110mm	**PAGE:** 1 of 2

Method	Water	Depth (m)	Graphic Log	Material Description	Consistency / Rel. Density	Sample / Test	DCP Blows / 100mm	Structure and additional observation
AD to 1.5 m then MS (RR)	▼	0.5		(SM) Silty SAND: Fine to medium sand, Moist, Dark brown	L			FILL
		1.0		(SP) SAND: Fine sand, Trace of silt, Moist, Pale brown				
		1.5		(SP) SAND: Fine sand, Trace of silt, Wet, Pale grey mottled grey	L	SPT 1.5 4,3,3 N=6		ALLUVIUM
		2.0						
		2.5						
		3.0		As above:	VL / L	SPT 3.0 3,1,2 N-3		
		3.5						
		4.0						
		4.5				SPT 4.5 1,-,- N=0		
		5.0						
		5.5		(SP) SAND: Fine sand, Trace of silt, Wet, Pale brown	MD			

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Ph: 0755 233 979 Fax: 0755 233 981

ENGINEERING LOG – BOREHOLE PROFILE

CLIENT: CLIFTON YAMBA LAND PTY LTD ATF YAMBA LAND TRUST	**BOREHOLE I.D. :** BH 4
PROJECT: NO.120 CARRS DRIVE, YAMBA (LOT 2 ON DP 733507)	**JOB No.:** GI 5952-a
EQUIPMENT TYPE: EXPLORA85 / **HOLE DIAMETER:** 110mm	**PAGE:** 2 of 2

Method	Water	Depth (m)	Graphic Log	Material Description	Consistency / Rel. Density	Sample / Test	DCP Blows / 100mm	Structure and additional observation
MS (RR)		6.0		(SP) SAND: Fine sand, Trace of silt, Wet, Pale brown	MD			ALLUVIUM
						SPT 6.0 10,11,16 N=27		
		7.0		(SP) SAND: Fine sand, Trace of silt, Wet, Pale brown	VD			
		7.5				SPT 7.5 17,27,25 N=52		
		8.0						
		9.0				SPT 9.0 11,26,29 N=55		
		9.5						
		10.9				SPT 10.5 15,23,31 N=54		

BH 4 TERMINATED AT 10.9m – LIMIT OF INVESTIGATION

METHOD		WEATHERING		CONSISTENCY / DENSITY / ROCK STRENGTH				SAMPLES / TESTS	
AD	Auger Drilling	EW	Extremely	VS	Very Soft	D	Dense	U( )	Undisturbed (size in mm)
RR	Rock Roller	HW	Highly	S	Soft	VD	Very Dense	D	Disturbed
MS	Mud Support	DW	Distinctly	F	Firm	Fb	Friable	BS	Bulk Sample
NMLC	Rock Coring	MW	Moderately	St	Stiff	ELw	Extremely Low	DCP	Dynamic Cone Penetrometer
WB	Wash Bore	SW	Slightly	VSt	Very Stiff	VLw	Very Low	SPT	Standard Penetrometer Test
		F	Fresh	Hd	Hard	Lw	Low	N	Number of blows for SPT / 300mm
WATER				VL	Very Loose	M	Medium	VS	Vane Shear
▼	Water Level			L	Loose	H	High	A	Acid Sulfate Sample
►	Water Seepage			MD	Medium Dense	VH	Very High	PP	Pocket Penetrometer (kPa)
»–	Partial Loss								
–«	Complete Loss								

Logged By:	JW	**Date:**	06/07/21	**Checked By:**	AOC	**Date:**	7/7/21

SCOPE These standard notes may be of assistance when understanding terms and recommendations given in this report. These notes are for general conditions and not all terms given may be of concern to the report attached. The descriptive terms adopted by Geotech Investigations Pty Ltd are given below and are largely consistent with Australian Standards AS1726-1993 'Geotechnical Site Investigations'.

CLIENT can be described and is limited to the financier of this geotechnical investigation.

LEGALITY and privacy of this document is based on communication between Geotech Investigations Pty Ltd and the client. Unless indicated otherwise the report was prepared specifically for the client involved and for the purposes indicated by the client. Use by any other party for any purpose, or by the client for a different purpose, will result in recommendations becoming invalid and Geotech Investigations Pty Ltd will hold no responsibility for problems which may arise.

GEOTECHNICAL REPORTS are predominantly derived using professional estimates determined from the results of fieldwork, in-situ and laboratory testing and experience from previous investigations in the area, from which geotechnical engineers then formulate an opinion about overall subsurface conditions. The client must be made aware that the investigations are undertaken to ensure minimal site impact using test-pits or small diameter boreholes and soil conditions on-site may vary from those encountered during the investigation.

CLIENTS RESPONSIBILITY to notify this office should there be adjustments in proposed structure/location or inconsistencies with material descriptions given in this report and those encountered on site. Geotech Investigations Pty Ltd is able to provide a range of services from on-site inspections to full project supervision to confirm recommendations given in the report.

CSIRO Publication BTF 18 'Foundation Maintenance and Footing Performance: A Homeowner's Guide' explains how to adequately maintain drainage during and post construction which lies as the responsibility of the client. Suitable drainage ensures recommendations given in this report remain valid.

INVESTIGATION METHODS adopted by Geotech Investigations Pty Ltd are designed to incorporate individual project-specific factors to obtain information on the physical properties of soil and rock around a site to design earthworks and foundations for proposed structures. The following methods of investigation currently adopted by this company are summarised below:-

HAND AUGER – investigations enable field work to be undertaken where access is limited. The materials must have sufficient cohesion to stand unsupported in an unlined borehole and there must be no large cobbles boulders or other obstructions which would prevent rotation of the auger.

TEST-PITS – investigations are carried out with an excavator or backhoe, allowing a visual inspection of sub-surface material in-situ and from samples removed. The limit of investigation is restricted by the reach of the excavator or backhoe.

CONTINUOUS SPIRAL FLIGHT AUGERING TECHNIQUES – investigations are advanced by pushing a 100mm diameter spiral into the sub-surface and withdrawing it at regular intervals to allow sampling or testing as it emerges.

WASH BORING – investigations are advanced by removing the loosened soil from the borehole by a stream of water or drilling mud issuing from the lower end of the wash pipe which is worked up and down or rotated by hand in the borehole. The water or mud carries the soil up the borehole where it overflows at ground level where the soil in suspension is allowed to settle in a pond or tank and the fluid is re-circulated or discharged to waste as required.

NON-CORE ROTARY DRILLING – investigations are advanced using a rotary bit with water being pumped down the drill rods and returned up the annulus, carrying the drill cuttings. Only major changes in stratification can be determined from the cuttings, together with some information from feel and rate of penetration.

ROTARY MUD DRILLING – is carried out as above using mud as support and circulating fluid for the borehole drilling. The mud tends to mask the cuttings and reliable identification is again only possible from separate intact sampling.

CONTINUOUS CORE DRILLING – investigations are carried out in rock material, specimens of rock in the form of cylindrical cores are recovered from the drill holes by the means of core barrel. The core barrel is provided at its lower end with a detachable core bit which carries industrial diamond chips in a matrix of metal. Rotation of the barrel by means of the drill rods causes the core bit to cut an annulus in the rock, the cuttings being washed to the surface by a stream of pumped down the hollow drill rods.

TESTING METHODS adopted by Geotech Investigations Pty Ltd to determine soil properties include but not limited to the following:-

U50 – Undisturbed samples are obtained by inserting a 50mm diameter thin-walled steel tube into the material and withdrawing with a sample of the soil in a moderately undisturbed condition.

PP – Pocket Penetrometer tests are commonly used on thin walled tube samples of cohesive soils to evaluate consistency and approximate unconfined compressive strength of saturated cohesive soils. They may also be used for the same purpose in freshly excavated trenches.

VS – Vane Shear test are commonly used in-situ or on thin walled tube samples of cohesive soils by introducing the vane into the material where the measurement of the undrained shear strength is required. Then the vane is rotated and the torsional force required to cause shearing is calculated.

DCP – Dynamic Cone Penetrometer tests are commonly used in-situ to measure the strength attributes of penetrability and compaction of sub-surface materials.

SPT – Standard Penetration Tests are commonly used to determine the density of granular deposits but are occasionally used in cohesive material as a means of determining strength and also of obtaining a relatively unmixed sample. Samples and results are obtained by driving a 50mm diameter split tube through blows from a slide hammer with a weight of 63.5kg falling through a distance of 760mm. Blow counts are recorded for 150mm intervals with the sum of the number of blows required for the second and third 150mm of penetration is termed the "standard penetration resistance" or the "N-value".

GEOLOGICAL ORIGINS of sub-surface material plays a considerable role in the development of engineering parameters and have been summarised as follows:-

FILL – materials are man made deposits, which may be significantly more variable between test locations than naturally occurring soils.

RESIDUAL – soils are present in a region because of weathering over the geological time scale.

COLLUVIAL – soils have been deposited recently, on the geological time scale, as soils being transported slowly down slope due to gravitational creep.

ALLUVIAL – soils have been deposited recently, on the geological time scale, as water borne materials.

AEOLIAN – soils have been deposited recently, on the geological time scale, as wind borne materials.

SOIL DESCRIPTION is based on an assessment of disturbed samples, as recovered from boreholes and excavations, and from undisturbed materials. Soil descriptions adopted by Geotech Investigations Pty Ltd are largely consistent with AS 1726-2017 '*Geotechnical Site Investigation'.* Soil types are described according to the predominating particle size and behaviour, qualified by the grading of other particles present on the following bases detailed in Table 1.

COHESIVE SOILS ability to hold moisture known as its liquid limit is the state of a soil when it goes from a solid state to a liquid state described in Table 2

TABLE 1

Soil Classification	Particle Size
Clay	< 0.002 mm
Silt	0.002 – 0.06 mm
Sand	0.06 – 2.00 mm
Gravel	2.00 – 60.0 mm

TABLE 2

Descriptive Type	Range of Liquid Limit %
Of low plasticity	≤ 35
Of medium plasticity	> 35 ≤ 50
Of high plasticity	> 50

Furthermore to soil description cohesive soils are described on their strength (assessed in conjunction with penetration tests) and liquid limit. Non-cohesive soil strengths are described by their density index. With descriptions for cohesive and non-cohesive soils summarised in Table 3.

TABLE 3

COHESIVE SOILS		NON-COHESIVE SOILS	
Term	**Undrained Shear Strength kPa**	**Term**	**Density Index %**
Very soft	≤ 12	Very Loose	≤15
Soft	> 12 ≤25	Loose	> 15 ≤35
Firm	> 25 ≤50	Medium Dense	> 35 ≤65
Stiff	> 50 ≤100	Dense	> 65 ≤85
Very Stiff	> 100 ≤200	Very Dense	> 85
Hard	> 200		

Description of terms used to describe material portion are summarised in Table 4.

TABLE 4

COARSE GRAINIED SOILS		FINE GRAINED SOILS	
% Fines	**Modifier**	**% Coarse**	**Modifier**
≤ 5	Omit or 'trace'	≤ 15	Omit or 'trace'
> 5 ≤12	Describe as 'with'	> 15 ≤30	Describe as 'with'
> 12	Prefix soil as 'silty/clayey'	> 30	Prefix soil as 'sandy/gravelly'

ROCK DESCRIPTIONS are determined from disturbed samples or specimens collected during field investigations. A rocks presence of defects and the effects of weathering are likely to have a great influence on engineering behaviour.

Rock Material Weathering Classification is summarised in Table 5.

TABLE 5

Term	Symbol	Definition
Residual Soils	-	Soil developed on extremely weathered rock; the mass structure and substance fabric are no longer evident; there is a large change in volume but the soil has not been significantly transported
Extremely Weathered Rock	XW	Rock is weathered to such an extent that it has 'soil' properties, i.e. it either disintegrates or can be remoulded, in water
Distinctly Weathered Rock	DW	Rock strength usually changed by weathering. The rock may be highly discoloured, usually by iron staining. Porosity may be increased by leaching, or may be decreased due to decomposition of weathering products in pores
Slightly Weathered Rock	SW	Rock is slightly discoloured but shows little or no change of strength from fresh rock
Fresh rock	FR	Rock shows no signs of decomposition or staining

Rock Material Strength Classification is summarised in Table 6.

TABLE 6

Term	Symbol	Point load index (MPa) I_s50	Field guide to strength
Extremely Low	EL	≤0.03	Easily remoulded by hand to a material with soil properties
Very Low	VL	>0.03 ≤0.1	Material crumbles under firm blows with sharp end of pick; can be peeled with knife; too hard to cut a triaxial sample by hand. Pieces up to 3cm thick can be broken by finger pressure
Low	L	>0.1 ≤0.3	Easily scored with a knife; indentations 1mm to 3mm show in the specimen with firm blows of the pick point; has dull sound under hammer. A piece of core 150mm long 50mm diameter may be broken by hand. Sharp edges of core may be friable and break during handling
Medium	M	>0.3 ≤1.0	Readily scored with a knife; a piece of core 150mm long by 50mm diameter can be broken by hand with difficulty
High	H	>1.0 ≤3.0	A piece of core 150mm long by 50mm diameter cannot be broken by hand but can be broken by a pick with a single firm blow; rock rings under hammer
Very High	VH	>3.0 ≤10	Hand specimen breaks with pick after more than one blow; rock rings under hammer
Extremely High	EH	>10	Specimen requires many blows with geological pick to break through intact material; rock rings under hammer

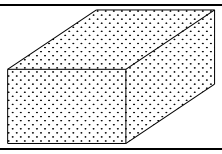
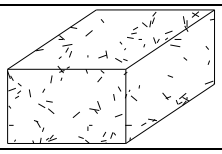
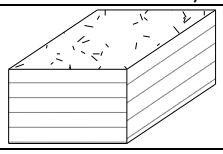
Rock Material Defect Shapes are summarised in Table 7.

TABLE 7

Term	Description
Planar	The defect does not vary in orientation.
Curved	The defect has a gradual change in orientation
Undulating	The defect has a wavy surface
Stepped	The defect has one or more well defined steps.
Irregular	The defect has many sharp changes of orientation
Smooth	The defect has a flat even finish
Rough	The defect has a irregular disoriented finish

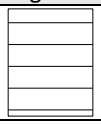
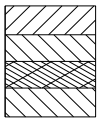
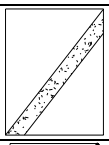
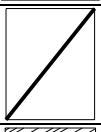
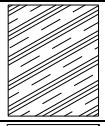
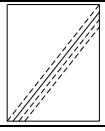
Rock Material Texture and Fabric are summarised in Table 8.

TABLE 8

Geological Description	Massive		Layered (Bedded foliate cleaved)
Diagram			
Fabric Type	Effectively homogenous and isotropic. Bulky or equi-dimensional grains uniformly distributed	Effectively homogeneous and isotropic. Elongated	Effective homogeneous with planar anisotropy. Elongated or tabular grains or pores in a layered arrangement

Rock Material Defect Type is summarised in Table 9

TABLE 9

Term	Definition	Diagram
Bedding	Signifying existence of beds or laminate. Planes dividing sedimentary rocks of the same or different lithology. Structure occurring in granite and similar rocks evident in a tendency to split more or less horizontally to the land surface	
Cross Bedding	Also called cross-lamination or false bedding. The structure commonly present in granular sedimentary rocks, which consists of tabular, irregularly lenticular or wedge-shaped bodies lying essentially parallel to the general stratification and which them selves show pronounced lamination structure in which the laminae are steeply inclined to the general bedding.	
Crushed Seam	A fracture at a more or less acute angle to applied force generally with some pulverized material along its surface	
Joint	A fracture in rock, generally more or less vertical or transverse to bedding, along which no appreciable movement has occurred.	
Parting	A small joint in rock or a layered rock where the tendency of crystals to separate along certain planes that are not true cleavage planes.	
Sheared Zone	A fracture that results from stresses which tend to shear one part of a specimen past the adjacent part	

PRECISE ENVIRONMENTAL
Consulting Environmental Scientists

ACID SULFATE SOIL INVESTIGATION AND MANAGEMENT PLAN

Lot 2 DP733507 and Lot 32 DP1280863

110 - 120 Carrs Drive, Yamba, New South Wales

Easterly Point Environmental

August 2022

Precise Environmental Pty Ltd
ATF Precise Environmental Unit Trust
7/14 Fremantle Street, Burleigh Heads QLD 4220
T 1300 488 215 **P** 07 5593 7848 **F** 07 5593 7020

Correspondence
PO Box 4424, Robina Town Centre QLD 4230
E mail@preciseenvironmental.com.au

www.preciseenvironmental.com.au

ACN: 118147078 ABN: 94335911259

Report

Precise Environmental Pty Ltd **ATF Precise Environmental Unit Trust**		**Job No:**	PE3394.22
Project Manager	Chris Butler	**Email:**	chris@preciseenvironmental.com.au
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Issuing office

Precise Environmental Pty Ltd
ATF Precise Environmental Unit Trust
Unit 7 / 14 Fremantle Street, Burleigh Heads, Queensland 4220
Tel. (07) 5593 7848
Fax (07) 5593 7020

Sean Gardiner BSc (Env)
Environmental Scientist

Chris Butler BEnvSc DipAppSc MEIANZ,
CEnvP (Site Contamination Specialist)
Director | Principal Scientist

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1 INTRODUCTION

Precise Environmental (PE) was commissioned by Easterly Point Environmental to conduct and acid sulfate soil investigation (ASSI) and prepare an acid sulfate soil management plan (ASSMP) for the proposed residential subdivision of Lot 2 DP733507 and Lot 32 DP1280863, 110 - 120 Carrs Drive, Yamba, New South Wales.

The current site layout is presented in Appendix A, Figure 1.

1.1 Project overview

The extent of the development is 10 ha and will be restricted to the eastern half of the site which is currently zoned for residential land use (refer Table 1). The western half of the site is zoned as environmental conservation and environmental management and is heavily vegetated. The proposed allotment layout is provided in Appendix B.

The development area will be filled by importing ~ 2.0 – 2.5 m of sand across the development area. Whilst most utility services will be constructed / installed within the imported fill, localised excavations will be required in natural soils at depths < 5 m AHD. The vertical extent of earthworks is expected to be limited to disturbance of natural soils in the top 0.5 – 1.0 m, noting the extent of PE's ASSI was 2.0 – 3.0 m depth.

Lateral extents of the ASSI were limited to areas of the site which could be accessed by a drilling rig. Borehole locations are provided in Appendix A, Figure 1.

1.1.1 Potential disturbance of ASS

ASS occur predominantly on coastal land with elevations generally below 5 m Australian Height Datum (AHD). These soils also occur further inland in saline seepage areas, rivers, lake beds and irrigation channels. Where ASS are present, draw-down of the local water table can expose these soils to oxidising conditions creating acidity and mobilising metals at potentially harmful concentrations.

In such situations, extracted groundwater can be impacted by acidity and dissolved heavy metals at potentially harmful concentrations, and requires appropriate management.

1.2 Objectives

The objectives of the ASSMP are to:

- Summarise acid sulfate soil (ASS) conditions within the development area
- Describe the nature and extents of ASS which may be disturbed and any requirement/s for management.

1.3 Scope of work

To meet the above objectives, the following scope of work was undertaken:

- Detailed site inspection
- Underground service clearance
- Drilling of fifteen boreholes ranging in depth from 2.0 – 3.0 m depth
- Collection of soil samples at 0.25 m depth intervals in each borehole
- ASS screen testing (pH_F and pH_{FOX}) of all recovered soil samples
- Selective chromium reducible sulfur suite (SCR Method 22B) and S_{KCl} analysis based on screen testing results
- Preparation of this ASSI and ASSMP.

1.4 Relevant guidance

It has been established with NSW EPA that Queensland-based guidance documents provide the best ASS management practices currently available, and therefore shall form the basis of the methodology described in this plan. NSW based guidance is also referenced for thoroughness.

Guidance information referenced in completing the scope of work included:

- Acid Sulfate Soils Laboratory Methods Guidelines (Ahern et al, 2004)
- Acid Sulfate Soil Manual (ASSMAC 1998)
- Clarence Valley Local Environmental Plan (LEP) 2011
- Guidelines for Sampling and Analysis of Lowland Acid Sulfate Soils (ASS) in Queensland (Ahern et al, 1998)
- Queensland Acid Sulfate Soil Technical Manual: Soil Management Guidelines Version 4 (Dear et. al. 2014)

1.5 Planning trigger for ASS management

The NSW Government ePlanning Spatial Viewer maps the site within a Class 2 acid sulfate soil (refer property reports presented in Appendix B). As per section 7.1 of the Clarence Valley LEP development consent is required in Class 2 land where works are carried out below the natural ground surface or where works which will lower the water table.

Section 7.1 states consent must not be granted under this clause for the carrying out of works unless an acid sulfate soils management plan has been prepared for the proposed works in accordance with the Acid Sulfate Soils Manual and has been provided to the consent authority.

1.6 Limitations

The findings of this report are based on the objectives and scope of work outlined above. PE performed the services in a manner consistent with the normal level of care and expertise exercised by members of the environmental assessment profession. No warranties or guarantees, express or implied, are made. Subject to the scope of work, PE's assessment is limited strictly to identifying typical environmental conditions associated with the subject property, and does not include evaluation of any other issues.

This report does not comment on any regulatory obligations based on the findings, for which a legal opinion should be sought. This report relates only to the objectives and scope of work stated, and does not relate to any other works undertaken for the Client. The report and conclusions are based on the information obtained at the time of the assessment. Changes to the subsurface conditions may occur subsequent to the investigation described herein, through natural processes or through the intentional or accidental addition of contaminants, and these conditions may change with space and time.

The results of this assessment are based upon site inspection and fieldwork conducted by PE personnel and information provided by the Client. All conclusions regarding the property area are the professional opinions of the PE personnel involved with the project, subject to the qualifications made above. While normal assessments of data reliability have been made, PE assumes no responsibility or liability for errors in any data obtained from regulatory agencies, information from sources outside of PE, or developments resulting from situations outside the scope of this project.

2 SITE CONDITIONS AND ENVIRONMENTAL SETTING

2.1 Site and environmental setting

Site identification, land use and environmental setting details are provided in Table 1. Key built features within the site are shown in Appendix A, Figure 1.

Table 1. Site and surrounding land details.

Aspect	**Detail**	
Street address	120 Carrs Drive, Yamba, New South Wales.	
Real property description	Lot 2 DP733507	Lot 32 DP1280863
Total area	16.2 ha	~1.5 ha
Local Government	Clarence Valley Council (CVC)	
Zoning (CVC)	Eastern half: R1 – General residential Western half: C2 – Environmental conservation C3 – Environmental management	R1 – General residential
	The objectives of the general residential zone are to: 1. Provide for the housing needs of the community 2. Provide for a variety of housing types and densities; and 3. Enable other land uses that provide facilities of services to meet the day to day needs of residents The objectives of the environmental conservation zone are to: 1. Protect, manage and restore areas of high ecological, scientific, cultural or aesthetic values 2. Prevent development that could destroy, damage or otherwise have an adverse effect on those values 3. Protect coastal wetlands and littoral rainforests 4. Protect land affected by coastal processes and environmentally sensitive coastal land 5. Prevent development that would adversely affect, or be adversely affect by coastal processes The objectives of the environmental management zone are to: 1. Protect, manage and restore areas with special ecological, scientific, cultural or aesthetic values 2. Provide for a limited range of development that does not have an adverse effect on those values 3. Prevent inappropriate development in geologically hazardous areas so as to minimise erosion and other adverse impacts on escarpment areas 4. Ensure that development does not unreasonably increase the demand for public services or public facilities 5. Ensure development is not adversely impacted by environmental hazards 6. Protect prominent hillsides, ridgelines, other major natural features, riparian areas and water catchment areas	
Existing land use and site structures	An existing (unoccupied) residential dwelling is located in the southeast corner of Lot 2 DP733507. A concrete slab located in the northeast corner of Lot 2	

Aspect	Detail
	DP733507 formerly contained a shed – anecdotal information supplied by the client indicates the building was demolished after a fire.
Surrounding land uses	North: Earthworks occurring for adjacent residential subdivision South: Low-density rural / residential land East: Low-density rural / residential land West: Oyster Channel – tidal waterbody between Wooloweyah Lagoon and Clarence River
Watercourses	An ephemeral watercourse is mapped in the southeast corner of the site and traverses west parallel to the southern site boundary terminating beyond the west site boundary in Oyster Channel. The ephemeral watercourse will be repurposed as a riparian zone as part of the redevelopment.

3 GEOTECHNICAL INFORMATION

The following sections presents key information derived / summarised from the geotechnical report which will need to be considered as part of the overall management strategy of disturbed ASS within the proposed development. The geotechnical report (GI 2021) was prepared by Geotech Investigations (GI) Pty Ltd on 7 July 2021.

Notwithstanding general limitations of the geotechnical report, it is noted boreholes constructed as part of the investigation were limited to three boreholes adjacent to the residential dwelling in the southeast corner of the site and one adjacent to the western boundary of Lot 32 DP1280863.

A summary of the soil conditions encountered by GI are presented in Table 2. No unconsolidated marine clay sediments were identified.

Table 2. Summary of soil conditions (GI 2021).

Material descriptions	**BH1 (m)**	**BH2 (m)**	**BH3 (m)**	**BH4 (m)**
Alluvial topsoil	0 – 0.2	0 – 0.3	0 – 0.2	NE
Alluvial Firm / stiff clay	0.2 – 0.3	0.3 – 0.5	0.2 – 0.3	NE
Loose or worse (SPT 'N' <10) sand	2.3 – 2.8	1.0 – 2.8	1.0 – 5.5	0.0 – 5.4
Medium dense (SPT 10 < 'N' < 30) sand	0.3 – 2.3 NE	0.5 – 1.0 NE	0.3 – 1.0 5.5 – 11.1	5.4 – 7.0 NE
Dense (SPT 30 < 'N' < 50) sand	NE	NE	11.1 – 12.4	NE
Very dense (SPT 'N' > 50) sand	NE	NE	NE	7.0 – 10.9
Terminated depth	2.8	2.8	12.4	10.9

Table notes:

NE denotes not encountered

3.1 Earthworks

Earthworks proposed for the proposed development include:

- Site preparation, clearing and grubbing
- Importation of up to 2.0 – 2.5 m of bulk filling across the site to achieve an estimated design level of up to RL 3.6 m
- Construction of a riparian corridor which is expected to comprise excavation and batter shaping
- Construction of a series of internal roads, entrances, and civil infrastructure.

PE has been advised by the client most civil infrastructure will be constructed within the bulk fill soils, with the exception of deeper utility services such as sewer rising mains, service trenches etc. PE has not been supplied with the proposed civil / utility services plan.

3.2 Stripping of topsoil

Topsoil stripping across the site will be in the order of 100 – 200 mm and will vary according to areas containing surface vegetation, root regrowth, site drainage and weather conditions encountered prior to stripping. Based on the development area of 10 ha there could be up to 20,000 m^3 of soil which cannot be reused as structural fill (not including uncontrolled fill encountered within the observed earthen access driveway). The topsoil may be reused onsite for landscaping following neutralisation treatment.

Alluvial soft to firm clays encountered from 100 – 500 mm in thickness below the topsoil in conjunction with the shallow water table won't be suitable to pass a 'test roll' and will cause trafficability issues during construction. Geotech Investigations have suggested importing a bridging layer to minimise the extent of disturbance to the natural ground. Building remnants and uncontrolled fill will also need to be stripped.

3.3 Bulk filling

Following clearing, site preparation and stripping, 500 mm of clean sand material shall be placed and compacted across the alluvial clay subgrade and a test roll completed prior to additional filling. Fill material should contain similar properties to the sites natural soil, and it was therefore recommended that clean cohesionless sand be used as the bulk filling material and should be placed in layers not exceeding 250 mm.

3.4 Groundwater

Groundwater was encountered at shallow depths across the site typically around 0.6 m (this was relatively consistent with PE's findings). Groundwater could rise to surface levels in times of flooding. The geotechnical report states the following relating to groundwater:

- Where excavations such as service trenches are proposed to extend near or below the water table, suitable methods of excavation and localised dewatering need to be considered
- Temporary retention such as shore boxes will be required where excavations of the groundwater is required
- Fill placement in areas within 0.5 – 1.0 m of the groundwater at the time of placement may pump groundwater into the placed fill causing heaving and compaction difficulties.

3.5 Batter slopes

The riparian zone is expected to be positioned at the natural surface level requiring no new fill and long-term batter slopes. The batter will need to be protected from erosion and scour protection.

3.6 Settlement

Settlement of the underlying alluvial sands at the site are relatively immediate and based on the depth of fill to be placed, settlement of the underlying alluvial sands is considered to be negligible (less than 20 – 30 mm). Settlements will occur as the surcharge layers are placed and will not impact the development infrastructure, or future structures.

4 ACID SULFATE SOIL INVESTIGATION METHODOLOGY

Standard operating procedures upon which the soil collection methods were based are provided in Appendix C.

4.1 Soil sampling and analysis

Fifteen boreholes (BH1 – BH15) were drilled on 12 July 2022 to depths of 2.0 – 3.0 m below ground level (BGL) using a track mounted drill rig with solid stem augers. Locations were selected to provide as much site coverage as possible noting parts of the site were inaccessible due to waterlogged soils / dense vegetation.

Soil samples were collected at 0.25 m intervals ensuring inclusion of distinct changes in soil type. Each sample was sealed in a snap-lock bag with excess air evacuated and stored and transported below 4ºC to minimise samples oxidation and degradation. All samples were dispatched to a NATA accredited laboratory under chain of custody documentation for field screening. Select samples were analysed for Chromium Reducible Sulfur suite analysis (S_{CR} - Method 22B) in accordance with Acid Sulfate Soils Laboratory Methods Guidelines (Ahern et al, 2004).

4.2 Action criteria

The Guidelines for Sampling and Analysis of Lowland Acid Sulfate Soils (ASS) in Queensland (Ahern *et al*, 1998) describes field pH_F / pH_{FOX} test results which indicate potential acid sulfate soils (PASS). A combination of three factors is considered in arriving at positive field sulfide identification - (a) a reaction with hydrogen peroxide, (b) a much lower pH_{FOX} than field pH_F (▲pH) and (c) the actual value of pH_{FOX}.

The guidelines offer the following information regarding the interpretation of field pH results:

- The strength of the reaction with peroxide is a useful indicator but cannot be used alone. Organic matter and other soil constituents such as manganese oxides can also cause a reaction. Care must be exercised in interpreting a reaction on surface soils and high organic matter soils such as peat and some mangrove/estuarine muds and marine clays. This reaction should be rated.
- A pH_{FOX} value at least one unit below field pH_F may indicate a PASS. The greater the difference between the two measurements (▲ pH), the more indicative the value is of a PASS. The lower the final pH_{FOX} value is, the better the indication of a positive result.
- If the pH_{FOX} is < 3, and the other two conditions apply, then it strongly indicates a PASS. The more the pH_{FOX} drops below 3, the more positive the presence of sulfides.
- A pH_{FOX} 3 - 4 is less positive and laboratory analyses are needed to confirm if sulfides are present.
- For pH_{FOX} 4 - 5 the test is neither positive nor negative.
- For pH_{FOX} > 5 and little or no drop in pH from the field value, little net acidifying ability is indicated.

The appropriate criteria, or action thresholds, are the texture-based action criteria from the Queensland Acid Sulfate Soil Technical Manual (Dear *et al*. 2014). The action criteria have been developed to determine when management of disturbed acid sulfate soil is required. Soil texture influences the risk associated with a disturbance, due to differences in the rate of oxidation, permeability and potential buffering capacity of the soil. The action criteria are shown in Table 3.

The ASS to be disturbed is >1,000 tonnes and the applicable action criteria is 18 mol. H^+/ t.

Table 3. Texture-based acid sulfate soil action criteria.

Type of Material	***Approx. clay content (%)***	***Sum of existing and potential acidity***			
		1-1000 tonnes disturbed		***>1000 tonnes disturbed***	
Texture range (NCST, 2009)		**% S-equiv. (oven-dried basis)**	**mol H^+/t (oven-dried basis)**	**% S-equiv. (oven-dried basis)**	**mol H^+/t (oven-dried basis)**
Fine Medium to heavy clays and silty clays	> 40	0.1	62	0.03	18
Medium Sandy loams to light clays	5 - 40	0.06	36		
Coarse Sands - loamy sands, peats	< 5	0.03	18		
Draft action criteria for poorly buffered sands					
Coarse Sands, poorly buffered	< 5	0.01	6	0.01	6

5 FIELD OBSERVATIONS AND LABORATORY RESULTS

The following section presents the results of the ASSI and should be read in conjunction with the borehole locations provided in Appendix A, data tables presented in Appendix D, complete soil profile descriptions in Appendix E and laboratory certificates of analysis presented in Appendix F.

5.1 Soil profiles

Fill soils were encountered in BH6, BH8 and BH11 which were drilled in the observed earthen access driveway (refer Appendix A, Figure 1). Fill soil comprised a mix of sand and clay of variable plasticity with silt inclusions to depths of 0.5 – 0.8 m.

With the exception of BH5 which comprised clayey sand and sand, natural soils comprised clay of variable plasticity (light to heavy) with silt and sand inclusions up to 0.95 m depth overlying sand (with some clay and silt inclusions).

Soil profiles were generally consistent with the geotechnical report (GI 2021) although deeper clay profiles were observed in some locations.

Groundwater seepage was observed on the day of works from 0.25 – 1.5 m.

5.2 Screening results

The screening results indicated the presence of PASS on the basis that:

- Most pH_{FOX} results were ≥1 unit less than pH_F results and pH_{FOX} results ≥ 2 units less than pH_F results was common.
- pH_{FOX} results < 3 were common although there did not appear to be any trends between sample depth and results.

5.3 Laboratory results

5.3.1 Fill soil

Net acidity excluding acid neutralising capacity (ANC) in analysed fill soils (applicable to BH6 0.5 – 0.75 m, BH8 0.0 – 0.25 m, BH8 0.25 – 0.5 m and BH11 0.5 – 0.75 m) ranged from 49 – 61 mol. H^+/tonne and exceeded the 18 mol. H+/tonne action criteria). Net acidity in these samples predominantly comprised titratable actual acidity (TAA) ranging from 32 – 45 mol. H^+ / tonne. Chromium reducible sulfur (potential acidity) was reported at <10 – 16 mol. H^+ / tonne.

5.3.2 Natural clay soil above the water bearing zone

Net acidity excluding ANC was detected in all analysed natural clay soil samples above the water bearing zone except for BH9 0.5 – 0.75 m. Results ranged from 26 – 138 mol H^+ / tonne and all results exceeded the action criteria.

Net acidity in these samples predominantly comprised TAA ranging from 9 – 124 mol H^+ / tonne and potential acidity ranged from <10 – 24 mol H^+ / tonne.

5.3.3 Natural sand soil below the water bearing zone

Net acidity excluding ANC was detected in all analysed natural sand soils below the water bearing zone. Results ranged from 13 – 142 mol H^+ / tonne and more than 60 % of samples exceeded the action criteria.

Net acidity in these samples predominantly comprised potential acidity ranging from <10 - 139 mol H^+ / tonne. TAA ranged from <2 – 15 mol H^+ / tonne.

6 ACID SULFATE SOIL MANAGEMENT MEASURES

6.1 Responsibility

The Principal Contractor shall be responsible for ensuring the appropriate management of acid sulfate soil (ASS) as detailed in the document.

6.2 Stripped surfaces

Aglime shall be placed at a rate ≥ 5 kg/m^2 across all surfaces following the stripping and grubbing of topsoil / clay above the water table. Additional aglime shall also be placed around the perimeter of stripped areas daily throughout the earthworks program. This shall be applied in all drainage lines, whether temporary or permanent.

6.3 Temporary ASS stockpiling and treatment areas

Stockpiling of untreated ASS should be minimised by preparing a detailed earthworks strategy that documents the timing of soil volumes to be moved, treatment locations and capacity of specified areas to accept materials.

Excavated ASS which has not been treated and verified must be contained within bunded areas constructed in accordance with relevant design standards and the cross sections presented in Appendix G. These areas will be positioned to mitigate potential runoff and/or stormwater ingress.

A guard layer of aglime shall be placed beneath and over the surface of untreated soils and surrounded by a lime enriched perimeter. The basal layer of aglime shall be at a minimum rate of 5 kg per m^2 per vertical metre of fill, with 5 kg per m^2 spread over the stockpile surface.

The recommended maximum time for which soils can be temporarily stockpiled without treatment are presented in Table 4. The total volume of material that is placed in short-term stockpiles should not exceed 20% of a day's total extraction, as immediate treatment should be implemented.

Table 4. Indicative maximum periods for short term stockpiling of untreated ASS.

Type of Material		***Sum of existing and potential acidity***
Texture range (NCST, 2009)	***Approx. clay content (%)***	
Fine Medium to heavy clays and silty clays	> 40	3 nights, e.g. a weekend (66 hours)
Medium Sandy loams to light clays	5 - 40	2 nights (42 hours)
Coarse Sands to loamy sands and peats	< 5	Overnight (18 hours)

6.4 Leachate collection and discharge

Leachate collection drains surrounding the treatment pads will be constructed within bunded areas. Leachate will be directed to a sump or holding ponds for monitoring, and treatment (if required), prior to discharge.

Alternatively, dispersal over land of leachate shall be the preferred method of disposal and shall be conducted in a manner to ensure the leachate does not enter the stormwater network, or adjacent waterways. Where this is not possible leachate must be managed in accordance with an approved Dewatering Management Plan.

Where off-site discharge via dispersal over land is required, or has the potential to occur, water quality monitoring shall be conducted prior to discharge in accordance Section 6.4.1.

6.4.1 Leachate monitoring

Where dewatering is occurring during works involving ASS, leachate generated shall be monitored in accordance with an approved DMP.

In all other cases (i.e. where leachate is generated in collection drains and stored in sumps / holding ponds) surface water quality monitoring shall be undertaken at the locations and frequencies specified in Table 5.

A suitably qualified person shall review the monitoring results. Non-compliance with the water quality objectives shall trigger corrective and preventive action to be determined by a suitably qualified expert (SQE).

Table 5. Water quality monitoring program.

Parameter	Water quality objectives	Location	Frequency
pH (units)	6.5 – 8.5 [A]	Discharge	Prior to release
Total suspended solids (mg/L)	≤50 [B]		
Dissolved aluminium and iron	-		

Table notes

A. Derived from Acid Sulfate Soils Management Guidelines (ASSMAC 1998)

B. Derived from Soils and construction (NSW Blue Book) Vol. 1 – 4th Edition, March 2004 (NSW Landcom 2004)

Corrective actions shall be implemented in consultation with a SQE to ensure potential impacts of the release on the receiving environment are mitigated.

Monitoring results shall be reviewed by a SQE prior to release and the necessary actions (e.g. water treatment) determined by the SQE. If visual and/or water quality monitoring indicates the production and migration of acidic leachate, additional treatment measures will be implemented as necessary. These measures may include:

- The application of additional neutralising agent (typically agricultural lime) to temporary and permanent stockpiles
- The application of additional neutralising agent (typically agricultural lime) to leachate collection drains and overland flow pathways
- Neutralisation treatment (typically hydrated lime) of surface water contained within the leachate collection tanks or basins.

6.5 Neutralisation treatment

6.5.1 Bulk excavated and trench excavated soils

All bulk excavated soils including topsoil will be treated using conventional neutralisation methods whereby agricultural lime is incorporated homogenously into the material either during the excavation process or on a purpose-built treatment pad/s (Refer Appendix G).

Testing will be undertaken on the treated soil not used as backfill on the day of excavation to verify that the quantity of lime added is sufficient to neutralise the soils net acidity to the standards specified in the Acid Sulfate Soils Laboratory Methods Guidelines (Ahern et al, 2004).

Verification results shall be interpreted by a SQE to assess conformance with the verification performance criteria (Table 2). Material deemed by the SQE to be non-conforming shall be re-treated at the liming rate nominated by the SQE and the verification process repeated.

Treated material may be reused within the development where fit for purpose or disposed of at a licensed landfill (Refer Section 6.7).

6.5.2 Excavations

The geotechnical investigation has not specified the depth of footings for the development as additional investigations are required following placement of compacted fill. Notwithstanding this, no ASS will be disturbed for all civil infrastructure constructed within the compacted fill.

Soils excavated as part of deeper service trenches which penetrate natural soils shall be treated by applying aglime at the nominated liming rate specified in Section 3.4.3 (according to the soil type encountered.

6.5.3 Liming rates

Based on a bulk density (BD) of 1.7 t / m^3, agricultural lime (97% pure fine $CaCO_3$) must be applied to the excavated material as per Table 6. Given the relatively high variability in net acidity between the three main soil types encountered at the site, liming rates have been calculated based on the 95%ile of net acidity results.

Where material requiring a higher liming rate cannot be separated from material with a lower liming rate then the highest liming applicable to those material types shall be used for neutralisation treatment.

Table 6. ASS treatment liming rates.

Soil type	Encountered depth	Liming rate minimum (kg / m^3)
Uncontrolled fill soils (earthen access driveway – refer Figure 1)	Up to 0.8 m below existing surface level	8.4
Natural clay	Up to 0.95 m below existing surface level	19.2
Natural sand	Generally ≥ 0.5 m below existing surface level	19.2

The calculation used to determine the liming rates was:

1) Sum of existing acidity + potential acidity (moles H+/t for oven-dried soil)
2) divided conversion factor for mol H+/t to kg $CaCO^3$/t (i.e. 19.98)
3) multiplied by lime purity factor for 97 % pure aglime (i.e. 100/97, or 1.03)
4) multiplied by default bulk density of wet soil (i.e. 1.7 t / m^3)
5) multiplied by default safety factor of (i.e. 1.5).

Note: Where soil bulk density is likely to vary from the default (1.7 t / m^3), or lime product used has a purity below 97%) lime treatment rates must be modified accordingly.

6.6 Verification of neutralisation treatment

All treated soil shall be verified at a minimum rate of 1 sample / 1,000 m^3 (as required for soils containing acidity concentrations < 142 mol H+/t), or greater where necessary in each batch of soil. Each sample

shall be a composite sample made up of at least 6 sub-samples collected using a random or stratified-random approach.

Chromium suite acid base accounting will be used to verify treated material in accordance with Table A3.6 of the Laboratory Methods Guidelines (Ahern et al. 2004).

The following performance criteria must all be met for soil that has been treated:

- The neutralising capacity of the treated soil must exceed the existing plus potential acidity of the soil by at least a safety factor of 1.5
- Post-neutralisation, the soil pH (pH_{KCl}) is to be > 6.5, and preferably < 8.5
- Excess neutralising agent should stay within the treated soil until all acid generation reactions are complete and the soil has no further capacity to generate acidity.

Interpretation of verification results may consider the following:

Medium and fine textured material (sandy loams, light clays, heavy clays and silty clays):

1) No single sample shall exceed a net acidity of 62 mol H^+/t.
2) If any single sample is between 0 - 62 mol H+/t, then the average of any four spatially adjacent samples (including the exceeding sample) shall have an average net acidity of zero or less.

Coarse textured material (sands to loamy sands and peats):

1) No single sample shall exceed a net acidity of 18 mol H^+/t.
2) If any single sample is between 0 - 18 mol H+/t, then the average of any four spatially adjacent samples (including the exceeding sample) shall have an average net acidity of zero or less.

Poorly buffered sands (see Soil Management Guidelines Table 4.1 and associated commentary):

1) No single sample shall exceed a net acidity of 6 mol H+/t.
2) If any single sample is between 0 - 6 mol H+/t, then the average of any four spatially adjacent samples (including the exceeding sample) shall have an average net acidity of zero or less.

6.7 Disposal of surplus acid sulfate soil

Following treatment, material that cannot be re-used within the development site (namely uncontrolled fill and clay topsoil) shall be removed to a landfill licensed to accept ASS in accordance with the NSW Waste Classification Guidelines Part 4: Acid Sulfate Soils (Refer Appendix H).

Dry material shall be kept moist and covered during transport. Wet material shall be of at least 'spadable' consistency or carted in lined containers to minimise potential spillage. Council must be provided with the full details of the facility prior to any material being removed off-site, and other records such as tonnage receipts upon request following disposal.

6.8 Potential displacement and extrusion of ASS due to settlement of materials

The upper unconsolidated natural clay layer and loose underlying sand has the potential to displace and extrude during the bulk filling of the site, and a rise in the groundwater level in the surrounding area. The degree of soil and groundwater movement which will depend on the settlement strategy adopted.

A slow rate (i.e. many years) of compression of unconsolidated material may minimise the environmental risks associated with the oxidation of disturbed ASS. However, this may not be feasible for the site.

The Soil Management Guidelines (2014) state:

> *Dewatering soils using wick drains is a common management strategy available when sediments need to be compressed and dewatered. Vacuum settlement (also known as vacuum consolidation) methods can potentially be employed to hasten the compression process. Vacuum settlement involves sealing the surface of the soil with an impermeable membrane and then using a preinstalled drainage network to pump air and water out of the soil, rather than waiting for it to compress under load….*
>
> *Note that where these techniques are employed, extracted water must be treated to meet pH, metals (particularly iron and aluminium) and visual amenity targets prior to discharge, and care must be taken to properly isolate the soil to be dewatered from the surrounding environment.*
>
> *Note: These techniques do not necessarily provide a clearance layer of non-ASS or fully treated ASS material for future land uses.*

Wick drains enable the direct vertical rise and capture of groundwater (typically by a preload perimeter drain) reducing the likelihood of lateral displacement of groundwater and extrusion of ASS.

Where wick drains are not required (e.g. no to limited unconsolidated soils present), then a limestone filled cut-off drain of sufficient depth to neutralise horizontal sub-surface groundwater flow may need to be installed around the fill zone boundaries. Decisions on, and design of, the most appropriate management strategy will be the responsibility of the project geotechnical engineer, in consultation with the SQE.

Groundwater monitoring wells must be installed around the perimeter of the fill area and baseline groundwater conditions assess at these locations. Existing baseline groundwater information shall be incorporated for the wider site where available. There can be no decline in groundwater pH as a result of the filling activities. A groundwater neutralising agent may be required where there is an unacceptable change in pH to mitigate risks to groundwater dependant ecosystems including surfaces waters.

6.9 Dewatering and oxidation of ASS

Excavation methodologies that minimise the extent and duration of dewatering as far as practicable shall be adopted as a primary control measure. All dewatering shall be undertaken in accordance with an approved dewatering management plan.

7 MONITORING

7.1 Visual monitoring of ASS impacts

Regular visual monitoring shall be undertaken to detect:

- Unexplained scalding or degradation of vegetation
- Iron staining
- Green-blue or extremely clear water indicating high concentrations of aluminium.

Any observations of the above shall be reported to the SQE who shall inspect the site and advise appropriate corrective action/s, as required.

8 REPORTING

All incidents that have the potential to cause environmental harm shall be immediately reported to Clarence Valley Council. The Site Manager is responsible for liaising with the Principal's Representative to determine the most appropriate communication pathways for reporting such incidents in accordance with the Protection of the Environment Operations (PoEO) Act 1997 and its associated schedules.

The Principal Contractor shall maintain records of the following:

- ASS verification testing
- ASS disposal (volumes, contractor, disposal facility, waste transport certificates)
- Soil and water treatment
- Water quality monitoring
- Incidents
- Corrective and preventive actions.

The records shall be available for inspection on site during the construction phase and maintained for a minimum of 5 years.

9 REFERENCES

Ahern, C.R., McElnea, A.E., Sulivan, L.A. 2004. *Acid Sulfate Soils Laboratory Methods Guidelines*. Queensland Department of Natural Resources, Mines and Energy

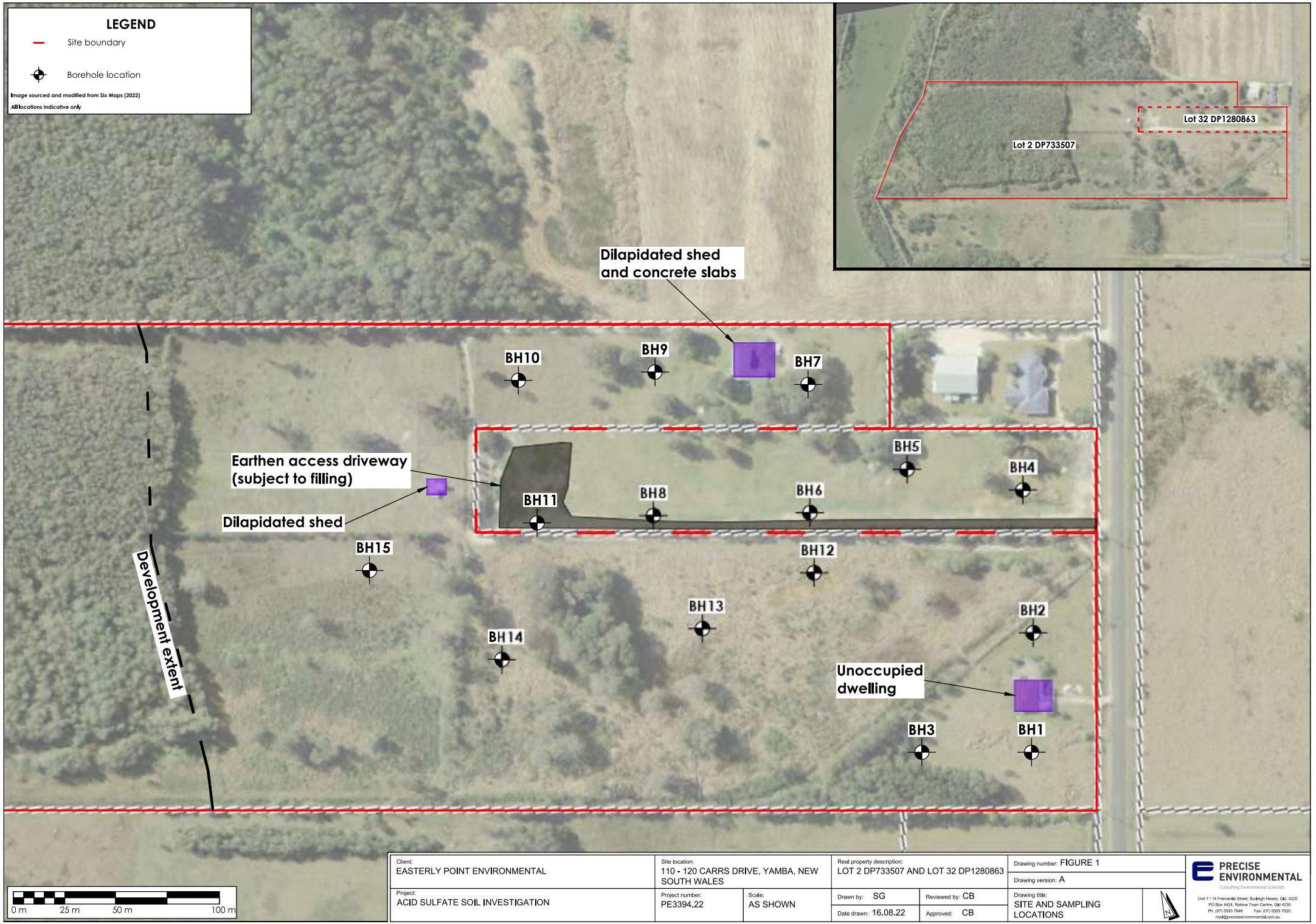
Ahern, C.R., Ahern, M.R. and Powell, B. 1998. *Guidelines for Sampling and Analysis of Lowland Acid Sulfate Soils (ASS) in Queensland 1998*. Queensland Department of Natural Resources, Resource Science Centre, Indooroopilly, Queensland, Australia. ISBN 0 7242 7442 1

Clarence Valley Local Environmental Plan 2011, July 2022, New South Wales Government

Dear, S-E., Ahern, C. R., O'Brien, L. E., Dobos, S. K., McElnea, A. E., Moore, N. G. & Watling, K. M., 2014. Queensland Acid Sulfate Soil Technical Manual: Soil Management Guidelines. Brisbane: Department of Science, Information Technology, Innovation and the Arts, Queensland Government.

GI. 2021. Preliminary Geotechnical Investigation for Proposed Manufactured Housing Estate at Carrs Drive, Yamba, NSW, Described as Lot 2 on DP733507, Geotech Investigatons Pty Ltd, 7 July 2022.

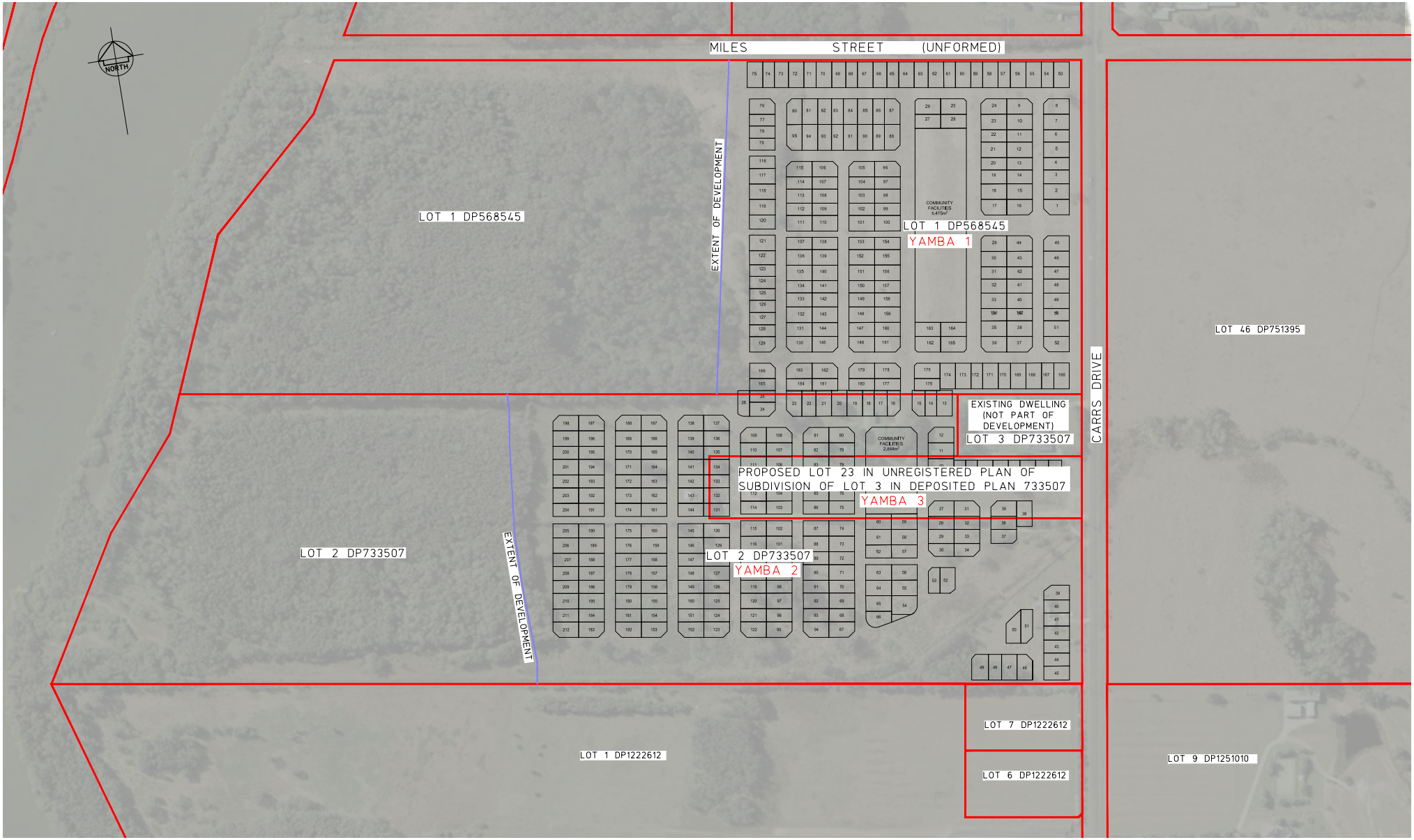
APPENDIX A – FIGURE



Client: EASTERLY POINT ENVIRONMENTAL	Site location: 110 - 120 CARRS DRIVE, YAMBA, NEW SOUTH WALES		Real property description: LOT 2 DP733507 AND LOT 32 DP1280863		Drawing number: FIGURE 1 Drawing version: A
Project: ACID SULFATE SOIL INVESTIGATION	Project number: PE3394.22	Scale: AS SHOWN	Drawn by: SG Date drawn: 16.08.22	Reviewed by: CB Approved: CB	Drawing title: SITE AND SAMPLING LOCATIONS

PRECISE ENVIRONMENTAL
Consulting Environmental Scientists
Unit 7 / 14 Fremantle Street, Burleigh Heads, Qld, 4220
PO Box 4424, Robina Town Centre, Qld 4230
Ph: (07) 5593 7848 Fax: (07) 5593 7020
mail@preciseenvironmental.com.au

APPENDIX B – PROPOSED SUBDIVISION LAYOUT AND PROPERTY REPORTS



30 15 0 30 60 90
Horizontal Scale 1:1500 (A1)
1:3000 (A3)

YAMBA 1:
LOT LAYOUT AS PER MASTERPLAN REV 16
TOTAL LOT YIELD 185

YAMBA 2 & 3:
LOT LAYOUT AS PER CONCEPT PLAN OPTION 3 REV 2
TOTAL LOTS YIELD 212

PLANS TO BE PRINTED IN COLOUR

PRELIMINARY FOR SITE PLANNING PURPOSES ONLY
NOT FOR CONSTRUCTION

NO ACCURACY SHOULD BE PLACED ON AERIAL IMAGE. AERIAL IMAGE IS FOR VISUAL PURPOSES ONLY

ISSUE	DESCRIPTION	DATE
3	MASTERPLAN LAYOUT OVERLAY ON AERIAL IMAGE YAMBA 1 & 2	02.12.2021
2	MASTERPLAN LAYOUT RE-ISSUED FOR CLIENT REVIEW	18.08.2021
1	MASTERPLAN LAYOUT RE-ISSUED FOR CLIENT REVIEW	23.07.2021
0	MASTERPLAN LAYOUT ISSUED FOR CLIENT REVIEW	28.06.2021

DESIGNED: T.RYDEN
DRAWN: A.SCHMID
SURVEYING:
DATE: DECEMBER 2021
SCALE: AS SHOWN
SHEET SIZE: A1

NOT FOR CONSTRUCTION

MANAGE-DESIGN-ENGINEER PTY LTD
PROJECT MANAGEMENT-CIVIL ENGINEERING-DESIGN-SURVEYING
SUITE 1, 64 BALLINA STREET, LENNOX HEAD NSW 2478
PO Box 44 LENNOX HEAD NSW 2478
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CLIENT: CLIFTON YAMBA LAND PTY LTD

TITLE: PROPOSED MANUFACTURED HOUSING ESTATE

PROJECT: CARRS DRIVE
YAMBA NSW
LOT 2 DP733507

CIVIL DRAWING

DRAWING TITLE: SITE MASTERPLAN
YAMBA 1 & 2 OVER AERIAL IMAGE

DWG No: 01
SHEET: 1 OF 1
REV: 3

APPENDIX C – STANDARD OPERATING PROCEDURES

SOP.PROC.001 - SOIL SAMPLING

1 PURPOSE AND SCOPE

This is a standard procedure for the collection of soil samples for environmental assessment. This procedure must be followed to ensure that soil samples are collected in an appropriate and consistent manner, that the soil sampling is appropriate for the media and analytes, and to allow the documentation of standard operating procedures used for soil sample collection and handling.

This procedure has been written for environmental soil sampling of *in situ* and *ex situ* soils and fills for general physical and chemical tests and non-volatile, semi-volatile, and volatile analyses.

2 DEFINITIONS

CoC - chain of custody form

OH&S - occupational health and safety

PID - photo-ionisation detector

VOCs - volatile organic compounds

3 REFERENCES

Guidance considered in preparing this standard operating procedure included:

- Australian Standard AS 4482.1. 2005. Guide to sampling and investigation of potentially contaminated soil, Part 1 Non-Volatile and semi-volatile compounds
- Australian Standard AS 4482.2. 1999. Guide to sampling and investigation of potentially contaminated soil, Part 2: Volatile substances
- Contaminated Sites: Sampling Design Guidelines. NSW Environmental Protection Authority (EPA 2005)
- National Environment Protection (Assessment of Site Contamination) Measure 1999, Schedule B (1) Guideline on the Investigation Levels for Soil and Groundwater, National Environment Protection Council Service Corporation (NEPC 2013)

4 GENERAL

Sampling locations and depths should be clearly stated in a sampling analysis quality plan (SAQP) prior to commencement of fieldwork.

A health and safety plan (HSP) should be produced or Safe Work Method Statement induction completed prior to the commencement of any field work.

Soil samples should be representative of the target depth, media and environmental condition from which they are collected. Soil samples should not be influenced by the method of extraction or sampling from the soil.

Soil samples should not be retained if they have come into direct contact with machinery or sampling equipment that has not been decontaminated.

In general samples should be collected at the surface and at depth at regular intervals consistent with the lithology or contaminant transport encountered during the assessment. This may include soil profiles or horizons or areas of contamination or media.

The assessor must record all information on how the samples were taken in the geological log including refusal or exceedance of equipment reach. The geological log should clearly document the reason sampling was discontinued and a description of material if it continues to greater depths.

Surface samples should be 0 – 0.10 m or 0 – 0.15 m and samples from depth should not exceed a depth range of 0.5 m to avoid compositing effects. Some land uses may require shallower surface samples, e.g. banana lands 0.075 m, and this should be established as part of the SAQP.

As a general rule, never composite samples unless stated in the SAQP.

5 PROCEDURE

5.1 Sample collection

All personnel who will come into contact with the soil must always use clean disposable gloves for each sample. Prevention of contamination exposure to personnel and cross-contamination of samples is paramount in soil sampling.

All sampling equipment is to be decontaminated before use and between samples

5.2 Sample collection

Once collected, samples are to be transferred immediately to the appropriate sample container, ensuring that the container is filled to the top so that no head-space remains.

5.3 Hand tools

Hand tools, including spatulas, trowels, shovels, spades, etc, can be used to collect samples from the land surface, walls and floors of test pits or excavations, stockpiles, etc.

The surface to be sampled is first to be cleared of any organic material, e.g. grass and roots, and the sample collected from fresh, exposed soil. Fresh soil should be exposed prior to sampling to remove any smear affects from the sampling equipment. Soil peds or clods should be removed from the auger or trowel and split so that samples can be taken from the middle of the peds or clods. The sampler should not sample from exposed surfaces which may not be representative of contamination, especially where release of volatiles may have occurred from the exposed soil.

Test pits or excavations are not to be entered unless appropriate assessment of stability has been conducted and documented. Test pits over 1 m depth are not to be entered.

5.4 Test pits

The sampler should direct the excavator operator as to where the sample is to be collected and ensure the location is accurate. The sampler must be aware of the 'swing zone' of the machine and follow *SOP_PROC_008-Vehicle and heavy machinery operations.*

Sampling from excavator buckets is permissible, providing the procedures in *Section 5.1 – 5.3* are adhered to by the sampler, where appropriate, and the following sampling quality controls are observed by the sampler:

- The sample must be collected from within soil clods or material which has not contacted the excavator bucket
- The bucket must be screened with a PID prior to sampling where volatiles are a contaminant of concern.

5.5 Soil cores

For push tubes, split spoons, etc, samples should be transferred directly to the sampling container and procedures in *Section 5.1 – 5.3* adhered to by the sampler, where appropriate.

5.6 Augers

Samples should be collected from the auger with a trowel by cutting away the outside and collecting soil from the centre of the auger bit. Samples should then be transferred directly to the sampling container. Procedures in *Section 5.1 – 5.3* must be adhered to by the sampler, where appropriate.

5.7 Field screening for VOCs

If volatiles are a contaminant of concern and field screening using a photo-ionisation detector (PID) is required, a sample should also be transferred to a snap-lock plastic bag. Refer to SOP_PROC_011- Measurement of volatiles – PIDs for field screening procedure.

5.8 Composite sampling

Composite sampling is used to reduce analytical costs and involves the bulking and thorough mixing of soil samples (collected as above) to form one composite sample for laboratory analysis. Generally, compositing is not encouraged and should only be undertaken if specifically stated in the SAQP. Samples should be sent to the laboratory for compositing with appropriate instructions recorded on the CoC. Composite sampling must not be undertaken where volatile substances are present, including BTEXN compounds and F1 TRHs / TRHs C_6 – C_9, or soils that have a high clay content.

Composite samples must be collected from the same soil/fill horizon and no more than four sub-samples should be included in a composite sample. The sub-samples should be equal in size, from immediately adjacent sampling points, evenly spaced, and composited laterally.

6 SAMPLE CONTAINERS

Sample containers from a NATA laboratory, usually 125 mL to 250 mL clear glass jars, are to be used by the sampler. This will ensure the jars are decontaminated, clean and dry, and of the appropriate size and material. Ensure the appropriate preservative is present if required, and all jars have a gastight, non-absorptive seal, which allow no headspace. The laboratory should be contacted if numerous and/or specialty analytes are required, to confirm the required sample container type and size.

6.1 Sample labelling

Samples should be labelled clearly on the outside wall of the container with the project number, sampler's initials, sample location, depth of sample and the date. The sample location and depth should also be provided on the container lid. All labelling should be with water proof pens/markers.

The sample location number should be followed by either the sample depth or a letter, e.g. BH1 0.0 - 0.15 or TP3 A.

6.2 Sample handling, storage and dispatch

The soil jars, once filled with sample with no head space, are to be wiped clean and wrapped in bubble wrap/padding, and immediately placed in a cooler such as an Esky. Coolers should be kept out of direct sunlight, hot vehicles, etc, as far as practical, and appropriate cooling media added (ice or ice bricks) to ensure samples are kept below 4˚C. For longer term storage, samples should be kept below 4˚C in a fridge/freezer.

A chain of custody (CoC) form is to be filled out and the CoC is to be sent with the sample/s to the laboratories. The CoC/s is to be placed in a snap-lock plastic bag or plastic folder to prevent damage. All samples sent to the laboratories are to be included on the CoC/s, and if no analyses required, marked as 'Hold'.

If additional air space exists in the cooler, this should be filled with scrunched up newspaper, bubble wrap or similar to minimise movement of the samples. Coolers are to be secured with heavy tape and security seals, and clearly show the laboratory and sender contact information.

All samples, including QC samples, are to be transported to the primary and secondary laboratories. If dispatch is by courier, coolers are not to be dispatched on Fridays (or days before public holidays) unless delivery the next day has been organised.

If samples cannot be dispatched on the day of sampling with refreshed ice-blocks or ice for transport, then the samples are to be refrigerated until dispatch. The laboratory should be contacted if any delays to dispatch occur to confirm holding times available prior to extraction/analysis.

6.3 Sample location logging

A geological log is to be completed for each sample location by a qualified environmental scientist. Logs are to be completed for all sample locations, including surface samples and *ex situ* samples.

The log is to include:

- Job details, date, location, methods, climatic conditions
- Soil classification (material type and texture), colour, consistency or density, odour, staining, presence of artefacts, moisture content, sample number, and depth
- Depth of water inflow and/or groundwater level, if encountered, and comments regarding water if required; depth of excavation/drilling, excavation/drilling refusal and any field measurements taken or other relevant field observations.

7 QA DOCUMENTATION

A CoC is to be completed for all samples sent to the laboratories and/or to be analysed by the laboratories. Samples not to be analysed should be described as "Hold".

The CoC is to detail laboratory reference numbers (including quotes),site identification, the samplers initials, nature of the sample, collection time and date, analyses to be performed, sample preservation method, any relevant comments, e.g. level contamination expected, level of quality control required and dispatch information and signature.

7.1 QC samples

QC sampling should be documented in the SAQP, which should include trip spikes and trip blanks as prepared by the laboratory and should be organised through the laboratory prior to conducting the field work. Trip spikes and trip blanks should be held for as little time as possible prior to the field work, and should be kept below 4°C in a fridge/freezer. After sample collection, trip spikes and trip blanks are to be handled as a primary sample, and should also be included on the CoC.

APPENDIX D – DATA TABLES

Table A.1: Soil results

12 July 2022		Screen testing				Chromium Reducible Sulfur suite (mol H+/t)				
Borehole	Sample depth	pH_F	pH_{FOX}	Change	Reaction	pH-KCl	Titratable actual acidity	S_{Cr}	Net acidity	Net acidity not including ANC (mol H^+/t)
		Laboratory limit of reporting								
		0.1	0.1	0.1	1	0.1	2	10	10	10
BH1	0	5.9	2.9	3.0	2	5.1	31	12	43	**43**
BH1	0.25	6.1	3.1	3.0	2	-	-	-	-	-
BH1	0.5	6	4.9	1.1	1	5.8	4	<10	13	13
BH1	0.75	6.3	5.4	0.9	1	-	-	-	-	-
BH1	1	6.1	4.8	1.3	1	5.7	4	<10	13	13
BH1	1.25	5.9	4.5	1.4	1	-	-	-	-	-
BH1	1.5	6.1	1.8	4.3	4	5.4	6	123	129	**129**
BH1	1.75	6	1.8	4.2	4	-	-	-	-	-
BH1	2	6.3	1.8	4.5	4	-	-	-	-	-
BH1	2.25	6.3	2.3	4.0	4	-	-	-	-	-
BH1	2.5	7.4	2	5.4	4	5.6	4	121	125	**125**
BH1	2.75	7.7	3.7	4.0	2	-	-	-	-	-
BH2	0	6.6	3.3	3.3	3	4.9	66	<10	74	**74**
BH2	0.25	6.6	3.8	2.8	2	-	-	-	-	-
BH2	0.5	6.6	5.1	1.5	1	-	-	-	-	-
BH2	0.75	6.3	4.9	1.4	1	-	-	-	-	-
BH2	1	6.4	4.3	2.1	2	-	-	-	-	-
BH2	1.25	6.3	2.1	4.2	4	-	-	-	-	-
BH2	1.5	6.1	1.8	4.3	4	-	-	-	-	-
BH2	1.75	6.3	2.1	4.2	4	-	-	-	-	-
BH3	0	6.1	2.8	3.3	3	4.5	128	10	138	**138**
BH3	0.25	6.2	3.6	2.6	2	-	-	-	-	-
BH3	0.5	6.4	4.6	1.8	2	-	-	-	-	-
BH3	0.75	6.4	5	1.4	1	-	-	-	-	-
BH3	1	6.3	4.2	2.1	2	-	-	-	-	-
BH3	1.25	6.3	1.8	4.5	4	-	-	-	-	-
BH3	1.5	6.4	1.8	4.6	4	-	-	-	-	-
BH3	1.75	7.1	1.8	5.3	4	-	-	-	-	-
BH4	0	6.6	2.7	3.9	3	5.4	17	24	41	**41**
BH4	0.25	6.8	3.2	3.6	3	-	-	-	-	-
BH4	0.5	7.2	4.1	3.1	2	5.8	9	17	26	**26**
BH4	1	7.2	1.4	5.8	4	5.9	2	139	142	**142**
BH4	1.25	7.2	1.6	5.6	4	-	-	-	-	-
BH4	1.5	7	2	5.0	4	5.7	3	116	120	**120**
BH4	1.75	6.9	1.6	5.3	4	-	-	-	-	-
BH4	2	6.8	1.9	4.9	4	-	-	-	-	-
BH4	2.25	7.4	1.9	5.5	4	6	<2	94	94	**94**
BH5	0	6.5	4.6	1.9	3	-	-	-	-	-
BH5	0.5	6.7	5.3	1.4	1	-	-	-	-	-
BH5	0.75	6.4	5.3	1.1	1	-	-	-	-	-
BH5	1	5.6	3.3	2.3	2	-	-	-	-	-
BH5	1.25	5.1	1.8	3.3	4	-	-	-	-	-
BH5	1.5	5	2	3.0	4	-	-	-	-	-
BH5	1.75	5.4	1.8	3.6	4	-	-	-	-	-
Action criteria - disturbances > 1,000 m^3										**18**

Notes:

nd denotes laboratory limits of detection

- denotes not applicable or no criterion

Action criteria applicable to disturbances of untreated soil > 1,000 m^3 - Refer Section 4.1 of the Soil Management Guidelines (Dear et. al. 2014).

Performance criteria applicable to soil treated using neutralisation - Refer Section 8.2.1 of the Soil Management Guidelines (Dear et. al. 2014) for allowable variations in net acidity greater than laboratory limit of reporting.

BOLD denotes non-compliance with action / performance criteria.

Table A.2: Soil results

12 July 2022		Screen testing				Chromium Reducible Sulfur suite (mol H+/t)				
Borehole	Sample depth	pH_F	pH_{FOX}	Change	Reaction	pH-KCl	Titratable actual acidity	S_{Cr}	Net acidity	Net acidity not including ANC (mol H^+/t)
		Laboratory limit of reporting								
		0.1	**0.1**	**0.1**	**1**	**0.1**	**2**	**10**	**10**	**10**
BH6	0	5.6	2.9	2.7	3	5.3	12	14	26	**26**
BH6	0.25	5.7	2.6	3.1	3	-	-	-	-	-
BH6	0.5	5.6	2.5	3.1	3	4.7	45	16	61	**61**
BH6	0.75	5.8	3.1	2.7	3	-	-	-	-	-
BH6	1	6.1	4.1	2.0	2	5.2	15	12	27	**27**
BH6	1.25	5.7	3	2.7	2	-	-	-	-	-
BH6	1.5	6	1.9	4.1	4	5.3	10	88	97	**97**
BH6	1.75	6.2	1.8	4.4	4	-	-	-	-	-
BH6	2	6.3	2	4.3	4	-	-	-	-	-
BH6	2.25	6.3	2	4.3	4	-	-	-	-	-
BH6	2.5	6.2	2.1	4.1	4	5.4	8	100	108	**108**
BH6	2.75	5.6	1.8	3.8	4	-	-	-	-	-
BH7	0	5.4	3.5	1.9	3	4.6	106	11	117	**117**
BH7	0.25	5.8	3.8	2.0	2	-	-	-	-	-
BH7	0.5	5.4	4.7	0.7	2	-	-	-	-	-
BH7	0.75	6	4.6	1.4	2	-	-	-	-	-
BH7	1	5.5	2.1	3.4	4	-	-	-	-	-
BH7	1.25	5.6	1.7	3.9	4	-	-	-	-	-
BH7	1.5	5.9	1.8	4.1	4	-	-	-	-	-
BH7	1.75	6	1.6	4.4	4	-	-	-	-	-
BH8	0	5.7	2.4	3.3	3	4.8	40	<10	49	**49**
BH8	0.25	5.7	2.9	2.8	3	4.7	44	11	55	**55**
BH8	0.5	5.8	4.2	1.6	1	5.8	<2	12	12	12
BH8	0.75	5.6	3.6	2.0	1	-	-	-	-	-
BH8	1	5.9	2	3.9	1	-	-	-	-	-
BH8	1.25	6	2.1	3.9	4	-	-	-	-	-
BH8	1.5	5.8	2.3	3.5	4	-	-	-	-	-
BH8	1.75	5.8	2	3.8	4	-	-	-	-	-
BH9	0	5.8	2.4	3.4	3	4.6	79	18	98	**98**
BH9	0.25	5.9	2.8	3.1	3	-	-	-	-	-
BH9	0.5	6.2	3.8	2.4	1	5.8	<2	<10	<10	<10
BH9	0.75	6.3	4.2	2.1	1	-	-	-	-	-
BH9	1	6.4	2	4.4	1	5.6	3	23	26	**26**
BH9	1.25	5.6	1.9	3.7	1	-	-	-	-	-
BH9	1.5	5.1	1.8	3.3	1	5.2	7	77	84	**84**
BH9	1.75	5.2	1.7	3.5	1	-	-	-	-	-
BH10	0	5.4	2.6	2.8	3	4.8	42	14	56	**56**
BH10	0.25	5.7	3.5	2.2	2	-	-	-	-	-
BH10	0.5	5.4	3	2.4	2	-	-	-	-	-
BH10	0.75	5.7	2.5	3.2	2	-	-	-	-	-
BH10	1	5.8	2.2	3.6	4	-	-	-	-	-
BH10	1.25	5.7	2.1	3.6	4	-	-	-	-	-
BH10	1.5	5.5	2	3.5	4	-	-	-	-	-
BH10	1.75	5.6	2.3	3.3	4	-	-	-	-	-
Action criteria - disturbances > 1,000 m^3										**18**

Notes:

nd denotes laboratory limits of detection

- denotes not applicable or no criterion

Action criteria applicable to disturbances of untreated soil > 1,000 m^3 - Refer Section 4.1 of the Soil Management Guidelines (Dear et. al. 2014).

Performance criteria applicable to soil treated using neutralisation - Refer Section 8.2.1 of the Soil Management Guidelines (Dear et. al. 2014) for allowable variations in net acidity greater than laboratory limit of reporting.

BOLD denotes non-compliance with action / performance criteria.

Table A.3: Soil results

12 July 2022		Screen testing				Chromium Reducible Sulfur suite (mol H+/t)				
Borehole	Sample depth	pH_F	pH_{FOX}	Change	Reaction	pH-KCl	Titratable actual acidity	S_{Cr}	Net acidity	Net acidity not including ANC (mol H^+/t)
		Laboratory limit of reporting								
		0.1	**0.1**	**0.1**	**1**	**0.1**	**2**	**10**	**10**	**10**
BH11	0	5.8	2.7	3.1	3	6.1	4	12	16	16
BH11	0.25	5.7	2.8	2.9	3	-	-	-	-	-
BH11	0.5	5	3	2.0	3	5.1	32	<10	39	**39**
BH11	0.75	5.1	2.5	2.6	3	4.8	49	<10	57	**57**
BH11	1	5.5	2.6	2.9	3	5.5	8	<10	16	16
BH11	1.25	5.5	2.2	3.3	1	-	-	-	-	-
BH11	1.5	5.3	2.2	3.1	4	5.4	5	132	138	**138**
BH11	1.75	5.2	2.1	3.1	4	-	-	-	-	-
BH11	2	5.5	2	3.5	4	-	-	-	-	-
BH11	2.25	5.4	2	3.4	4	-	-	-	-	-
BH11	2.5	5.5	2	3.5	4	5.5	4	118	122	**122**
BH11	2.75	5.5	2.2	3.3	4	-	-	-	-	-
BH12	0	5.3	2.9	2.4	2	4.6	66	<10	74	**74**
BH12	0.25	5.6	3	2.6	2	-	-	-	-	-
BH12	0.5	5.6	4.2	1.4	1	-	-	-	-	-
BH12	0.75	5.5	3.6	1.9	1	-	-	-	-	-
BH12	1	5.9	2	3.9	4	-	-	-	-	-
BH12	1.25	5.4	2	3.4	4	-	-	-	-	-
BH12	1.5	5.4	2.1	3.3	4	-	-	-	-	-
BH12	1.75	5.2	2.1	3.1	4	-	-	-	-	-
BH13	0	5.3	2.1	3.2	3	4.6	87	<10	96	**96**
BH13	0.25	4.8	2.7	2.1	3	-	-	-	-	-
BH13	0.5	6	3	3.0	2	-	-	-	-	-
BH13	0.75	5.9	3.8	2.1	1	-	-	-	-	-
BH13	1	6	2.1	3.9	4	-	-	-	-	-
BH13	1.25	6	2.1	3.9	4	-	-	-	-	-
BH13	1.5	5.9	2	3.9	4	-	-	-	-	-
BH13	1.75	6	2.1	3.9	4	-	-	-	-	-
BH14	0	5.5	2.8	2.7	3	4.5	124	15	138	**138**
BH14	0.25	5.6	3.3	2.3	1	-	-	-	-	-
BH14	0.5	5.5	3.6	1.9	1	5.6	4	<10	13	13
BH14	0.75	5.9	3.4	2.5	1	-	-	-	-	-
BH14	1	5.9	2	3.9	4	5.3	7	67	74	**74**
BH14	1.25	6.2	2	4.2	4	-	-	-	-	-
BH14	1.5	6	2.1	3.9	4	5	11	58	69	**69**
BH14	1.75	6.1	2	4.1	4	-	-	-	-	-
BH15	0	5.7	3	2.7	3	4.6	108	13	121	**121**
BH15	0.25	5.6	3.3	2.3	3	-	-	-	-	-
BH15	0.5	6.3	3.6	2.7	1	5.8	4	<10	14	14
BH15	0.75	6.4	4.3	2.1	1	-	-	-	-	-
BH15	1	6.6	1.9	4.7	1	5.6	4	67	71	**71**
BH15	1.25	6.8	2.1	4.7	4	-	-	-	-	-
BH15	1.5	6.9	2	4.9	1	-	-	-	-	-
BH15	1.75	7	1.9	5.1	1	-	-	-	-	-
Action criteria - disturbances > 1,000 m^3										**18**

Notes:

nd denotes laboratory limits of detection

- denotes not applicable or no criterion

Action criteria applicable to disturbances of untreated soil > 1,000 m^3 - Refer Section 4.1 of the Soil Management Guidelines (Dear et. al. 2014).

Performance criteria applicable to soil treated using neutralisation - Refer Section 8.2.1 of the Soil Management Guidelines (Dear et. al. 2014) for allowable variations in net acidity greater than laboratory limit of reporting.

BOLD denotes non-compliance with action / performance criteria.

Table B.1: Fill soils chromium suite results and calculated liming rates

12 July 2022				Chromium Reducible Sulfur suite (mol H+/t)					
Borehole	Sample depth	Predominant soil type	Wet	pH-KCl	Titratable actual acidity	S_{Cr}	Net acidity	Net acidity not including ANC (mol H^+/t)	Calculated liming rate (kg $CaCO_3$ / m^3)
				Limit of reporting					
				0.1	2	10	10	10	
BH6	0.5	Clay - F	No	4.7	45	16	61	61	8.5
BH8	0	Clay - F	No	4.8	40	5	49	49	6.8
BH8	0.25	Clay - F	No	4.7	44	11	55	55	7.7
BH11	0.5	Clay - F	No	5.1	32	5	39	39	5.4
Statistics									
Minimum				4.7	32	5	39	39	5.4
Mean				4.8	40.3	9.3	51.0	51.0	7.1
Median				4.75	42	8	52	52	7.2
Maximum				5.1	45	16	61	61	8.5
95%ile				5.1	44.9	15.3	60.1	60.1	8.4
Standard deviation				0.2	5.9	5.3	9.4	9.4	

Table notes:
Half LOR applied for results less than laboratory detection limits (grey shaded cells)

Table B.2: Natural clay chromium suite results and calculated liming rates

12 July 2022				Chromium Reducible Sulfur suite (mol H+/t)					
Borehole	Sample depth	Predominant soil type	Wet	pH-KCl	Titratable actual acidity	S_{Cr}	Net acidity	Net acidity not including ANC (mol H^+/t)	Calculated liming rate (kg $CaCO_3$ / m^3)
				Limit of reporting					
				0.1	2	10	10	10	
BH1	0	Clay - N	No	5.1	31	12	43	43	6.0
BH4	0	Clay - N	No	5.4	17	24	41	41	5.7
BH7	0	Clay - N	No	4.6	106	11	117	117	16.3
BH12	0	Clay - N	No	4.6	66	5	74	74	10.3
BH13	0	Clay - N	No	4.6	87	5	96	96	13.4
BH14	0	Clay - N	No	4.5	124	15	138	138	19.2
BH15	0	Clay - N	No	4.6	108	13	121	121	16.8
BH2	0	Clay - N	No	4.9	66	5	74	74	10.3
BH3	0	Clay - N	No	4.5	128	10	138	138	19.2
BH9	0	Clay - N	No	4.6	79	18	98	98	13.6
BH10	0	Clay - N	No	4.8	42	14	56	56	7.8
BH4	0.5	Clay - N	No	5.8	9	17	26	26	3.6
BH9	0.5	Clay - N	No	5.8	1	5	5	5	0.7
BH11	0.75	Clay - N	No	4.8	49	5	57	57	7.9
Statistics									
Minimum				4.5	1	5	5	5	0.7
Mean				4.9	67.8	11.3	80.1	80.1	11.1
Median				4.6	66	11	74	74	10.3
Maximum				5.8	128	24	138	138	19.2
95%ile				5.8	125.6	20.4	138.0	138.0	19.2
Standard deviation				0.5	42.7	6.2	42.4	42.4	

Table notes:
Half LOR applied for results less than laboratory detection limits (grey shaded cells)

Table B.3: Natural sand chromium suite results and calculated liming rates

12 July 2022				Chromium Reducible Sulfur suite (mol H+/t)					
Borehole	Sample depth	Predominant soil type	Wet	pH-KCl	Titratable actual acidity	S_{Cr}	Net acidity	Net acidity not including ANC (mol H^+/t)	Calculated liming rate (kg $CaCO_3$ / m^3)
				Limit of reporting					
				0.1	2	10	10	10	
BH8	0.5	Sand - N	Yes	5.8	1	12	12	12	1.7
BH1	0.5	Sand - N	Yes	5.8	4	5	13	13	1.8
BH14	0.5	Sand - N	Yes	5.6	4	5	13	13	1.8
BH15	0.5	Sand - N	Yes	5.8	4	5	14	14	1.9
BH4	1	Sand - N	Yes	5.9	2	139	142	142	19.8
BH9	1	Sand - N	Yes	5.6	3	23	26	26	3.6
BH11	1	Sand - N	No	5.5	8	5	16	16	2.2
BH14	1	Sand - N	Yes	5.3	7	67	74	74	10.3
BH1	1	Sand - N	Yes	5.7	4	5	13	13	1.8
BH6	1	Sand - N	Yes	5.2	15	12	27	27	3.8
BH15	1	Sand - N	Yes	5.6	4	67	71	71	9.9
BH1	1.5	Sand - N	Yes	5.4	6	123	129	129	17.9
BH4	1.5	Sand - N	Yes	5.7	3	116	120	120	16.7
BH6	1.5	Sand - N	Yes	5.3	10	88	97	97	13.5
BH9	1.5	Sand - N	Yes	5.2	7	77	84	84	11.7
BH11	1.5	Sand - N	Yes	5.4	5	132	138	138	19.2
BH14	1.5	Sand - N	Yes	5	11	58	69	69	9.6
BH4	2.25	Sand - N	Yes	6	1	94	94	94	13.1
BH1	2.5	Sand - N	Yes	5.6	4	121	125	125	17.4
BH6	2.5	Sand - N	Yes	5.4	8	100	108	108	15.0
BH11	2.5	Sand - N	Yes	5.5	4	118	122	122	17.0
Statistics									
Minimum				5	1	5	13	13	1.8
Mean				5.5	5.7	68.0	74.8	74.8	10.4
Median				5.55	4	72	79	79	11.0
Maximum				6	15	139	142	142	19.8
95%ile				5.9	11.2	132.4	138.2	138.0	19.2
Standard deviation				0.3	3.4	49.8	47.9	47.9	

Table notes:
Half LOR applied for results less than laboratory detection limits (grey shaded cells)

APPENDIX E – SOIL PROFILE DESCRIPTIONS

Table A. Soil profile description and sample analysis logs

Client:	Easterly Point Environmental			**Site Address:**	120 Carrs Drive, Yamba, New South Wales		**Commenced**	12 July 2022	**Key Results**				
							Completed:	12 July 2022					
Project:	Acid Sulfate Soil Investigation and Management Plan			**RPD:**	Lot 2 DP733507 and Lot 32 DP1280863		**Logged by:**	Chris Butler					
Project Number:	PE3394.22				**Equipment Type:**	Track mounted rig - solid stem augers	**Checked by:**	Sean Gardiner					
BOREHOLE	**FILL/NATURAL**	**DEPTH (m)**	**MATERIAL CLASSIFICATION**	**MATERIAL CONSTITUENTS**	**COLOUR**	**OTHER MATERIALS**	**SEEPAGE**	**ODOUR**	**FIELD SCREEN SAMPLE DEPTH**	**CHROMIUM SUITE SAMPLE DEPTH**	**Titratable actual acidity results (mol H^+/t)**	**S_{cr} (potential acidity)**	**Net acidity not including ANC (mol H^+/t)**
BH1	Natural	0.0	Sandy Light Clay	Fine to medium grained sand, moist	Brown	Organics	Nil	Nil	0.0 - 0.25	0.0 - 0.25	31	12	43
		0.25	Sandy Light to Medium Clay	Fine to medium grainded sand, moist	Brown	Trace organics	Nil	Nil	0.25 - 0.5	-	-	-	-
		0.5	Sand	Fine to medium grained, wet	Yellow brown	Trace silt	Yes	Nil	0.5 - 0.75	0.5 - 0.75	4	<10	13
									0.75 - 1.0	-	-	-	-
									1.0 - 1.25	1.0 - 1.25	4	<10	13
		1.25	Sand	Fine to medium grained, wet	Grey	Trace silt	Nil	Nil	1.25 - 1.5	-	-	-	-
									1.5 - 1.75	1.5 - 1.75	6	123	129
									1.75 - 2.0	-	-	-	-
									2.0 - 2.25	-	-	-	-
									2.25 - 2.5	-	-	-	-
									2.5 - 2.75	2.5 - 2.75	4	121	125
									2.75 - 3.0	-	-	-	-
		3.0	Borehole terminated										
BH2	Natural	0.0	Silty Medium Clay	Moist	Dark grey	Trace fine grained sand	Nil	Nil	0.0 - 0.25	0.0 - 0.25	66	<10	74
		0.25	Sandy Light to Medium Clay	Fine to medium grained sand, moist	Grey yellow orange	-	Nil	Nil	0.25 - 0.4	-	-	-	-
		0.40	Clayey Sand	Fine to medium grained sand, moist	Grey yellow orange	-	Nil	Nil	-	-	-	-	-
		0.50	Sand	Fine to medium grained, wet	Grey	-	Yes	Nil	0.5 - 0.75	-	-	-	-
		1.25	Sand	Fine to medium grained, wet	Grey	Trace silt	Nil	Nil	1.25 - 1.5	-	-	-	-
		2.0	Borehole terminated										
BH3	Natural	0.0	Silty Medium Clay	Moist	Dark grey	Trace fine grained sand	Nil	Nil	0.0 - 0.25	0.0 - 0.25	128	10	138
		0.25	Sandy Medium Clay	Fine to medium grained sand, abundant organics, moist	Grey orange brown mottled	-	Nil	Nil	0.25 - 0.5	-	-	-	-
		0.50	Sand	Fine grained, wet	Yellow brown	-	Yes	Nil	0.5 - 0.75	-	-	-	-
									0.75 - 1.0	-	-	-	-
									1.0 - 1.2	-	-	-	-
		1.20	Sand	Fine grained, wet	Grey	-	Nil	Nil	1.25 - 1.5	-	-	-	-
									1.5 - 1.75	-	-	-	-
									1.75 - 2.0	-	-	-	-
		2.0	Borehole terminated										
BH4	Natural	0.0	Sandy Medium Clay	Fine to coarse grained sand, moist to very moist	Brown	-	Nil	Nil	0.0 - 0.25	0.0 - 0.25	17	24	41
									0.25 - 0.5	-	-	-	-
		0.5	Sandy Heavy Clay	Fine to medium grained sand, moist	Brown with orange mottles	-	Nil	Nil	0.5 - 0.75	0.5 - 0.75	9	17	26
									0.75 - 0.9	-	-	-	-
		0.9	Silty Sand	Fine to coarse grained sand, wet	Grey	-	Yes	Nil	1.0 - 1.25	1.0 - 1.25	2	139	142
									1.25 - 1.5	-	-	-	-
									1.5 - 1.75	1.5 - 1.75	3	116	120
									1.75 - 2.0	-	-	-	-
									2.0 - 2.25	-	-	-	-
									2.25 - 2.5	2.25 - 2.5	<2	94	94
		3.0	Borehole terminated										
BH5	Natural	0.0	Clayey Sand	Fine to coarse grained sand, very moist	Dark grey	-	Nil	Nil	0.0 - 0.25	-	-	-	-
		0.4	Sand	Fine to medium grained, very moist	Brown grey with orange mottles	-	Nil	Nil	0.5 - 0.75	-	-	-	-
									0.75 - 0.9	-	-	-	-
		0.9	Sand	Fine to medium grained, wet	Brown grey with orange	-	Yes	Nil	1.0 - 1.1	-	-	-	-
		1.1	Sand	Fine to medium grained, wet	Grey	-	Nil	Nil	1.25 - 1.5	-	-	-	-
									1.5 - 1.75	-	-	-	-
									1.75 - 2.0	-	-	-	-
									2.0 - 2.25	-	-	-	-
		3.0	Borehole terminated										
BH6	Fill	0.0	Clayey Sand	Fine to medium grained sand, moist	Orange grey brown	-	Nil	Nil	0.0 - 0.2	0.0 - 0.2	12	14	26
		0.2	Sandy Light Clay	Fine to medium grained sand, moist	Grey black	-	Nil	Nil	0.25 - 0.5	-	-	-	-
									0.5 - 0.75	0.5 - 0.75	45	16	61
									0.75 - 0.8	-	-	-	-
	Natural	0.8	Clayey Sand	Fine to coarse grained sand, wet	Brown grey	-	Yes	Nil	-	-	-	-	-
		1.0	Sand	Fine to coarse grained, wet	Brown grey with orange mottles	-	Nil	Nil	1.0 - 1.25	1.0 - 1.25	15	12	27
									1.25 - 1.5	-	-	-	-
		1.5	Sand	Fine to coarse grained, wet	Grey	-	Nil	Nil	1.5 - 1.75	1.5 - 1.75	10	88	97
									1.75 - 2.0	-	-	-	-
									2.0 - 2.25	-	-	-	-
									2.25 - 2.5	-	-	-	-
									2.5 - 2.75	2.5 - 2.75	8	100	107
									2.75 - 3.0	-	-	-	-
		3.0	Borehole terminated										
BH7	Natural	0.0	Sandy silty medium clay	Fine to medium grained sand, moist	Dark brown	-	Nil	Nil	0.0 - 0.25	0.0 - 0.25	106	11	117
		0.25	Clayey Sand	Fine to coarse grained sand, very moist	Yellow brown	-	Nil	Nil	0.25 - 0.4	-	-	-	-
		0.4	Sand	Fine to coarse grained, wet	Grey yellow brown	-	Yes	Nil	0.5 - 0.75	-	-	-	-
									0.75 - 1.0	-	-	-	-
									1.0 - 1.25	-	-	-	-
		1.25	Sand	Fine to coarse grained, wet	Grey	-	Nil	Nil	1.25 - 1.5	-	-	-	-
									1.5 - 1.75	-	-	-	-
									1.75 - 2.0	-	-	-	-
		2.0	Borehole terminated										
BH8	Fill	0.0	Sandy Light Clay	Fine to medium grained sand, moist	Dark grey with brown mottles	-	Nil	Nil	0.0 - 0.25	0.0 - 0.25	40	<10	49
		0.25	Silty Sandy Heavy Clay	Fine to medium grained sand, moist	Grey with orange mottles	-	Nil	Nil	0.25 - 0.5	0.25 - 0.5	44	11	55
	Natural	0.5	Sand	Fine to medium grained, wet	Grey	-	Yes	Nil	0.5 - 0.75	0.5 - 0.75	<2	12	12
									0.75 - 1.0	-	-	-	-
									1.0 - 1.25	-	-	-	-
									1.25 - 1.5	-	-	-	-
									1.5 - 1.75	-	-	-	-
									1.75 - 2.0	-	-	-	-
		2.0	Borehole terminated										

Table A. Soil profile description and sample analysis logs

Client:	Easterly Point Environmental			**Site Address:**	110 - 120 Carrs Drive, Yamba, New South Wales	**Commenced**	12 July 2022	**Key Results**				
						Completed:	12 July 2022					
Project:	Acid Sulfate Soil Investigation and Management Plan			**RPD:**	Lot 2 DP733507 and Lot 32 DP1280863	**Logged by:**	Chris Butler					
Project Number:	PE3394.22			**Equipment Type:**	Track mounted rig solid stem augers	**Checked by:**	Sean Gardiner					

BOREHOLE	FILL/NATURAL	DEPTH (m)	MATERIAL CLASSIFICATION	MATERIAL CONSTITUENTS	COLOUR	OTHER MATERIALS	SEEPAGE	ODOUR	FIELD SCREEN SAMPLE DEPTH	CHROMIUM SUITE SAMPLE DEPTH	Titratable actual acidity results (mol H^+/t)	S_{Cr} (potential acidity)	Net acidity not including ANC (mol H^+/t)
BH9	Natural	0.0	Sandy Light Clay	Fine to medium grained, sand, moist	Dark grey	Trace tree roots and	Nil	Nil	0.0 - 0.25	0.0 - 0.25	79	18	98
		0.25	Sandy Medium Clay	Fine to medium grained sand, moist to very moist	Grey with orange mottles	-	Nil	Nil	0.25 - 0.5	-	-	-	-
									0.5 - 0.7	0.5 - 0.7	<2	<10	<10
		0.7	Sand	Fine to medium grained, wet	Brown	-	Yes	Nil	0.75 - 1.0	-	-	-	-
		1.0	Sand	Fine to medium grained, wet	Grey	Trace of silt	Nil	Nil	1.0 - 1.25	1.0 - 1.25	3	23	26
									1.25 - 1.5	-	-	-	-
									1.5 - 1.75	1.5 - 1.75	7	77	84
									1.75 - 2.0	-	-	-	-
		2.0	Borehole terminated										
BH10	Natural	0.0	Sandy Light to Medium Clay	Fine to medium grained sand, moist	Dark grey	Trace tree roots	Nil	Nil	0.0 - 0.25	0.0 - 0.25	42	14	56
		0.25	Clayey Sand	Fine to medium grained sand, wet	Grey brown	-	Yes	Nil	0.25 - 0.4	-	-	-	-
		0.4	Sand	Fine to medium grained, wet	Yellow brown	-	Nil	Nil	0.5 - 0.75	-	-	-	-
									0.75 - 1.0	-	-	-	-
		0.9	Sand	Fine to medium grained, wet	Grey	-	Nil	Nil	1.0 - 1.25	-	-	-	-
									1.25 - 1.5	-	-	-	-
									1.5 - 1.75	-	-	-	-
									1.75 - 2.0	-	-	-	-
		2.0	Borehole terminated										
BH11	Fill	0.0	Sand	Fine to medium grained, moist	Grey	-	Nil	Nil	0.0 - 0.25	0.0 - 0.25	4	12	16
		0.25	Sandy Light Clay	Fine to medium grained sand, moist	Grey with dark grey mottles	-	Nil	Nil	0.25 - 0.5	-	-	-	-
									0.5 - 0.75	0.5 - 0.75	32	<10	39
	Natural	0.75	Sandy Light Clay	Fine to medium grained sand, moist	Dark grey	Trace organics	Nil	Nil	0.75 - 0.95	0.75 - 0.95	49	<10	57
		0.95	Sand	Fine to medium grained, moist	Grey	-	Nil	Nil	1.0 - 1.2	1.0 - 1.2	8	<10	16
		1.2	Sand	Fine to medium grained, moist	Light grey	-	Nil	Nil	1.25 - 1.5	-	-	-	-
		1.5	Sand	Fine to medium grained, wet	Light grey	-	Yes	Nil	1.5 - 1.75	1.5 - 1.75	5	132	138
									1.75 - 2.0	-	-	-	-
									2.0 - 2.25	-	-	-	-
									2.25 - 2.5	-	-	-	-
									2.5 - 2.75	2.5 - 2.75	4	118	122
									2.75 - 3.0	-	-	-	-
		3.0	Borehole terminated										
BH12	Natural	0.0	Silty Medium Clay	-	Brown	Moderate organics	Nil	Nil	0.0 - 0.25	0.0 - 0.25	66	<10	74
		0.25	Sand	Fine to coarse grained, wet	Brown	-	Yes	Nil	0.25 - 0.5	-	-	-	-
									0.5 - 0.75	-	-	-	-
									0.75 - 1.0	-	-	-	-
		1.0	Sand	Fine to coarse grained, wet	Grey	-	Nil	Nil	1.0 - 1.25	-	-	-	-
									1.25 - 1.5	-	-	-	-
									1.5 - 1.75	-	-	-	-
									1.75 - 2.0	-	-	-	-
		2.0	Borehole terminated										
BH13	Natural	0.0	Sandy Light Clay	Fine to medium grained sand, very moist	Dark brown	-	Nil	Nil	0.0 - 0.25	0.0 - 0.25	87	<10	96
		0.25	Sandy Light Clay	Fine to medium grained sand, very moist	Grey with orange mottles	-	Nil	Nil	0.25 - 0.5	-	-	-	-
		0.5	Sand	Fine to coarse grained, wet	Brown grey	-	Yes	Nil	0.5 - 0.75	-	-	-	-
									0.75 - 1.0	-	-	-	-
									1.0 - 1.25	-	-	-	-
									1.25 - 1.5	-	-	-	-
									1.5 - 1.75	-	-	-	-
									1.75 - 2.0	-	-	-	-
		2.0	Borehole terminated										
BH14	Natural	0.0	Sandy Light Clay	Fine to medium grained sand, very moist	Dark brown	-	Nil	Nil	0.0 - 0.2	0.0 - 0.2	124	15	138
		0.2	Sandy Light Clay	Fine to medium grained sand, very moist	Grey with orange mottles	-	Nil	Nil	0.25 - 0.5	-	-	-	-
		0.5	Sand	Fine to coarse grained, wet	Grey orange	-	Yes	Nil	0.5 - 0.75	0.5 - 0.75	4	<10	13
									0.75 - 1.0	-	-	-	-
		1.0	Sand	Fine to coarse grained, wet	Grey	-	Nil	Nil	1.0 - 1.25	1.0 - 1.25	7	67	74
									1.25 - 1.5	-	-	-	-
									1.5 - 1.75	1.5 - 1.75	11	69	69
									1.75 - 2.0	-	-	-	-
		2.0	Borehole terminated										
BH15	Natural	0.0	Sandy Light Clay	Fine to medium grained sand, very moist	Dark brown	-	Nil	Nil	0.0 - 0.25	0.0 - 0.25	108	13	121
		0.25	Sandy Light Clay	Fine to medium grained sand, very moist	Grey with orange mottles	-	Nil	Nil	0.25 - 0.5	-	-	-	-
		0.5	Sand	Fine to coarse grained, wet	Grey brown	-	Yes	Nil	0.5 - 0.75	0.5 - 0.75	4	<10	14
									0.75 - 1.0	-	-	-	-
									1.0 - 1.25	1.0 - 1.25	4	67	71
									1.25 - 1.5	-	-	-	-
		1.5	Sand	Fine to coarse grained, wet	Grey	-	Nil	Nil	1.5 - 1.75	-	-	-	-
									1.75 - 2.0	-	-	-	-
		2.0	Borehole terminated										

APPENDIX F – LABORATORY CERTIFICATES OF ANALYSIS

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EB2220520**

Client	: **PRECISE ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR CHRIS BUTLER	Contact	: Nidhi Bhimani
Address	: PO BOX 4424 ROBINA TOWN CENTRE QLD, AUSTRALIA 4230	Address	: 2 Byth Street Stafford QLD Australia 4053
E-mail	: mail@preciseenvironmental.com.au	E-mail	: nidhi.bhimani@alsglobal.com
Telephone	: ----	Telephone	: +61-7-3243 7222
Facsimile	: ----	Facsimile	: +61-7-3243 7218
Project	: PE3394.22	Page	: 1 of 4
Order number	: PE3394.22	Quote number	: EB2017PREENV0003 (EN/222)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: CHRIS BUTLER, SEAN GARDINER		

Dates

Date Samples Received	: 14-Jul-2022 11:35	Issue Date	: 14-Jul-2022
Client Requested Due Date	: 21-Jul-2022	Scheduled Reporting Date	: **21-Jul-2022**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Intact.
No. of coolers/boxes	: 4	Temperature	: 3.8, 5.0, 3.4, 4.4°C - Ice present
Receipt Detail	: HARD ESKY	No. of samples received / analysed	: 68 / 68

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please be advised that the container for "BH10 1.75"(ALS ID#24) was received, labelled as "10". As all other "BH10" samples have been accounted for, this container will be reported as this sample. If you wish to discuss this further, please contact Client Services at ALSEnviro.Brisbane@alsglobal.com.**
- **SPLIT WORK ORDER: It should be noted that ALS has split this work order over the following work orders EB2220520 and EB2220427 due to the size of the sample numbers. For any further information regarding this processing of samples please contact ALS client services division on ALSEnviro.Brisbane@alsglobal.com**
- Discounted Package Prices apply only when specific ALS Group Codes ('W', 'S', 'NT' suites) are referenced on COCs.
- Please direct any turn around / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months ± 1 week) from receipt of samples.
- Analysis will be conducted by ALS Environmental, Brisbane, NATA accreditation no. 825, Site No. 818 (Micro site no. 18958).
- **Breaches in recommended extraction / analysis holding times (if any) are displayed overleaf in the Proactive Holding Time Report table.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The laboratory will process these samples unless instructions are received from you indicating you do not wish to proceed. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	*Sampling date / time*	*Sample ID*	SOIL - EA033 Chromium Suite for Acid Sulphate Soils	SOIL - EA037 ASS Field Screening Analysis
EB2220520-001	12-Jul-2022 00:00	BH8 0.0		✓
EB2220520-002	12-Jul-2022 00:00	BH8 0.25		✓
EB2220520-003	12-Jul-2022 00:00	BH8 0.50		✓
EB2220520-004	12-Jul-2022 00:00	BH8 0.75		✓
EB2220520-005	12-Jul-2022 00:00	BH8 1.00		✓
EB2220520-006	12-Jul-2022 00:00	BH8 1.25		✓
EB2220520-007	12-Jul-2022 00:00	BH8 1.50		✓
EB2220520-008	12-Jul-2022 00:00	BH8 1.75		✓
EB2220520-009	12-Jul-2022 00:00	BH9 0.0		✓
EB2220520-010	12-Jul-2022 00:00	BH9 0.25		✓
EB2220520-011	12-Jul-2022 00:00	BH9 0.50		✓
EB2220520-012	12-Jul-2022 00:00	BH9 0.75		✓
EB2220520-013	12-Jul-2022 00:00	BH9 1.00		✓
EB2220520-014	12-Jul-2022 00:00	BH9 1.25		✓
EB2220520-015	12-Jul-2022 00:00	BH9 1.50		✓
EB2220520-016	12-Jul-2022 00:00	BH9 1.75		✓
EB2220520-017	12-Jul-2022 00:00	BH10 0.0		✓
EB2220520-018	12-Jul-2022 00:00	BH10 0.25		✓
EB2220520-019	12-Jul-2022 00:00	BH10 0.50		✓
EB2220520-020	12-Jul-2022 00:00	BH10 0.75		✓
EB2220520-021	12-Jul-2022 00:00	BH10 1.00		✓
EB2220520-022	12-Jul-2022 00:00	BH10 1.25		✓
EB2220520-023	12-Jul-2022 00:00	BH10 1.50		✓
EB2220520-024	12-Jul-2022 00:00	BH10 1.75		✓
EB2220520-025	12-Jul-2022 00:00	BH11 0.0	✓	✓
EB2220520-026	12-Jul-2022 00:00	BH11 0.25		✓
EB2220520-027	12-Jul-2022 00:00	BH11 0.50	✓	✓
EB2220520-028	12-Jul-2022 00:00	BH11 0.75		✓
EB2220520-029	12-Jul-2022 00:00	BH11 1.00	✓	✓
EB2220520-030	12-Jul-2022 00:00	BH11 1.25		✓
EB2220520-031	12-Jul-2022 00:00	BH11 1.50	✓	✓
EB2220520-032	12-Jul-2022 00:00	BH11 1.75		✓
EB2220520-033	12-Jul-2022 00:00	BH11 2.00		✓
EB2220520-034	12-Jul-2022 00:00	BH11 2.25		✓
EB2220520-035	12-Jul-2022 00:00	BH11 2.50	✓	✓

			SOIL - EA033 Chromium Suite for Acid Sulphate Soils	SOIL - EA037 ASS Field Screening Analysis
EB2220520-036	12-Jul-2022 00:00	BH11 2.75		✓
EB2220520-037	12-Jul-2022 00:00	BH12 0.0		✓
EB2220520-038	12-Jul-2022 00:00	BH12 0.25		✓
EB2220520-039	12-Jul-2022 00:00	BH12 0.50		✓
EB2220520-040	12-Jul-2022 00:00	BH12 0.75		✓
EB2220520-041	12-Jul-2022 00:00	BH12 1.00		✓
EB2220520-042	12-Jul-2022 00:00	BH12 1.25		✓
EB2220520-043	12-Jul-2022 00:00	BH12 1.50		✓
EB2220520-044	12-Jul-2022 00:00	BH12 1.75		✓
EB2220520-045	12-Jul-2022 00:00	BH13 0.0		✓
EB2220520-046	12-Jul-2022 00:00	BH13 0.25		✓
EB2220520-047	12-Jul-2022 00:00	BH13 0.50		✓
EB2220520-048	12-Jul-2022 00:00	BH13 0.75		✓
EB2220520-049	12-Jul-2022 00:00	BH13 1.00		✓
EB2220520-050	12-Jul-2022 00:00	BH13 1.25		✓
EB2220520-051	12-Jul-2022 00:00	BH13 1.50		✓
EB2220520-052	12-Jul-2022 00:00	BH13 1.75		✓
EB2220520-053	12-Jul-2022 00:00	BH14 0.0		✓
EB2220520-054	12-Jul-2022 00:00	BH14 0.25		✓
EB2220520-055	12-Jul-2022 00:00	BH14 0.50		✓
EB2220520-056	12-Jul-2022 00:00	BH14 0.75		✓
EB2220520-057	12-Jul-2022 00:00	BH14 1.00		✓
EB2220520-058	12-Jul-2022 00:00	BH14 1.25		✓
EB2220520-059	12-Jul-2022 00:00	BH14 1.50		✓
EB2220520-060	12-Jul-2022 00:00	BH14 1.75		✓
EB2220520-061	12-Jul-2022 00:00	BH15 0.0	✓	✓
EB2220520-062	12-Jul-2022 00:00	BH15 0.25		✓
EB2220520-063	12-Jul-2022 00:00	BH15 0.50	✓	✓
EB2220520-064	12-Jul-2022 00:00	BH15 0.75		✓
EB2220520-065	12-Jul-2022 00:00	BH15 1.00	✓	✓
EB2220520-066	12-Jul-2022 00:00	BH15 1.25		✓
EB2220520-067	12-Jul-2022 00:00	BH15 1.50		✓
EB2220520-068	12-Jul-2022 00:00	BH15 1.75		✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

RESULTS & INVOICE

- *AU Certificate of Analysis - NATA (COA)	Email	mail@preciseenvironmental.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	mail@preciseenvironmental.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	mail@preciseenvironmental.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	mail@preciseenvironmental.com.au
- A4 - AU Tax Invoice (INV)	Email	mail@preciseenvironmental.com.au
- Chain of Custody (CoC) (COC)	Email	mail@preciseenvironmental.com.au
- EDI Format - XTab (XTAB)	Email	mail@preciseenvironmental.com.au

CHAIN OF CUSTODY CHAIN OF CUSTODY

ALS Laboratory: please tick → ALS Laboratory: please tick →

☐ Sydney: 277 Woodpark Rd, Smithfield NSW 2176 Ph: 02 8784 8555 E:samples.sydney@alsenviro.com
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☐ Perth: 10 Hod W Ph: 08 9209 7655 E
☐ Newcastle: 5 Rosegum Rd, Warabrook NSW 2304 Ph:02 4968 9433 E:samples.newcastle@alsenviro.com
☐ Townsville: 14-15 Desma Ct, Bohle QLD 4818 Ph 07 4796 0600 E: townsville.environmental@alsenviro.com
☐ Adelaide: 2-1 Burma Rd, Pooraka SA 5095 Ph: 08 8359 0890 E:adelaide@alsenviro.com
☐ Launceston: 27 Ph: 03 6331 2158 E

Environmental Division
Brisbane
Work Order Reference
EB2220520

Telephone : +61-7-3243 7222

CLIENT:	PRECISE ENVIRONMENTAL	TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	☐ Standard TAT (List due date): ☐ Non Standard or urgent TAT (List due date):	FOR LABO: Custody Seal / Free ice / Temp receipt / Random Sam / Other comme	
OFFICE:	7/14 FREMANTLE ST, BURLEIGH HEADS 4220				
PROJECT:	PE3394.22	ALS QUOTE NO.:	BN031/16 v4	COC SEQUENCE NUMBER (Circle)	
ORDER NUMBER:	PE3394.22			COC: 1 2 3 4 5 6 7	
PROJECT MANAGER:	CHRIS BUTLER	CONTACT: 0431 565 210		OF: 1 2 3 4 5 6 7	
SAMPLER:	CHRIS BUTLER / SEAN GARDINER	SAMPLER MOBILE: 0409 827 396	RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED I
COC emailed to ALS? (YES / NO)		EDD FORMAT (or default):	CHRIS BUTLER		
Email Reports to: mail@preciseenvironmental.com.au			DATE/TIME: 13.07.22 9AM	DATE/TIME:	DATE/TIME:
Mail Invoice to: PO Box 4424, Robina Town Centre 4230					

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE ONLY	SAMPLE DETAILS (Water(W) / MATRIX: Solid(S))				CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	SAMPLE DESCRIPTION	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	EA037 (pHF and pHFOX)	EA033 (Chromium suite)							Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	BH8	0.0	12.07.22	S	BAG/<4°C	1	X								
2	BH8	0.25	12.07.22	S	BAG/<4°C	1	X								
3	BH8	0.50	12.07.22	S	BAG/<4°C	1	X								
4	BH8	0.75	12.07.22	S	BAG/<4°C	1	X								
5	BH8	1.00	12.07.22	S	BAG/<4°C	1	X								
6	BH8	1.25	12.07.22	S	BAG/<4°C	1	X								
7	BH8	1.50	12.07.22	S	BAG/<4°C	1	X								
8	BH8	1.75	12.07.22	S	BAG/<4°C	1	X								
					TOTAL	8									

SPLIT BACK
Test Assoc. Batch No.
EB2204277

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

CHAIN OF CUSTODY CHAIN OF CUSTODY

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☐ Melbourne: 2-4 Westall Rd, Springvale VIC 3171 Ph:03 8549 9600 E: samples.melbourne@alsenviro.com
☐ Perth: 10 Hod Way, Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsenviro.com
☐ Newcastle: 5 Rosegum Rd, Warabrook NSW 2304 Ph:02 4968 9433 E:samples.newcastle@alsenviro.com
☐ Townsville: 14-15 Desma Ct, Bohle QLD 4818 Ph:07 4796 0600 E: townsville.environmental@alsenviro.com
☐ Adelaide: 2-1 Burma Rd, Pooraka SA 5095 Ph: 08 8359 0890 E:adelaide@alsenviro.com
☐ Launceston: 27 Wellington St, Launceston TAS 7250 Ph: 03 6331 2458 E: launceston@alsenviro.com

CLIENT:	PRECISE ENVIRONMENTAL	TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	☐ Standard TAT (List due date): ☐ Non Standard or urgent TAT (List due date):
OFFICE:	7/14 FREMANTLE ST, BURLEIGH HEADS 4220		
PROJECT:	PE3394.22	ALS QUOTE NO.:	BN031/16 v4
ORDER NUMBER:	PE3394.22		
PROJECT MANAGER:	CHRIS BUTLER	CONTACT: 0431 565 210	
SAMPLER:	CHRIS BUTLER / SEAN GARDINER	SAMPLER MOBILE: 0409 827 396	
COC emailed to ALS? (YES / NO)		EDD FORMAT (or default):	
Email Reports to: mail@preciseenvironmental.com.au			
Mail Invoice to: PO Box 4424, Robina Town Centre 4230			

COC SEQUENCE NUMBER (Circle)
COC: 1 2 3 4 5 6 7
OF: 1 2 3 4 5 6 7

FOR LABORATORY USE ONLY (Circle)
Custody Seal Intact? Yes No N/A
Free ice / frozen ice bricks present upon receipt? Yes No N/A
Random Sample Temperature on Receipt: °C
Other comment:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
CHRIS BUTLER			
DATE/TIME: 13.07.22 9AM	DATE/TIME:	DATE/TIME:	DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE ONLY	SAMPLE DETAILS (Water(W))			MATRIX: Solid(S)	CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	SAMPLE DESCRIPTION	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	EA037 (pHF and pHFOX)	EA033 (Chromium suite)							Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
9	BH9	0.0	12.07.22	S	BAG/<4°C	1	X								
10	BH9	0.25	12.07.22	S	BAG/<4°C	1	X								
11	BH9	0.50	12.07.22	S	BAG/<4°C	1	X								
12	BH9	0.75	12.07.22	S	BAG/<4°C	1	X								
13	BH9	1.00	12.07.22	S	BAG/<4°C	1	X								
14	BH9	1.25	12.07.22	S	BAG/<4°C	1	X								
15	BH9	1.50	12.07.22	S	BAG/<4°C	1	X								
16	BH9	1.75	12.07.22	S	BAG/<4°C	1	X								
					TOTAL	8									

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

CHAIN OF CUSTODY CHAIN OF CUSTODY

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☐ Perth 10 Hod Way, Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsenviro.com
☐ Newcastle: 5 Rosegum Rd, Warabrook NSW 2304 Ph: 02 4968 9433 E: samples.newcastle@alsenviro.com
☐ Townsville: 14-15 Desma Ct, Bohle QLD 4818 Ph: 07 4796 0600 E: townsville.environmental@alsenviro.com
☐ Adelaide: 2-1 Burma Rd, Pooraka SA 5095 Ph: 08 8359 0890 E: adelaide@alsenviro.com
☐ Launceston: 27 Wellington St, Launceston TAS 7250 Ph: 03 6331 2158 E: launceston@alsenviro.com

CLIENT:	PRECISE ENVIRONMENTAL	TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	☐ Standard TAT (List due date): ☐ Non Standard or urgent TAT (List due date):
OFFICE:	7/14 FREMANTLE ST, BURLEIGH HEADS 4220		
PROJECT:	PE3394.22	ALS QUOTE NO.: BN031/16 v4	COC SEQUENCE NUMBER (Circle) COC: 1 2 3 4 5 6 7
ORDER NUMBER:	PE3394.22		OF: 1 2 3 4 5 6 7
PROJECT MANAGER:	CHRIS BUTLER	CONTACT: 0431 565 210	
SAMPLER:	CHRIS BUTLER / SEAN GARDINER	SAMPLER MOBILE: 0409 827 396	
COC emailed to ALS? (YES / NO)		EDD FORMAT (or default):	
Email Reports to: mail@preciseenvironmental.com.au			
Mail Invoice to: PO Box 4424, Robina Town Centre 4230			

FOR LABORATORY USE ONLY (Circle)			
Custody seal intact?	Yes	No	N/A
Free ice / frozen ice bricks present upon receipt?	Yes	No	N/A
Random Sample Temperature on Receipt		°C	
Other comment:			

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
CHRIS BUTLER			
DATE/TIME: 13.07.22 9AM	DATE/TIME:	DATE/TIME:	DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE ONLY	SAMPLE DETAILS (Water(W))			MATRIX: Solid(S)	CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	SAMPLE DESCRIPTION	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	EA037 (pHF and pHFOX)	EA033 (Chromium suite)							Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
17	BH10	0.0	12.07.22	S	BAG/<4°C	1	X								
18	BH10	0.25	12.07.22	S	BAG/<4°C	1	X								
19	BH10	0.50	12.07.22	S	BAG/<4°C	1	X								
20	BH10	0.75	12.07.22	S	BAG/<4°C	1	X								
21	BH10	1.00	12.07.22	S	BAG/<4°C	1	X								
22	BH10	1.25	12.07.22	S	BAG/<4°C	1	X								
23	BH10	1.50	12.07.22	S	BAG/<4°C	1	X								
24	BH10	1.75	12.07.22	S	BAG/<4°C	1	X								
					TOTAL	8									

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

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☐ Perth: 10 Hod Way, Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsenviro.com
☐ Newcastle: 5 Rosegum Rd, Warabrook NSW 2304 Ph 02 4968 9433 E:samples.newcastle@alsenviro.com
☐ Townsville: 14-15 Desma Ct, Bohle QLD 4818 Ph:07 4796 0600 E: townsville.environmental@alsenviro.com
☐ Adelaide: 2-1 Burma Rd, Pooraka SA 5095 Ph: 08 8359 0890 E:adelaide@alsenviro.com
☐ Launceston: 27 Wellington St, Launceston TAS 7250 Ph: 03 6331 2158 E: launceston@alsenviro.com

CLIENT:	PRECISE ENVIRONMENTAL	TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	☐ Standard TAT (List due date): ☐ Non Standard or urgent TAT (List due date):
OFFICE:	7/14 FREMANTLE ST, BURLEIGH HEADS 4220		
PROJECT:	PE3394.22	ALS QUOTE NO.: BN031/16 v4	COC SEQUENCE NUMBER (Circle) COC: 1 2 3 4 5 6 7
ORDER NUMBER:	PE3394.22		OF: 1 2 3 4 5 6 7
PROJECT MANAGER:	CHRIS BUTLER	CONTACT: 0431 565 210	
SAMPLER:	CHRIS BUTLER / SEAN GARDINER	SAMPLER MOBILE: 0409 827 396	
COC emailed to ALS? (YES / NO)		EDD FORMAT (or default):	
Email Reports to: mail@preciseenvironmental.com.au			
Mail Invoice to: PO Box 4424, Robina Town Centre 4230			

FOR LABORATORY USE ONLY (Circle)
Custody Seal Intact? Yes No N/A
Free ice / frozen ice bricks present upon receipt? Yes No N/A
Random Sample Temperature on Receipt: °C
Other comment:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
CHRIS BUTLER			
DATE/TIME: 13.07.22 9AM	DATE/TIME:	DATE/TIME:	DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE ONLY	SAMPLE DETAILS Water(W)			MATRIX: Solid(S)	CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	SAMPLE DESCRIPTION	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	EA037 (pHF and pHFOX)	EA033 (Chromium suite)							Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
25	BH11	0.0	12.07.22	S	BAG/<4°C	1	X	X							
26	BH11	0.25	12.07.22	S	BAG/<4°C	1	X								
27	BH11	0.50	12.07.22	S	BAG/<4°C	1	X	X							
28	BH11	0.75	12.07.22	S	BAG/<4°C	1	X								
29	BH11	1.00	12.07.22	S	BAG/<4°C	1	X	X							
30	BH11	1.25	12.07.22	S	BAG/<4°C	1	X								
31	BH11	1.50	12.07.22	S	BAG/<4°C	1	X	X							
32	BH11	1.75	12.07.22	S	BAG/<4°C	1	X								
33	BH11	2.00	12.07.22	S	BAG/<4°C	1	X								
34	BH11	2.25	12.07.22	S	BAG/<4°C	1	X								
35	BH11	2.50	12.07.22	S	BAG/<4°C	1	X	X							
36	BH11	2.75	12.07.22	S	BAG/<4°C	1	X								
					TOTAL	12									

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

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☐ Adelaide: 2-1 Burma Rd, Pooraka SA 5095 Ph: 08 8359 0890 E:adelaide@alsenviro.com
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CLIENT:	PRECISE ENVIRONMENTAL	**TURNAROUND REQUIREMENTS :** (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	☐ Standard TAT (List due date): ☐ Non Standard or urgent TAT (List due date):
OFFICE:	7/14 FREMANTLE ST, BURLEIGH HEADS 4220		
PROJECT:	PE3394.22	**ALS QUOTE NO.:**	BN031/16 v4
ORDER NUMBER:	PE3394.22		
PROJECT MANAGER:	CHRIS BUTLER	**CONTACT:** 0431 565 210	
SAMPLER:	CHRIS BUTLER / SEAN GARDINER	**SAMPLER MOBILE:** 0409 827 396	
COC emailed to ALS? (YES / NO)		**EDD FORMAT (or default):**	
Email Reports to: mail@preciseenvironmental.com.au			
Mail Invoice to: PO Box 4424, Robina Town Centre 4230			

COC SEQUENCE NUMBER (Circle)

COC: 1 2 3 4 5 6 7

OF: 1 2 3 4 5 6 7

FOR LABORATORY USE ONLY (Circle)

Custody Seal Intact?	Yes	No	N/A
Free ice / frozen ice bricks present upon receipt?	Yes	No	N/A
Random Sample Temperature on Receipt:		°C	
Other comment:			

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
CHRIS BUTLER			
DATE/TIME: 13.07.22 9AM	DATE/TIME:	DATE/TIME:	DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE ONLY	SAMPLE DETAILS (Water(W))			MATRIX: Solid(S)	CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	SAMPLE DESCRIPTION	DATE / TIME	MATRIX	TYPE & PRESERVATIVE *(refer to codes below)*	TOTAL BOTTLES	EA037 (pHF and pHFOX)	EA033 (Chromium suite)							Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
37	BH12	0.0	12.07.22	S	BAG/<4°C	1	X								
38	BH12	0.25	12.07.22	S	BAG/<4°C	1	X								
39	BH12	0.50	12.07.22	S	BAG/<4°C	1	X								
40	BH12	0.75	12.07.22	S	BAG/<4°C	1	X								
41	BH12	1.00	12.07.22	S	BAG/<4°C	1	X								
42	BH12	1.25	12.07.22	S	BAG/<4°C	1	X								
43	BH12	1.50	12.07.22	S	BAG/<4°C	1	X								
44	BH12	1.75	12.07.22	S	BAG/<4°C	1	X								
					TOTAL:	8									

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

CHAIN OF CUSTODY CHAIN OF CUSTODY

ALS Laboratory: please tick → ALS Laboratory: please tick →

☐ Sydney 277 Woodpark Rd, Smithfield NSW 2176 Ph 02 8784 8555 E samples.sydney@alsenviro.com
☐ Newcastle: 5 Rosegum Rd, Warabrook NSW 2304 Ph 02 4968 9433 E samples.newcastle@alsenviro.com
☐ Brisbane 32 Shand St, Stafford QLD 4053 Ph 07 3243 7222 E samples.brisbane@alsenviro.com
☐ Townsville: 14-15 Desma Ct, Bohle QLD 4818 Ph 07 4796 0600 E: townsville.environmental@alsenviro.com
☐ Melbourne 2-4 Westall Rd, Springvale VIC 3171 Ph 03 8549 9600 E samples.melbourne@alsenviro.com
☐ Adelaide: 2-1 Burma Rd, Pooraka SA 5095 Ph: 08 8359 0890 E:adelaide@alsenviro.com
☐ Perth: 10 Hod Way, Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsenviro.com
☐ Launceston: 27 Wellington St, Launceston TAS 7250 Ph: 03 8331 2158 E: launceston@alsenviro.com

CLIENT:	PRECISE ENVIRONMENTAL	TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	☐ Standard TAT (List due date):	FOR LABORATORY USE ONLY - (Circle)	
OFFICE:	7/14 FREMANTLE ST, BURLEIGH HEADS 4220		☐ Non Standard or urgent TAT (List due date):	Custody Seal Intact?	Yes No N/A
PROJECT:	PE3394.22	ALS QUOTE NO.: BN031/16 v4	COC SEQUENCE NUMBER (Circle)	Free ice / frozen ice bricks present upon receipt?	Yes No N/A
ORDER NUMBER:	PE3394.22		COC: 1 2 3 4 5 6 7	Random Sample Temperature on Receipt:	°C
PROJECT MANAGER:	CHRIS BUTLER	CONTACT: 0431 565 210	OF: 1 2 3 4 5 6 7	Other comment:	

SAMPLER:	CHRIS BUTLER / SEAN GARDINER	SAMPLER MOBILE: 0409 827 396	RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
COC emailed to ALS? (YES / NO)		EDD FORMAT (or default):	CHRIS BUTLER			
Email Reports to: mail@preciseenvironmental.com.au			DATE/TIME: C Butler	DATE/TIME:	DATE/TIME:	DATE/TIME:
Mail Invoice to: PO Box 4424, Robina Town Centre 4230			13.07.22 9AM			

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE ONLY	SAMPLE DETAILS Water(W)			MATRIX: Solid(S)	CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	SAMPLE DESCRIPTION	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	EA037 (pHF and pHFOX)	EA033 (Chromium suite)							Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
45	BH13	0.0	12.07.22	S	BAG/<4°C	1	X								
46	BH13	0.25	12.07.22	S	BAG/<4°C	1	X								
47	BH13	0.50	12.07.22	S	BAG/<4°C	1	X								
48	BH13	0.75	12.07.22	S	BAG/<4°C	1	X								
49	BH13	1.00	12.07.22	S	BAG/<4°C	1	X								
50	BH13	1.25	12.07.22	S	BAG/<4°C	1	X								
51	BH13	1.50	12.07.22	S	BAG/<4°C	1	X								
52	BH13	1.75	12.07.22	S	BAG/<4°C	1	X								
					TOTAL	8									

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

CHAIN OF CUSTODY CHAIN OF CUSTODY

ALS Laboratory: please tick → *ALS Laboratory: please tick →*

☐ **Sydney:** 277 Woodpark Rd, Smithfield NSW 2176 Ph: 02 8784 8555 E:samples.sydney@alsenviro.com
☐ **Newcastle:** 5 Rosegum Rd, Warabrook NSW 2304 Ph:02 4968 9433 E:samples.newcastle@alsenviro.com
☐ **Brisbane:** 32 Shand St, Stafford QLD 4053 Ph:07 3243 7222 E:samples.brisbane@alsenviro.com
☐ **Townsville:** 14-15 Desma Cl, Bohle QLD 4818 Ph: 07 4796 0600 E: townsville.environmental@alsenviro.com
☐ **Melbourne:** 2-4 Westall Rd, Springvale VIC 3171 Ph:03 8549 9600 E: samples.melbourne@alsenviro.com
☐ **Adelaide:** 2-1 Burma Rd, Pooraka SA 5095 Ph: 08 8359 0890 E:adelaide@alsenviro.com
☐ **Perth:** 10 Hod Way, Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsenviro.com
☐ **Launceston:** 27 Wellington St, Launceston TAS 7250 Ph: 03 6331 2158 E: launceston@alsenviro.com

CLIENT:	PRECISE ENVIRONMENTAL	**TURNAROUND REQUIREMENTS :** (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	☐ Standard TAT **(List due date):** ☐ Non Standard or urgent TAT **(List due date):**
OFFICE:	7/14 FREMANTLE ST, BURLEIGH HEADS 4220		
PROJECT:	PE3394.22	**ALS QUOTE NO.:**	BN031/16 v4
ORDER NUMBER:	PE3394.22		
PROJECT MANAGER:	CHRIS BUTLER	**CONTACT:** 0431 565 210	
SAMPLER:	CHRIS BUTLER / SEAN GARDINER	**SAMPLER MOBILE:** 0409 827 396	
COC emailed to ALS? (YES / NO)		**EDD FORMAT (or default):**	
Email Reports to: mail@preciseenvironmental.com.au			
Mail Invoice to: PO Box 4424, Robina Town Centre 4230			

COC SEQUENCE NUMBER (Circle)
COC: 1 2 3 4 5 6 7
OF: 1 2 3 4 5 6 7

FOR LABORATORY USE ONLY: (Circle)
Custody Seal Intact? Yes No N/A
Free ice / frozen ice bricks present upon receipt? Yes No N/A
Random Sample Temperature on Receipt: °C
Other comment:

RELINQUISHED BY:	**RECEIVED BY:**	**RELINQUISHED BY:**	**RECEIVED BY:**
CHRIS BUTLER			
DATE/TIME: 13.07.22 9AM	DATE/TIME:	DATE/TIME:	DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE ONLY	SAMPLE DETAILS				CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where **Metals** are required, specify **Total** (unfiltered bottle required) or **Dissolved** (field filtered bottle required).								Additional Information
	Water(W)			MATRIX: Solid(S)											
LAB ID	SAMPLE ID	SAMPLE DESCRIPTION	DATE / TIME	MATRIX	TYPE & PRESERVATIVE *(refer to codes below)*	TOTAL BOTTLES	EA037 (pHF and pHFOX)	EA033 (Chromium suite)							Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
53	BH14	0.0	12.07.22	S	BAG/<4°C	1	X								
54	BH14	0.25	12.07.22	S	BAG/<4°C	1	X								
55	BH14	0.50	12.07.22	S	BAG/<4°C	1	X								
56	BH14	0.75	12.07.22	S	BAG/<4°C	1	X								
57	BH14	1.00	12.07.22	S	BAG/<4°C	1	X								
58	BH14	1.25	12.07.22	S	BAG/<4°C	1	X								
59	BH14	1.50	12.07.22	S	BAG/<4°C	1	X								
60	BH14	1.75	12.07.22	S	BAG/<4°C	1	X								
					TOTAL:	8									

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

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☐ Perth: 10 Hod Way, Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsenviro.com
☐ Newcastle: 5 Rhesegum Rd, Warabrook NSW 2304 Ph:02 4968 9433 E:samples.newcastle@alsenviro.com
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☐ Launceston: 27 Wellington St, Launceston TAS 7250 Ph: 03 6331 2158 E: launceston@alsenviro.com

CLIENT:	PRECISE ENVIRONMENTAL	TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	☐ Standard TAT (List due date): ☐ Non Standard or urgent TAT (List due date):
OFFICE:	7/14 FREMANTLE ST, BURLEIGH HEADS 4220		
PROJECT:	PE3394.22	ALS QUOTE NO.:	BN031/16 v4
ORDER NUMBER:	PE3394.22		
PROJECT MANAGER:	CHRIS BUTLER	CONTACT: 0431 565 210	
SAMPLER:	CHRIS BUTLER / SEAN GARDINER	SAMPLER MOBILE: 0409 827 396	
COC emailed to ALS? (YES / NO)		EDD FORMAT (or default):	
Email Reports to: mail@preciseenvironmental.com.au			
Mail Invoice to: PO Box 4424, Robina Town Centre 4230			

COC SEQUENCE NUMBER (Circle)
COC: 1 2 3 4 5 6 7
OF: 1 2 3 4 5 6 7

FOR LABORATORY USE ONLY (Circle)
Custody Seal Intact? Yes No N/A
Free ice / frozen ice bricks present upon receipt? Yes No N/A
Random Sample Temperature on Receipt: °C
Other comment:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
CHRIS BUTLER			
DATE/TIME: 13.07.22 9AM	DATE/TIME:	DATE/TIME:	DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE ONLY	SAMPLE DETAILS			MATRIX: Solid(S) Water(W)	CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	SAMPLE DESCRIPTION	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	EA037 (pHF and pHFOX)	EA033 (Chromium suite)							Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
61	BH15	0.0	12.07.22	S	BAG/<4°C	1	X	X							
62	BH15	0.25	12.07.22	S	BAG/<4°C	1	X								
63	BH15	0.50	12.07.22	S	BAG/<4°C	1	X	X							
64	BH15	0.75	12.07.22	S	BAG/<4°C	1	X								
65	BH15	1.00	12.07.22	S	BAG/<4°C	1	X	X							
66	BH15	1.25	12.07.22	S	BAG/<4°C	1	X								
67	BH15	1.50	12.07.22	S	BAG/<4°C	1	X								
68	BH15	1.75	12.07.22	S	BAG/<4°C	1	X								
					TOTAL:	8									

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
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ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB2220520**	Page	: 1 of 16
Client	: **PRECISE ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR CHRIS BUTLER	Contact	: Nidhi Bhimani
Address	: PO BOX 4424 ROBINA TOWN CENTRE QLD, AUSTRALIA 4230	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: ----	Telephone	: +61-7-3243 7222
Project	: PE3394.22	Date Samples Received	: 14-Jul-2022 11:35
Order number	: PE3394.22	Date Analysis Commenced	: 19-Jul-2022
C-O-C number	: ----	Issue Date	: 21-Jul-2022 15:20
Sampler	: CHRIS BUTLER, SEAN GARDINER		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 68		
No. of samples analysed	: 68		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD

General Comments

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

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

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

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- **SPLIT WORK ORDER: It should be noted that ALS has split this work order over the following work orders EB2220520 and EB2220427 due to the size of the sample numbers. For any further information regarding this processing of samples please contact ALS client services division on ALSEnviro.Brisbane@alsglobal.com**
- ASS: EA033 (CRS Suite):Retained Acidity not required because pH KCl greater than or equal to 4.5
- ASS: EA033 (CRS Suite): ANC not required because pH KCl less than 6.5
- ASS: EA037 (Rapid Field and F(ox) screening): pH F(ox) Reaction Rate: 1 - Slight; 2 - Moderate; 3 - Strong; 4 - Extreme
- ASS: EA033 (CRS Suite): 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'.
- EA037 ASS Field Screening: NATA accreditation does not cover performance of this service.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH8 0.0	BH8 0.25	BH8 0.50	BH8 0.75	BH8 1.00
			Sampling date / time	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00
Compound	CAS Number	LOR	Unit	EB2220520-001	EB2220520-002	EB2220520-003	EB2220520-004	EB2220520-005
				Result	Result	Result	Result	Result
EA037: Ass Field Screening Analysis								
ø **pH (F)**	---	0.1	pH Unit	**5.7**	**5.7**	**5.8**	**5.6**	**5.9**
ø **pH (Fox)**	---	0.1	pH Unit	**2.4**	**2.9**	**4.2**	**3.6**	**2.0**
ø **Reaction Rate**	---	1	-	**3**	**3**	**1**	**1**	**1**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH8 1.25	BH8 1.50	BH8 1.75	BH9 0.0	BH9 0.25
			Sampling date / time	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00
Compound	CAS Number	LOR	Unit	EB2220520-006	EB2220520-007	EB2220520-008	EB2220520-009	EB2220520-010
				Result	Result	Result	Result	Result
EA037: Ass Field Screening Analysis								
ø **pH (F)**	---	0.1	pH Unit	**6.0**	**5.8**	**5.8**	**5.8**	**5.9**
ø **pH (Fox)**	---	0.1	pH Unit	**2.1**	**2.3**	**2.0**	**2.4**	**2.8**
ø **Reaction Rate**	---	1	-	**4**	**4**	**4**	**3**	**3**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Sample ID	BH9 0.50	BH9 0.75	BH9 1.00	BH9 1.25	BH9 1.50
			Sampling date / time	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB2220520-011**	**EB2220520-012**	**EB2220520-013**	**EB2220520-014**	**EB2220520-015**
				Result	Result	Result	Result	Result
EA037: Ass Field Screening Analysis								
ø pH (F)	---	0.1	pH Unit	**6.2**	**6.3**	**6.4**	**5.6**	**5.1**
ø pH (Fox)	---	0.1	pH Unit	**3.8**	**4.2**	**2.0**	**1.9**	**1.8**
ø Reaction Rate	---	1	-	**1**	**1**	**1**	**1**	**1**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH9 1.75	BH10 0.0	BH10 0.25	BH10 0.50	BH10 0.75
			Sampling date / time	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00
Compound	CAS Number	LOR	Unit	EB2220520-016	EB2220520-017	EB2220520-018	EB2220520-019	EB2220520-020
				Result	Result	Result	Result	Result
EA037: Ass Field Screening Analysis								
ø **pH (F)**	---	0.1	pH Unit	**5.2**	**5.4**	**5.7**	**5.4**	**5.7**
ø **pH (Fox)**	---	0.1	pH Unit	**1.7**	**2.6**	**3.5**	**3.0**	**2.5**
ø **Reaction Rate**	---	1	-	**1**	**3**	**2**	**2**	**2**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH10 1.00	BH10 1.25	BH10 1.50	BH10 1.75	BH11 0.0
			Sampling date / time	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00
Compound	CAS Number	LOR	Unit	EB2220520-021	EB2220520-022	EB2220520-023	EB2220520-024	EB2220520-025
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	---	0.1	pH Unit	---	---	---	---	6.1
Titratable Actual Acidity (23F)	---	2	mole H+ / t	---	---	---	---	4
sulfidic - Titratable Actual Acidity (s-23F)	---	0.02	% pyrite S	---	---	---	---	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	---	0.005	% S	---	---	---	---	0.020
acidity - Chromium Reducible Sulfur (a-22B)	---	10	mole H+ / t	---	---	---	---	12
EA033-E: Acid Base Accounting								
ANC Fineness Factor	---	0.5	-	---	---	---	---	1.5
Net Acidity (sulfur units)	---	0.02	% S	---	---	---	---	0.02
Net Acidity (acidity units)	---	10	mole H+ / t	---	---	---	---	16
Liming Rate	---	1	kg CaCO3/t	---	---	---	---	1
Net Acidity excluding ANC (sulfur units)	---	0.02	% S	---	---	---	---	0.02
Net Acidity excluding ANC (acidity units)	---	10	mole H+ / t	---	---	---	---	16
Liming Rate excluding ANC	---	1	kg CaCO3/t	---	---	---	---	1
EA037: Ass Field Screening Analysis								
ø pH (F)	---	0.1	pH Unit	5.8	5.7	5.5	5.6	5.8
ø pH (Fox)	---	0.1	pH Unit	2.2	2.1	2.0	2.3	2.7
ø Reaction Rate	---	1	-	4	4	4	4	3

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH11 0.25	BH11 0.50	BH11 0.75	BH11 1.00	BH11 1.25
			Sampling date / time	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00
Compound	CAS Number	LOR	Unit	EB2220520-026	EB2220520-027	EB2220520-028	EB2220520-029	EB2220520-030
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	---	0.1	pH Unit	---	5.1	---	5.5	---
Titratable Actual Acidity (23F)	---	2	mole H+ / t	---	32	---	8	---
sulfidic - Titratable Actual Acidity (s-23F)	---	0.02	% pyrite S	---	0.05	---	<0.02	---
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	---	0.005	% S	---	0.011	---	0.014	---
acidity - Chromium Reducible Sulfur (a-22B)	---	10	mole H+ / t	---	<10	---	<10	---
EA033-E: Acid Base Accounting								
ANC Fineness Factor	---	0.5	-	---	1.5	---	1.5	---
Net Acidity (sulfur units)	---	0.02	% S	---	0.06	---	0.02	---
Net Acidity (acidity units)	---	10	mole H+ / t	---	39	---	16	---
Liming Rate	---	1	kg CaCO3/t	---	3	---	1	---
Net Acidity excluding ANC (sulfur units)	---	0.02	% S	---	0.06	---	0.02	---
Net Acidity excluding ANC (acidity units)	---	10	mole H+ / t	---	39	---	16	---
Liming Rate excluding ANC	---	1	kg CaCO3/t	---	3	---	1	---
EA037: Ass Field Screening Analysis								
ø pH (F)	---	0.1	pH Unit	5.7	5.0	5.1	5.5	5.5
ø pH (Fox)	---	0.1	pH Unit	2.8	3.0	2.5	2.6	2.2
ø Reaction Rate	---	1	-	3	3	3	3	1

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH11 1.50	BH11 1.75	BH11 2.00	BH11 2.25	BH11 2.50
			Sampling date / time	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00
Compound	CAS Number	LOR	Unit	EB2220520-031	EB2220520-032	EB2220520-033	EB2220520-034	EB2220520-035
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	---	0.1	pH Unit	5.4	---	---	---	5.5
Titratable Actual Acidity (23F)	---	2	mole H+ / t	5	---	---	---	4
sulfidic - Titratable Actual Acidity (s-23F)	---	0.02	% pyrite S	<0.02	---	---	---	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	---	0.005	% S	0.212	---	---	---	0.189
acidity - Chromium Reducible Sulfur (a-22B)	---	10	mole H+ / t	132	---	---	---	118
EA033-E: Acid Base Accounting								
ANC Fineness Factor	---	0.5	-	1.5	---	---	---	1.5
Net Acidity (sulfur units)	---	0.02	% S	0.22	---	---	---	0.19
Net Acidity (acidity units)	---	10	mole H+ / t	138	---	---	---	122
Liming Rate	---	1	kg CaCO3/t	10	---	---	---	9
Net Acidity excluding ANC (sulfur units)	---	0.02	% S	0.22	---	---	---	0.19
Net Acidity excluding ANC (acidity units)	---	10	mole H+ / t	138	---	---	---	122
Liming Rate excluding ANC	---	1	kg CaCO3/t	10	---	---	---	9
EA037: Ass Field Screening Analysis								
ø pH (F)	---	0.1	pH Unit	5.3	5.2	5.5	5.4	5.5
ø pH (Fox)	---	0.1	pH Unit	2.2	2.1	2.0	2.0	2.0
ø Reaction Rate	---	1	-	4	4	4	4	4

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH11 2.75	BH12 0.0	BH12 0.25	BH12 0.50	BH12 0.75
			Sampling date / time	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00
Compound	CAS Number	LOR	Unit	EB2220520-036	EB2220520-037	EB2220520-038	EB2220520-039	EB2220520-040
				Result	Result	Result	Result	Result
EA037: Ass Field Screening Analysis								
ø **pH (F)**	---	0.1	pH Unit	**5.5**	**5.3**	**5.6**	**5.6**	**5.5**
ø **pH (Fox)**	---	0.1	pH Unit	**2.2**	**2.9**	**3.0**	**4.2**	**3.6**
ø **Reaction Rate**	---	1	-	**4**	**2**	**2**	**1**	**1**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH12 1.00	BH12 1.25	BH12 1.50	BH12 1.75	BH13 0.0
			Sampling date / time	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00
Compound	CAS Number	LOR	Unit	EB2220520-041	EB2220520-042	EB2220520-043	EB2220520-044	EB2220520-045
				Result	Result	Result	Result	Result
EA037: Ass Field Screening Analysis								
ø **pH (F)**	---	0.1	pH Unit	**5.9**	**5.4**	**5.4**	**5.2**	**5.3**
ø **pH (Fox)**	---	0.1	pH Unit	**2.0**	**2.0**	**2.1**	**2.1**	**2.1**
ø **Reaction Rate**	---	1	-	**4**	**4**	**4**	**4**	**3**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH13 0.25	BH13 0.50	BH13 0.75	BH13 1.00	BH13 1.25
			Sampling date / time	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00
Compound	CAS Number	LOR	Unit	EB2220520-046	EB2220520-047	EB2220520-048	EB2220520-049	EB2220520-050
				Result	Result	Result	Result	Result
EA037: Ass Field Screening Analysis								
ø **pH (F)**	---	0.1	pH Unit	**4.8**	**6.0**	**5.9**	**6.0**	**6.0**
ø **pH (Fox)**	---	0.1	pH Unit	**2.7**	**3.0**	**3.8**	**2.1**	**2.1**
ø **Reaction Rate**	---	1	-	**3**	**2**	**1**	**4**	**4**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH13 1.50	BH13 1.75	BH14 0.0	BH14 0.25	BH14 0.50
			Sampling date / time	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00
Compound	CAS Number	LOR	Unit	EB2220520-051	EB2220520-052	EB2220520-053	EB2220520-054	EB2220520-055
				Result	Result	Result	Result	Result
EA037: Ass Field Screening Analysis								
ø **pH (F)**	---	0.1	pH Unit	**5.9**	**6.0**	**5.5**	**5.6**	**5.5**
ø **pH (Fox)**	---	0.1	pH Unit	**2.0**	**2.1**	**2.8**	**3.3**	**3.6**
ø **Reaction Rate**	---	1	-	**4**	**4**	**3**	**1**	**1**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH14 0.75	BH14 1.00	BH14 1.25	BH14 1.50	BH14 1.75
			Sampling date / time	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00
Compound	CAS Number	LOR	Unit	EB2220520-056	EB2220520-057	EB2220520-058	EB2220520-059	EB2220520-060
				Result	Result	Result	Result	Result
EA037: Ass Field Screening Analysis								
ø **pH (F)**	---	0.1	pH Unit	**5.9**	**5.9**	**6.2**	**6.0**	**6.1**
ø **pH (Fox)**	---	0.1	pH Unit	**3.4**	**2.0**	**2.0**	**2.1**	**2.0**
ø **Reaction Rate**	---	1	-	**1**	**4**	**4**	**4**	**4**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH15 0.0	BH15 0.25	BH15 0.50	BH15 0.75	BH15 1.00
			Sampling date / time	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00
Compound	CAS Number	LOR	Unit	EB2220520-061	EB2220520-062	EB2220520-063	EB2220520-064	EB2220520-065
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	---	0.1	pH Unit	4.6	---	5.8	---	5.6
Titratable Actual Acidity (23F)	---	2	mole H+ / t	108	---	4	---	4
sulfidic - Titratable Actual Acidity (s-23F)	---	0.02	% pyrite S	0.17	---	<0.02	---	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	---	0.005	% S	0.020	---	0.016	---	0.107
acidity - Chromium Reducible Sulfur (a-22B)	---	10	mole H+ / t	13	---	<10	---	67
EA033-E: Acid Base Accounting								
ANC Fineness Factor	---	0.5	-	1.5	---	1.5	---	1.5
Net Acidity (sulfur units)	---	0.02	% S	0.19	---	0.02	---	0.11
Net Acidity (acidity units)	---	10	mole H+ / t	121	---	14	---	71
Liming Rate	---	1	kg CaCO3/t	9	---	1	---	5
Net Acidity excluding ANC (sulfur units)	---	0.02	% S	0.19	---	0.02	---	0.11
Net Acidity excluding ANC (acidity units)	---	10	mole H+ / t	121	---	14	---	71
Liming Rate excluding ANC	---	1	kg CaCO3/t	9	---	1	---	5
EA037: Ass Field Screening Analysis								
ø pH (F)	---	0.1	pH Unit	5.7	5.6	6.3	6.4	6.6
ø pH (Fox)	---	0.1	pH Unit	3.0	3.3	3.6	4.3	1.9
ø Reaction Rate	---	1	-	3	3	1	1	1

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Sample ID	**BH15 1.25**	**BH15 1.50**	**BH15 1.75**	----	----
			Sampling date / time	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	---	---
Compound	*CAS Number*	*LOR*	*Unit*	**EB2220520-066**	**EB2220520-067**	**EB2220520-068**	----	----
				Result	Result	Result	---	---
EA037: Ass Field Screening Analysis								
ø **pH (F)**	---	0.1	pH Unit	**6.8**	**6.9**	**7.0**	---	---
ø **pH (Fox)**	---	0.1	pH Unit	**2.1**	**2.0**	**1.9**	---	---
ø **Reaction Rate**	---	1	-	**4**	**1**	**1**	---	---

QUALITY CONTROL REPORT

Work Order	: **EB2220520**	Page	: 1 of 4
Client	: **PRECISE ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR CHRIS BUTLER	Contact	: Nidhi Bhimani
Address	: PO BOX 4424 ROBINA TOWN CENTRE QLD, AUSTRALIA 4230	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: ----	Telephone	: +61-7-3243 7222
Project	: PE3394.22	Date Samples Received	: 14-Jul-2022
Order number	: PE3394.22	Date Analysis Commenced	: 19-Jul-2022
C-O-C number	: ----	Issue Date	: 21-Jul-2022
Sampler	: CHRIS BUTLER, SEAN GARDINER		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 68		
No. of samples analysed	: 68		

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

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

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

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

Signatories	*Position*	*Accreditation Category*
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD

General Comments

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

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA033-A: Actual Acidity (QC Lot: 4467835)									
EB2220449-016	Anonymous	EA033: sulfidic - Titratable Actual Acidity (s-23F)	---	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA033: Titratable Actual Acidity (23F)	---	2	mole H+ / t	<2	<2	0.0	No Limit
		EA033: pH KCl (23A)	---	0.1	pH Unit	8.4	8.5	0.0	0% - 20%
EB2220520-063	BH15 0.50	EA033: sulfidic - Titratable Actual Acidity (s-23F)	---	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA033: Titratable Actual Acidity (23F)	---	2	mole H+ / t	4	5	0.0	No Limit
		EA033: pH KCl (23A)	---	0.1	pH Unit	5.8	5.7	0.0	0% - 20%
EA033-B: Potential Acidity (QC Lot: 4467835)									
EB2220449-016	Anonymous	EA033: Chromium Reducible Sulfur (22B)	---	0.005	% S	0.042	0.045	7.2	No Limit
		EA033: acidity - Chromium Reducible Sulfur (a-22B)	---	10	mole H+ / t	26	28	7.2	No Limit
EB2220520-063	BH15 0.50	EA033: Chromium Reducible Sulfur (22B)	---	0.005	% S	0.016	0.015	0.0	No Limit
		EA033: acidity - Chromium Reducible Sulfur (a-22B)	---	10	mole H+ / t	<10	<10	0.0	No Limit
EA037: Ass Field Screening Analysis (QC Lot: 4465711)									
EB2220520-001	BH8 0.0	EA037: pH (F)	---	0.1	pH Unit	5.7	5.7	0.0	0% - 20%
		EA037: pH (Fox)	---	0.1	pH Unit	2.4	2.4	0.0	0% - 20%
EB2220520-011	BH9 0.50	EA037: pH (F)	---	0.1	pH Unit	6.2	6.3	0.0	0% - 20%
		EA037: pH (Fox)	---	0.1	pH Unit	3.8	3.8	0.0	0% - 20%
EA037: Ass Field Screening Analysis (QC Lot: 4465712)									
EB2220520-021	BH10 1.00	EA037: pH (F)	---	0.1	pH Unit	5.8	5.7	0.0	0% - 20%
		EA037: pH (Fox)	---	0.1	pH Unit	2.2	2.2	0.0	0% - 20%
EB2220520-031	BH11 1.50	EA037: pH (F)	---	0.1	pH Unit	5.3	5.2	1.9	0% - 20%
		EA037: pH (Fox)	---	0.1	pH Unit	2.2	2.2	0.0	0% - 20%

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EA037: Ass Field Screening Analysis (QC Lot: 4465713)									
EB2220520-041	BH12 1.00	EA037: pH (F)	---	0.1	pH Unit	5.9	6.0	0.0	0% - 20%
		EA037: pH (Fox)	---	0.1	pH Unit	2.0	2.0	0.0	0% - 50%
EB2220520-051	BH13 1.50	EA037: pH (F)	---	0.1	pH Unit	5.9	5.9	0.0	0% - 20%
		EA037: pH (Fox)	---	0.1	pH Unit	2.0	2.0	0.0	0% - 20%
EA037: Ass Field Screening Analysis (QC Lot: 4465714)									
EB2220520-061	BH15 0.0	EA037: pH (F)	---	0.1	pH Unit	5.7	5.8	0.0	0% - 20%
		EA037: pH (Fox)	---	0.1	pH Unit	3.0	2.9	0.0	0% - 20%

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA033-A: Actual Acidity (QCLot: 4467835)								
EA033: pH KCl (23A)	---	---	pH Unit	---	4.4 pH Unit	102	91.0	107
EA033: Titratable Actual Acidity (23F)	---	2	mole H+ / t	<2	19 mole H+ / t	89.9	70.0	124
EA033: sulfidic - Titratable Actual Acidity (s-23F)	---	0.02	% pyrite S	<0.02	---	---	---	---
EA033-B: Potential Acidity (QCLot: 4467835)								
EA033: Chromium Reducible Sulfur (22B)	---	0.005	% S	<0.005	0.246 % S	91.4	77.0	121
EA033: acidity - Chromium Reducible Sulfur (a-22B)	---	10	mole H+ / t	<10	---	---	---	---

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

- **No Matrix Spike (MS) or Matrix Spike Duplicate (MSD) Results are required to be reported.**

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EB2220520**	Page	: 1 of 5
Client	: **PRECISE ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR CHRIS BUTLER	Telephone	: +61-7-3243 7222
Project	: PE3394.22	Date Samples Received	: 14-Jul-2022
Site	: ----	Issue Date	: 21-Jul-2022
Sampler	: CHRIS BUTLER, SEAN GARDINER	No. of samples received	: 68
Order number	: PE3394.22	No. of samples analysed	: 68

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

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

Outliers : Analysis Holding Time Compliance

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

Outliers : Frequency of Quality Control Samples

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

Analysis Holding Time Compliance

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

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

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

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

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA033-A: Actual Acidity								
Snap Lock Bag - frozen (EA033)								
BH11 - 0.0,	BH11 - 0.50,	**12-Jul-2022**	**20-Jul-2022**	12-Jul-2023	✓	**20-Jul-2022**	18-Oct-2022	✓
BH11 - 1.00,	BH11 - 1.50,							
BH11 - 2.50,	BH15 - 0.0,							
BH15 - 0.50,	BH15 - 1.00							
EA033-B: Potential Acidity								
Snap Lock Bag - frozen (EA033)								
BH11 - 0.0,	BH11 - 0.50,	**12-Jul-2022**	**20-Jul-2022**	12-Jul-2023	✓	**20-Jul-2022**	18-Oct-2022	✓
BH11 - 1.00,	BH11 - 1.50,							
BH11 - 2.50,	BH15 - 0.0,							
BH15 - 0.50,	BH15 - 1.00							
EA033-C: Acid Neutralising Capacity								
Snap Lock Bag - frozen (EA033)								
BH11 - 0.0,	BH11 - 0.50,	**12-Jul-2022**	**20-Jul-2022**	12-Jul-2023	✓	**20-Jul-2022**	18-Oct-2022	✓
BH11 - 1.00,	BH11 - 1.50,							
BH11 - 2.50,	BH15 - 0.0,							
BH15 - 0.50,	BH15 - 1.00							
EA033-D: Retained Acidity								
Snap Lock Bag - frozen (EA033)								
BH11 - 0.0,	BH11 - 0.50,	**12-Jul-2022**	**20-Jul-2022**	12-Jul-2023	✓	**20-Jul-2022**	18-Oct-2022	✓
BH11 - 1.00,	BH11 - 1.50,							
BH11 - 2.50,	BH15 - 0.0,							
BH15 - 0.50,	BH15 - 1.00							
EA033-E: Acid Base Accounting								
Snap Lock Bag - frozen (EA033)								
BH11 - 0.0,	BH11 - 0.50,	**12-Jul-2022**	**20-Jul-2022**	12-Jul-2023	✓	**20-Jul-2022**	18-Oct-2022	✓
BH11 - 1.00,	BH11 - 1.50,							
BH11 - 2.50,	BH15 - 0.0,							
BH15 - 0.50,	BH15 - 1.00							

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA037: Ass Field Screening Analysis							
Snap Lock Bag - frozen (EA037)							
BH8 - 0.0, BH8 - 0.25, BH8 - 0.50, BH8 - 0.75, BH8 - 1.00, BH8 - 1.25, BH8 - 1.50, BH8 - 1.75, BH9 - 0.0, BH9 - 0.25, BH9 - 0.50, BH9 - 0.75, BH9 - 1.00, BH9 - 1.25, BH9 - 1.50, BH9 - 1.75, BH10 - 0.0, BH10 - 0.25, BH10 - 0.50, BH10 - 0.75, BH11 - 0.0, BH10 - 1.00, BH10 - 1.25, BH10 - 1.50, BH10 - 1.75, BH11 - 0.25, BH11 - 0.50, BH11 - 0.75, BH11 - 1.00, BH11 - 1.25, BH11 - 1.50, BH11 - 1.75, BH11 - 2.00, BH11 - 2.25, BH11 - 2.50, BH11 - 2.75, BH12 - 0.0, BH12 - 0.25, BH12 - 0.50, BH12 - 0.75, BH12 - 1.00, BH12 - 1.25, BH12 - 1.50, BH12 - 1.75, BH13 - 0.0, BH13 - 0.25, BH13 - 0.50, BH13 - 0.75, BH13 - 1.00, BH13 - 1.25, BH13 - 1.50, BH13 - 1.75, BH14 - 0.0, BH14 - 0.25, BH14 - 0.50, BH14 - 0.75, BH14 - 1.00, BH14 - 1.25, BH14 - 1.50, BH14 - 1.75, BH15 - 0.0, BH15 - 0.25, BH15 - 0.50, BH15 - 0.75, BH15 - 1.00, BH15 - 1.25, BH15 - 1.50, BH15 - 1.75	**12-Jul-2022**	**19-Jul-2022**	08-Jan-2023	✓	**19-Jul-2022**	08-Jan-2023	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
ASS Field Screening Analysis	EA037	7	68	**10.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chromium Suite for Acid Sulphate Soils	EA033	2	14	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Chromium Suite for Acid Sulphate Soils	EA033	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Chromium Suite for Acid Sulphate Soils	EA033	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Chromium Suite for Acid Sulphate Soils	EA033	SOIL	In house: Referenced to Ahern et al 2004. This method covers the determination of Chromium Reducible Sulfur (SCR); pHKCl; titratable actual acidity (TAA); acid neutralising capacity by back titration (ANC); and net acid soluble sulfur (SNAS) which incorporates peroxide sulfur. It applies to soils and sediments (including sands) derived from coastal regions. Liming Rate is based on results for samples as submitted and incorporates a minimum safety factor of 1.5.
ASS Field Screening Analysis	* EA037	SOIL	In house: Referenced to Acid Sulfate Soils Laboratory Methods Guidelines. As received samples are tested for pH field and pH fox and assessed for a reaction rating.

Preparation Methods	Method	Matrix	Method Descriptions
Drying only	EN020D	SOIL	In house
Drying at 85 degrees, bagging and labelling (ASS)	EN020PR	SOIL	In house

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EB2220427**

Client	: **PRECISE ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR CHRIS BUTLER	Contact	: Nidhi Bhimani
Address	: PO BOX 4424 ROBINA TOWN CENTRE QLD, AUSTRALIA 4230	Address	: 2 Byth Street Stafford QLD Australia 4053
E-mail	: mail@preciseenvironmental.com.au	E-mail	: nidhi.bhimani@alsglobal.com
Telephone	: ----	Telephone	: +61-7-3243 7222
Facsimile	: ----	Facsimile	: +61-7-3243 7218
Project	: PE3394.22	Page	: 1 of 3
Order number	: PE3394.22	Quote number	: EB2017PREENV0003 (EN/222)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: CHRIS BUTLER, SEAN GARDINER		

Dates

Date Samples Received	: 14-Jul-2022 11:35	Issue Date	: 14-Jul-2022
Client Requested Due Date	: 20-Jul-2022	Scheduled Reporting Date	: **20-Jul-2022**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Intact.
No. of coolers/boxes	: 4	Temperature	: 3.8, 5.0, 3.4, 4.4°C - Ice present
Receipt Detail	: HARD ESKY	No. of samples received / analysed	: 64 / 64

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please be advised that sample "BH4 0.75, BH5 2.00 and BH5 2.25" was not received at the laboratory (denoted SNR on the scanned COC).**
- **SPLIT WORK ORDER: It should be noted that ALS has split this work order over the following work orders EB2220520 and EB2220427 due to the size of the sample numbers. For any further information regarding this processing of samples please contact ALS client services division on ALSEnviro.Brisbane@alsglobal.com**
- Discounted Package Prices apply only when specific ALS Group Codes ('W', 'S', 'NT' suites) are referenced on COCs.
- Please direct any turn around / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months ± 1 week) from receipt of samples.
- Analysis will be conducted by ALS Environmental, Brisbane, NATA accreditation no. 825, Site No. 818 (Micro site no. 18958).
- **Breaches in recommended extraction / analysis holding times (if any) are displayed overleaf in the Proactive Holding Time Report table.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The laboratory will process these samples unless instructions are received from you indicating you do not wish to proceed. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	*Sampling date / time*	*Sample ID*	SOIL - EA033 Chromium Suite for Acid Sulphate Soils	SOIL - EA037 ASS Field Screening Analysis
EB2220427-001	12-Jul-2022 00:00	BH1 0.0	✓	✓
EB2220427-002	12-Jul-2022 00:00	BH1 0.25		✓
EB2220427-003	12-Jul-2022 00:00	BH1 0.50	✓	✓
EB2220427-004	12-Jul-2022 00:00	BH1 0.75		✓
EB2220427-005	12-Jul-2022 00:00	BH1 1.00	✓	✓
EB2220427-006	12-Jul-2022 00:00	BH1 1.25		✓
EB2220427-007	12-Jul-2022 00:00	BH1 1.50	✓	✓
EB2220427-008	12-Jul-2022 00:00	BH1 1.75		✓
EB2220427-009	12-Jul-2022 00:00	BH1 2.00		✓
EB2220427-010	12-Jul-2022 00:00	BH1 2.25		✓
EB2220427-011	12-Jul-2022 00:00	BH1 2.50	✓	✓
EB2220427-012	12-Jul-2022 00:00	BH1 2.75		✓
EB2220427-013	12-Jul-2022 00:00	BH2 0.0		✓
EB2220427-014	12-Jul-2022 00:00	BH2 0.25		✓
EB2220427-015	12-Jul-2022 00:00	BH2 0.50		✓
EB2220427-016	12-Jul-2022 00:00	BH2 0.75		✓
EB2220427-017	12-Jul-2022 00:00	BH2 1.00		✓
EB2220427-018	12-Jul-2022 00:00	BH2 1.25		✓
EB2220427-019	12-Jul-2022 00:00	BH2 1.50		✓
EB2220427-020	12-Jul-2022 00:00	BH2 1.75		✓
EB2220427-021	12-Jul-2022 00:00	BH3 0.0		✓
EB2220427-022	12-Jul-2022 00:00	BH3 0.25		✓
EB2220427-023	12-Jul-2022 00:00	BH3 0.50		✓
EB2220427-024	12-Jul-2022 00:00	BH3 0.75		✓
EB2220427-025	12-Jul-2022 00:00	BH3 1.00		✓
EB2220427-026	12-Jul-2022 00:00	BH3 1.25		✓
EB2220427-027	12-Jul-2022 00:00	BH3 1.50		✓
EB2220427-028	12-Jul-2022 00:00	BH3 1.75		✓
EB2220427-029	12-Jul-2022 00:00	BH4 0.0	✓	✓
EB2220427-030	12-Jul-2022 00:00	BH4 0.25		✓
EB2220427-031	12-Jul-2022 00:00	BH4 0.50	✓	✓
EB2220427-033	12-Jul-2022 00:00	BH4 1.00	✓	✓
EB2220427-034	12-Jul-2022 00:00	BH4 1.25		✓
EB2220427-035	12-Jul-2022 00:00	BH4 1.50	✓	✓
EB2220427-036	12-Jul-2022 00:00	BH4 1.75		✓

			SOIL - EA033 Chromium Suite for Acid Sulphate Soils	SOIL - EA037 ASS Field Screening Analysis
EB2220427-037	12-Jul-2022 00:00	BH4 2.00		✓
EB2220427-038	12-Jul-2022 00:00	BH4 2.25	✓	✓
EB2220427-039	12-Jul-2022 00:00	BH5 0.0		✓
EB2220427-040	12-Jul-2022 00:00	BH5 0.50		✓
EB2220427-041	12-Jul-2022 00:00	BH5 0.75		✓
EB2220427-042	12-Jul-2022 00:00	BH5 1.00		✓
EB2220427-043	12-Jul-2022 00:00	BH5 1.25		✓
EB2220427-044	12-Jul-2022 00:00	BH5 1.50		✓
EB2220427-045	12-Jul-2022 00:00	BH5 1.75		✓
EB2220427-048	12-Jul-2022 00:00	BH6 0.0	✓	✓
EB2220427-049	12-Jul-2022 00:00	BH6 0.25		✓
EB2220427-050	12-Jul-2022 00:00	BH6 0.50	✓	✓
EB2220427-051	12-Jul-2022 00:00	BH6 0.75		✓
EB2220427-052	12-Jul-2022 00:00	BH6 1.00	✓	✓
EB2220427-053	12-Jul-2022 00:00	BH6 1.25		✓
EB2220427-054	12-Jul-2022 00:00	BH6 1.50	✓	✓
EB2220427-055	12-Jul-2022 00:00	BH6 1.75		✓
EB2220427-056	12-Jul-2022 00:00	BH6 2.00		✓
EB2220427-057	12-Jul-2022 00:00	BH6 2.25		✓
EB2220427-058	12-Jul-2022 00:00	BH6 2.50	✓	✓
EB2220427-059	12-Jul-2022 00:00	BH6 2.75		✓
EB2220427-060	12-Jul-2022 00:00	BH7 0.0		✓
EB2220427-061	12-Jul-2022 00:00	BH7 0.25		✓
EB2220427-062	12-Jul-2022 00:00	BH7 0.50		✓
EB2220427-063	12-Jul-2022 00:00	BH7 0.75		✓
EB2220427-064	12-Jul-2022 00:00	BH7 1.00		✓
EB2220427-065	12-Jul-2022 00:00	BH7 1.25		✓
EB2220427-066	12-Jul-2022 00:00	BH7 1.50		✓
EB2220427-067	12-Jul-2022 00:00	BH7 1.75		✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

RESULTS & INVOICE

- *AU Certificate of Analysis - NATA (COA)	Email	mail@preciseenvironmental.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	mail@preciseenvironmental.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	mail@preciseenvironmental.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	mail@preciseenvironmental.com.au
- A4 - AU Tax Invoice (INV)	Email	mail@preciseenvironmental.com.au
- Chain of Custody (CoC) (COC)	Email	mail@preciseenvironmental.com.au
- EDI Format - XTab (XTAB)	Email	mail@preciseenvironmental.com.au

SAMPLE RECEIPT INFORMATION & BOTTLE TYPE

160

WORKORDER No:

To be completed by Sample Receipt 13/07/22

Sorting Times (Only record for BP, Mobil & URS)	Temperature Details (record if NOT on COC)	Packaging			Courier Details (Mandatory for Quarantine)	Samples checked, labelled and put in trays by:
Time Sorting Commenced:	Sample Temp °C	Security Seal Intact? *Circle below*	Packaging Type	No.	Con Note: Jet @ 12:40, 13/7/22	Initial:
Time Placed in Fridge:	Chilling Method - Circle	(YES) (Security seal intact)	Hard Esky m	4		
Sorting to Fridge Target Time <1 Hour	(Ice) / Ice Bricks / No Chilling	NO (Security seal broken)	Foam Esky		*Cells shaded grey don't need to be completed on this form if they are entered directly into LIMS/ANGEL by Sample Receipt staff.*	
		NA (No security seal used)	Other			

Sample Receipt Advice Comments - To be completed by Sorting Staff

VOC analysis may be compromised as sample containers contained **headspace** *(list):*

Details of any samples damaged during transit:

Other Information (eg. Were bottles received that weren't completely filled) (eg. If sample temperature is above 6°C add further detail here - *Internal use only - Not for SRN*):

3.8 / 5.0 / 3.4 / 4.4

Precise Enviro ; PE3394.22

Environmental Division
Brisbane
Work Order Reference
EB2220427

Telephone : +61-7-3243 7222

Metals Bottles: F = Field filtered. T = Total. N/S = Not Specified.
Cyanide Bottles: Tr = Treated, meaning the client has ticked the pre-treated box on the bottle. Un = Untreated, meaning the box is not ticked.
Ferrous Iron, Hexavalent Chromium & Geosmin and MIB: F = Field filtered. N/S = Not Specified.
Soil Bags: S = Small. M = Medium (~500mL asbestos or PSD bag). L = Large (~6kg FMT bag)

Lab No.	-S		-G					-O		-P				-RF				-RGF				-B		-M					-TOC		-VOC						
	Soil Jar 125mL 250mL	Bag Plastic White Green	Nat Green			Nat White 500mL	UT Nutrients		Green Vial (Geos & MIB)	Glass Orange		Glass Purp (O&G) 250mL	Plastic Purp 250mL	Plastic Grey (PFOS / PFOA) 60ml	Bacto Black / Thio Grey 250mL	-RT 60mL Nitric Red				-RGT 60mL Lab Acidified				NaOH Hexa Chrome Blue 60mL	NaOH CN Blue 60mL	0.5L Glass Brown CIRCLE Lab Preserved Or Pre-preserved	Fluoro Yellow (Sulfide) 250mL		Fluoro Orange 125mL (Sulfite)	HCl Fe^{2+} Maroon 60mL		-DOC Vial H_2SO_4 Purple 40mL		Vial H_2SO_4 Purple 40mL (VOC)	H.S Y/N	EDA Vial 40mL	Endo-Toxin Tube	DUST CuSO4 UnPres 2.5L 4L	Other
														STD		ORC		STD		ORC																	
	Frozen Wet Dry		1L	500mL	250mL	1L	Light Green (T)	Turquoise (F)		100 mL	500 mL	1L	60mL	250mL	500mL	F	T	F	T	F	T	F	T	F	T	250mL	Pre-preserved	UHS F	T		F	T	TOC	DOC						
	This line allows for an initial indication of bottle types received without specifying the exact number for each sample. When using this function tick the boxes matching the containers received for this work order.																																				
1																																					
2																																					
3																																					
4																																					
5																																					
6																																					
7																																					
8																																					
9																																					
10																																					

CHAIN OF CUSTODY CHAIN OF CUSTODY

ALS Laboratory: please tick → ALS Laboratory: please tick →

☐ Sydney: 277 Woodpark Rd, Smithfield NSW 2176 Ph: 02 8784 8555 E: samples.sydney@alsenviro.com
☐ Brisbane: 32 Shand St, Stafford QLD 4053 Ph:07 3243 7222 E:samples.brisbane@alsenviro.com
☐ Melbourne: 2-4 Westall Rd, Springvale VIC 3171 Ph:03 8549 9600 E: samples.melbourne@alsenviro.com
☐ Perth: 10 Hod Way, Mala Ph: 08 9209 7655 E: sample
☐ Newcastle: 5 Rosegum Rd, Warabrook NSW 2304 Ph:02 4968 9433 E:samples.newcastle@alsenviro.com
☐ Townsville: 14-15 Desma Ct, Bohle QLD 4818 Ph: 07 4796 0600 E: townsville.environmental@alsenviro.com
☐ Adelaide: 2-1 Burma Rd, Pooraka SA 5095 Ph: 08 8359 0890 E: adelaide@alsenviro.com
☐ Launceston: 27 Wellingt Ph: 03 6331 2158 E: launce

Environmental Division
Brisbane
Work Order Reference
EB2220427

Telephone : +61-7-3243 7222

CLIENT:	PRECISE ENVIRONMENTAL	TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	☐ Standard TAT (List due date): ☐ Non Standard or urgent TAT (List due date):
OFFICE:	7/14 FREMANTLE ST, BURLEIGH HEADS 4220		
PROJECT:	PE3394.22	ALS QUOTE NO.: BN031/16 v4	COC SEQUENCE NUMBER (Circle) COC: 1 2 3 4 5 6 7 OF: 1 2 3 4 5 6 7
ORDER NUMBER:	PE3394.22		
PROJECT MANAGER:	CHRIS BUTLER	CONTACT: 0431 565 210	
SAMPLER:	CHRIS BUTLER / SEAN GARDINER	SAMPLER MOBILE: 0409 827 396	RELINQUISHED BY: CHRIS BUTLER DATE/TIME: 13.07.22 9AM
COC emailed to ALS? (YES / NO)		EDD FORMAT (or default):	RECEIVED BY: DATE/TIME:
Email Reports to: mail@preciseenvironmental.com.au			RELINQUISHED BY: DATE/TIME:
Mail Invoice to: PO Box 4424, Robina Town Centre 4230			

FOR LABORATO
Custody seal intact?
Free ice/frozen ice
receipt
Random Sample Ter
Other comment:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE ONLY	SAMPLE DETAILS Water(W)			MATRIX: Solid(S)	CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	SAMPLE DESCRIPTION	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	EA037 (pHF and pHFOX)	EA033 (Chromium suite)							Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	BH1	0.0	12.07.22	S	BAG/<4°C	1	X	X							
2	BH1	0.25	12.07.22	S	BAG/<4°C	1	X								
3	BH1	0.50	12.07.22	S	BAG/<4°C	1	X	X							
4	BH1	0.75	12.07.22	S	BAG/<4°C	1	X								
5	BH1	1.00	12.07.22	S	BAG/<4°C	1	X	X							
6	BH1	1.25	12.07.22	S	BAG/<4°C	1	X								
7	BH1	1.50	12.07.22	S	BAG/<4°C	1	X	X							
8	BH1	1.75	12.07.22	S	BAG/<4°C	1	X								
9	BH1	2.00	12.07.22	S	BAG/<4°C	1	X								
10	BH1	2.25	12.07.22	S	BAG/<4°C	1	X								
11	BH1	2.50	12.07.22	S	BAG/<4°C	1	X	X							
12	BH1	2.75	12.07.22	S	BAG/<4°C	1	X								
					TOTAL	12									

SPLIT BATCH
Test
Assoc. Batch No.
EB2220520

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

CHAIN OF CUSTODY CHAIN OF CUSTODY

ALS Laboratory: please tick → *ALS Laboratory: please tick →*

☐ Sydney: 277 Woodpark Rd, Smithfield NSW 2176 Ph: 02 8784 8555 E: samples.sydney@alsenviro.com
☐ Brisbane: 32 Shand St, Stafford QLD 4053 Ph 07 3243 7222 E:samples.brisbane@alsenviro.com
☐ Melbourne: 2-4 Westall Rd, Springvale VIC 3171 Ph 03 8549 9600 E: samples.melbourne@alsenviro.com
☐ Perth: 10 Hod Way, Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsenviro.com
☐ Newcastle: 5 Rosegum Rd, Warabrook NSW 2304 Ph:02 4968 9433 E:samples.newcastle@alsenviro.com
☐ Townsville: 14-15 Desma Ct, Bohle QLD 4818 Ph:07 4796 0600 E: townsville.environmental@alsenviro.com
☐ Adelaide: 2-1 Burma Rd, Pooraka SA 5095 Ph: 08 8359 0890 E:adelaide@alsenviro.com
☐ Launceston: 27 Wellington St, Launceston TAS 7250 Ph: 03 6331 2158 E: launceston@alsenviro.com

CLIENT:	PRECISE ENVIRONMENTAL	**TURNAROUND REQUIREMENTS :** (Standard TAT may be longer for some tests e.g. Ultra Trace Organics)	☐ Standard TAT (List due date): ☐ Non Standard or urgent TAT (List due date):
OFFICE:	7/14 FREMANTLE ST, BURLEIGH HEADS 4220		
PROJECT:	PE3394.22	**ALS QUOTE NO.:**	BN031/16 v4
ORDER NUMBER:	PE3394.22		
PROJECT MANAGER:	CHRIS BUTLER	**CONTACT: 0431 565 210**	
SAMPLER:	CHRIS BUTLER / SEAN GARDINER	**SAMPLER MOBILE: 0409 827 396**	
COC emailed to ALS? (YES / NO)		**EDD FORMAT (or default):**	
Email Reports to: mail@precisenvironmental.com.au			
Mail Invoice to: PO Box 4424, Robina Town Centre 4230			

COC SEQUENCE NUMBER (Circle)

COC: 1 2 3 4 5 6 7

OF: 1 2 3 4 5 6 7

FOR LABORATORY USE ONLY: (Circle)

Custody Seal Intact?	Yes	No	N/A
Free/cool frozen ice bricks present upon receipt?	Yes	No	N/A
Random Sample Temperature on Receipt:	°C		
Other comment:			

RELINQUISHED BY:	**RECEIVED BY:**	**RELINQUISHED BY:**	**RECEIVED BY:**
CHRIS BUTLER			
DATE/TIME: 13.07.22 9AM	DATE/TIME:	DATE/TIME:	DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE ONLY	SAMPLE DETAILS			MATRIX: Solid(S) Water(W)	CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	SAMPLE DESCRIPTION	DATE / TIME	MATRIX	TYPE & PRESERVATIVE *(refer to codes below)*	TOTAL BOTTLES	EA037 (pHF and pHFOX)	EA033 (Chromium suite)							Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
13	BH2	0.0	12.07.22	S	BAG/<4°C	1	X								
14	BH2	0.25	12.07.22	S	BAG/<4°C	1	X								
15	BH2	0.50	12.07.22	S	BAG/<4°C	1	X								
16	BH2	0.75	12.07.22	S	BAG/<4°C	1	X								
17	BH2	1.00	12.07.22	S	BAG/<4°C	1	X								
18	BH2	1.25	12.07.22	S	BAG/<4°C	1	X								
19	BH2	1.50	12.07.22	S	BAG/<4°C	1	X								
20	BH2	1.75	12.07.22	S	BAG/<4°C	1	X								
					TOTAL	8									

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

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☐ Brisbane: 32 Shand St, Stafford QLD 4053 Ph:07 3243 7222 E:samples.brisbane@alsenviro.com
☐ Townsville: 14-15 Desma Ct, Bohle QLD 4818 Ph:07 4796 0600 E: townsville.environmental@alsenviro.com
☐ Melbourne: 2-4 Westall Rd, Springvale VIC 3171 Ph:03 8549 9600 E: samples.melbourne@alsenviro.com
☐ Adelaide: 2-1 Burma Rd, Pooraka SA 5095 Ph: 08 8359 0890 E:adelaide@alsenviro.com
☐ Perth: 10 Hod Way, Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsenviro.com
☐ Launceston: 27 Wellington St, Launceston TAS 7250 Ph: 03 6331 2158 E: launceston@alsenviro.com

CLIENT:	PRECISE ENVIRONMENTAL	TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	☐ Standard TAT (List due date): ☐ Non Standard or urgent TAT (List due date):
OFFICE:	7/14 FREMANTLE ST, BURLEIGH HEADS 4220		
PROJECT:	PE3394.22	ALS QUOTE NO.: BN031/16 v4	
ORDER NUMBER:	PE3394.22		
PROJECT MANAGER:	CHRIS BUTLER	CONTACT: 0431 565 210	
SAMPLER:	CHRIS BUTLER / SEAN GARDINER	SAMPLER MOBILE: 0409 827 396	
COC emailed to ALS? (YES / NO)		EDD FORMAT (or default):	
Email Reports to: mail@preciseenvironmental.com.au			
Mail Invoice to: PO Box 4424, Robina Town Centre 4230			

COC SEQUENCE NUMBER (Circle)
COC: 1 2 3 4 5 6 7
OF: 1 2 3 4 5 6 7

FOR LABORATORY USE ONLY (Circle):
Custody seal intact? Yes No N/A
Free ice / frozen ice bricks present upon receipt? Yes No N/A
Random Sample Temperature on Receipt: °C
Other comment:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
CHRIS BUTLER			
DATE/TIME: 13.07.22 9AM	DATE/TIME:	DATE/TIME:	DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE ONLY	SAMPLE DETAILS			MATRIX: Solid(S) Water(W)	CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	SAMPLE DESCRIPTION	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	EA037 (pHF and pHFOX)	EA033 (Chromium suite)							Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
21	BH3	0.0	12.07.22	S	BAG/<4°C	1	X								
22	BH3	0.25	12.07.22	S	BAG/<4°C	1	X								
23	BH3	0.50	12.07.22	S	BAG/<4°C	1	X								
24	BH3	0.75	12.07.22	S	BAG/<4°C	1	X								
25	BH3	1.00	12.07.22	S	BAG/<4°C	1	X								
26	BH3	1.25	12.07.22	S	BAG/<4°C	1	X								
27	BH3	1.50	12.07.22	S	BAG/<4°C	1	X								
28	BH3	1.75	12.07.22	S	BAG/<4°C	1	X								
					TOTAL	8									

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

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☐ **Newcastle**: 5 Rosegum Rd, Warabrook NSW 2304 Ph:02 4968 9433 E:samples.newcastle@alsenviro.com
☐ **Brisbane**: 32 Shand St, Stafford QLD 4053 Ph:07 3243 7222 E:samples.brisbane@alsenviro.com
☐ **Townsville**: 14-15 Desma Ct, Bohle QLD 4818 Ph:07 4796 0600 E: townsville.environmental@alsenviro.com
☐ **Melbourne**: 2-4 Westall Rd, Springvale VIC 3171 Ph:03 8549 9600 E: samples.melbourne@alsenviro.com
☐ **Adelaide**: 2-1 Burma Rd, Pooraka SA 5095 Ph: 08 8359 0890 E:adelaide@alsenviro.com
☐ **Perth**: 10 Hod Way, Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsenviro.com
☐ **Launceston**: 27 Wellington St, Launceston TAS 7250 Ph: 03 6331 2158 E: launceston@alsenviro.com

CLIENT:	**PRECISE ENVIRONMENTAL**	**TURNAROUND REQUIREMENTS :** (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	☐ Standard TAT (**List due date**): ☐ Non Standard or urgent TAT (**List due date**):
OFFICE:	**7/14 FREMANTLE ST, BURLEIGH HEADS 4220**		
PROJECT:	**PE3394.22**	**ALS QUOTE NO.:** BN031/16 v4	**COC SEQUENCE NUMBER (Circle)** COC: 1 2 3 4 5 6 7 OF: 1 2 3 4 5 6 7
ORDER NUMBER:	**PE3394.22**		
PROJECT MANAGER:	**CHRIS BUTLER**	**CONTACT: 0431 565 210**	
SAMPLER:	**CHRIS BUTLER / SEAN GARDINER**	**SAMPLER MOBILE: 0409 827 396**	
COC emailed to ALS? (YES / NO)		**EDD FORMAT (or default):**	
Email Reports to: mail@preciseenvironmental.com.au			
Mail Invoice to: PO Box 4424, Robina Town Centre 4230			

FOR LABORATORY USE ONLY (Circle)
Custody Seal Intact? Yes No N/A
Free ice / frozen ice bricks present upon receipt? Yes No N/A
Random Sample Temperature on Receipt °C
Other comment

RELINQUISHED BY:	**RECEIVED BY:**	**RELINQUISHED BY:**	**RECEIVED BY:**
CHRIS BUTLER			
DATE/TIME: 13.07.22 9AM	DATE/TIME:	DATE/TIME:	DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE ONLY	**SAMPLE DETAILS** Water(W)			MATRIX: Solid(S)	**CONTAINER INFORMATION**		**ANALYSIS REQUIRED including SUITES** (NB. Suite Codes must be listed to attract suite price) Where **Metals** are required, specify **Total** (unfiltered bottle required) or **Dissolved** (field filtered bottle required).								**Additional Information**
LAB ID	SAMPLE ID	SAMPLE DESCRIPTION	DATE / TIME	MATRIX	TYPE & PRESERVATIVE *(refer to codes below)*	TOTAL BOTTLES	EA037 (pHF and pHFOX)	EA033 (Chromium suite)							Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
29	BH4	0.0	12.07.22	S	BAG/<4°C	1	X	X							
30	BH4	0.25	12.07.22	S	BAG/<4°C	1	X								
31	BH4	0.50	12.07.22	S	BAG/<4°C	1	X	X							
32	BH4	0.75	12.07.22	S	BAG/<4°C	1	X								
33	BH4	1.00	12.07.22	S	BAG/<4°C	1	X	X							
34	BH4	1.25	12.07.22	S	BAG/<4°C	1	X								
35	BH4	1.50	12.07.22	S	BAG/<4°C	1	X	X							
36	BH4	1.75	12.07.22	S	BAG/<4°C	1	X								
37	BH4	2.00	12.07.22	S	BAG/<4°C	1	X								
38	BH4	2.25	12.07.22	S	BAG/<4°C	1	X	X							
					TOTAL	10									

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

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☐ Perth: 10 Hod Way, Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsenviro.com
☐ Newcastle: 5 Rosegum Rd, Warabrook NSW 2304 Ph:02 4968 9433 E:samples.newcastle@alsenviro.com
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☐ Adelaide: 2-1 Burma Rd, Pooraka SA 5095 Ph: 08 8359 0890 E:adelaide@alsenviro.com
☐ Launceston: 27 Wellington St, Launceston TAS 7250 Ph: 03 6331 2158 E: launceston@alsenviro.com

CLIENT:	PRECISE ENVIRONMENTAL	TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	☐ Standard TAT (List due date): ☐ Non Standard or urgent TAT (List due date):
OFFICE:	7/14 FREMANTLE ST, BURLEIGH HEADS 4220		
PROJECT:	PE3394.22	ALS QUOTE NO.: BN031/16 v4	COC SEQUENCE NUMBER (Circle) COC: 1 2 3 4 5 6 7
ORDER NUMBER:	PE3394.22		OF: 1 2 3 4 5 6 7
PROJECT MANAGER:	CHRIS BUTLER	CONTACT: 0431 565 210	
SAMPLER:	CHRIS BUTLER / SEAN GARDINER	SAMPLER MOBILE: 0409 827 396	
COC emailed to ALS? (YES / NO)		EDD FORMAT (or default):	
Email Reports to: mail@preciseenvironmental.com.au			
Mail Invoice to: PO Box 4424, Robina Town Centre 4230			

FOR LABORATORY USE ONLY: (Circle)
Custody Seal Intact? Yes No N/A
Free ice / frozen ice bricks present upon receipt? Yes No N/A
Random Sample Temperature on Receipt: °C
Other comments:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
CHRIS BUTLER			
DATE/TIME: 13.07.22 9AM	DATE/TIME:	DATE/TIME:	DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE ONLY	SAMPLE DETAILS			Water(W) MATRIX: Solid(S)	CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	SAMPLE DESCRIPTION	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	EA037 (pHF and pHFOX)	EA033 (Chromium suite)							Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
39	BH5	0.0	12.07.22	S	BAG/<4°C	1	X								
40	BH5	0.50	12.07.22	S	BAG/<4°C	1	X								
41	BH5	0.75	12.07.22	S	BAG/<4°C	1	X								
42	BH5	1.00	12.07.22	S	BAG/<4°C	1	X								
43	BH5	1.25	12.07.22	S	BAG/<4°C	1	X								
44	BH5	1.50	12.07.22	S	BAG/<4°C	1	X								
45	BH5	1.75	12.07.22	S	BAG/<4°C	1	X								
46	BH5	2.00	12.07.22	S	BAG/<4°C	1	X								
47	BH5	2.25	12.07.22	S	BAG/<4°C	1	X								
					TOTAL:	9									

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

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☐ Perth: 10 Hod Way, Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsenviro.com
☐ Launceston: 27 Wellington St, Launceston TAS 7250 Ph: 03 6331 2158 E: launceston@alsenviro.com

CLIENT:	PRECISE ENVIRONMENTAL	TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g. Ultra Trace Organics)	☐ Standard TAT (List due date): ☐ Non Standard or urgent TAT (List due date):
OFFICE:	7/14 FREMANTLE ST, BURLEIGH HEADS 4220		
PROJECT:	PE3394.22	ALS QUOTE NO.: BN031/16 v4	COC SEQUENCE NUMBER (Circle) COC: 1 2 3 4 5 6 7
ORDER NUMBER:	PE3394.22		OF: 1 2 3 4 5 6 7
PROJECT MANAGER:	CHRIS BUTLER	CONTACT: 0431 565 210	
SAMPLER:	CHRIS BUTLER / SEAN GARDINER	SAMPLER MOBILE: 0409 827 396	
COC emailed to ALS? (YES / NO)		EDD FORMAT (or default):	
Email Reports to: mail@preciseenvironmental.com.au			
Mail Invoice to: PO Box 4424, Robina Town Centre 4230			

FOR LABORATORY USE ONLY (Circle)
Custody Seal Intact? Yes No N/A
Free ice / frozen ice bricks present upon receipt? Yes No N/A
Random Sample Temperature on Receipt: °C
Other comment:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
CHRIS BUTLER			
DATE/TIME: 13.07.22 9AM	DATE/TIME:	DATE/TIME:	DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE ONLY	SAMPLE DETAILS Water(W)			MATRIX: Solid(S)	CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	SAMPLE DESCRIPTION	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	EA037 (pHF and pHFOX)	EA033 (Chromium suite)							Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
48	BH6	0.0	12.07.22	S	BAG/<4°C	1	X	X							
49	BH6	0.25	12.07.22	S	BAG/<4°C	1	X								
50	BH6	0.50	12.07.22	S	BAG/<4°C	1	X	X							
51	BH6	0.75	12.07.22	S	BAG/<4°C	1	X								
52	BH6	1.00	12.07.22	S	BAG/<4°C	1	X	X							
53	BH6	1.25	12.07.22	S	BAG/<4°C	1	X								
54	BH6	1.50	12.07.22	S	BAG/<4°C	1	X	X							
55	BH6	1.75	12.07.22	S	BAG/<4°C	1	X								
56	BH6	2.00	12.07.22	S	BAG/<4°C	1	X								
57	BH6	2.25	12.07.22	S	BAG/<4°C	1	X								
58	BH6	2.50	12.07.22	S	BAG/<4°C	1	X	X							
59	BH6	2.75	12.07.22	S	BAG/<4°C	1	X								
					TOTAL	12									

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

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CLIENT:	PRECISE ENVIRONMENTAL	TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	☐ Standard TAT (List due date): ☐ Non Standard or urgent TAT (List due date):
OFFICE:	7/14 FREMANTLE ST, BURLEIGH HEADS 4220		
PROJECT:	PE3394.22	ALS QUOTE NO.:	BN031/16 v4
ORDER NUMBER:	PE3394.22		
PROJECT MANAGER:	CHRIS BUTLER	CONTACT: 0431 565 210	
SAMPLER:	CHRIS BUTLER / SEAN GARDINER	SAMPLER MOBILE: 0409 827 396	
COC emailed to ALS? (YES / NO)		EDD FORMAT (or default):	
Email Reports to: mail@preciseenvironmental.com.au			
Mail Invoice to: PO Box 4424, Robina Town Centre 4230			

COC SEQUENCE NUMBER (Circle)
COC: 1 2 3 4 5 6 7
OF: 1 2 3 4 5 6 7

FOR LABORATORY USE ONLY: (Circle)
Custody Seal Intact? Yes No N/A
Free ice / frozen ice bricks present upon receipt? Yes No N/A
Random Sample Temperature on Receipt: °C
Other comment:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
CHRIS BUTLER			
DATE/TIME: 13.07.22 9AM	DATE/TIME:	DATE/TIME:	DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE ONLY	SAMPLE DETAILS (Water(W))			MATRIX: Solid(S)	CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	SAMPLE DESCRIPTION	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	EA037 (pHF and pHFOX)	EA033 (Chromium suite)							Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
60	BH7	0.0	12.07.22	S	BAG/<4°C	1	X								
61	BH7	0.25	12.07.22	S	BAG/<4°C	1	X								
62	BH7	0.50	12.07.22	S	BAG/<4°C	1	X								
63	BH7	0.75	12.07.22	S	BAG/<4°C	1	X								
64	BH7	1.00	12.07.22	S	BAG/<4°C	1	X								
65	BH7	1.25	12.07.22	S	BAG/<4°C	1	X								
66	BH7	1.50	12.07.22	S	BAG/<4°C	1	X								
67	BH7	1.75	12.07.22	S	BAG/<4°C	1	X								
					TOTAL	8									

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

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☐ Launceston: 27 Wellingt Ph: 03 6331 2158 E: launce

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Brisbane
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EB22204

CLIENT:	PRECISE ENVIRONMENTAL	TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	☐ Standard TAT (List due date): ☐ Non Standard or urgent TAT (List due date):
OFFICE:	7/14 FREMANTLE ST, BURLEIGH HEADS 4220		
PROJECT:	PE3394.22	ALS QUOTE NO.:	BN031/16 v4
ORDER NUMBER:	PE3394.22		
PROJECT MANAGER:	CHRIS BUTLER	CONTACT: 0431 565 210	
SAMPLER:	CHRIS BUTLER / SEAN GARDINER	SAMPLER MOBILE: 0409 827 396	
COC emailed to ALS? (YES / NO)		EDD FORMAT (or default):	
Email Reports to: mail@preciseenvironmental.com.au			
Mail Invoice to: PO Box 4424, Robina Town Centre 4230			

COC SEQUENCE NUMBER (Circle)
COC: 1 2 3 4 5 6 7
OF: 1 2 3 4 5 6 7

FOR LABORATO
Custody Seal Intact(
Free ice / frozen ice
receipt
Random Sample Ter
Other comments:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:
CHRIS BUTLER		
DATE/TIME: 13.07.22 9AM	DATE/TIME:	DATE/TIME:

Telephone : + 61-7-3243 7222

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE ONLY	SAMPLE DETAILS			MATRIX: Solid(S) Water(W)	CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	SAMPLE DESCRIPTION	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	EA037 (pHF and pHFOX)	EA033 (Chromium suite)							Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	BH1	0.0	12.07.22	S	BAG/<4°C	1	X	X							
2	BH1	0.25	12.07.22	S	BAG/<4°C	1	X								
3	BH1	0.50	12.07.22	S	BAG/<4°C	1	X	X							
4	BH1	0.75	12.07.22	S	BAG/<4°C	1	X								
5	BH1	1.00	12.07.22	S	BAG/<4°C	1	X	X							
6	BH1	1.25	12.07.22	S	BAG/<4°C	1	X								
7	BH1	1.50	12.07.22	S	BAG/<4°C	1	X	X							
8	BH1	1.75	12.07.22	S	BAG/<4°C	1	X								
9	BH1	2.00	12.07.22	S	BAG/<4°C	1	X								
10	BH1	2.25	12.07.22	S	BAG/<4°C	1	X								
11	BH1	2.50	12.07.22	S	BAG/<4°C	1	X	X							
12	BH1	2.75	12.07.22	S	BAG/<4°C	1	X								
					TOTAL	12									

SPLIT BATCH
Test
Assoc. Batch No.
EB2220520

SCANNED

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

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☐ Melbourne: 2-4 Westall Rd, Springvale VIC 3171 Ph:03 8549 9600 E samples.melbourne@alsenviro.com
☐ Perth: 10 Hod Way, Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsenviro.com
☐ Newcastle: 5 Rosegum Rd, Warabrook NSW 2304 Ph:02 4968 9433 E:samples.newcastle@alsenviro.com
☐ Townsville: 14-15 Desma Ct, Bohle QLD 4818 Ph 07 4796 0600 E: townsville.environmental@alsenviro.com
☐ Adelaide: 2-1 Burma Rd Pooraka SA 5095 Ph: 08 8359 0890 E adelaide@alsenviro.com
☐ Launceston: 27 Wellington St, Launceston TAS 7250 Ph: 03 6331 2158 E: launceston@alsenviro.com

CLIENT:	PRECISE ENVIRONMENTAL	TURNAROUND REQUIREMENTS : ☐ Standard TAT (List due date):	FOR LABORATORY USE ONLY: (Circle)
OFFICE:	7/14 FREMANTLE ST, BURLEIGH HEADS 4220	(Standard TAT may be longer for some tests e.g., Ultra Trace Organics) ☐ Non Standard or urgent TAT (List due date):	Custody Seal Intact? Yes No
PROJECT:	PE3394.22	ALS QUOTE NO.: BN031/16 v4	Ice/ice packs present upon receipt? Yes No
ORDER NUMBER:	PE3394.22	COC SEQUENCE NUMBER (Circle) COC: 1 2 3 4 5 6 7	Random Sample Temperature on Receipt: °C
PROJECT MANAGER:	CHRIS BUTLER	CONTACT: 0431 565 210 OF: 1 2 3 4 5 6 7	Other comments:
SAMPLER:	CHRIS BUTLER / SEAN GARDINER	SAMPLER MOBILE: 0409 827 396	
COC emailed to ALS? (YES / NO)		EDD FORMAT (or default):	
Email Reports to: mail@preciseenvironmental.com.au			
Mail Invoice to: PO Box 4424, Robina Town Centre 4230			

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
CHRIS BUTLER			
DATE/TIME: 13.07.22 9AM	DATE/TIME:	DATE/TIME:	DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE ONLY	SAMPLE DETAILS Water(W)			MATRIX: Solid(S)	CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	SAMPLE DESCRIPTION	DATE / TIME	MATRIX	TYPE & PRESERVATIVE *(refer to codes below)*	TOTAL BOTTLES	EA037 (pHF and pHFOX)	EA033 (Chromium suite)							Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
13	BH2	0.0	12.07.22	S	BAG/<4°C	1	X								
14	BH2	0.25	12.07.22	S	BAG/<4°C	1	X								
15	BH2	0.50	12.07.22	S	BAG/<4°C	1	X								
16	BH2	0.75	12.07.22	S	BAG/<4°C	1	X								
17	BH2	1.00	12.07.22	S	BAG/<4°C	1	X								
18	BH2	1.25	12.07.22	S	BAG/<4°C	1	X								
19	BH2	1.50	12.07.22	S	BAG/<4°C	1	X								
20	BH2	1.75	12.07.22	S	BAG/<4°C	1	X								
					TOTAL	8									

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

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☐ Melbourne: 2-4 Westall Rd, Springvale VIC 3171 Ph:03 8549 9600 E: samples.melbourne@alsenviro.com
☐ Perth: 10 Hod Way, Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsenviro.com
☐ Newcastle: 5 Rosegum Rd, Warabrook NSW 2304 Ph:02 4968 9433 E:samples.newcastle@alsenviro.com
☐ Townsville: 14-15 Desma Ct, Bohle QLD 4818 Ph:07 4796 0600 E. townsville.environmental@alsenviro.com
☐ Adelaide: 2-1 Burma Rd, Pooraka SA 5095 Ph: 08 8359 0890 E:adelaide@alsenviro.com
☐ Launceston: 27 Wellington St, Launceston TAS 7250 Ph: 03 6331 2158 E: launceston@alsenviro.com

CLIENT:	PRECISE ENVIRONMENTAL	TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	☐ Standard TAT (List due date):	FOR LABORATORY USE ONLY (Circle)	
OFFICE:	7/14 FREMANTLE ST, BURLEIGH HEADS 4220		☐ Non Standard or urgent TAT (List due date):	Custody Seal Intact?	Yes / No / n/a
PROJECT:	PE3394.22	ALS QUOTE NO.: BN031/16 v4	COC SEQUENCE NUMBER (Circle)	Free ice / frozen ice bricks present upon receipt?	Yes / No
ORDER NUMBER:	PE3394.22		COC: 1 2 3 4 5 6 7	Random Sample Temperature on Receipt	°C
PROJECT MANAGER:	CHRIS BUTLER	CONTACT: 0431 565 210	OF: 1 2 3 4 5 6 7	Other comments:	
SAMPLER:	CHRIS BUTLER / SEAN GARDINER	SAMPLER MOBILE: 0409 827 396	RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY: / RECEIVED BY:
COC emailed to ALS? (YES / NO)		EDD FORMAT (or default):	CHRIS BUTLER		
Email Reports to: mail@preciseenvironmental.com.au			DATE/TIME: 13.07.22 9AM	DATE/TIME:	DATE/TIME: / DATE/TIME:
Mail Invoice to: PO Box 4424, Robina Town Centre 4230					

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE ONLY	SAMPLE DETAILS (Water(W))			MATRIX: Solid(S)	CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	SAMPLE DESCRIPTION	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	EA037 (pHF and pHFOX)	EA033 (Chromium suite)							Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
21	BH3	0.0	12.07.22	S	BAG/<4°C	1	X								
22	BH3	0.25	12.07.22	S	BAG/<4°C	1	X								
23	BH3	0.50	12.07.22	S	BAG/<4°C	1	X								
24	BH3	0.75	12.07.22	S	BAG/<4°C	1	X								
25	BH3	1.00	12.07.22	S	BAG/<4°C	1	X								
26	BH3	1.25	12.07.22	S	BAG/<4°C	1	X								
27	BH3	1.50	12.07.22	S	BAG/<4°C	1	X								
28	BH3	1.75	12.07.22	S	BAG/<4°C	1	X								
					TOTAL	8									

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

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☐ Perth: 10 Hod Way, Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsenviro.com
☐ Newcastle: 5 Rosegum Rd, Warabrook NSW 2304 Ph:02 4968 9433 E:samples.newcastle@alsenviro.com
☐ Townsville: 14-15 Desma Ct, Bohle QLD 4818 Ph:07 4796 0600 E: townsville.environmental@alsenviro.com
☐ Adelaide: 2-1 Burma Rd, Pooraka SA 5095 Ph: 08 8359 0890 E:adelaide@alsenviro.com
☐ Launceston: 27 Wellington St, Launceston TAS 7250 Ph: 03 6331 2158 E: launceston@alsenviro.com

CLIENT:	PRECISE ENVIRONMENTAL	TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	☐ Standard TAT (List due date): ☐ Non Standard or urgent TAT (List due date):
OFFICE:	7/14 FREMANTLE ST, BURLEIGH HEADS 4220		
PROJECT:	PE3394.22	ALS QUOTE NO.:	BN031/16 v4
ORDER NUMBER:	PE3394.22		COC SEQUENCE NUMBER (Circle) COC: 1 2 3 4 5 6 7 OF: 1 2 3 4 5 6 7
PROJECT MANAGER:	CHRIS BUTLER	CONTACT: 0431 565 210	
SAMPLER:	CHRIS BUTLER / SEAN GARDINER	SAMPLER MOBILE: 0409 827 396	
COC emailed to ALS? (YES / NO)		EDD FORMAT (or default):	
Email Reports to: mail@preciseenvironmental.com.au			
Mail Invoice to: PO Box 4424, Robina Town Centre 4230			

FOR LABORATORY USE ONLY (Circle)

Custody Seal Intact?	Yes	No
Free ice / frozen ice bricks present upon receipt?	Yes	No
Random Sample Temperature on Receipt		°C
Other comments:		

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
CHRIS BUTLER			
DATE/TIME: 13.07.22 9AM	DATE/TIME:	DATE/TIME:	DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE ONLY	SAMPLE DETAILS (Water(W))			MATRIX: Solid(S)	CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	SAMPLE DESCRIPTION	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	EA037 (pHF and pHFOX)	EA033 (Chromium suite)							Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
29	BH4	0.0	12.07.22	S	BAG/<4°C	1	X	X							
30	BH4	0.25	12.07.22	S	BAG/<4°C	1	X								
31	BH4	0.50	12.07.22	S	BAG/<4°C	1	X	X							
SNR	BH4	0.75	12.07.22	S	BAG/<4°C	1	X								
33	BH4	1.00	12.07.22	S	BAG/<4°C	1	X	X							
34	BH4	1.25	12.07.22	S	BAG/<4°C	1	X								
35	BH4	1.50	12.07.22	S	BAG/<4°C	1	X	X							
36	BH4	1.75	12.07.22	S	BAG/<4°C	1	X								
37	BH4	2.00	12.07.22	S	BAG/<4°C	1	X								
38	BH4	2.25	12.07.22	S	BAG/<4°C	1	X	X							
					TOTAL	10									

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

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☐ Perth: 10 Hod Way, Malaga WA 6090 Ph: 08 9209 7555 E:: samples.perth@alsenviro.com
☐ Launceston: 27 Wellington St, Launceston TAS 7250 Ph: 03 6331 2158 E: launceston@alsenviro.com

CLIENT:	PRECISE ENVIRONMENTAL	TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	☐ Standard TAT (List due date): ☐ Non Standard or urgent TAT (List due date):
OFFICE:	7/14 FREMANTLE ST, BURLEIGH HEADS 4220		
PROJECT:	PE3394.22	ALS QUOTE NO.:	BN031/16 v4
ORDER NUMBER:	PE3394.22		
PROJECT MANAGER:	CHRIS BUTLER	CONTACT: 0431 565 210	
SAMPLER:	CHRIS BUTLER / SEAN GARDINER	SAMPLER MOBILE: 0409 827 396	
COC emailed to ALS? (YES / NO)		EDD FORMAT (or default):	
Email Reports to: mail@preciseenvironmental.com.au			
Mail Invoice to: PO Box 4424, Robina Town Centre 4230			

COC SEQUENCE NUMBER (Circle)
COC: 1 2 3 4 5 6 7
OF: 1 2 3 4 5 6 7

FOR LABORATORY USE ONLY (Circle)
Custody Seal Intact? Yes / No
Free ice / frozen ice bricks present upon receipt? Yes / No
Random Sample Temperature on Receipt °C
Other comments:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
CHRIS BUTLER			
DATE/TIME: 13.07.22 9AM	DATE/TIME:	DATE/TIME:	DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE ONLY	SAMPLE DETAILS (Water(W))			MATRIX: Solid(S)	CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	SAMPLE DESCRIPTION	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	EA037 (pHF and pHFOX)	EA033 (Chromium suite)							Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
39	BH5	0.0	12.07.22	S	BAG/<4°C	1	X								
40	BH5	0.50	12.07.22	S	BAG/<4°C	1	X								
41	BH5	0.75	12.07.22	S	BAG/<4°C	1	X								
42	BH5	1.00	12.07.22	S	BAG/<4°C	1	X								
43	BH5	1.25	12.07.22	S	BAG/<4°C	1	X								
44	BH5	1.50	12.07.22	S	BAG/<4°C	1	X								
45	BH5	1.75	12.07.22	S	BAG/<4°C	1	X								
SNR	BH5	2.00	12.07.22	S	BAG/<4°C	1	X								
SNR	BH5	2.25	12.07.22	S	BAG/<4°C	1	X								
					TOTAL	9									

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

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CLIENT:	PRECISE ENVIRONMENTAL	TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	☐ Standard TAT (List due date):	FOR LABORATORY USE ONLY (Circle)	
OFFICE:	7/14 FREMANTLE ST, BURLEIGH HEADS 4220		☐ Non Standard or urgent TAT (List due date):	Custody Seal Intact?	Yes No
PROJECT:	PE3394.22	ALS QUOTE NO.: BN031/16 v4	COC SEQUENCE NUMBER (Circle)	Free ice / frozen ice bricks present upon receipt?	Yes No
ORDER NUMBER:	PE3394.22		COC: 1 2 3 4 5 6 7	Random Sample Temperature on Receipt:	°C
PROJECT MANAGER:	CHRIS BUTLER	CONTACT: 0431 565 210	OF: 1 2 3 4 5 6 7	Other comments:	

SAMPLER:	CHRIS BUTLER / SEAN GARDINER	SAMPLER MOBILE: 0409 827 396	RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
COC emailed to ALS? (YES / NO)		EDD FORMAT (or default):	CHRIS BUTLER			
Email Reports to: mail@preciseenvironmental.com.au			DATE/TIME: C Butler	DATE/TIME:	DATE/TIME:	DATE/TIME:
Mail Invoice to: PO Box 4424, Robina Town Centre 4230			13.07.22 9AM			

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE ONLY	SAMPLE DETAILS (Water(W))			MATRIX: Solid(S)	CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	SAMPLE DESCRIPTION	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	EA037 (pHF and pHFOX)	EA033 (Chromium suite)							Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
48	BH6	0.0	12.07.22	S	BAG/<4°C	1	X	X							
49	BH6	0.25	12.07.22	S	BAG/<4°C	1	X								
50	BH6	0.50	12.07.22	S	BAG/<4°C	1	X	X							
51	BH6	0.75	12.07.22	S	BAG/<4°C	1	X								
52	BH6	1.00	12.07.22	S	BAG/<4°C	1	X	X							
53	BH6	1.25	12.07.22	S	BAG/<4°C	1	X								
54	BH6	1.50	12.07.22	S	BAG/<4°C	1	X	X							
55	BH6	1.75	12.07.22	S	BAG/<4°C	1	X								
56	BH6	2.00	12.07.22	S	BAG/<4°C	1	X								
57	BH6	2.25	12.07.22	S	BAG/<4°C	1	X								
58	BH6	2.50	12.07.22	S	BAG/<4°C	1	X	X							
59	BH6	2.75	12.07.22	S	BAG/<4°C	1	X								
					TOTAL	12									

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

CHAIN OF CUSTODY CHAIN OF CUSTODY

ALS Laboratory: please tick → ALS Laboratory: please tick →

☐ Sydney: 277 Woodpark Rd, Smithfield NSW 2176 Ph: 02 8784 8555 E: samples.sydney@alsenviro.com
☐ Newcastle: 5 Rosegum Rd, Warabrook NSW 2304 Ph:02 4968 9433 E:samples.newcastle@alsenviro.com
☐ Brisbane: 32 Shand St, Stafford QLD 4053 Ph:07 3243 7222 E:samples.brisbane@alsenviro.com
☐ Townsville: 14-15 Desma Ct, Bohle QLD 4818 Ph:07 4796 0600 E: townsville.environmental@alsenviro.com
☐ Melbourne: 2-4 Westall Rd, Springvale VIC 3171 Ph:03 8549 9600 E: samples.melbourne@alsenviro.com
☐ Adelaide: 2-1 Burma Rd, Pooraka SA 5095 Ph: 08 8359 0890 E:adelaide@alsenviro.com
☐ Perth: 10 Hod Way, Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsenviro.com
☐ Launceston: 27 Wellington St, Launceston TAS 7250 Ph: 03 6331 2158 E: launceston@alsenviro.com

CLIENT:	PRECISE ENVIRONMENTAL	TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	☐ Standard TAT (List due date): ☐ Non Standard or urgent TAT (List due date):
OFFICE:	7/14 FREMANTLE ST, BURLEIGH HEADS 4220		
PROJECT:	PE3394.22	ALS QUOTE NO.:	BN031/16 v4
ORDER NUMBER:	PE3394.22		
PROJECT MANAGER:	CHRIS BUTLER	CONTACT: 0431 565 210	
SAMPLER:	CHRIS BUTLER / SEAN GARDINER	SAMPLER MOBILE: 0409 827 396	
COC emailed to ALS? (YES / NO)		EDD FORMAT (or default):	
Email Reports to: mail@preciseenvironmental.com.au			
Mail Invoice to: PO Box 4424, Robina Town Centre 4230			

COC SEQUENCE NUMBER (Circle)
COC: 1 2 3 4 5 6 7
OF: 1 2 3 4 5 6 7

FOR LABORATORY USE ONLY: (Circle)
Custody Seal Intact? Yes No
Free ice / frozen ice bricks present upon receipt? Yes No
Random Sample Temperature on Receipt: °C
Other Comment:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
CHRIS BUTLER			
DATE/TIME: 13.07.22 9AM	DATE/TIME:	DATE/TIME:	DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE ONLY	SAMPLE DETAILS			MATRIX: Solid(S) Water(W)	CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	SAMPLE DESCRIPTION	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	EA037 (pHF and pHFOX)	EA033 (Chromium suite)							Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
60	BH7	0.0	12.07.22	S	BAG/<4°C	1	X								
61	BH7	0.25	12.07.22	S	BAG/<4°C	1	X								
62	BH7	0.50	12.07.22	S	BAG/<4°C	1	X								
63	BH7	0.75	12.07.22	S	BAG/<4°C	1	X								
64	BH7	1.00	12.07.22	S	BAG/<4°C	1	X								
65	BH7	1.25	12.07.22	S	BAG/<4°C	1	X								
66	BH7	1.50	12.07.22	S	BAG/<4°C	1	X								
67	BH7	1.75	12.07.22	S	BAG/<4°C	1	X								
					TOTAL	8									

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP = Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB2220427**	Page	: 1 of 15
Client	: **PRECISE ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR CHRIS BUTLER	Contact	: Nidhi Bhimani
Address	: PO BOX 4424 ROBINA TOWN CENTRE QLD, AUSTRALIA 4230	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: ----	Telephone	: +61-7-3243 7222
Project	: PE3394.22	Date Samples Received	: 14-Jul-2022 11:35
Order number	: PE3394.22	Date Analysis Commenced	: 18-Jul-2022
C-O-C number	: ----	Issue Date	: 20-Jul-2022 11:24
Sampler	: CHRIS BUTLER, SEAN GARDINER		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 64		
No. of samples analysed	: 64		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD

General Comments

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

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

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

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- **SPLIT WORK ORDER: It should be noted that ALS has split this work order over the following work orders EB2220520 and EB2220427 due to the size of the sample numbers. For any further information regarding this processing of samples please contact ALS client services division on ALSEnviro.Brisbane@alsglobal.com**
- ASS: EA033 (CRS Suite):Retained Acidity not required because pH KCl greater than or equal to 4.5
- ASS: EA033 (CRS Suite): ANC not required because pH KCl less than 6.5
- ASS: EA037 (Rapid Field and F(ox) screening): pH F(ox) Reaction Rate: 1 - Slight; 2 - Moderate; 3 - Strong; 4 - Extreme
- ASS: EA033 (CRS Suite): 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'.
- EA037 ASS Field Screening: NATA accreditation does not cover performance of this service.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH1 0.0	BH1 0.25	BH1 0.50	BH1 0.75	BH1 1.00
			Sampling date / time	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00
Compound	CAS Number	LOR	Unit	EB2220427-001	EB2220427-002	EB2220427-003	EB2220427-004	EB2220427-005
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	---	0.1	pH Unit	5.1	---	5.8	---	5.7
Titratable Actual Acidity (23F)	---	2	mole H+ / t	31	---	4	---	4
sulfidic - Titratable Actual Acidity (s-23F)	---	0.02	% pyrite S	0.05	---	<0.02	---	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	---	0.005	% S	0.019	---	0.014	---	0.014
acidity - Chromium Reducible Sulfur (a-22B)	---	10	mole H+ / t	12	---	<10	---	<10
EA033-E: Acid Base Accounting								
ANC Fineness Factor	---	0.5	-	1.5	---	1.5	---	1.5
Net Acidity (sulfur units)	---	0.02	% S	0.07	---	0.02	---	0.02
Net Acidity (acidity units)	---	10	mole H+ / t	43	---	13	---	13
Liming Rate	---	1	kg CaCO3/t	3	---	<1	---	<1
Net Acidity excluding ANC (sulfur units)	---	0.02	% S	0.07	---	0.02	---	0.02
Net Acidity excluding ANC (acidity units)	---	10	mole H+ / t	43	---	13	---	13
Liming Rate excluding ANC	---	1	kg CaCO3/t	3	---	<1	---	<1
EA037: Ass Field Screening Analysis								
ø pH (F)	---	0.1	pH Unit	5.9	6.1	6.0	6.3	6.1
ø pH (Fox)	---	0.1	pH Unit	2.9	3.1	4.9	5.4	4.8
ø Reaction Rate	---	1	-	2	2	1	1	1

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH1 1.25	BH1 1.50	BH1 1.75	BH1 2.00	BH1 2.25
			Sampling date / time	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00
Compound	CAS Number	LOR	Unit	EB2220427-006	EB2220427-007	EB2220427-008	EB2220427-009	EB2220427-010
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	---	0.1	pH Unit	---	5.4	---	---	---
Titratable Actual Acidity (23F)	---	2	mole H+ / t	---	6	---	---	---
sulfidic - Titratable Actual Acidity (s-23F)	---	0.02	% pyrite S	---	<0.02	---	---	---
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	---	0.005	% S	---	0.197	---	---	---
acidity - Chromium Reducible Sulfur (a-22B)	---	10	mole H+ / t	---	123	---	---	---
EA033-E: Acid Base Accounting								
ANC Fineness Factor	---	0.5	-	---	1.5	---	---	---
Net Acidity (sulfur units)	---	0.02	% S	---	0.21	---	---	---
Net Acidity (acidity units)	---	10	mole H+ / t	---	129	---	---	---
Liming Rate	---	1	kg CaCO3/t	---	10	---	---	---
Net Acidity excluding ANC (sulfur units)	---	0.02	% S	---	0.21	---	---	---
Net Acidity excluding ANC (acidity units)	---	10	mole H+ / t	---	129	---	---	---
Liming Rate excluding ANC	---	1	kg CaCO3/t	---	10	---	---	---
EA037: Ass Field Screening Analysis								
ø pH (F)	---	0.1	pH Unit	5.9	6.1	6.0	6.3	6.3
ø pH (Fox)	---	0.1	pH Unit	4.5	1.8	1.8	1.8	2.3
ø Reaction Rate	---	1	-	1	4	4	4	4

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH1 2.50	BH1 2.75	BH2 0.0	BH2 0.25	BH2 0.50
			Sampling date / time	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00
Compound	CAS Number	LOR	Unit	EB2220427-011	EB2220427-012	EB2220427-013	EB2220427-014	EB2220427-015
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	---	0.1	pH Unit	5.6	---	---	---	---
Titratable Actual Acidity (23F)	---	2	mole H+ / t	4	---	---	---	---
sulfidic - Titratable Actual Acidity (s-23F)	---	0.02	% pyrite S	<0.02	---	---	---	---
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	---	0.005	% S	0.194	---	---	---	---
acidity - Chromium Reducible Sulfur (a-22B)	---	10	mole H+ / t	121	---	---	---	---
EA033-E: Acid Base Accounting								
ANC Fineness Factor	---	0.5	-	1.5	---	---	---	---
Net Acidity (sulfur units)	---	0.02	% S	0.20	---	---	---	---
Net Acidity (acidity units)	---	10	mole H+ / t	125	---	---	---	---
Liming Rate	---	1	kg CaCO3/t	9	---	---	---	---
Net Acidity excluding ANC (sulfur units)	---	0.02	% S	0.20	---	---	---	---
Net Acidity excluding ANC (acidity units)	---	10	mole H+ / t	125	---	---	---	---
Liming Rate excluding ANC	---	1	kg CaCO3/t	9	---	---	---	---
EA037: Ass Field Screening Analysis								
ø pH (F)	---	0.1	pH Unit	7.4	7.7	6.6	6.6	6.6
ø pH (Fox)	---	0.1	pH Unit	2.0	3.7	3.3	3.8	5.1
ø Reaction Rate	---	1	-	4	2	3	2	1

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Sample ID	**BH2 0.75**	**BH2 1.00**	**BH2 1.25**	**BH2 1.50**	**BH2 1.75**
			Sampling date / time	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB2220427-016**	**EB2220427-017**	**EB2220427-018**	**EB2220427-019**	**EB2220427-020**
				Result	Result	Result	Result	Result
EA037: Ass Field Screening Analysis								
ø **pH (F)**	---	0.1	pH Unit	**6.3**	**6.4**	**6.3**	**6.1**	**6.3**
ø **pH (Fox)**	---	0.1	pH Unit	**4.9**	**4.3**	**2.1**	**1.8**	**2.1**
ø **Reaction Rate**	---	1	-	**1**	**2**	**4**	**4**	**4**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Sample ID	BH3 0.0	BH3 0.25	BH3 0.50	BH3 0.75	BH3 1.00
			Sampling date / time	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB2220427-021**	**EB2220427-022**	**EB2220427-023**	**EB2220427-024**	**EB2220427-025**
				Result	Result	Result	Result	Result
EA037: Ass Field Screening Analysis								
ø pH (F)	---	0.1	pH Unit	**6.1**	**6.2**	**6.4**	**6.4**	**6.3**
ø pH (Fox)	---	0.1	pH Unit	**2.8**	**3.6**	**4.6**	**5.0**	**4.2**
ø Reaction Rate	---	1	-	**3**	**2**	**2**	**1**	**2**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH3 1.25	BH3 1.50	BH3 1.75	BH4 0.0	BH4 0.25
			Sampling date / time	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00
Compound	CAS Number	LOR	Unit	EB2220427-026	EB2220427-027	EB2220427-028	EB2220427-029	EB2220427-030
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	---	0.1	pH Unit	---	---	---	5.4	---
Titratable Actual Acidity (23F)	---	2	mole H+ / t	---	---	---	17	---
sulfidic - Titratable Actual Acidity (s-23F)	---	0.02	% pyrite S	---	---	---	0.03	---
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	---	0.005	% S	---	---	---	0.039	---
acidity - Chromium Reducible Sulfur (a-22B)	---	10	mole H+ / t	---	---	---	24	---
EA033-E: Acid Base Accounting								
ANC Fineness Factor	---	0.5	-	---	---	---	1.5	---
Net Acidity (sulfur units)	---	0.02	% S	---	---	---	0.07	---
Net Acidity (acidity units)	---	10	mole H+ / t	---	---	---	41	---
Liming Rate	---	1	kg CaCO3/t	---	---	---	3	---
Net Acidity excluding ANC (sulfur units)	---	0.02	% S	---	---	---	0.07	---
Net Acidity excluding ANC (acidity units)	---	10	mole H+ / t	---	---	---	41	---
Liming Rate excluding ANC	---	1	kg CaCO3/t	---	---	---	3	---
EA037: Ass Field Screening Analysis								
ø pH (F)	---	0.1	pH Unit	6.3	6.4	7.1	6.6	6.8
ø pH (Fox)	---	0.1	pH Unit	1.8	1.8	1.8	2.7	3.2
ø Reaction Rate	---	1	-	4	4	4	3	3

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH4 0.50	BH4 1.00	BH4 1.25	BH4 1.50	BH4 1.75
			Sampling date / time	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00
Compound	CAS Number	LOR	Unit	EB2220427-031	EB2220427-033	EB2220427-034	EB2220427-035	EB2220427-036
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	---	0.1	pH Unit	5.8	5.9	---	5.7	---
Titratable Actual Acidity (23F)	---	2	mole H+ / t	9	2	---	3	---
sulfidic - Titratable Actual Acidity (s-23F)	---	0.02	% pyrite S	<0.02	<0.02	---	<0.02	---
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	---	0.005	% S	0.027	0.223	---	0.187	---
acidity - Chromium Reducible Sulfur (a-22B)	---	10	mole H+ / t	17	139	---	116	---
EA033-E: Acid Base Accounting								
ANC Fineness Factor	---	0.5	-	1.5	1.5	---	1.5	---
Net Acidity (sulfur units)	---	0.02	% S	0.04	0.23	---	0.19	---
Net Acidity (acidity units)	---	10	mole H+ / t	26	142	---	120	---
Liming Rate	---	1	kg CaCO3/t	2	11	---	9	---
Net Acidity excluding ANC (sulfur units)	---	0.02	% S	0.04	0.23	---	0.19	---
Net Acidity excluding ANC (acidity units)	---	10	mole H+ / t	26	142	---	120	---
Liming Rate excluding ANC	---	1	kg CaCO3/t	2	11	---	9	---
EA037: Ass Field Screening Analysis								
ø pH (F)	---	0.1	pH Unit	7.2	7.2	7.2	7.0	6.9
ø pH (Fox)	---	0.1	pH Unit	4.1	1.4	1.6	2.0	1.6
ø Reaction Rate	---	1	-	2	4	4	4	4

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH4 2.00	BH4 2.25	BH5 0.0	BH5 0.50	BH5 0.75
			Sampling date / time	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00
Compound	CAS Number	LOR	Unit	EB2220427-037	EB2220427-038	EB2220427-039	EB2220427-040	EB2220427-041
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	---	0.1	pH Unit	---	6.0	---	---	---
Titratable Actual Acidity (23F)	---	2	mole H+ / t	---	<2	---	---	---
sulfidic - Titratable Actual Acidity (s-23F)	---	0.02	% pyrite S	---	<0.02	---	---	---
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	---	0.005	% S	---	0.151	---	---	---
acidity - Chromium Reducible Sulfur (a-22B)	---	10	mole H+ / t	---	94	---	---	---
EA033-E: Acid Base Accounting								
ANC Fineness Factor	---	0.5	-	---	1.5	---	---	---
Net Acidity (sulfur units)	---	0.02	% S	---	0.15	---	---	---
Net Acidity (acidity units)	---	10	mole H+ / t	---	94	---	---	---
Liming Rate	---	1	kg CaCO3/t	---	7	---	---	---
Net Acidity excluding ANC (sulfur units)	---	0.02	% S	---	0.15	---	---	---
Net Acidity excluding ANC (acidity units)	---	10	mole H+ / t	---	94	---	---	---
Liming Rate excluding ANC	---	1	kg CaCO3/t	---	7	---	---	---
EA037: Ass Field Screening Analysis								
ø pH (F)	---	0.1	pH Unit	6.8	7.4	6.5	6.7	6.4
ø pH (Fox)	---	0.1	pH Unit	1.9	1.9	4.6	5.3	5.3
ø Reaction Rate	---	1	-	4	4	3	1	1

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH5 1.00	BH5 1.25	BH5 1.50	BH5 1.75	BH6 0.0
			Sampling date / time	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00
Compound	CAS Number	LOR	Unit	EB2220427-042	EB2220427-043	EB2220427-044	EB2220427-045	EB2220427-048
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	---	0.1	pH Unit	---	---	---	---	5.3
Titratable Actual Acidity (23F)	---	2	mole H+ / t	---	---	---	---	12
sulfidic - Titratable Actual Acidity (s-23F)	---	0.02	% pyrite S	---	---	---	---	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	---	0.005	% S	---	---	---	---	0.022
acidity - Chromium Reducible Sulfur (a-22B)	---	10	mole H+ / t	---	---	---	---	14
EA033-E: Acid Base Accounting								
ANC Fineness Factor	---	0.5	-	---	---	---	---	1.5
Net Acidity (sulfur units)	---	0.02	% S	---	---	---	---	0.04
Net Acidity (acidity units)	---	10	mole H+ / t	---	---	---	---	26
Liming Rate	---	1	kg CaCO3/t	---	---	---	---	2
Net Acidity excluding ANC (sulfur units)	---	0.02	% S	---	---	---	---	0.04
Net Acidity excluding ANC (acidity units)	---	10	mole H+ / t	---	---	---	---	26
Liming Rate excluding ANC	---	1	kg CaCO3/t	---	---	---	---	2
EA037: Ass Field Screening Analysis								
ø pH (F)	---	0.1	pH Unit	5.6	5.1	5.0	5.4	5.6
ø pH (Fox)	---	0.1	pH Unit	3.3	1.8	2.0	1.8	2.9
ø Reaction Rate	---	1	-	2	4	4	4	3

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH6 0.25	BH6 0.50	BH6 0.75	BH6 1.00	BH6 1.25
			Sampling date / time	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00
Compound	CAS Number	LOR	Unit	EB2220427-049	EB2220427-050	EB2220427-051	EB2220427-052	EB2220427-053
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	---	0.1	pH Unit	---	4.7	---	5.2	---
Titratable Actual Acidity (23F)	---	2	mole H+ / t	---	45	---	15	---
sulfidic - Titratable Actual Acidity (s-23F)	---	0.02	% pyrite S	---	0.07	---	0.02	---
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	---	0.005	% S	---	0.027	---	0.020	---
acidity - Chromium Reducible Sulfur (a-22B)	---	10	mole H+ / t	---	16	---	12	---
EA033-E: Acid Base Accounting								
ANC Fineness Factor	---	0.5	-	---	1.5	---	1.5	---
Net Acidity (sulfur units)	---	0.02	% S	---	0.10	---	0.04	---
Net Acidity (acidity units)	---	10	mole H+ / t	---	61	---	27	---
Liming Rate	---	1	kg CaCO3/t	---	5	---	2	---
Net Acidity excluding ANC (sulfur units)	---	0.02	% S	---	0.10	---	0.04	---
Net Acidity excluding ANC (acidity units)	---	10	mole H+ / t	---	61	---	27	---
Liming Rate excluding ANC	---	1	kg CaCO3/t	---	5	---	2	---
EA037: Ass Field Screening Analysis								
ø pH (F)	---	0.1	pH Unit	5.7	5.6	5.8	6.1	5.7
ø pH (Fox)	---	0.1	pH Unit	2.6	2.5	3.1	4.1	3.0
ø Reaction Rate	---	1	-	3	3	3	2	2

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH6 1.50	BH6 1.75	BH6 2.00	BH6 2.25	BH6 2.50
			Sampling date / time	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00
Compound	CAS Number	LOR	Unit	EB2220427-054	EB2220427-055	EB2220427-056	EB2220427-057	EB2220427-058
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	---	0.1	pH Unit	5.3	---	---	---	5.4
Titratable Actual Acidity (23F)	---	2	mole H+ / t	10	---	---	---	8
sulfidic - Titratable Actual Acidity (s-23F)	---	0.02	% pyrite S	<0.02	---	---	---	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	---	0.005	% S	0.141	---	---	---	0.161
acidity - Chromium Reducible Sulfur (a-22B)	---	10	mole H+ / t	88	---	---	---	100
EA033-E: Acid Base Accounting								
ANC Fineness Factor	---	0.5	-	1.5	---	---	---	1.5
Net Acidity (sulfur units)	---	0.02	% S	0.16	---	---	---	0.17
Net Acidity (acidity units)	---	10	mole H+ / t	97	---	---	---	108
Liming Rate	---	1	kg CaCO3/t	7	---	---	---	8
Net Acidity excluding ANC (sulfur units)	---	0.02	% S	0.16	---	---	---	0.17
Net Acidity excluding ANC (acidity units)	---	10	mole H+ / t	97	---	---	---	108
Liming Rate excluding ANC	---	1	kg CaCO3/t	7	---	---	---	8
EA037: Ass Field Screening Analysis								
ø pH (F)	---	0.1	pH Unit	6.0	6.2	6.3	6.3	6.2
ø pH (Fox)	---	0.1	pH Unit	1.9	1.8	2.0	2.0	2.1
ø Reaction Rate	---	1	-	4	4	4	4	4

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Sample ID	**BH6 2.75**	**BH7 0.0**	**BH7 0.25**	**BH7 0.50**	**BH7 0.75**
			Sampling date / time	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB2220427-059**	**EB2220427-060**	**EB2220427-061**	**EB2220427-062**	**EB2220427-063**
				Result	Result	Result	Result	Result
EA037: Ass Field Screening Analysis								
ø pH (F)	---	0.1	pH Unit	**5.6**	**5.4**	**5.8**	**5.4**	**6.0**
ø pH (Fox)	---	0.1	pH Unit	**1.8**	**3.5**	**3.8**	**4.7**	**4.6**
ø Reaction Rate	---	1	-	**4**	**3**	**2**	**2**	**2**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Sample ID	BH7 1.00	BH7 1.25	BH7 1.50	BH7 1.75	----
			Sampling date / time	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	--
Compound	*CAS Number*	*LOR*	*Unit*	**EB2220427-064**	**EB2220427-065**	**EB2220427-066**	**EB2220427-067**	**----**
				Result	Result	Result	Result	---
EA037: Ass Field Screening Analysis								
ø pH (F)	---	0.1	pH Unit	**5.5**	**5.6**	**5.9**	**6.0**	**---**
ø pH (Fox)	---	0.1	pH Unit	**2.1**	**1.7**	**1.8**	**1.6**	**---**
ø Reaction Rate	---	1	-	**4**	**4**	**4**	**4**	**---**

QUALITY CONTROL REPORT

Work Order	: **EB2220427**	Page	: 1 of 4
Client	: **PRECISE ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR CHRIS BUTLER	Contact	: Nidhi Bhimani
Address	: PO BOX 4424 ROBINA TOWN CENTRE QLD, AUSTRALIA 4230	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: ----	Telephone	: +61-7-3243 7222
Project	: PE3394.22	Date Samples Received	: 14-Jul-2022
Order number	: PE3394.22	Date Analysis Commenced	: 18-Jul-2022
C-O-C number	: ----	Issue Date	: 20-Jul-2022
Sampler	: CHRIS BUTLER, SEAN GARDINER		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 64		
No. of samples analysed	: 64		

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

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

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

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

Signatories	*Position*	*Accreditation Category*
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD

General Comments

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

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA033-A: Actual Acidity (QC Lot: 4465208)									
EB2220272-010	Anonymous	EA033: sulfidic - Titratable Actual Acidity (s-23F)	---	0.02	% pyrite S	0.02	<0.02	0.0	No Limit
		EA033: Titratable Actual Acidity (23F)	---	2	mole H+ / t	14	12	17.2	No Limit
		EA033: pH KCl (23A)	---	0.1	pH Unit	5.2	5.2	0.0	0% - 20%
EB2220427-033	BH4 1.00	EA033: sulfidic - Titratable Actual Acidity (s-23F)	---	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA033: Titratable Actual Acidity (23F)	---	2	mole H+ / t	2	2	0.0	No Limit
		EA033: pH KCl (23A)	---	0.1	pH Unit	5.9	5.9	0.0	0% - 20%
EA033-B: Potential Acidity (QC Lot: 4465208)									
EB2220272-010	Anonymous	EA033: Chromium Reducible Sulfur (22B)	---	0.005	% S	0.136	0.134	1.4	0% - 20%
		EA033: acidity - Chromium Reducible Sulfur (a-22B)	---	10	mole H+ / t	85	84	1.4	No Limit
EB2220427-033	BH4 1.00	EA033: Chromium Reducible Sulfur (22B)	---	0.005	% S	0.223	0.210	6.2	0% - 20%
		EA033: acidity - Chromium Reducible Sulfur (a-22B)	---	10	mole H+ / t	139	131	6.2	0% - 50%
EA037: Ass Field Screening Analysis (QC Lot: 4461683)									
EB2220427-001	BH1 0.0	EA037: pH (F)	---	0.1	pH Unit	5.9	6.0	0.0	0% - 20%
		EA037: pH (Fox)	---	0.1	pH Unit	2.9	2.9	0.0	0% - 20%
EB2220427-011	BH1 2.50	EA037: pH (F)	---	0.1	pH Unit	7.4	7.5	1.3	0% - 20%
		EA037: pH (Fox)	---	0.1	pH Unit	2.0	2.0	0.0	0% - 20%
EA037: Ass Field Screening Analysis (QC Lot: 4461684)									
EB2220427-021	BH3 0.0	EA037: pH (F)	---	0.1	pH Unit	6.1	6.0	0.0	0% - 20%
		EA037: pH (Fox)	---	0.1	pH Unit	2.8	2.7	0.0	0% - 20%
EB2220427-031	BH4 0.50	EA037: pH (F)	---	0.1	pH Unit	7.2	7.1	0.0	0% - 20%
		EA037: pH (Fox)	---	0.1	pH Unit	4.1	4.2	0.0	0% - 20%

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EA037: Ass Field Screening Analysis (QC Lot: 4461685)									
EB2220427-042	BH5 1.00	EA037: pH (F)	---	0.1	pH Unit	5.6	5.5	2.0	0% - 20%
		EA037: pH (Fox)	---	0.1	pH Unit	3.3	3.4	5.1	0% - 20%
EB2220427-054	BH6 1.50	EA037: pH (F)	---	0.1	pH Unit	6.0	6.1	2.2	0% - 20%
		EA037: pH (Fox)	---	0.1	pH Unit	1.9	1.9	0.0	0% - 50%
EA037: Ass Field Screening Analysis (QC Lot: 4461686)									
EB2220427-064	BH7 1.00	EA037: pH (F)	---	0.1	pH Unit	5.5	5.6	0.0	0% - 20%
		EA037: pH (Fox)	---	0.1	pH Unit	2.1	2.1	0.0	0% - 20%

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA033-A: Actual Acidity (QCLot: 4465208)								
EA033: pH KCl (23A)	---	---	pH Unit	---	4.4 pH Unit	102	91.0	107
EA033: Titratable Actual Acidity (23F)	---	2	mole H+ / t	<2	19 mole H+ / t	88.7	70.0	124
EA033: sulfidic - Titratable Actual Acidity (s-23F)	---	0.02	% pyrite S	<0.02	---	---	---	---
EA033-B: Potential Acidity (QCLot: 4465208)								
EA033: Chromium Reducible Sulfur (22B)	---	0.005	% S	<0.005	0.246 % S	92.2	77.0	121
EA033: acidity - Chromium Reducible Sulfur (a-22B)	---	10	mole H+ / t	<10	---	---	---	---

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

- **No Matrix Spike (MS) or Matrix Spike Duplicate (MSD) Results are required to be reported.**

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EB2220427**	Page	: 1 of 6
Client	: **PRECISE ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR CHRIS BUTLER	Telephone	: +61-7-3243 7222
Project	: PE3394.22	Date Samples Received	: 14-Jul-2022
Site	: ----	Issue Date	: 20-Jul-2022
Sampler	: CHRIS BUTLER, SEAN GARDINER	No. of samples received	: 64
Order number	: PE3394.22	No. of samples analysed	: 64

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

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

Outliers : Analysis Holding Time Compliance

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

Outliers : Frequency of Quality Control Samples

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

Analysis Holding Time Compliance

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

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

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

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

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA033-A: Actual Acidity							
Snap Lock Bag - frozen (EA033)							
BH1 - 0.0, BH1 - 0.50, BH1 - 1.00, BH1 - 1.50, BH1 - 2.50, BH4 - 0.0, BH4 - 0.50, BH4 - 1.00, BH4 - 1.50, BH4 - 2.25, BH6 - 0.0, BH6 - 0.50, BH6 - 1.00, BH6 - 1.50, BH6 - 2.50	**12-Jul-2022**	**19-Jul-2022**	12-Jul-2023	✓	**19-Jul-2022**	17-Oct-2022	✓
EA033-B: Potential Acidity							
Snap Lock Bag - frozen (EA033)							
BH1 - 0.0, BH1 - 0.50, BH1 - 1.00, BH1 - 1.50, BH1 - 2.50, BH4 - 0.0, BH4 - 0.50, BH4 - 1.00, BH4 - 1.50, BH4 - 2.25, BH6 - 0.0, BH6 - 0.50, BH6 - 1.00, BH6 - 1.50, BH6 - 2.50	**12-Jul-2022**	**19-Jul-2022**	12-Jul-2023	✓	**19-Jul-2022**	17-Oct-2022	✓
EA033-C: Acid Neutralising Capacity							
Snap Lock Bag - frozen (EA033)							
BH1 - 0.0, BH1 - 0.50, BH1 - 1.00, BH1 - 1.50, BH1 - 2.50, BH4 - 0.0, BH4 - 0.50, BH4 - 1.00, BH4 - 1.50, BH4 - 2.25, BH6 - 0.0, BH6 - 0.50, BH6 - 1.00, BH6 - 1.50, BH6 - 2.50	**12-Jul-2022**	**19-Jul-2022**	12-Jul-2023	✓	**19-Jul-2022**	17-Oct-2022	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA033-D: Retained Acidity							
Snap Lock Bag - frozen (EA033)							
BH1 - 0.0, BH1 - 0.50, BH1 - 1.00, BH1 - 1.50, BH1 - 2.50, BH4 - 0.0, BH4 - 0.50, BH4 - 1.00, BH4 - 1.50, BH4 - 2.25, BH6 - 0.0, BH6 - 0.50, BH6 - 1.00, BH6 - 1.50, BH6 - 2.50	**12-Jul-2022**	**19-Jul-2022**	12-Jul-2023	✓	**19-Jul-2022**	17-Oct-2022	✓
EA033-E: Acid Base Accounting							
Snap Lock Bag - frozen (EA033)							
BH1 - 0.0, BH1 - 0.50, BH1 - 1.00, BH1 - 1.50, BH1 - 2.50, BH4 - 0.0, BH4 - 0.50, BH4 - 1.00, BH4 - 1.50, BH4 - 2.25, BH6 - 0.0, BH6 - 0.50, BH6 - 1.00, BH6 - 1.50, BH6 - 2.50	**12-Jul-2022**	**19-Jul-2022**	12-Jul-2023	✓	**19-Jul-2022**	17-Oct-2022	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA037: Ass Field Screening Analysis							
Snap Lock Bag - frozen (EA037)							
BH1 - 0.0, BH1 - 0.25, BH1 - 0.50, BH1 - 0.75, BH1 - 1.00, BH1 - 1.25, BH1 - 1.50, BH1 - 1.75, BH1 - 2.00, BH1 - 2.25, BH1 - 2.50, BH1 - 2.75, BH2 - 0.0, BH2 - 0.25, BH2 - 0.50, BH2 - 0.75, BH2 - 1.00, BH2 - 1.25, BH2 - 1.50, BH2 - 1.75, BH3 - 0.0, BH3 - 0.25, BH3 - 0.50, BH3 - 0.75, BH3 - 1.00, BH3 - 1.25, BH3 - 1.50, BH3 - 1.75, BH4 - 0.0, BH4 - 0.25, BH4 - 0.50, BH4 - 1.00, BH4 - 1.25, BH4 - 1.50, BH4 - 1.75, BH4 - 2.00, BH4 - 2.25, BH5 - 0.0, BH5 - 0.50, BH5 - 0.75, BH5 - 1.00, BH5 - 1.25, BH5 - 1.50, BH5 - 1.75, BH6 - 0.0, BH6 - 0.25, BH6 - 0.50, BH6 - 0.75, BH6 - 1.00, BH6 - 1.25, BH6 - 1.50, BH6 - 1.75, BH6 - 2.00, BH6 - 2.25, BH6 - 2.50, BH6 - 2.75, BH7 - 0.0, BH7 - 0.25, BH7 - 0.50, BH7 - 0.75, BH7 - 1.00, BH7 - 1.25, BH7 - 1.50, BH7 - 1.75	**12-Jul-2022**	**18-Jul-2022**	08-Jan-2023	✓	**18-Jul-2022**	08-Jan-2023	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
ASS Field Screening Analysis	EA037	7	64	**10.94**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chromium Suite for Acid Sulphate Soils	EA033	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Chromium Suite for Acid Sulphate Soils	EA033	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Chromium Suite for Acid Sulphate Soils	EA033	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Chromium Suite for Acid Sulphate Soils	EA033	SOIL	In house: Referenced to Ahern et al 2004. This method covers the determination of Chromium Reducible Sulfur (SCR); pHKCl; titratable actual acidity (TAA); acid neutralising capacity by back titration (ANC); and net acid soluble sulfur (SNAS) which incorporates peroxide sulfur. It applies to soils and sediments (including sands) derived from coastal regions. Liming Rate is based on results for samples as submitted and incorporates a minimum safety factor of 1.5.
ASS Field Screening Analysis	* EA037	SOIL	In house: Referenced to Acid Sulfate Soils Laboratory Methods Guidelines. As received samples are tested for pH field and pH fox and assessed for a reaction rating.

Preparation Methods	Method	Matrix	Method Descriptions
Drying only	EN020D	SOIL	In house
Drying at 85 degrees, bagging and labelling (ASS)	EN020PR	SOIL	In house

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EB2222068**

Client	: **PRECISE ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: RESULTS & INVOICE	Contact	: Nidhi Bhimani
Address	: PO BOX 4424 ROBINA TOWN CENTRE QLD, AUSTRALIA 4230	Address	: 2 Byth Street Stafford QLD Australia 4053
E-mail	: mail@preciseenvironmental.com.au	E-mail	: nidhi.bhimani@alsglobal.com
Telephone	: +61 07 5593 7848	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 5593 7020	Facsimile	: +61-7-3243 7218
Project	: PE3394.22	Page	: 1 of 2
Order number	: PE3394.22	Quote number	: EB2019PREENV0003 (BN/031/16 V5)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: CHRIS BUTLER, SEAN GARDINER		

Dates

Date Samples Received	: 25-Jul-2022 15:29	Issue Date	: 28-Jul-2022
Client Requested Due Date	: 04-Aug-2022	Scheduled Reporting Date	: **04-Aug-2022**

Delivery Details

Mode of Delivery	: Samples On Hand	Security Seal	: Not Available
No. of coolers/boxes	: ----	Temperature	: ----
Receipt Detail	: REBATCH	No. of samples received / analysed	: 18 / 18

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **This work order was created to rebatch samples from EB2220427 and EB2220520.**
- Discounted Package Prices apply only when specific ALS Group Codes ('W', 'S', 'NT' suites) are referenced on COCs.
- Please direct any turn around / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months ± 1 week) from receipt of samples.
- Analysis will be conducted by ALS Environmental, Brisbane, NATA accreditation no. 825, Site No. 818 (Micro site no. 18958).
- **Breaches in recommended extraction / analysis holding times (if any) are displayed overleaf in the Proactive Holding Time Report table.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The laboratory will process these samples unless instructions are received from you indicating you do not wish to proceed. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	Sampling date / time	Sample ID	SOIL - EA033 Chromium Suite for Acid Sulphate Soils
EB2222068-001	12-Jul-2022 00:00	BH2 0.0	✓
EB2222068-002	12-Jul-2022 00:00	BH3 0.0	✓
EB2222068-003	12-Jul-2022 00:00	BH7 0.0	✓
EB2222068-004	12-Jul-2022 00:00	BH8 0.0	✓
EB2222068-005	12-Jul-2022 00:00	BH8 0.25	✓
EB2222068-006	12-Jul-2022 00:00	BH8 0.50	✓
EB2222068-007	12-Jul-2022 00:00	BH9 0.0	✓
EB2222068-008	12-Jul-2022 00:00	BH9 0.50	✓
EB2222068-009	12-Jul-2022 00:00	BH9 1.00	✓
EB2222068-010	12-Jul-2022 00:00	BH9 1.50	✓
EB2222068-011	12-Jul-2022 00:00	BH10 0.0	✓
EB2222068-012	12-Jul-2022 00:00	BH11 0.75	✓
EB2222068-013	12-Jul-2022 00:00	BH12 0.0	✓
EB2222068-014	12-Jul-2022 00:00	BH13 0.0	✓
EB2222068-015	12-Jul-2022 00:00	BH14 0.0	✓
EB2222068-016	12-Jul-2022 00:00	BH14 0.50	✓
EB2222068-017	12-Jul-2022 00:00	BH14 1.00	✓
EB2222068-018	12-Jul-2022 00:00	BH14 1.50	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

RESULTS & INVOICE

- *AU Certificate of Analysis - NATA (COA)	Email	mail@preciseenvironmental.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	mail@preciseenvironmental.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	mail@preciseenvironmental.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	mail@preciseenvironmental.com.au
- A4 - AU Tax Invoice (INV)	Email	mail@preciseenvironmental.com.au
- Chain of Custody (CoC) (COC)	Email	mail@preciseenvironmental.com.au
- EDI Format - XTab (XTAB)	Email	mail@preciseenvironmental.com.au

CHAIN OF CUSTODY CHAIN OF CUSTODY

ALS Laboratory: please tick → ALS Laboratory: please tick →

☐ **Sydney:** 277 Woodpark Rd, Smithfield NSW 2176 Ph: 02 8784 8555 E:samples.sydney@alsenviro.com
☐ **Brisbane:** 32 Shand St, Stafford QLD 4053 Ph:07 3243 7222 E:samples.brisbane@alsenviro.com
☐ **Melbourne:** 2-4 Westall Rd, Springvale VIC 3171 Ph:03 8549 9600 E: samples.melbourne@alsenviro.com
☐ **Perl** Ph: 08
☐ **Newcastle:** 5 Rosegum Rd, Warabrook NSW 2304 Ph:02 4968 9433 E:samples.newcastle@alsenviro.com
☐ **Townsville:** 14-15 Desma Ct, Bohle QLD 4818 Ph:07 4796 0600 E: townsville.environmental@alsenviro.com
☐ **Adelaide:** 2-1 Burma Rd, Pooraka SA 5095 Ph: 08 8359 0890 E:adelaide@alsenviro.com
☐ **Lau** Ph: 03

Environmental Division
Brisbane
Work Order Reference
EB2222068

Telephone : + 61-7-3243 7222

CLIENT:	PRECISE ENVIRONMENTAL	TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	☐ Standard TAT (List due date): ☐ Non Standard or urgent TAT (List due date):
OFFICE:	7/14 FREMANTLE ST, BURLEIGH HEADS 4220		
PROJECT:	PE3394.22	ALS QUOTE NO.: BN031/16 v4	COC SEQUENCE NUMBER (Circle) COC: 1 2 3 4 5 6 7
ORDER NUMBER:	PE3394.22		OF: 1 2 3 4 5 6 7
PROJECT MANAGER:	CHRIS BUTLER	CONTACT: 0431 565 210	
SAMPLER:	CHRIS BUTLER / SEAN GARDINER	SAMPLER MOBILE: 0409 827 396	RELINQUISHED BY: CHRIS BUTLER
COC emailed to ALS? (YES / NO)		EDD FORMAT (or default):	DATE/TIME: 25.07.22 3pm
Email Reports to: mail@preciseenvironmental.com.au			RECEIVED BY: DATE/TIME:
Mail Invoice to: PO Box 4424, Robina Town Centre 4230			RELINQ DATE/TIME: DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE ONLY	SAMPLE DETAILS (Water(W))			MATRIX: Solid(S)	CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	SAMPLE DESCRIPTION	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	EA037 (pHF and pHFOX)	EA033 (Chromium suite)							Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	BH2	0.0	12.07.22	S	BAG/<4°C	1		X							
2	BH3	0.0	12.07.22	S	BAG/<4°C	1		X							
3	BH7	0.0	12.07.22	S	BAG/<4°C	1		X							
4	BH8	0.0	12.07.22	S	BAG/<4°C	1		X							
5	BH8	0.25	12.07.22	S	BAG/<4°C	1		X							
6	BH8	0.50	12.07.22	S	BAG/<4°C	1		X							
7	BH9	0.0	12.07.22	S	BAG/<4°C	1		X							
8	BH9	0.50	12.07.22	S	BAG/<4°C	1		X							
9	BH9	1.00	12.07.22	S	BAG/<4°C	1		X							
10	BH9	1.50	12.07.22	S	BAG/<4°C	1		X							
					TOTAL	10									

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

CHAIN OF CUSTODY CHAIN OF CUSTODY

ALS Laboratory: please tick → ALS Laboratory: please tick →

☐ **Sydney**: 277 Woodpark Rd, Smithfield NSW 2176 Ph: 02 8784 8555 E:samples.sydney@alsenviro.com
☐ **Brisbane**: 32 Shand St, Stafford QLD 4053 Ph:07 3243 7222 E:samples.brisbane@alsenviro.com
☐ **Melbourne**: 2-4 Westall Rd, Springvale VIC 3171 Ph:03 8549 9600 E: samples.melbourne@alsenviro.com
☐ **Perth**: 10 Hod Way, Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsenviro.com
☐ **Newcastle**: 5 Rosegum Rd, Warabrook NSW 2304 Ph:02 4968 9433 E:samples.newcastle@alsenviro.com
☐ **Townsville**: 14-15 Desma Ct, Bohle QLD 4818 Ph:07 4796 0600 E: townsville.environmental@alsenviro.com
☐ **Adelaide**: 2-1 Burma Rd, Pooraka SA 5095 Ph: 08 8359 0890 E:adelaide@alsenviro.com
☐ **Launceston**: 27 Wellington St, Launceston TAS 7250 Ph: 03 6331 2158 E: launceston@alsenviro.com

CLIENT:	PRECISE ENVIRONMENTAL	TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	☐ Standard TAT (List due date): ☐ Non Standard or urgent TAT (List due date):
OFFICE:	7/14 FREMANTLE ST, BURLEIGH HEADS 4220		
PROJECT:	PE3394.22	ALS QUOTE NO.: BN031/16 v4	COC SEQUENCE NUMBER (Circle) COC: 1 2 3 4 5 6 7
ORDER NUMBER:	PE3394.22		OF: 1 2 3 4 5 6 7
PROJECT MANAGER:	CHRIS BUTLER	CONTACT: 0431 565 210	FOR LABORATORY USE ONLY (Circle)
SAMPLER:	CHRIS BUTLER / SEAN GARDINER	SAMPLER MOBILE: 0409 827 396	
COC emailed to ALS? (YES / NO)		EDD FORMAT (or default):	
Email Reports to: mail@preciseenvironmental.com.au			
Mail Invoice to: PO Box 4424, Robina Town Centre 4230			

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
CHRIS BUTLER			
DATE/TIME: 25.07.22 3pm	DATE/TIME:	DATE/TIME:	DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE ONLY	SAMPLE DETAILS			MATRIX: Solid(S) Water(W)	CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	SAMPLE DESCRIPTION	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	EA037 (pHF and pHFOX)	EA033 (Chromium suite)							Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
11	BH10	0.0	12.07.22	S	BAG/<4°C	1		X							
12	BH11	0.75	12.07.22	S	BAG/<4°C	1		X							
13	BH12	0.0	12.07.22	S	BAG/<4°C	1		X							
14	BH13	0.0	12.07.22	S	BAG/<4°C	1		X							
15	BH14	0.0	12.07.22	S	BAG/<4°C	1		X							
16	BH14	0.50	12.07.22	S	BAG/<4°C	1		X							
17	BH14	1.00	12.07.22	S	BAG/<4°C	1		X							
18	BH14	1.50	12.07.22	S	BAG/<4°C	1		X							
					TOTAL	8									

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB2222068**	Page	: 1 of 6
Client	: **PRECISE ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: RESULTS & INVOICE	Contact	: Nidhi Bhimani
Address	: PO BOX 4424 ROBINA TOWN CENTRE QLD, AUSTRALIA 4230	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: +61 07 5593 7848	Telephone	: +61-7-3243 7222
Project	: PE3394.22	Date Samples Received	: 25-Jul-2022 15:29
Order number	: PE3394.22	Date Analysis Commenced	: 03-Aug-2022
C-O-C number	: ----	Issue Date	: 03-Aug-2022 15:26
Sampler	: CHRIS BUTLER, SEAN GARDINER		
Site	: ----		
Quote number	: BN/031/16 V5		
No. of samples received	: 18		
No. of samples analysed	: 18		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD

General Comments

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

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

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

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- ASS: EA033 (CRS Suite):Retained Acidity not required because pH KCl greater than or equal to 4.5
- ASS: EA033 (CRS Suite): ANC not required because pH KCl less than 6.5
- ASS: EA033 (CRS Suite): Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO3) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from 'kg/t dry weight' to 'kg/m3 in-situ soil', multiply 'reported results' x 'wet bulk density of soil in t/m3'.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH2 0.0	BH3 0.0	BH7 0.0	BH8 0.0	BH8 0.25
			Sampling date / time	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00
Compound	CAS Number	LOR	Unit	EB2222068-001	EB2222068-002	EB2222068-003	EB2222068-004	EB2222068-005
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	---	0.1	pH Unit	4.9	4.5	4.6	4.8	4.7
Titratable Actual Acidity (23F)	---	2	mole H+ / t	66	128	106	40	44
sulfidic - Titratable Actual Acidity (s-23F)	---	0.02	% pyrite S	0.10	0.20	0.17	0.06	0.07
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	---	0.005	% S	0.013	0.016	0.018	0.014	0.018
acidity - Chromium Reducible Sulfur (a-22B)	---	10	mole H+ / t	<10	10	11	<10	11
EA033-E: Acid Base Accounting								
ANC Fineness Factor	---	0.5	-	1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)	---	0.02	% S	0.12	0.22	0.19	0.08	0.09
Net Acidity (acidity units)	---	10	mole H+ / t	74	138	117	49	55
Liming Rate	---	1	kg CaCO3/t	6	10	9	4	4
Net Acidity excluding ANC (sulfur units)	---	0.02	% S	0.12	0.22	0.19	0.08	0.09
Net Acidity excluding ANC (acidity units)	---	10	mole H+ / t	74	138	117	49	55
Liming Rate excluding ANC	---	1	kg CaCO3/t	6	10	9	4	4

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH8 0.50	BH9 0.0	BH9 0.50	BH9 1.00	BH9 1.50
			Sampling date / time	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00
Compound	CAS Number	LOR	Unit	EB2222068-006	EB2222068-007	EB2222068-008	EB2222068-009	EB2222068-010
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	---	0.1	pH Unit	**5.8**	**4.6**	**5.8**	**5.6**	**5.2**
Titratable Actual Acidity (23F)	---	2	mole H+ / t	<2	**79**	<2	**3**	**7**
sulfidic - Titratable Actual Acidity (s-23F)	---	0.02	% pyrite S	<0.02	**0.13**	<0.02	<0.02	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	---	0.005	% S	**0.019**	**0.030**	**0.015**	**0.037**	**0.124**
acidity - Chromium Reducible Sulfur (a-22B)	---	10	mole H+ / t	**12**	**18**	<10	**23**	**77**
EA033-E: Acid Base Accounting								
ANC Fineness Factor	---	0.5	-	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	---	0.02	% S	<0.02	**0.16**	<0.02	**0.04**	**0.14**
Net Acidity (acidity units)	---	10	mole H+ / t	**12**	**98**	<10	**26**	**84**
Liming Rate	---	1	kg CaCO3/t	<1	**7**	<1	**2**	**6**
Net Acidity excluding ANC (sulfur units)	---	0.02	% S	<0.02	**0.16**	<0.02	**0.04**	**0.14**
Net Acidity excluding ANC (acidity units)	---	10	mole H+ / t	**12**	**98**	<10	**26**	**84**
Liming Rate excluding ANC	---	1	kg CaCO3/t	<1	**7**	<1	**2**	**6**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH10 0.0	BH11 0.75	BH12 0.0	BH13 0.0	BH14 0.0
			Sampling date / time	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00
Compound	CAS Number	LOR	Unit	EB2222068-011	EB2222068-012	EB2222068-013	EB2222068-014	EB2222068-015
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	---	0.1	pH Unit	4.8	4.8	4.6	4.6	4.5
Titratable Actual Acidity (23F)	---	2	mole H+ / t	42	49	66	87	124
sulfidic - Titratable Actual Acidity (s-23F)	---	0.02	% pyrite S	0.07	0.08	0.11	0.14	0.20
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	---	0.005	% S	0.023	0.012	0.012	0.015	0.024
acidity - Chromium Reducible Sulfur (a-22B)	---	10	mole H+ / t	14	<10	<10	<10	15
EA033-E: Acid Base Accounting								
ANC Fineness Factor	---	0.5	-	1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)	---	0.02	% S	0.09	0.09	0.12	0.15	0.22
Net Acidity (acidity units)	---	10	mole H+ / t	56	57	74	96	138
Liming Rate	---	1	kg CaCO3/t	4	4	6	7	10
Net Acidity excluding ANC (sulfur units)	---	0.02	% S	0.09	0.09	0.12	0.15	0.22
Net Acidity excluding ANC (acidity units)	---	10	mole H+ / t	56	57	74	96	138
Liming Rate excluding ANC	---	1	kg CaCO3/t	4	4	6	7	10

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH14 0.50	BH14 1.00	BH14 1.50	----	----
			Sampling date / time	12-Jul-2022 00:00	12-Jul-2022 00:00	12-Jul-2022 00:00	---	---
Compound	CAS Number	LOR	Unit	EB2222068-016	EB2222068-017	EB2222068-018	----	----
				Result	Result	Result	---	---
EA033-A: Actual Acidity								
pH KCl (23A)	---	0.1	pH Unit	**5.6**	**5.3**	**5.0**	---	---
Titratable Actual Acidity (23F)	---	2	mole H+ / t	**4**	**7**	**11**	---	---
sulfidic - Titratable Actual Acidity (s-23F)	---	0.02	% pyrite S	<0.02	<0.02	<0.02	---	---
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	---	0.005	% S	**0.015**	**0.108**	**0.094**	---	---
acidity - Chromium Reducible Sulfur (a-22B)	---	10	mole H+ / t	<10	**67**	**58**	---	---
EA033-E: Acid Base Accounting								
ANC Fineness Factor	---	0.5	-	**1.5**	**1.5**	**1.5**	---	---
Net Acidity (sulfur units)	---	0.02	% S	**0.02**	**0.12**	**0.11**	---	---
Net Acidity (acidity units)	---	10	mole H+ / t	**13**	**74**	**69**	---	---
Liming Rate	---	1	kg CaCO3/t	<1	**6**	**5**	---	---
Net Acidity excluding ANC (sulfur units)	---	0.02	% S	**0.02**	**0.12**	**0.11**	---	---
Net Acidity excluding ANC (acidity units)	---	10	mole H+ / t	**13**	**74**	**69**	---	---
Liming Rate excluding ANC	---	1	kg CaCO3/t	<1	**6**	**5**	---	---

QUALITY CONTROL REPORT

Work Order	: **EB2222068**	Page	: 1 of 4
Client	: **PRECISE ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: RESULTS & INVOICE	Contact	: Nidhi Bhimani
Address	: PO BOX 4424 ROBINA TOWN CENTRE QLD, AUSTRALIA 4230	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: +61 07 5593 7848	Telephone	: +61-7-3243 7222
Project	: PE3394.22	Date Samples Received	: 25-Jul-2022
Order number	: PE3394.22	Date Analysis Commenced	: 03-Aug-2022
C-O-C number	: ----	Issue Date	: 03-Aug-2022
Sampler	: CHRIS BUTLER, SEAN GARDINER		
Site	: ----		
Quote number	: BN/031/16 V5		
No. of samples received	: 18		
No. of samples analysed	: 18		

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

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

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

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

Signatories	*Position*	*Accreditation Category*
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD

General Comments

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

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA033-A: Actual Acidity (QC Lot: 4494355)									
EB2221902-001	Anonymous	EA033: sulfidic - Titratable Actual Acidity (s-23F)	---	0.02	% pyrite S	0.08	0.08	0.0	No Limit
		EA033: Titratable Actual Acidity (23F)	---	2	mole H+ / t	48	47	0.0	0% - 20%
		EA033: pH KCl (23A)	---	0.1	pH Unit	4.5	4.5	0.0	0% - 20%
EB2222060-005	Anonymous	EA033: sulfidic - Titratable Actual Acidity (s-23F)	---	0.02	% pyrite S	0.03	0.03	0.0	No Limit
		EA033: Titratable Actual Acidity (23F)	---	2	mole H+ / t	19	18	0.0	No Limit
		EA033: pH KCl (23A)	---	0.1	pH Unit	4.9	4.9	0.0	0% - 20%
EA033-A: Actual Acidity (QC Lot: 4494356)									
EB2222068-010	BH9 1.50	EA033: sulfidic - Titratable Actual Acidity (s-23F)	---	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA033: Titratable Actual Acidity (23F)	---	2	mole H+ / t	7	7	0.0	No Limit
		EA033: pH KCl (23A)	---	0.1	pH Unit	5.2	5.2	0.0	0% - 20%
EB2222247-002	Anonymous	EA033: sulfidic - Titratable Actual Acidity (s-23F)	---	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA033: Titratable Actual Acidity (23F)	---	2	mole H+ / t	<2	<2	0.0	No Limit
		EA033: pH KCl (23A)	---	0.1	pH Unit	7.0	7.0	0.0	0% - 20%
EA033-B: Potential Acidity (QC Lot: 4494355)									
EB2221902-001	Anonymous	EA033: Chromium Reducible Sulfur (22B)	---	0.005	% S	0.033	0.030	7.8	No Limit
		EA033: acidity - Chromium Reducible Sulfur (a-22B)	---	10	mole H+ / t	20	19	7.8	No Limit
EB2222060-005	Anonymous	EA033: Chromium Reducible Sulfur (22B)	---	0.005	% S	0.025	0.024	0.0	No Limit
		EA033: acidity - Chromium Reducible Sulfur (a-22B)	---	10	mole H+ / t	15	15	0.0	No Limit
EA033-B: Potential Acidity (QC Lot: 4494356)									
EB2222068-010	BH9 1.50	EA033: Chromium Reducible Sulfur (22B)	---	0.005	% S	0.124	0.126	1.3	0% - 20%
		EA033: acidity - Chromium Reducible Sulfur (a-22B)	---	10	mole H+ / t	77	78	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EA033-B: Potential Acidity (QC Lot: 4494356) - continued									
EB2222247-002	Anonymous	EA033: Chromium Reducible Sulfur (22B)	---	0.005	% S	0.025	0.024	0.0	No Limit
		EA033: acidity - Chromium Reducible Sulfur (a-22B)	---	10	mole H+ / t	16	15	0.0	No Limit

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA033-A: Actual Acidity (QCLot: 4494355)								
EA033: pH KCl (23A)	---	---	pH Unit	---	4.4 pH Unit	99.2	91.0	107
EA033: Titratable Actual Acidity (23F)	---	2	mole H+ / t	<2	16 mole H+ / t	102	70.0	124
EA033: sulfidic - Titratable Actual Acidity (s-23F)	---	0.02	% pyrite S	<0.02	---	---	---	---
EA033-A: Actual Acidity (QCLot: 4494356)								
EA033: pH KCl (23A)	---	---	pH Unit	---	4.4 pH Unit	99.2	91.0	107
EA033: Titratable Actual Acidity (23F)	---	2	mole H+ / t	<2	16 mole H+ / t	98.4	70.0	124
EA033: sulfidic - Titratable Actual Acidity (s-23F)	---	0.02	% pyrite S	<0.02	---	---	---	---
EA033-B: Potential Acidity (QCLot: 4494355)								
EA033: Chromium Reducible Sulfur (22B)	---	0.005	% S	<0.005	0.246 % S	92.4	77.0	121
EA033: acidity - Chromium Reducible Sulfur (a-22B)	---	10	mole H+ / t	<10	---	---	---	---
EA033-B: Potential Acidity (QCLot: 4494356)								
EA033: Chromium Reducible Sulfur (22B)	---	0.005	% S	<0.005	0.246 % S	88.7	77.0	121
EA033: acidity - Chromium Reducible Sulfur (a-22B)	---	10	mole H+ / t	<10	---	---	---	---

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

- **No Matrix Spike (MS) or Matrix Spike Duplicate (MSD) Results are required to be reported.**

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EB2222068**	Page	: 1 of 5
Client	: **PRECISE ENVIRONMENTAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: RESULTS & INVOICE	Telephone	: +61-7-3243 7222
Project	: PE3394.22	Date Samples Received	: 25-Jul-2022
Site	: ----	Issue Date	: 03-Aug-2022
Sampler	: CHRIS BUTLER, SEAN GARDINER	No. of samples received	: 18
Order number	: PE3394.22	No. of samples analysed	: 18

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

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

Outliers : Analysis Holding Time Compliance

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

Outliers : Frequency of Quality Control Samples

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

Analysis Holding Time Compliance

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

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

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

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

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA033-A: Actual Acidity							
80* dried soil (EA033)							
BH2 - 0.0, BH3 - 0.0, BH7 - 0.0, BH8 - 0.0, BH8 - 0.25, BH8 - 0.50, BH9 - 0.0, BH9 - 0.50, BH9 - 1.00, BH9 - 1.50, BH10 - 0.0, BH11 - 0.75, BH12 - 0.0, BH13 - 0.0, BH14 - 0.0, BH14 - 0.50, BH14 - 1.00, BH14 - 1.50	**12-Jul-2022**	**03-Aug-2022**	12-Jul-2023	✓	**03-Aug-2022**	01-Nov-2022	✓
EA033-B: Potential Acidity							
80* dried soil (EA033)							
BH2 - 0.0, BH3 - 0.0, BH7 - 0.0, BH8 - 0.0, BH8 - 0.25, BH8 - 0.50, BH9 - 0.0, BH9 - 0.50, BH9 - 1.00, BH9 - 1.50, BH10 - 0.0, BH11 - 0.75, BH12 - 0.0, BH13 - 0.0, BH14 - 0.0, BH14 - 0.50, BH14 - 1.00, BH14 - 1.50	**12-Jul-2022**	**03-Aug-2022**	12-Jul-2023	✓	**03-Aug-2022**	01-Nov-2022	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA033-C: Acid Neutralising Capacity								
80* dried soil (EA033)								
BH2 - 0.0,	BH3 - 0.0,	**12-Jul-2022**	**03-Aug-2022**	12-Jul-2023	✓	**03-Aug-2022**	01-Nov-2022	✓
BH7 - 0.0,	BH8 - 0.0,							
BH8 - 0.25,	BH8 - 0.50,							
BH9 - 0.0,	BH9 - 0.50,							
BH9 - 1.00,	BH9 - 1.50,							
BH10 - 0.0,	BH11 - 0.75,							
BH12 - 0.0,	BH13 - 0.0,							
BH14 - 0.0,	BH14 - 0.50,							
BH14 - 1.00,	BH14 - 1.50							
EA033-D: Retained Acidity								
80* dried soil (EA033)								
BH2 - 0.0,	BH3 - 0.0,	**12-Jul-2022**	**03-Aug-2022**	12-Jul-2023	✓	**03-Aug-2022**	01-Nov-2022	✓
BH7 - 0.0,	BH8 - 0.0,							
BH8 - 0.25,	BH8 - 0.50,							
BH9 - 0.0,	BH9 - 0.50,							
BH9 - 1.00,	BH9 - 1.50,							
BH10 - 0.0,	BH11 - 0.75,							
BH12 - 0.0,	BH13 - 0.0,							
BH14 - 0.0,	BH14 - 0.50,							
BH14 - 1.00,	BH14 - 1.50							
EA033-E: Acid Base Accounting								
80* dried soil (EA033)								
BH2 - 0.0,	BH3 - 0.0,	**12-Jul-2022**	**03-Aug-2022**	12-Jul-2023	✓	**03-Aug-2022**	01-Nov-2022	✓
BH7 - 0.0,	BH8 - 0.0,							
BH8 - 0.25,	BH8 - 0.50,							
BH9 - 0.0,	BH9 - 0.50,							
BH9 - 1.00,	BH9 - 1.50,							
BH10 - 0.0,	BH11 - 0.75,							
BH12 - 0.0,	BH13 - 0.0,							
BH14 - 0.0,	BH14 - 0.50,							
BH14 - 1.00,	BH14 - 1.50							

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Chromium Suite for Acid Sulphate Soils	EA033	4	32	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Chromium Suite for Acid Sulphate Soils	EA033	2	32	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Chromium Suite for Acid Sulphate Soils	EA033	2	32	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Chromium Suite for Acid Sulphate Soils	EA033	SOIL	In house: Referenced to Ahern et al 2004. This method covers the determination of Chromium Reducible Sulfur (SCR); pHKCl; titratable actual acidity (TAA); acid neutralising capacity by back titration (ANC); and net acid soluble sulfur (SNAS) which incorporates peroxide sulfur. It applies to soils and sediments (including sands) derived from coastal regions. Liming Rate is based on results for samples as submitted and incorporates a minimum safety factor of 1.5.

Preparation Methods	Method	Matrix	Method Descriptions
Drying at 85 degrees, bagging and labelling (ASS)	EN020PR	SOIL	In house

APPENDIX G – CROSS SECTION SCHEMATICS

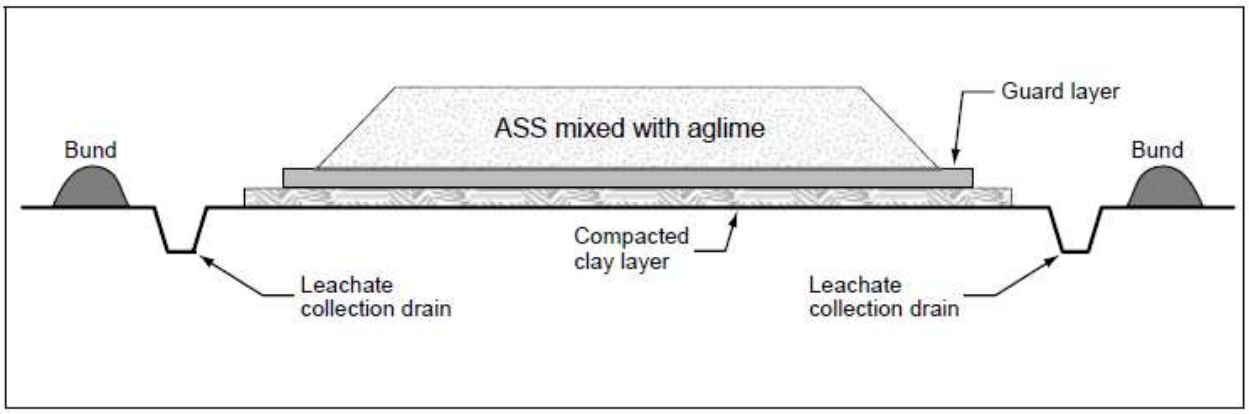

Figure 1. Schematic cross-section of a treatment pad, including a compacted clay layer, guard layer, leachate collection system and containment with bunding (Source: Soil Management Guidelines, DNRM, 2002).

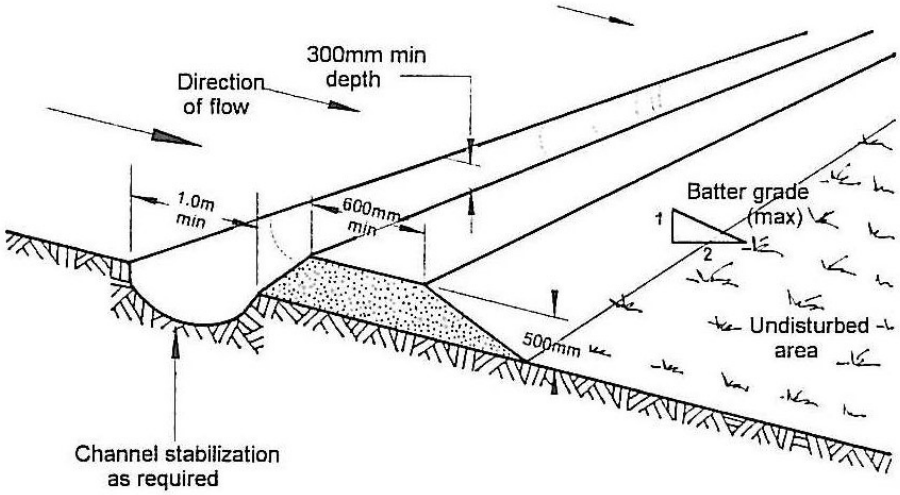

Figure 2. Cross-section of typical catch drain (Source: IE Aust, 1996).

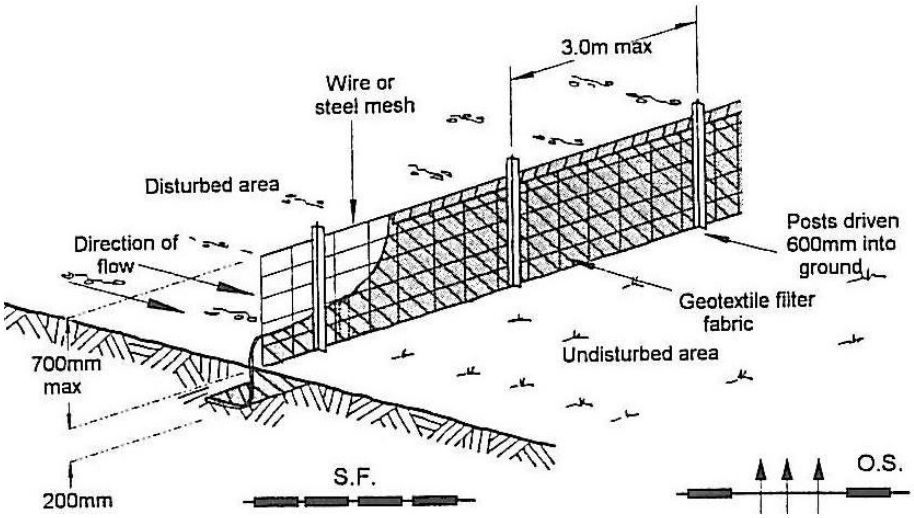

Figure 3. Cross-section of typical sediment fence (Source: IE Aust, 1996).

APPENDIX H – NSW WASTE CLASSIFICATION GUIDELINES

Waste classification guidelines

Part 4: Acid sulfate soils

www.epa.nsw.gov.au

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NSW Environment Protection Authority (EPA)
59–61 Goulburn Street, Sydney
PO Box A290
Sydney South NSW 1232

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Email: info@environment.nsw.gov.au
Website: www.epa.nsw.gov.au

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Handling potential acid sulfate soils prior to disposal 1
Disposal of potential acid sulfate soils *below* the water table 2
Disposal of potential acid sulfate soils *above* the water table 2
Actual acid sulfate soils **2**
Treatment of actual acid sulfate soils prior to disposal 2
Disposal of actual acid sulfate soils 3

Classifying wastes into groups that pose similar risks to the environment and human health facilitates their management and appropriate disposal. It is the responsibility of those who generate waste to classify that waste. To assist waste generators classify the wastes they produce, the EPA has developed the *Waste Classification Guidelines* ('the Guidelines') which are a step-by-step process for classifying waste.

Generators and waste facilities must carefully follow the procedures in these Guidelines to ensure they comply with applicable laws in classifying their waste and safeguard protection of the environment and human health.

The Guidelines are comprised of the following sections, of which this document is Part 4:

Overview of the Guidelines

Part 1: Classifying waste

Part 2: Immobilisation of waste

Part 3: Waste containing radioactive material

Part 4: Acid sulfate soils

All sections of the Guidelines are available for download from the EPA website at www.epa.nsw.gov.au/waste/classification.htm.

Introduction

Acid sulfate soils (ASS) are those naturally occurring sediments and soils which contain sulfides, mainly iron sulfide and iron disulfide or their precursors. Exposure of these sulfides in the soil to oxygen – often as a result of drainage or excavation – can produce sulfuric acid, which may have a significant impact on the environment. Leaching of sulfuric acid into waterways can cause serious water quality problems, resulting in fish kills and damage to infrastructure, such as floodgates and bridges.

ASS are most commonly found in NSW along the coast and they need to be managed appropriately to avoid major environmental damage.

The NSW *Acid Sulfate Soils Manual*[1] (the ASS Manual) provides 'best practice' guidance for planning, assessing and managing activities in areas prone to developing ASS. The manual is available from the NSW Department of Planning: phone 1300 305 695.

Using this part of the Guidelines

This part of the EPA Waste Classification Guidelines (the Guidelines) applies to acid sulfate soils which are unable to be managed on-site. In these cases, off-site disposal to landfill is often the most appropriate management option.

Waste generators need to assess the status of ASS at their point of generation, using the techniques outlined in the ASS Manual. The ASS Manual also provides guidance for on-site management, while this part of the Waste Classification Guidelines details disposal requirements for ASS that need to be transported and managed off-site.

This document has advice on dealing with both 'potential' ASS and 'actual' ASS. The two types are often found together in the same soil profile, with actual ASS generally overlying potential ASS horizons.

Potential acid sulfate soils

Potential ASS are soils that contain iron sulfides or sulfidic materials that have not been exposed to air and thus are not oxidised. The pH of these soils in their undisturbed state is 5.5 or more, making them neutral or slightly alkaline. If not managed appropriately, potential ASS pose a considerable environmental risk: disturbance and exposure to air may render them severely acidic.

Handling potential acid sulfate soils prior to disposal

Potential ASS must be kept wet at all times during excavation and subsequent handling, transport and storage, until they can be disposed of safely. They must be received at the proposed disposal point within 16 hours of being dug up.

[1] Stone Y, Ahem, CR and Blunden, B 1998. *Acid Sulphate Soils Manual 1998*. Acid Sulphate Soils Management Advisory Committee (ASSMAC), Wollongbar, NSW.

Disposal of potential acid sulfate soils *below* the water table

Potential ASS may be disposed of in water below the permanent water table, provided:

- this occurs before they have had a chance to oxidise, i.e. within 24 hours of excavation

and

- they meet the definition of 'virgin excavated natural material' (VENM) under the *Protection of the Environment Operations Act 1997*, even though they contain sulfidic ores or soils.

Landfills must be licensed by the EPA to dispose of potential ASS below the water table. EPA's Environment Line has details on facilities able to accept this waste: phone 131 555.

Potential ASS must be disposed of within 8 hours of their receipt at a landfill and kept wet at all times until their burial at least two metres below the lowest historical level of the water table at the disposal site.

Documentation must be provided to the occupier of the landfill for each truckload of potential ASS received, indicating that the soil's excavation, transport and handling have been in accordance with the ASS Manual, thus preventing the generation of acid.

The occupier of the disposal site must also test the pH of each load of soil received immediately prior to its placement under water using the test method(s) in the ASS Manual (Methods 21A and/or 21Af). These details, together with the pH of the soil recorded at the time of its extraction, must be retained by the occupier of the landfill site.

The disposal site's licence will outline what documentation needs to be kept and for how long.

Soil that has dried out, undergone any oxidation of its sulfidic minerals, or which has a pH of less than 5.5 must be treated by neutralisation and disposed of at a landfill that can lawfully accept it (see **Disposal of actual acid sulfate soils** below).

The pH of the water at the landfill into which the potential ASS is placed must not be less than 6.0 at any time. Landfill licence conditions require the occupiers of potential ASS disposal sites to regularly monitor the pH of ground and surface waters at their premises.

Disposal of potential acid sulfate soils *above* the water table

Where potential ASS cannot be classified as VENM or a suitable underwater disposal site at a landfill is not available, the soil must be treated in accordance with the neutralising techniques in the ASS Manual. After treatment the soil should be chemically assessed in accordance with Step 5 in Part 1 of the Waste Classification Guidelines, available at www.epa.nsw.gov.au/waste/classification.htm. This will determine whether any other contaminants are present in the material. When the classification has been established, the soil should be disposed of to a landfill that can lawfully accept that class of waste.

Actual acid sulfate soils

Actual ASS contain highly acidic soil horizons or layers resulting from the aeration of soil materials that are rich in sulfides, primarily iron sulfide. This oxidation produces more hydrogen ions than the sediment is able to neutralise, resulting in soils with a pH of 5.5 or less when measured in dry season conditions. These soils can usually be identified by the presence of pale yellow mottles and coatings of jarosite.

Treatment of actual acid sulfate soils prior to disposal

Actual ASS must be treated by the generator of the waste before they can be considered for disposal. Treatment should be in accordance with the neutralising techniques outlined in the ASS Manual.

Disposal of actual acid sulfate soils

Following neutralisation, the generator of the waste must chemically assess the soil in accordance with Step 5 of Part 1 of the Waste Classification Guidelines. This will determine whether there are any other contaminants that may affect how the waste is classified for disposal.

Once classified, the waste must be taken to a landfill licensed to accept that class of waste.

Prior arrangements should be made with the occupier of the landfill to ensure that it is licensed to accept the waste. The landfill should be informed that the actual ASS has been treated in accordance with the neutralising techniques outlined in the ASS Manual and that the waste has also been classified in accordance with Part 1 of the Waste Classification Guidelines.

1/64 Ballina Street
(PO Box 44)
Lennox Head NSW 2478
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APPENDIX C – DA BULK EARTHWORKS PLANS

20 10 0 10 20 30 40
Horizontal Scale 1:750 (A1)
1:1500 (A3)

EARTHWORKS PLAN
SCALE 1:750

LEGEND

- CUT 0.5 - 1.0m DEPTH
- CUT 0.0 - 0.5m DEPTH
- FILL 0.0 - 0.5m DEPTH
- FILL 0.5 - 1.0m DEPTH
- FILL 1.0 - 1.5m DEPTH
- FILL 1.5 - 2.0m DEPTH
- FILL 2.0 - 2.5m DEPTH
- FILL 2.5 - 2.7m DEPTH
- 6.6 EXISTING SITE CONTOURS 0.1m INTERVAL
- 2.6 PROPOSED RE-GRADING CONTOURS 0.1m INTERVAL

PRELIMINARY EARTHWORKS ESTIMATE

EARTHWORKS CUT TO FILL FROM NOMINAL 100mm DEEP STRIPPED SURFACE.
TOPSOIL DEPTH TO BE CONFIRMED AT DETAILED DESIGN STAGE.

VOLUMES INCLUDING NOMINAL INTERNAL ROADWAY BOXING 320mm DEEP

AREA OF EARTHWORKS =10.07Ha (EXCL. CARRS DRIVE RECONSTRUCTION)
TOPSOIL STRIPPED TO STOCKPILE = 10,078m^3

GENERAL BULK EARTHWORKS
TOTAL CUT = 500m^3
TOTAL FILL = 169,500m^3
BALANCE = 169,000m^3 (IMPORTED FROM APPROVED SOURCE or QUARRY)

* NOTES:
100 YEAR FLOOD LEVEL RL=2.5m AHD

ALLOTMENT EARTHWORKS LEVELS TO BE MINIMUM 200mm ABOVE 100 YEAR FLOOD LEVEL RL=2.7m AHD.

FINISHED FLOOR LEVELS (FFL) TO BE MINIMUM 500mm ABOVE 100 YEAR FLOOD LEVEL FFL = 3.0m AHD

PLANS TO BE PRINTED IN COLOUR

PRELIMINARY PLANS FOR DA PURPOSES ONLY NOT FOR CONSTRUCTION

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0	ISSUED FOR DEVELOPMENT APPLICATION	08.09.2022

DESIGNED: T.RYDEN | DATE: SEPT 2022
DRAWN: A.SCHMID | SCALE: AS SHOWN
SURVEYING: | SHEET SIZE: A1

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DEVELOPMENT APPLICATION CIVIL WORKS PLANS

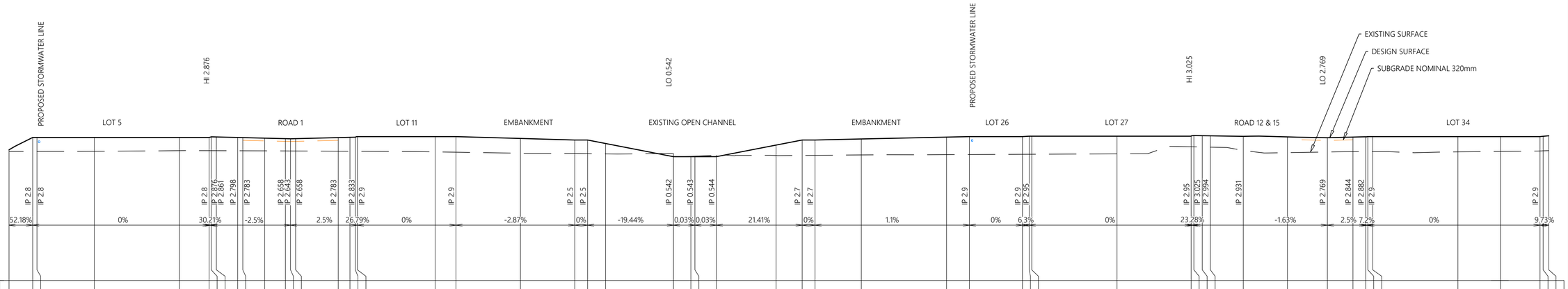
CLIFTON YAMBA

PROJECT: PROPOSED MHE DEVELOPMENT
110 & 120 CARRS DRIVE
YAMBA, NSW 2464
LOT 2 DP733507 & LOT 32 DP128863

DA CIVIL DRAWING

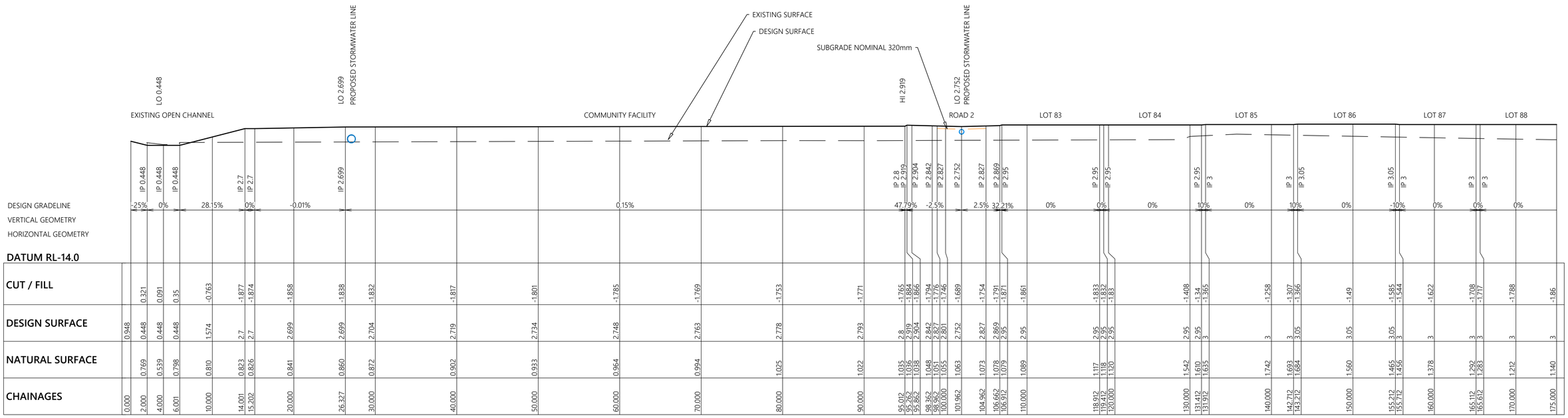
DRAWING TITLE: EARTHWORKS PLAN

DWG No: D14 | SHEET: 14 OF 45 | REV: 0

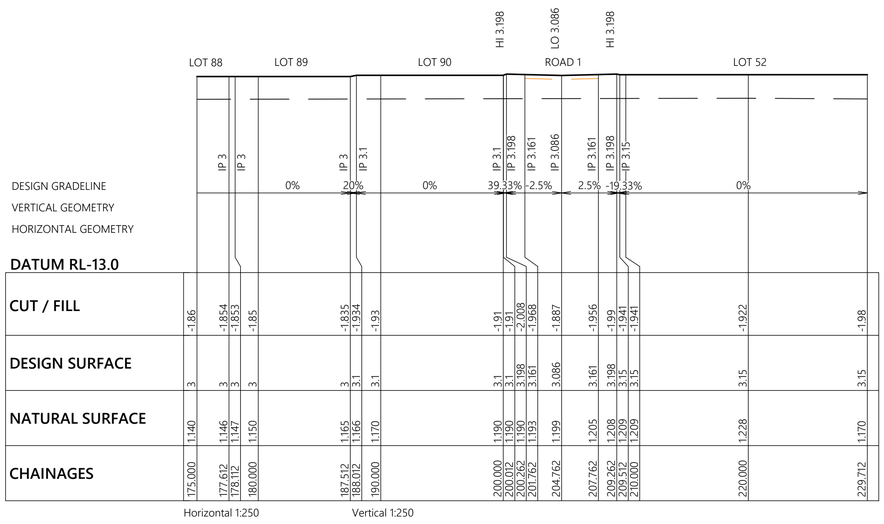

PROPOSED STORMWATER LINE
HI 2.876
LO 0.542
PROPOSED STORMWATER LINE
HI 3.025
LO 2.769
EXISTING SURFACE
DESIGN SURFACE
SUBGRADE NOMINAL 320mm
LOT 5
ROAD 1
LOT 11
EMBANKMENT
EXISTING OPEN CHANNEL
EMBANKMENT
LOT 26
LOT 27
ROAD 12 & 15
LOT 34
IP 2.8 IP 2.8
IP 2.8 IP 2.876 IP 2.861 IP 2.798 IP 2.783
IP 2.658 IP 2.643 IP 2.658 IP 2.783 IP 2.833 IP 2.9
IP 2.9
IP 2.5 IP 2.5
IP 0.542 IP 0.543 IP 0.544
IP 2.7 IP 2.7
IP 2.9
IP 2.9 IP 2.95
IP 2.95 IP 3.025 IP 2.994 IP 2.931
IP 2.769 IP 2.844 IP 2.882 IP 2.9
IP 2.9
DESIGN GRADELINE
VERTICAL GEOMETRY
HORIZONTAL GEOMETRY
52.18% 0% 30.21% -2.5% 2.5% 26.79% 0% -2.87% 0% -19.44% 0.03% 0.03% 21.41% 0% 1.1% 0% 6.3% 0% 23.28% -1.63% 2.5% 7.2% 0% 9.73%

DATUM RL-14.0

| | | |



SECTION B / D14



CONTINUATION SECTION B / D14

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CLIFTON YAMBA

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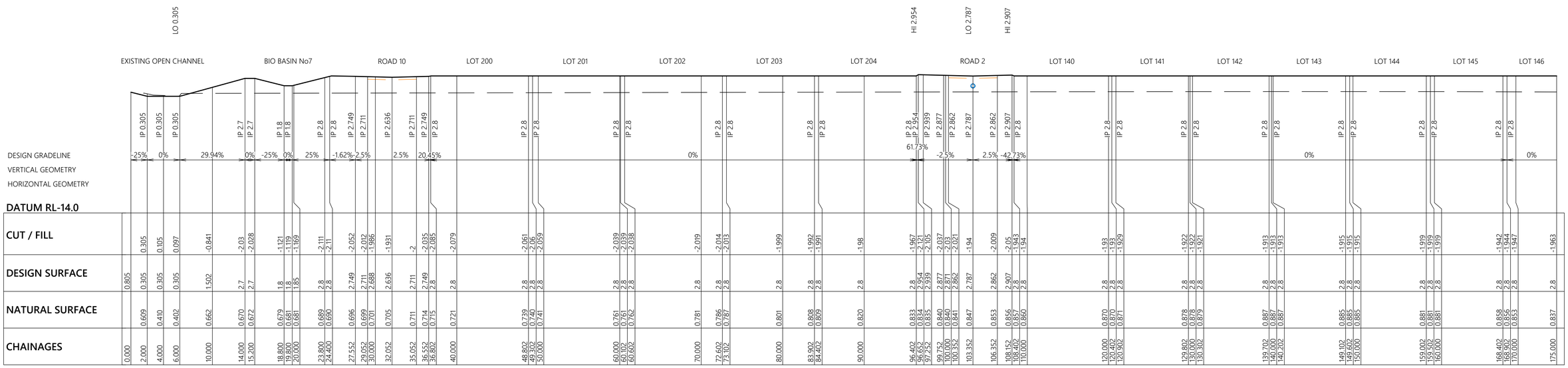
110 & 120 CARRS DRIVE
YAMBA, NSW 2464
LOT 2 DP733507 & LOT 32 DP128863

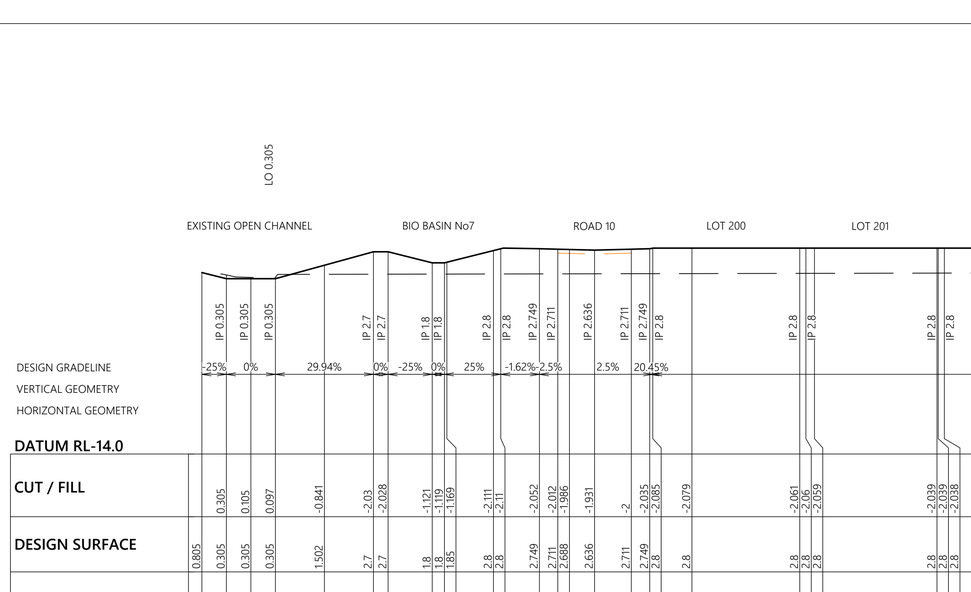
DA CIVIL DRAWING

DRAWING TITLE: EARTHWORKS LONGSECTOIONS - SHEET 2

DWG No: D16 | SHEET: 16 OF 45 | REV: 0



SECTION C/D14



CONTINUATION SECTION C/D14

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LOT 2 DP733507 & LOT 32 DP128863

DA CIVIL DRAWING

DRAWING TITLE: EARTHWORKS LONGSECTOIONS - SHEET 3

DWG No: D17 | SHEET: 17 OF 45 | REV: 0

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APPENDIX D – DA CIVIL ENGINEERING AND STORMWATER DESIGN PLANS

PROPOSED MANUFACTURED HOUSING ESTATE
'CLIFTON YAMBA'
110 & 120 CARRS DRIVE, YAMBA NSW 2464
CLARENCE VALLEY COUNCIL
LOT 2 DP733507 & LOT 32 DP1280863
DEVELOPMENT APPLICATION - CIVIL DRAWINGS
ROADWORKS, EARTHWORKS, DRAINAGE & SERVICES

SCHEDULE OF DRAWINGS:

GENERAL DRAWINGS
D01 COVER SHEET
D02 SITE PLAN

ROADWORKS DRAWINGS
D03 ROADWORKS & DRAINAGE PLAN
D04 ROAD TYPICAL DETAIL
D05 ROAD TYPICAL SECTIONS - SHEET 1
D06 ROAD TYPICAL SECTION - SHEET 2
D07 ROAD LONGITUDINAL SECTIONS - SHEET 1
D08 ROAD LONGITUDINAL SECTIONS - SHEET 2
D09 ROAD LONGITUDINAL SECTIONS - SHEET 3
D10 ROAD LONGITUDINAL SECTIONS - SHEET 4
D11 ROAD LONGITUDINAL SECTIONS - SHEET 5
D12 ROAD LONGITUDINAL SECTIONS - SHEET 6
D13 INTERSECTION DETAIL PLAN - ROAD 1 & CARRS DRIVE

EARTHWORKS DRAWINGS
D14 EARTHWORKS PLAN
D15 EARTHWORKS LONGITUDINAL SECTION - SHEET 1
D16 EARTHWORKS LONGITUDINAL SECTION - SHEET 2
D17 EARTHWORKS LONGITUDINAL SECTION - SHEET 3

STORMWATER DRAWIGNS
D18 STORMWATER LONGITUDINAL SECTION - SHEET 1
D19 STORMWATER LONGITUDINAL SECTION - SHEET 2
D20 STORMWATER LONGITUDINAL SECTION - SHEET 3
D21 STORMWATER LONGITUDINAL SECTION - SHEET 4
D22 STORMWATER LONGITUDINAL SECTION - SHEET 5
D23 STORMWATER LONGITUDINAL SECTION - SHEET 6
D24 STORMWATER LONGITUDINAL SECTION - SHEET 7
D25 STORMWATER LONGITUDINAL SECTION - SHEET 8
D26 STORMWATER LONGITUDINAL SECTION - SHEET 9
D27 STORMWATER LONGITUDINAL SECTION - SHEET 10
D28 STORMWATER LONGITUDINAL SECTION - SHEET 11
D29 STORMWATER LONGITUDINAL SECTION - SHEET 12
D30 STORMWATER LONGITUDINAL SECTION - SHEET 13
D31 STORMWATER LONGITUDINAL SECTION - SHEET 14
D32 STORMWATER LONGITUDINAL SECTION - SHEET 15
D33 STORMWATER LONGITUDINAL SECTION - SHEET 16
D34 OPEN CHANNEL DETAIL PLAN
D35 OPEN CHANNEL TYPICAL SECTIONS
D36 STORMWATER MANAGEMENT PLAN
D37 STORMWATER MANAGEMENT PLAN - SHEET 1
D38 STORMWATER MANAGEMENT PLAN - SHEET 2
D39 STORMWATER MANAGEMENT PLAN - SHEET 3
D40 STORMWATER MANAGEMENT PLAN - SHEET 4
D41 STORMWATER MANAGEMENT PLAN - SHEET 5

SEWER AND WATER RETICULATION DRAWINGS
D42 SEWER AND WATER RETICULATION PLAN
D43 SEWER AND WATER RETICULATION DETAIL

EROSION & SEDIMENTATION CONTROL DRAWINGS
D44 EROSION SEDIMENTATION PLAN
D45 EROSION SEDIMENTATION DETAIL

CLIFTON YAMBA

LOCALITY PLAN
N.T.S.

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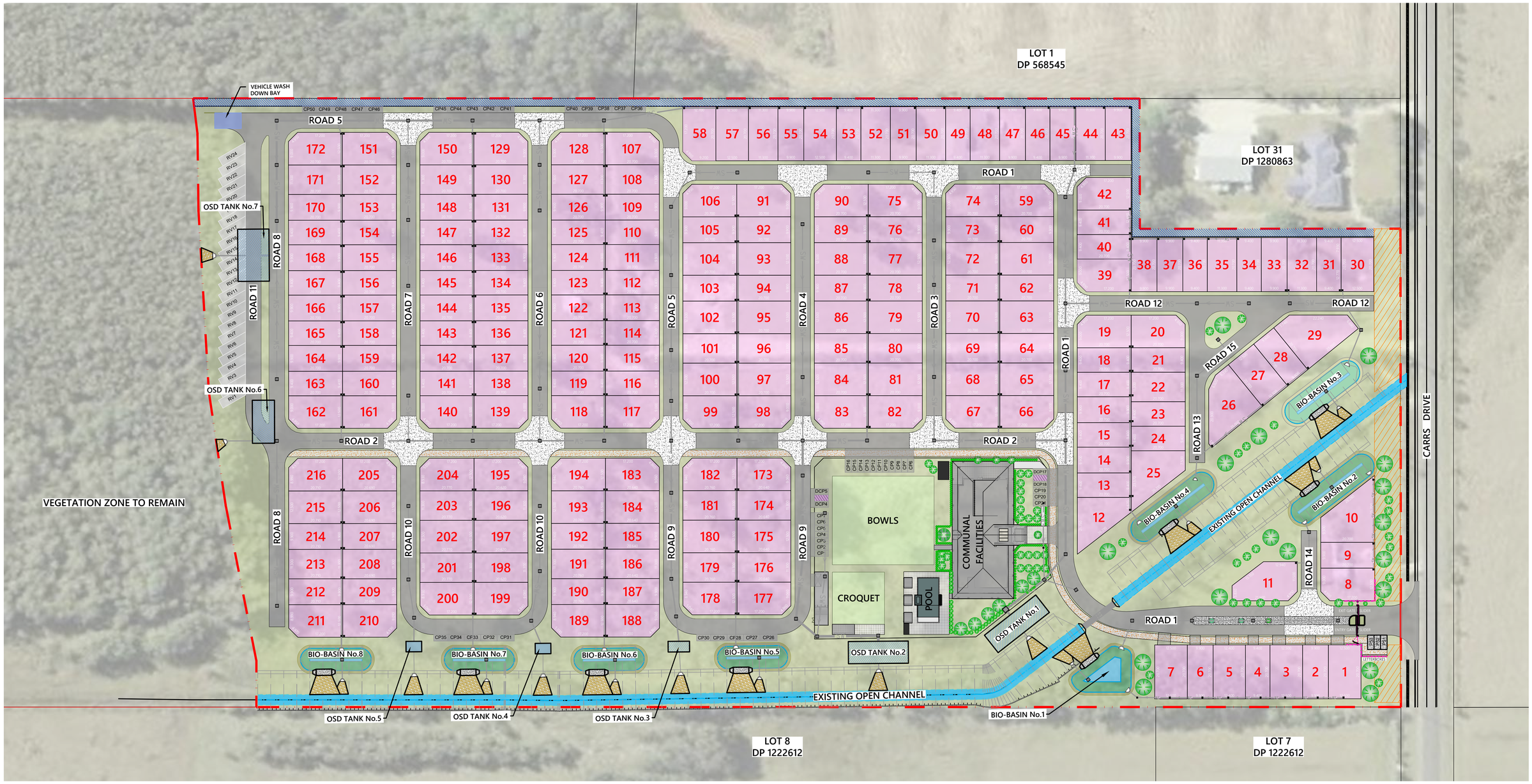
CLIFTON YAMBA

PROJECT: PROPOSED MHE DEVELOPMENT
110 & 120 CARRS DRIVE
YAMBA, NSW 2464
LOT 2 DP733507 & LOT 32 DP128863

DA CIVIL DRAWING

DRAWING TITLE: COVER SHEET

DWG No: D01 | SHEET: 01 OF 45 | REV: 0



SITE PLAN

SCALE 1:750

LEGEND

- DEVELOPMENT BOUNDARY
- INTERNAL LOT BOUNDARY
- BIO - BASIN TOP
- CHANNEL TOP OF BANK
- CHANNEL CENTRE LINE
- PROPOSED STORMWATER DRAINAGE
- RETAINING WALL
- STORMWATER DRAINAGE PIT
- HEADWALL
- PROPOSED MHE ALLOTMENT
- NEW INTERNAL CONCRETE ROAD PAVEMENT
- NEW INTERNAL CONCRETE INTERSECTION TREATMENTS & DRIVEWAYS
- NEW 2.5m WIDE SHARED PATH WITHIN SITE BOUNDARY
- MHE BOUNDARY SETBACK 3m WIDE 'NO BUILD ZONE'
- MHE BOUNDARY SETBACK 10m WIDE 'NO BUILD ZONE'
- VISITOR AND RECREATIONAL VEHICLE PARKING
- SCOUR PROTECTION
- BIO-BASIN BREM
- BIO-BASIN GRASSED AREA
- BIO-BASIN WEIR
- BIO-BASIN FLOOR
- GRASSED AREA

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20 10 0 10 20 30 40
Horizontal Scale 1:750 (A1)
1:1500 (A3)

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110 & 120 CARRS DRIVE
YAMBA, NSW 2464
LOT 2 DP733507 & LOT 32 DP128863

DA CIVIL DRAWING

DRAWING TITLE: SITE PLAN

DWG No: D02 | SHEET: 02 OF 45 | REV: 0

GENERAL ARRANGEMENT PLAN
SCALE 1:600

LEGEND

- DEVELOPMENT BOUNDARY
- INTERNAL LOT BOUNDARY
- BIO - BASIN TOP
- CHANNEL TOP OF BANK
- CHANNEL CENTRE LINE
- DESIGN CONTOURS
- PROPOSED STORMWATER DRAINAGE
- WATERMAIN Ø100mm
- GRAVITY SEWER Ø150mm
- LOW PRESSURE SEWER
- RETAINING WALL
- HEADWALL
- STORMWATER DRAINAGE PIT
- LOW PRESSURE SEWER ISOLATION VALVE
- LOW PRESSURE SEWER FLOW METER
- LOW PRESSURE SEWER BOUNDARY KIT
- AQUATEC LOW PRESSURE SEWER CHAMBER
- PROPOSED MHE ALLOTMENT
- NEW INTERNAL CONCRETE ROAD PAVEMENT
- NEW INTERNAL CONCRETE INTERSECTION TREATMENTS & DRIVEWAYS
- NEW 2.5m WIDE SHARED PATH WITHIN SITE BOUNDARY
- MHE BOUNDARY SETBACK 3m WIDE 'NO BUILD ZONE'
- MHE BOUNDARY SETBACK 10m WIDE 'NO BUILD ZONE'
- VISITOR AND RECREATIONAL VEHICLE PARKING
- SCOUR PROTECTION
- BIO-BASIN BREM
- BIO-BASIN GRASSED AREA
- BIO-BASIN WEIR
- BIO-BASIN FLOOR
- GRASSED AREA

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ARCHITECTURAL INFORMATION FOR CLUB HOUSE SUPPLIED BY MARK SHAPIRO ARCHITECTS DRAWING NUMBER DA1002WIP REV 2

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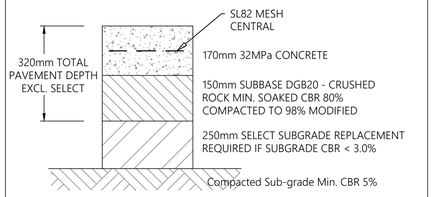
DA CIVIL DRAWING

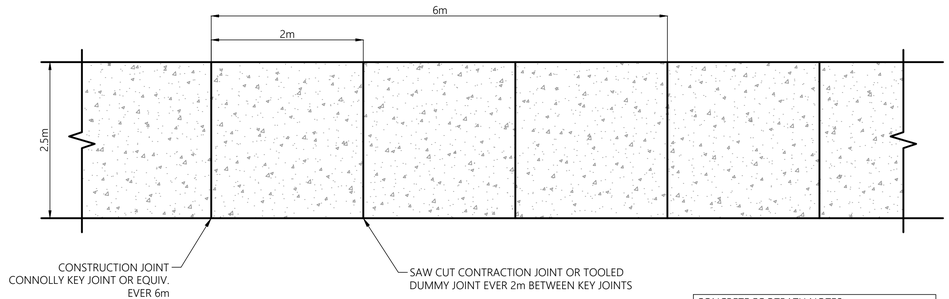
DRAWING TITLE: ROADWORKS & DRAINAGE PLAN

DWG No: D03 | SHEET: 03 OF 45 | REV: 0

RIGID PAVEMENT DESIGN

INTERNAL ROADS
DESIGN TRAFFIC LOAD $1x10^5$ ESA
(25 Year Design Life)



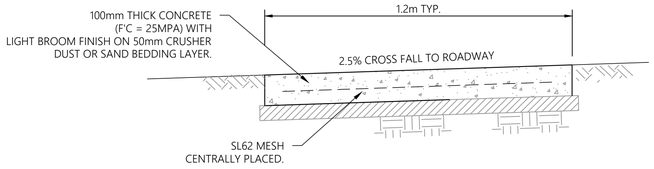


TYPICAL LAYOUT - CONCRETE FOOTPTAH

NOTE: REFER TO NRLG SD R-07 FOR DETAILS

CONCRETE FOOTPATH NOTES:

1. PROVIDE SAW CUT CONTRACTION JOINT OR TOOLED DUMMY JOINTS EVERY 2.0m WITH EXPANSION KEY JOINTS EVERY 6.0m, REFER TO NRLG STD DRAWING No. R-07 FOR DETAILS
2. THICKEN TO RIGID PAVEMENT DESIGN WHEREVER PATH BECOMES TRAFFICABLE
3. RESIDENTIAL DRIVEWAYS TO BE MAINTAINED AT RIGID PAVEMENT DESIGN THICKNESS, DOWEL PATH TO DRIVEWAY AT INTERFACE AS REQUIRED.



TYPICAL SECTION -CONCRETE PATH

NOTE: REFER TO NRLG SD R-07 FOR DETAILS

TYPICAL - EXPOSED AGGREGATE BORAL 'SPITFIRE' OR EQUIV.

CONCRETE:

C1 Workmanship and materials to comply with AS3600, AS2870, AS3610, AS1379, AS1478, AS3582 and AS3972 for liquid retaining structures also comply with AS3735.

C2 Concrete Supply
- CONCRETE PAVEMENT 32MPa 80mm SLUMP 20mm AGGREGATE
- CONCRETE PATHS 25MPa 80mm SLUMP 20mm AGGREGATE
- CONCRETE KERB 20MPa KERB MIX

C3 Review location of embedded items to minimize possible zones of poor compaction that may compromise structural integrity.

C4 Concrete quality shall be as follows:
U.N.O. Concrete shall be "Normal Class" to AS1379.

C5 Sampling, testing and acceptance
- Permanent records of plant assessment and project assessment shall be maintained at the plant and project respectively. Copies of these records shall be given promptly to the Engineer.
- Concrete is subject to project assessment.
- Sampling and testing shall comply with AS1379 and this specification and all such costs shall be borne by the contractor.
- The sampling and site treatment of project control test specimens shall be carried out by a NATA laboratory other than that of the supplier.
- Acceptance of concrete prior to placement shall be based on measured slump for compliance with the specification. Acceptance to hardened concrete for design properties shall be in accordance with AS1379.

C6 Construction tolerances to be in accordance with AS3610.

C7 Do not make holes, penetrations, recesses, chases, nor embed pipes (other than those shown on structural drawings) without approval of superintendent. Do not place conduits, pipes etc within cover concrete. Locate conduits, pipes etc only in middle third of slab or beam depth and between reinforcement layers, and spaced at 3 x diameter centres minimum. Do not cut reinforcement at penetrations without approval.

C8 Concrete cover shall be maintained by the use of plastic bar chairs at 750mm maximum centres U.N.O. Plastic tipped ferrous chairs not permitted.

C9 Construction joints where not shown shall be located to the approval of the Engineer in writing.

C10 Symbols on drawings for grade and type of reinforcement are as follows :-
- N Denotes grade 500 normal ductility deformed bar to AS4671
- R Denotes grade 250 normal ductility plain round bar to AS4671
- SL Denotes grade 500 low ductility welded square mesh to AS4671
- RL Denotes grade 500 low ductility welded rectangular mesh to AS4671

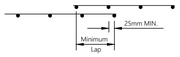
C11 Reinforcement is shown diagramatically and not necessarily in true position.

C12 Splices in reinforcement shall be made only in positions shown or otherwise approved in writing by the Engineer.

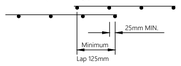
C13 Cogs and hooks to be standard in accordance with AS3600

C14 Reinforcement splices unless noted otherwise on the drawing.
All spices shall conform to the following table:
- i) Plain Bars - Actual lap length for plain (non-deformed) bars shall be 1.5 times the basic lap length.
- ii) Epoxy-Coated Bars - Actual lap length shall be 1.5 times the basic lap length.
- iii) Lightweight Concrete - Actual lap length shall be 1.3 times the basic lap length.
- iv) Structural elements built using slip forms - actual lap length shall be 1.3 times the basic lap length.

C15 Fabric splices shall be made by either of the following methods:-
(1) Lapping of fabric (Standard Fabric)



(2) Lapping of fabric (Mesh Type)



(3) Use of splice bars

Splice bar length is 800mm or 1000mm for horizontal bars where more than 300mm concrete cast below bar.

Fabric Reference	Spacing of Bars mm	
	At sheet ends	At sheet sides
RL1218	75	300
RL1118	100	300
RL1018	125	300
RL918	150	300
RL718, RL818	200	300
SL102, SL81	200	200
SL82, SL92	300	300

C16 Welding of reinforcement is only permitted where shown on the drawings or otherwise approved by the Engineer. Where welding of reinforcement is approved, it shall be carried out in accordance with AS1554. Part 3.

C17 Dowels shall be sawn to length. In skewed joints, dowels shall be aligned with the longitudinal joints. Dowel alignment to be maintained by use of a support assembly suitable to ensure a horizontal and vertical tolerance of 5 in 400.

C18 Minimum lap of fabric shall be two transverse wires plus 30 mm. Minimum 500mm lap length for trench mesh.

C19 All concrete shall be placed and cured in accordance with Australian Standards. Curing must be applied to slabs immediately after finishing and onto walls and columns immediately after removal of formwork. Curing compounds must be compatible with future finishes and comply with AS3799.

C20 Builder shall be responsible for design of formwork, shoring and scaffolding. Formwork and shoring shall comply with AS3610. Scaffolding shall comply with AS1576.

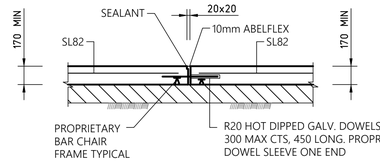
C21 Do not strip formwork until concrete is hardened sufficiently to withstand movement and form removal without damage. Strip formwork to AS3600 Clause 17.6 Remove form tie bolts without damaging concrete, parts of bolts left in concrete must not intrude into cover concrete. Flush fill holes using pre-mixed non-shrink cementitious repair mortar matching concrete surface colour, strength and durability and adequate bond. Remove props and formwork for beams and slabs and ensure concrete has gained adequate strength before constructing walls or placing other permanent loading on work.

C22 Site bending of reinforcement bars shall be done without heating. The bars shall be bent using a re-bending tool and against a flat surface or a pin with a diameter not less than the minimum pin size prescribed in AS3600.

C23 U.N.O. all hold down bolts shall be hot dipped galvanised.

C24 Saw cut crack control joints as soon after casting as practicable to avoid spalling or ravelling of joint edges, and within 16 hours of casting to prevent thermal and/or shrinkage cracking of slab. Immediately after saw cutting, flush out joints to remove sawing residue and insert a temporary foamed plastic bead to keep joint clean prior to filling or sealing protect saw cuts from wheel loads for at least one week after cutting.

C25 Do not install sealants if expected maximum daily temperature exceeds 30° degrees celcius. Ensure recesses are clean and dry prior to installing fillers or sealants, and prepare in accordance with manufacturer's recommendations. Tolerance on sealant widths +5, -0 mm.

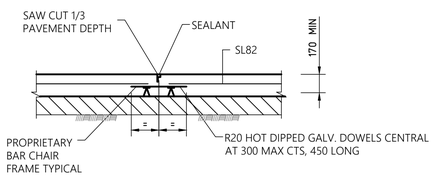


RIGID PAVEMENT EXPANSION JOINT - EJ

SCALE 1:20

NOTE: DOWEL KEY JOINT 'CONNOLLY' OR EQUIV. ACCEPTED FOR RIGID PAVEMENT EXPANSION JOINT UPON AGREEMENT WITH SUPERINTENDENT.

EXPANSION JOINT (EJ) & SAWN DOWEL JOINT (SDJ1) NOTES
1. DOWELS TO BE PLASTIC WRAPPED FULL LENGTH.
2. DOWELS TO BE RIGIDLY SUPPORTED ON BAR CHAIR FRAME WITH DOWELS PERPENDICULAR TO SAW CUT.
3. MARK POSITION OF SAW CUT ON FORMWORK. DO NOT POUR UNTIL POSITION OF MARK AND DOWEL FRAME HAS BEEN VERIFIED BY SUPERINTENDENT.

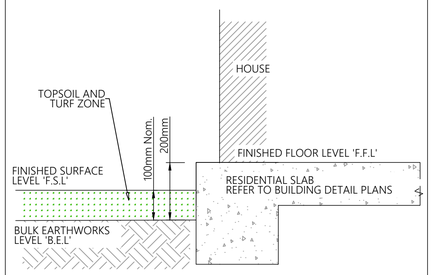


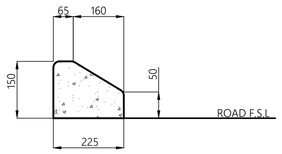
RIGID PAVEMENT SAWN DOWEL JOINT - SDJ

SCALE 1:20

RESIDENTIAL ALLOTMENT - TYPICAL SECTION

NOTES:
1. NOMINAL SETDOWN OF 200mm FROM FINISHED FLOOR LEVEL ' FFL' TO BULK EARTHWORKS LEVEL 'BEL' ON EACH RESIDENTIAL ALLOTMENT, REFER TO BULK EARTHWORKS PLANS FOR LEVEL DETAILS.





TYPE 'SM3' MOUNTABLE KERB

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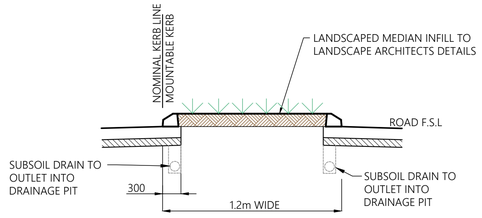

TYPICAL MEDIAN DETAIL

N.T.S

ISSUE	DESCRIPTION	DATE
0	ISSUED FOR DEVELOPMENT APPLICATION	08.09.2022

DESIGNED: T.RYDEN | DATE: SEPT 2022
DRAWN: A.SCHMID | SCALE: AS SHOWN
SURVEYING: | SHEET SIZE: A1

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MDE Manage Design Engineer

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TITLE: 110 & 120 CARRS DRIVE, YAMBA
DEVELOPMENT APPLICATION CIVIL WORKS PLANS

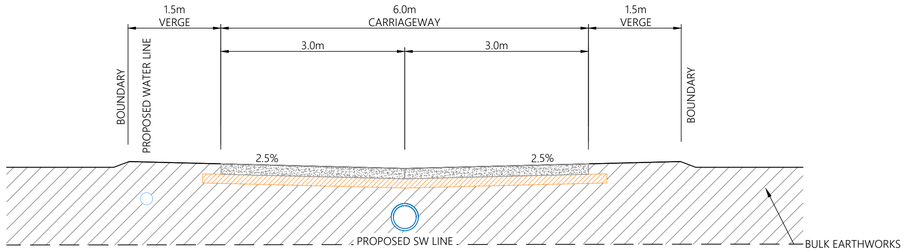
CLIFTON YAMBA

PROJECT: PROPOSED MHE DEVELOPMENT
110 & 120 CARRS DRIVE
YAMBA, NSW 2464
LOT 2 DP733507 & LOT 32 DP128863

DA CIVIL DRAWING

DRAWING TITLE: ROAD TYPICAL DETAIL

DWG No: D04 | SHEET: 04 OF 45 | REV: 0



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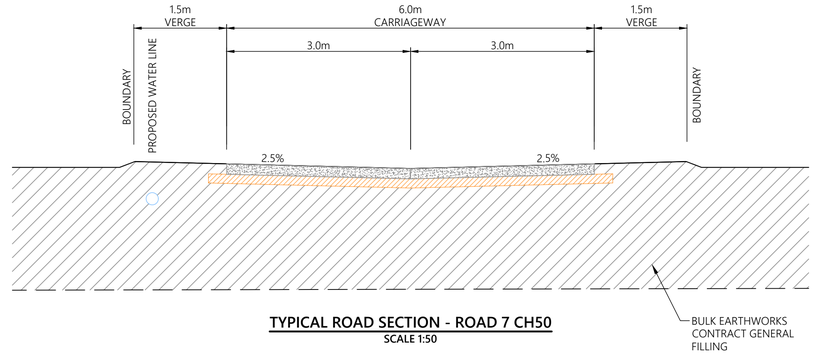

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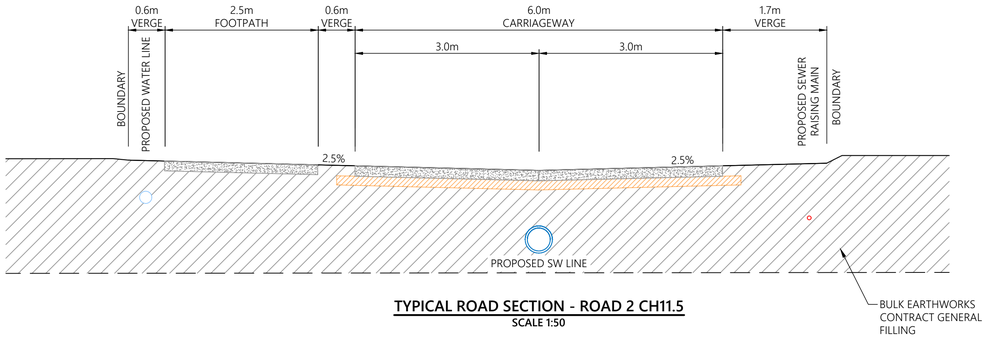

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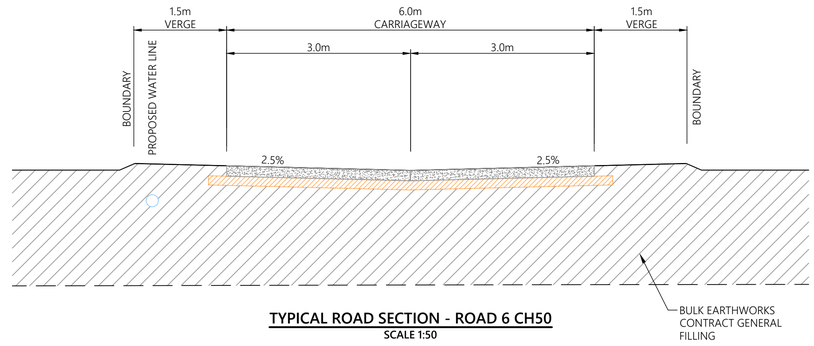

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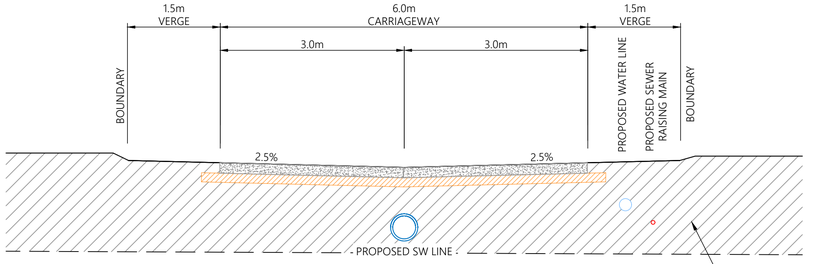

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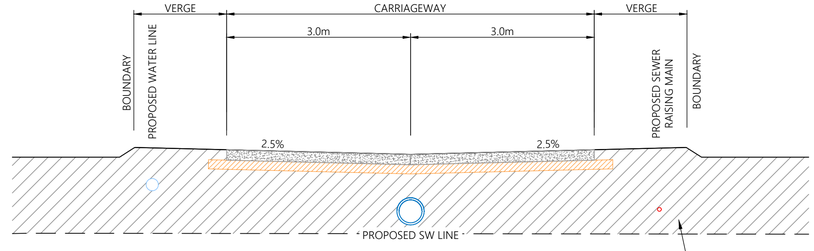

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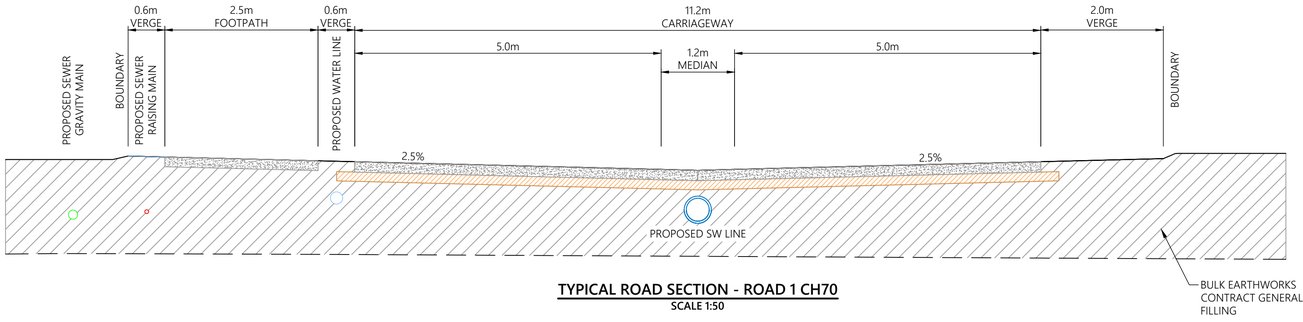

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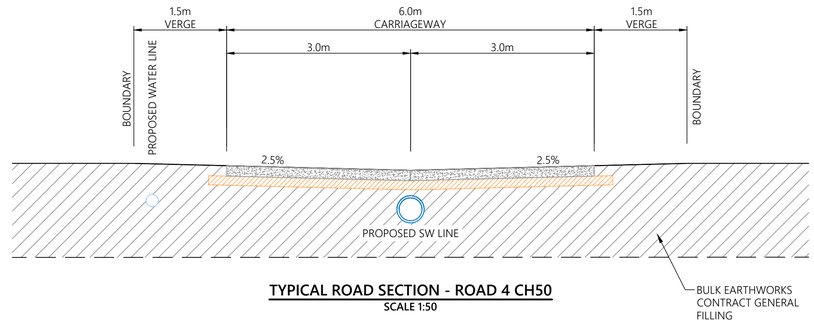

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ISSUE	DESCRIPTION	DATE
0	ISSUED FOR DEVELOPMENT APPLICATION	08.09.2022

DESIGNED: T.RYDEN | DATE: SEPT 2022
DRAWN: A.SCHMID | SCALE: AS SHOWN
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CLIFTON YAMBA

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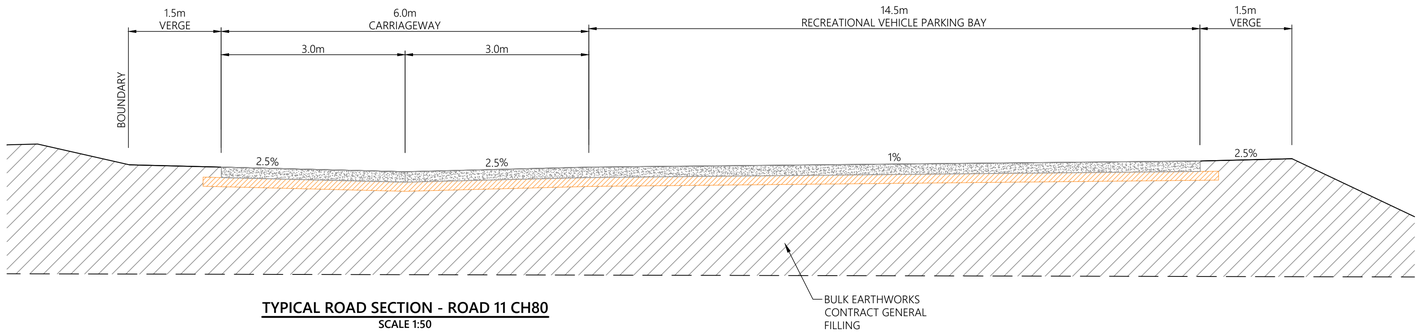
LOT 2 DP733507 & LOT 32 DP128863

DA CIVIL DRAWING

DRAWING TITLE: ROAD TYPICAL SECTIONS - SHEET 1

DWG No: D05 | SHEET: 05 OF 45 | REV: 0



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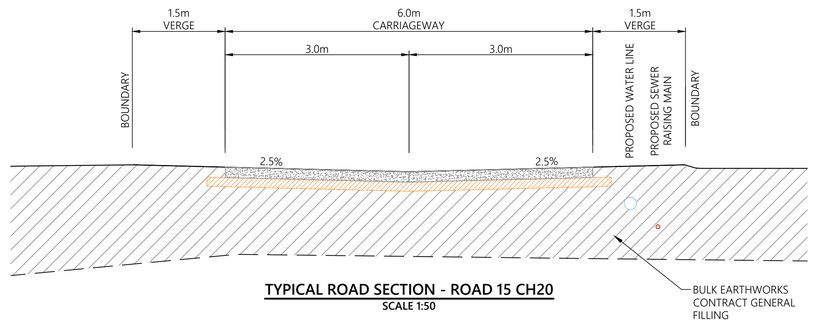

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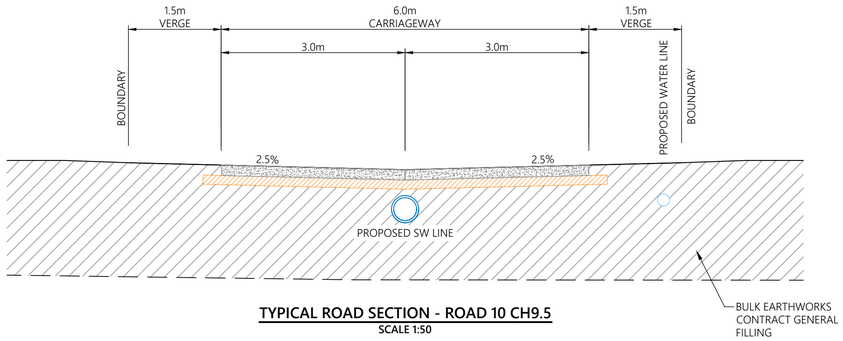

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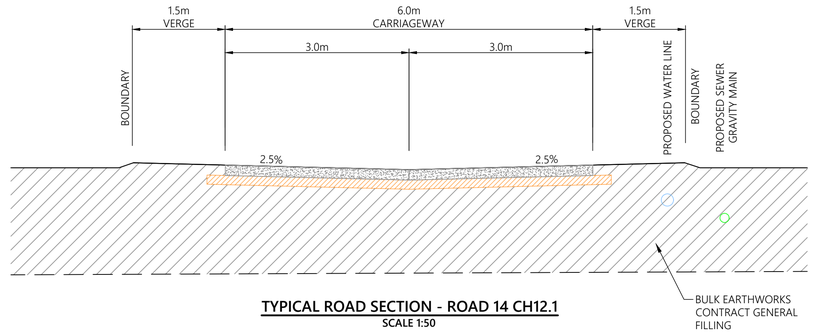

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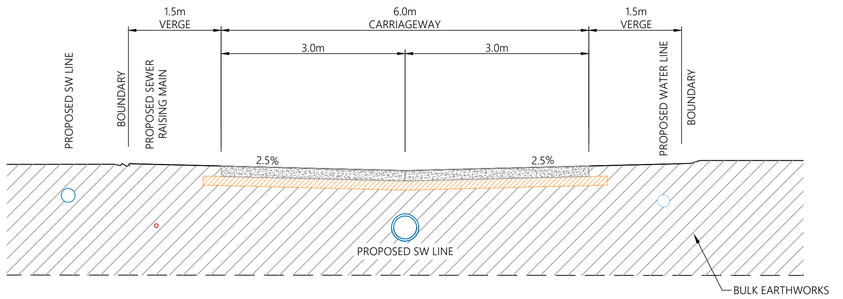

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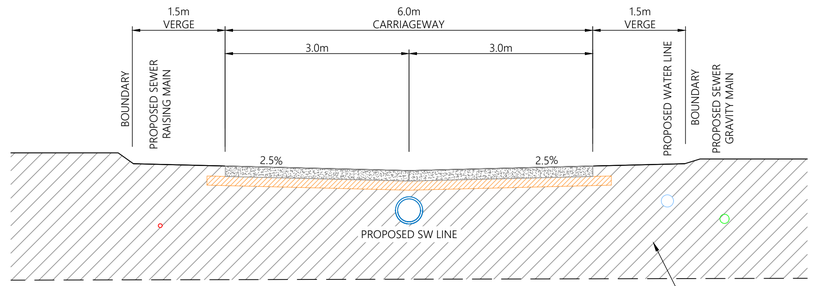

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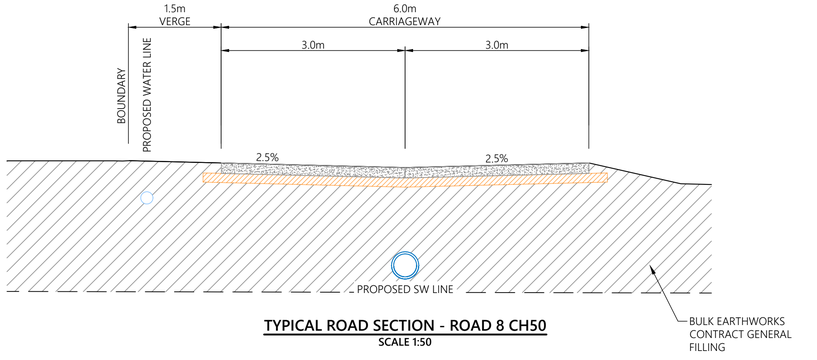

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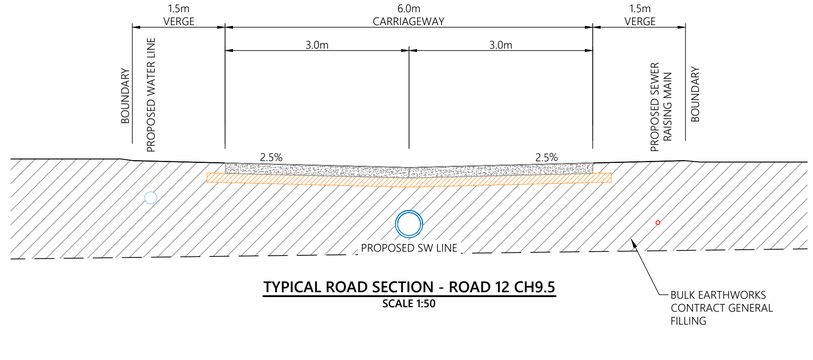

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ISSUE	DESCRIPTION	DATE
0	ISSUED FOR DEVELOPMENT APPLICATION	08.09.2022

DESIGNED: T.RYDEN | DATE: SEPT 2022
DRAWN: A.SCHMID | SCALE: AS SHOWN
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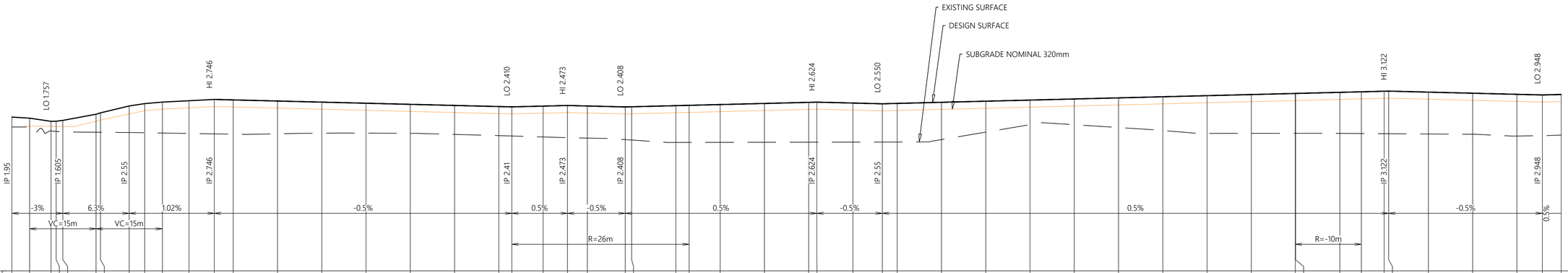
DA CIVIL DRAWING

DRAWING TITLE:
ROAD TYPICAL SECTION - SHEET 2

DWG No: D06 | SHEET: 06 OF 45 | REV: 0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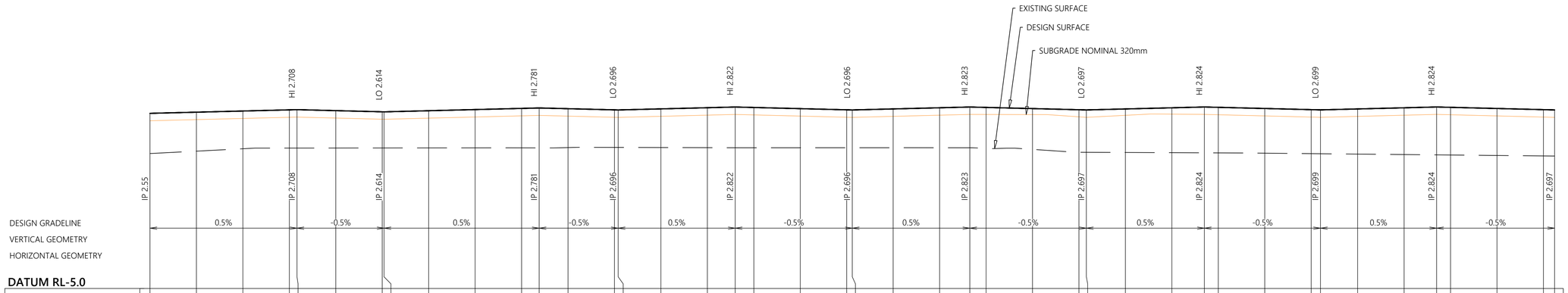
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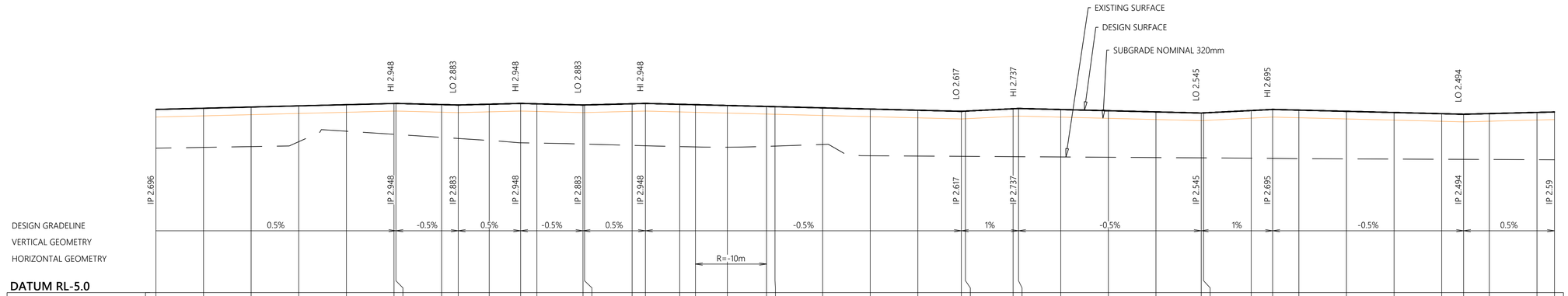
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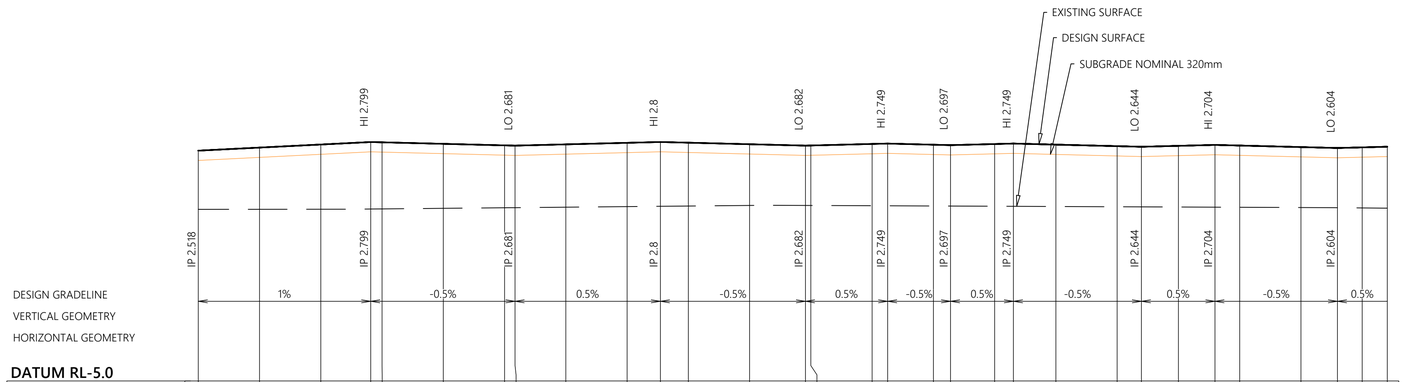
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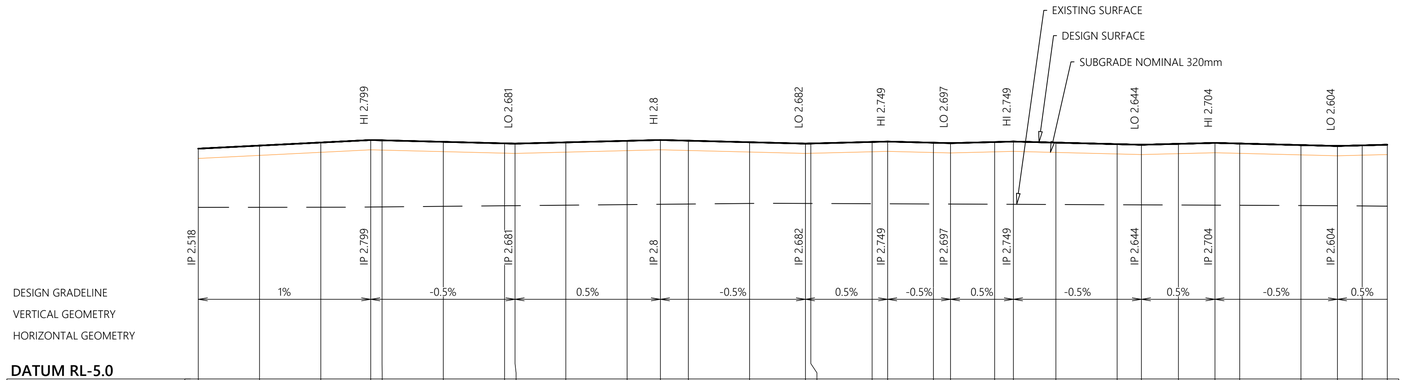
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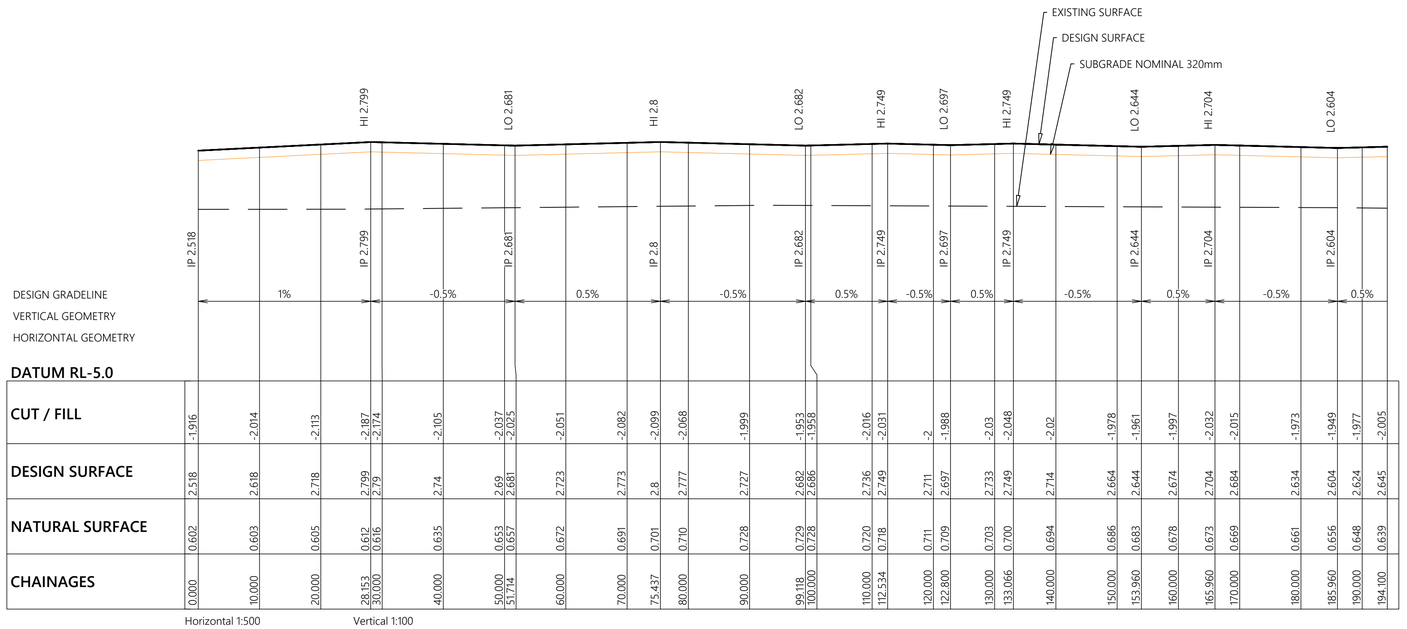
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DESIGN GRADELINE
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HORIZONTAL GEOMETRY
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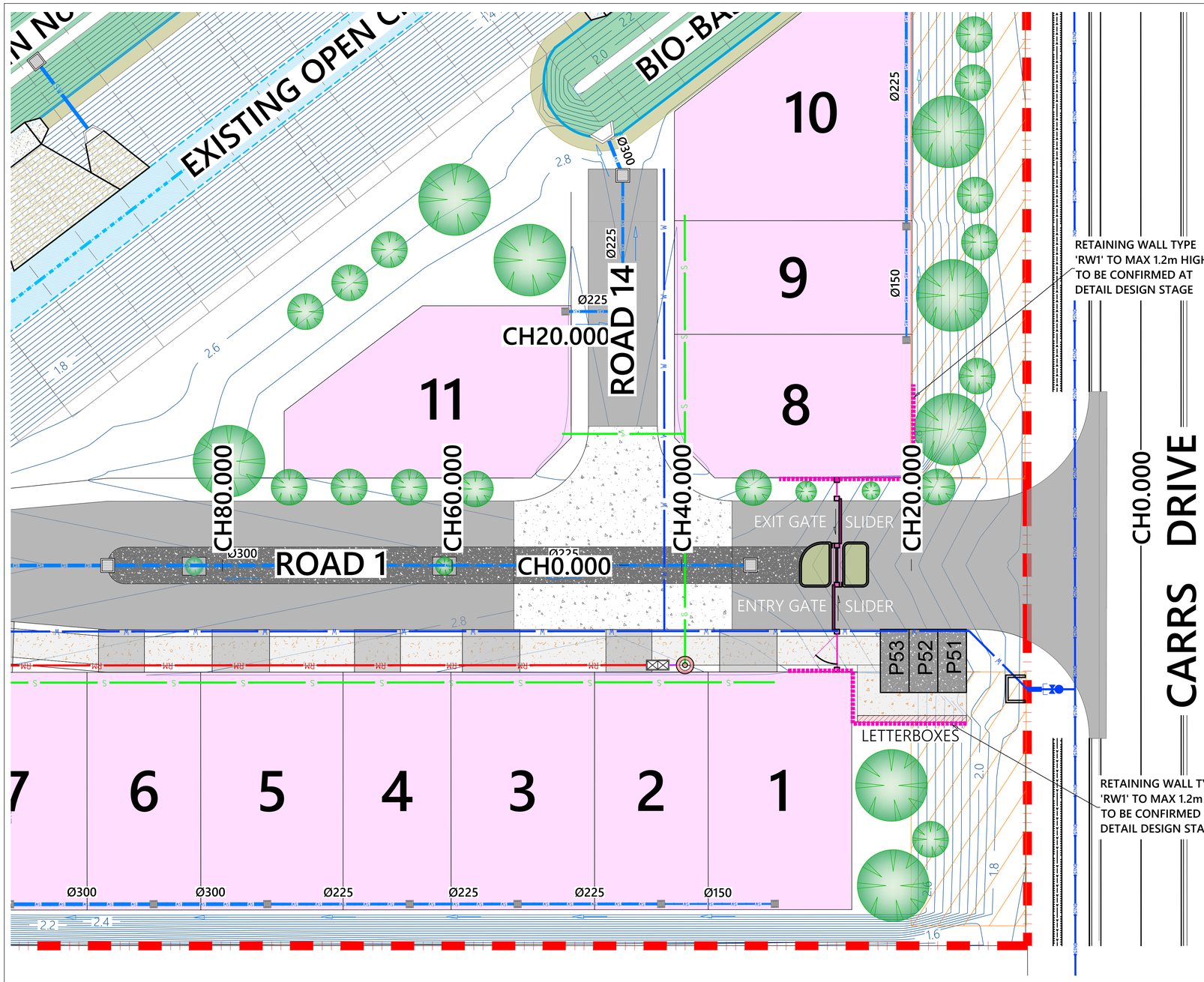

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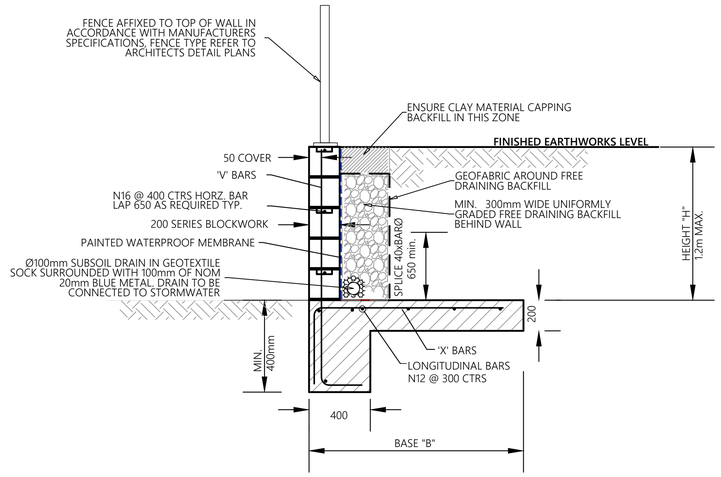
INTERSECTION DETAIL PLAN - ROAD 1 & CARRS DRIVE

SCALE 1:200



TYPICAL - RETAINING WALL - TYPE 'RW1'

NOTE:
BLOCK WALL TO BE CORE FILLED

BLOCK RETAINING WALL SCHEDULE TYPE RW1

WALL HEIGHT 'H'	WALL THICKNESS	BASE WIDTH 'B'	BARS	
			"V" - BARS	"X" - BARS
600 TO 1000	200	1000	N16 @ 400 CTRS	N16 @ 400 CTRS
1000 TO 1200	200	1200	N16 @ 400 CTRS	N16 @ 400 CTRS

LEGEND

- DEVELOPMENT BOUNDARY
- INTERNAL LOT BOUNDARY
- BIO - BASIN TOP
- CHANNEL TOP OF BANK
- CHANNEL CENTRE LINE
- DESIGN CONTOURS
- PROPOSED STORMWATER DRAINAGE
- RETAINING WALL
- WATERMAIN Ø100mm
- GRAVITY SEWER Ø150mm
- LOW PRESSURE SEWER
- SEWER HOUSE CONNECTION
- WATER MAIN TEE
- WATER METER
- STROMWATER DRAINAGE PIT
- HEADWALL
- DUAL PILLAR HYDRANT
- SLUICE VALVE
- LOW PRESSURE SEWER ISOLATION VALVE
- LOW PRESSURE SEWER FLOW METER
- LOW PRESSURE SEWER BOUNDARY KIT
- AQUATEC LOW PRESSURE SEWER CHAMBER
- PROPOSED MHE ALLOTMENT
- NEW INTERNAL CONCRETE ROAD PAVEMENT
- NEW INTERNAL CONCRETE INTERSECTION TREATMENTS & DRIVEWAYS
- NEW 2.5m WIDE SHARED PATH WITHIN SITE BOUNDARY
- MHE BOUNDARY SETBACK 3m WIDE 'NO BUILD ZONE'
- MHE BOUNDARY SETBACK 10m WIDE 'NO BUILD ZONE'
- VISITOR AND RECREATIONAL VEHICLE PARKING
- SCOUR PROTECTION
- BIO-BASIN BREM
- BIO-BASIN GRASSED AREA
- BIO-BASIN WEIR
- BIO-BASIN FLOOR
- GRASSED AREA

PLANS TO BE PRINTED IN COLOUR

PRELIMINARY PLANS FOR DA PURPOSES ONLY NOT FOR CONSTRUCTION

ISSUE	DESCRIPTION	DATE
0	ISSUED FOR DEVELOPMENT APPLICATION	08.09.2022

DESIGNED: T.RYDEN | DATE: SEPT 2022
DRAWN: A.SCHMID | SCALE: AS SHOWN
SURVEYING: | SHEET SIZE: A1

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CLIENT: CLIFTON YAMBA LAND PTY LTD

TITLE: 110 & 120 CARRS DRIVE, YAMBA
DEVELOPMENT APPLICATION CIVIL WORKS PLANS

CLIFTON YAMBA

PROJECT: PROPOSED MHE DEVELOPMENT
110 & 120 CARRS DRIVE
YAMBA, NSW 2464
LOT 2 DP733507 & LOT 32 DP128863

DA CIVIL DRAWING

DRAWING TITLE: INTERSECTION DETAIL PLAN - ROAD 1 & CARRS DRIVE

DWG No: D13 | SHEET: 13 OF 45 | REV: 0

20 10 0 10 20 30 40
Horizontal Scale 1:750 (A1)
1:1500 (A3)

EARTHWORKS PLAN
SCALE 1:750

LEGEND

- CUT 0.5 - 1.0m DEPTH
- CUT 0.0 - 0.5m DEPTH
- FILL 0.0 - 0.5m DEPTH
- FILL 0.5 - 1.0m DEPTH
- FILL 1.0 - 1.5m DEPTH
- FILL 1.5 - 2.0m DEPTH
- FILL 2.0 - 2.5m DEPTH
- FILL 2.5 - 2.7m DEPTH
- 6.6 EXISTING SITE CONTOURS 0.1m INTERVAL
- 2.6 PROPOSED RE-GRADING CONTOURS 0.1m INTERVAL

PRELIMINARY EARTHWORKS ESTIMATE

EARTHWORKS CUT TO FILL FROM NOMINAL 100mm DEEP STRIPPED SURFACE.
TOPSOIL DEPTH TO BE CONFIRMED AT DETAILED DESIGN STAGE.

VOLUMES INCLUDING NOMINAL INTERNAL ROADWAY BOXING 320mm DEEP

AREA OF EARTHWORKS =10.07Ha (EXCL. CARRS DRIVE RECONSTRUCTION)
TOPSOIL STRIPPED TO STOCKPILE = 10,078m^3

GENERAL BULK EARTHWORKS
TOTAL CUT = 500m^3
TOTAL FILL = 169,500m^3
BALANCE = 169,000m^3 (IMPORTED FROM APPROVED SOURCE or QUARRY)

* NOTES:
100 YEAR FLOOD LEVEL RL=2.5m AHD

ALLOTMENT EARTHWORKS LEVELS TO BE MINIMUM 200mm ABOVE 100 YEAR FLOOD LEVEL RL=2.7m AHD.

FINISHED FLOOR LEVELS (FFL) TO BE MINIMUM 500mm ABOVE 100 YEAR FLOOD LEVEL FFL = 3.0m AHD

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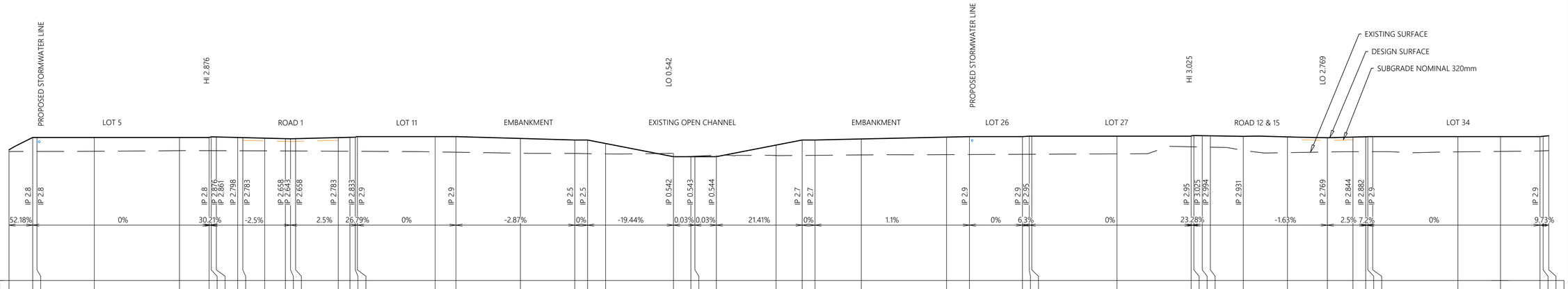
DA CIVIL DRAWING

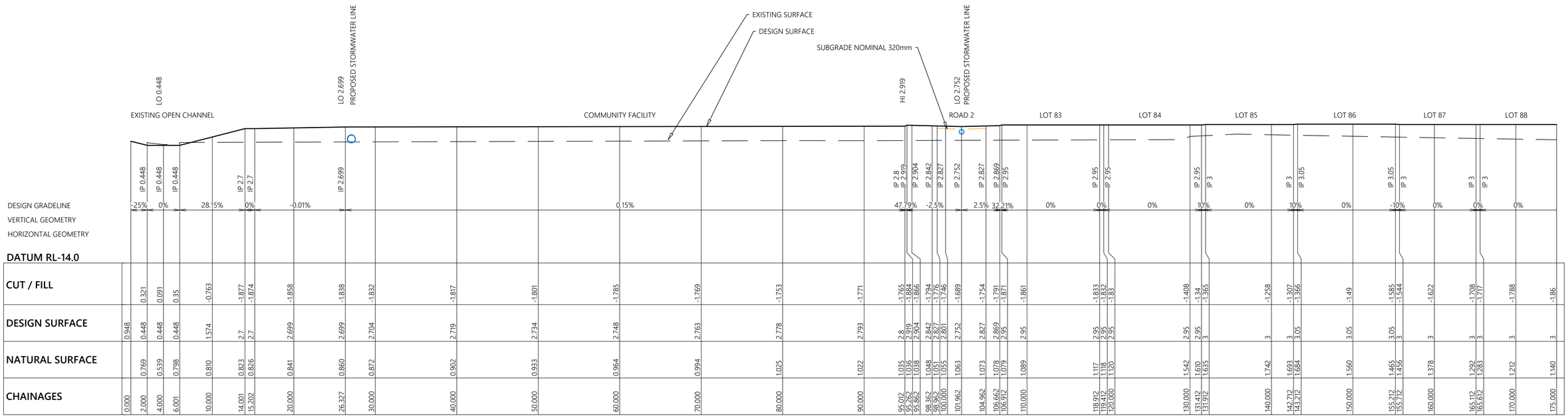
DRAWING TITLE: EARTHWORKS PLAN

DWG No: D14 | SHEET: 14 OF 45 | REV: 0

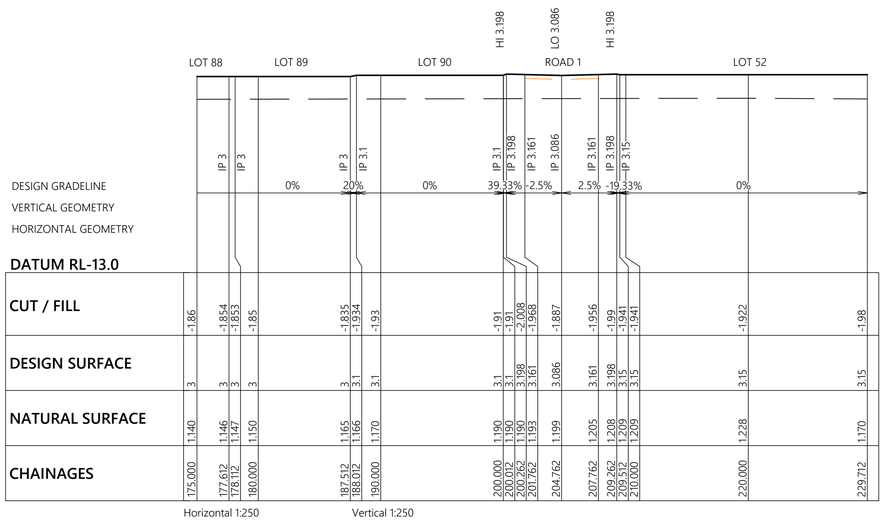

PROPOSED STORMWATER LINE
HI 2.876
LO 0.542
PROPOSED STORMWATER LINE
HI 3.025
LO 2.769
EXISTING SURFACE
DESIGN SURFACE
SUBGRADE NOMINAL 320mm
LOT 5
ROAD 1
LOT 11
EMBANKMENT
EXISTING OPEN CHANNEL
EMBANKMENT
LOT 26
LOT 27
ROAD 12 & 15
LOT 34
IP 2.8 IP 2.8
IP 2.8 IP 2.876 IP 2.861 IP 2.798 IP 2.783
IP 2.658 IP 2.643 IP 2.658 IP 2.783 IP 2.833 IP 2.9
IP 2.9
IP 2.5 IP 2.5
IP 0.542 IP 0.543 IP 0.544
IP 2.7 IP 2.7
IP 2.9
IP 2.9 IP 2.95
IP 2.95 IP 3.025 IP 2.994 IP 2.931
IP 2.769 IP 2.844 IP 2.882 IP 2.9
IP 2.9
DESIGN GRADELINE
VERTICAL GEOMETRY
HORIZONTAL GEOMETRY
52.18% 0% 30.21% -2.5% 2.5% 26.79% 0% -2.87% 0% -19.44% 0.03% 0.03% 21.41% 0% 1.1% 0% 6.3% 0% 23.28% -1.63% 2.5% 7.2% 0% 9.73%

DATUM RL-14.0

| | | |



SECTION B / D14



CONTINUATION SECTION B / D14

ISSUE	DESCRIPTION	DATE
0	ISSUED FOR DEVELOPMENT APPLICATION	08.09.2022

DESIGNED: T.RYDEN | DATE: SEPT 2022
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CLIFTON YAMBA

PROJECT: PROPOSED MHE DEVELOPMENT
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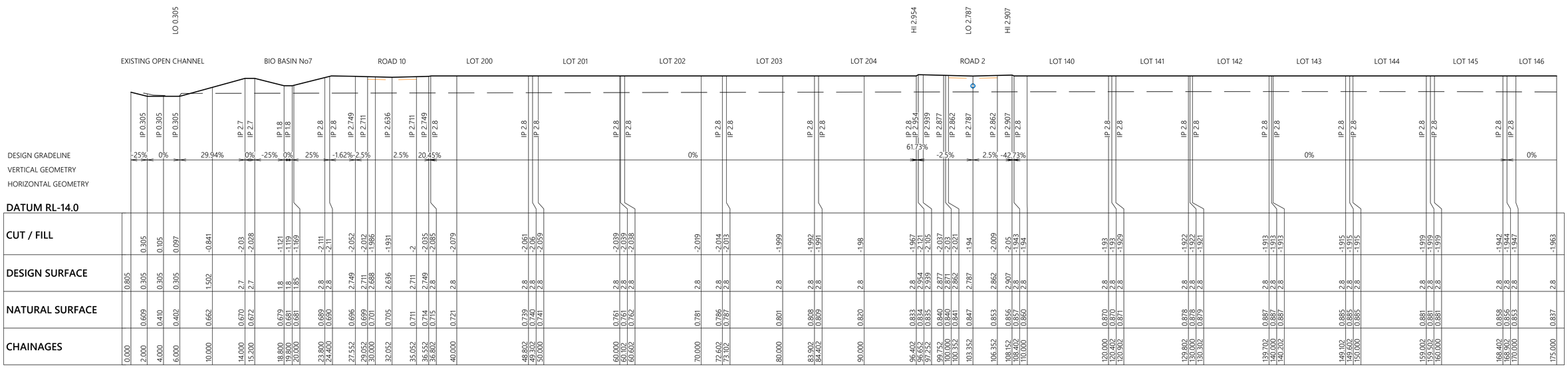
YAMBA, NSW 2464
LOT 2 DP733507 & LOT 32 DP128863

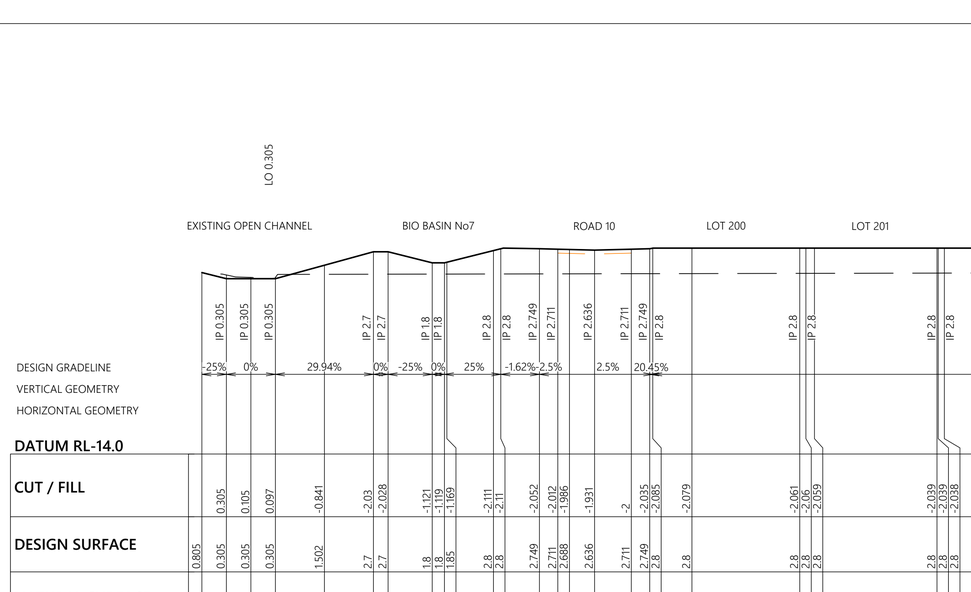
DA CIVIL DRAWING

DRAWING TITLE: EARTHWORKS LONGSECTOIONS - SHEET 2

DWG No: D16 | SHEET: 16 OF 45 | REV: 0



SECTION C/D14



CONTINUATION SECTION C/D14

ISSUE	DESCRIPTION	DATE
0	ISSUED FOR DEVELOPMENT APPLICATION	08.09.2022

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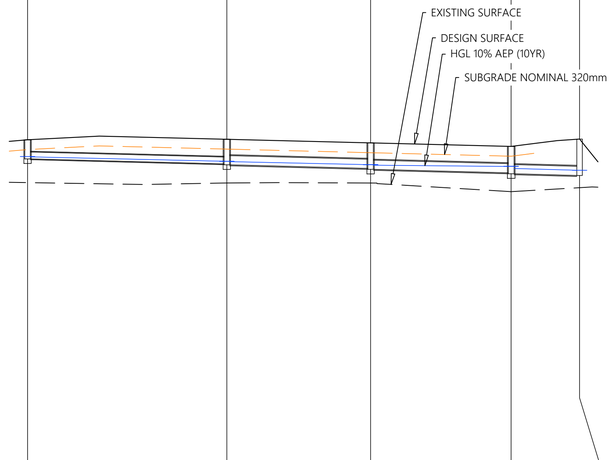
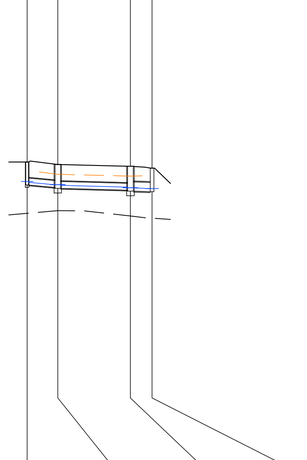
110 & 120 CARRS DRIVE
YAMBA, NSW 2464
LOT 2 DP733507 & LOT 32 DP128863

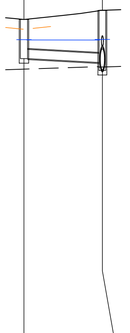
DA CIVIL DRAWING

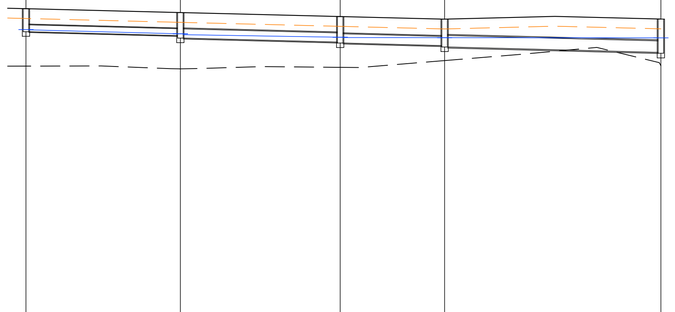
DRAWING TITLE: EARTHWORKS LONGSECTOIONS - SHEET 3

DWG No: D17 | SHEET: 17 OF 45 | REV: 0









STRUCTURE NAME	P1-1	P2-1	P3-1	P4-1	P5-1
STRUCTURE DESCRIPTION	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	HEADWALL
PIPE SIZE (mm)		225	300	300	300
PIPE SIZE / CLASS		STORM-PRO	STORM-PRO	STORM-PRO	STORM-PRO
PIPE GRADE (%)		0.50%	0.50%	0.50%	0.50%
PIPE SLOPE (1 in X)		200.0	200.0	200.0	200.0
PIPE FLOW (cumecs)		0.007	0.019	0.031	0.050
CAPACITY FLOW (cumecs)		0.038	0.081	0.081	0.081
FULL PIPE VELOCITY (m/s)		0.17	0.27	0.44	0.70
NORMAL DEPTH VELOCITY (m/s)		0.72	0.93	1.07	1.20
DATUM RL	-15.000				
HGL 10% AEP (10YR)	2.080 / 2.069	1.925	1.913 / 1.814	1.797 / 1.756	1.761 / 1.690 / 1.631
DEPTH TO INVERT	0.625	0.803	0.833 / 0.833	0.863	0.863 / 0.893 / 1.189 / 1.189
INVERT LEVEL AT PIT	2.002	1.839	1.809 / 1.692	1.662	1.547 / 1.517 / 1.461 / 1.461
DESIGN SURFACE LEVEL	2.627 (1.228)	2.642 (1.215)	2.525 (1.215)	2.410 (0.933)	2.650 (1.063)
SETOUT COORDINATES	532128.001E 6742991.451N	532095.870E 6742996.512N	532072.683E 6743000.165N	532050.026E 6743003.734N	532044.457E 6742994.043N
CHAINAGE	0.000	32.527	32.527 / 56.000	23.472 / 78.936	22.936 / 90.113

STORMWATER LINE 1

STRUCTURE NAME	P1-2	P2-2	P3-2	P4-2
STRUCTURE DESCRIPTION	INTERALLOTMENT PIT 450x450mm PIT & GRATE	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	HEADWALL
PIPE SIZE (mm)		225	225	300
PIPE SIZE / CLASS		STORM-PRO	STORM-PRO	STORM-PRO
PIPE GRADE (%)		1.61%	0.50%	0.50%
PIPE SLOPE (1 in X)		62.1	200.0	200.0
PIPE FLOW (cumecs)		0.011	0.015	0.019
CAPACITY FLOW (cumecs)		0.067	0.038	0.081
FULL PIPE VELOCITY (m/s)		0.28	0.38	0.27
NORMAL DEPTH VELOCITY (m/s)		1.26	0.89	0.94
DATUM RL	-14.000			
HGL 10% AEP (10YR)	2.266 / 2.237	2.158 / 2.161	2.141 / 2.080 / 2.063	2.056 / 2.033
DEPTH TO INVERT	0.750	0.750	0.780	0.780 / 0.810 / 0.767 / 0.767
INVERT LEVEL AT PIT	2.150	2.069	2.039	1.980 / 1.950 / 1.933 / 1.933
DESIGN SURFACE LEVEL	2.900 (1.226)	2.819 (1.313)	2.760 (1.140)	2.700 (1.068)
SETOUT COORDINATES	532115.520E 6743015.789N	532120.460E 6743015.014N	532122.303E 6743026.714N	532121.520E 6743030.174N
CHAINAGE	0.000	5.000 / 5.000	11.844 / 16.844	3.547 / 20.391

2

STRUCTURE NAME	P1-3	P10-4
STRUCTURE DESCRIPTION	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME
PIPE SIZE (mm)		300
PIPE SIZE / CLASS		STORM-PRO
PIPE GRADE (%)		1.00%
PIPE SLOPE (1 in X)		100.0
PIPE FLOW (cumecs)		0.012
CAPACITY FLOW (cumecs)		0.114
FULL PIPE VELOCITY (m/s)		0.17
NORMAL DEPTH VELOCITY (m/s)		1.04
DATUM RL	-15.000	
HGL 10% AEP (10YR)	1.749 / 1.739	1.738 / 1.755 / 1.660
DEPTH TO INVERT	1.277	1.704 / 1.962
INVERT LEVEL AT PIT	1.130	1.002 / 0.744
DESIGN SURFACE LEVEL	2.408 (0.786)	2.706 (0.855)
SETOUT COORDINATES	532030.608E 6743018.758N	532019.167E 6743024.504N
CHAINAGE	0.000	12.803 / 12.803

3

STRUCTURE NAME	P1-4	P2-4	P3-4	P4-4	P5-4
STRUCTURE DESCRIPTION	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME
PIPE SIZE (mm)		225	300	300	375
PIPE SIZE / CLASS		STORM-PRO	STORM-PRO	STORM-PRO	STORM-PRO
PIPE GRADE (%)		0.50%	0.50%	0.50%	0.50%
PIPE SLOPE (1 in X)		200.0	200.0	200.0	200.0
PIPE FLOW (cumecs)		0.006	0.021	0.028	0.033
CAPACITY FLOW (cumecs)		0.038	0.081	0.081	0.147
FULL PIPE VELOCITY (m/s)		0.15	0.30	0.40	0.30
NORMAL DEPTH VELOCITY (m/s)		0.69	0.96	1.04	1.07
DATUM RL	-14.000				
HGL 10% AEP (10YR)	2.392 / 2.384	2.256 / 2.254	2.226 / 2.143	2.132 / 2.130	2.129 / 2.122
DEPTH TO INVERT	0.752	0.752	0.833 / 0.833	0.863 / 0.863	0.908 / 1.088
INVERT LEVEL AT PIT	2.322	2.196	2.115 / 1.985	1.955 / 1.869	1.825 / 1.649
DESIGN SURFACE LEVEL	3.074 (1.200)	2.948 (1.111)	2.818 (1.160)	2.733 (1.361)	2.736 (1.211)
SETOUT COORDINATES	531976.896E 6743189.304N	532001.791E 6743185.386N	531997.727E 6743159.620N	531995.076E 6743142.778N	531989.588E 6743107.899N
CHAINAGE	0.000	25.202 / 25.202	26.085 / 51.287	17.049 / 68.336	35.309 / 103.644

4

Horizontal Scale 1:250 (A1) 1:500 (A3)

Vertical Scale 1:50 (A1) 1:100 (A3)

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THE LOCATION OF UNDERGROUND SERVICES SHOWN ARE INDICATIVE ONLY. THE CONTRACTOR IS RESPONSIBLE FOR CONTACTING ALL AUTHORITIES TO DETERMINE THE LOCATION OF UNDERGROUND SERVICES PRIOR TO THE COMMENCEMENT OF CONSTRUCTION WORK. ANY CLASH OF WORKS WITH A SERVICE IS TO BE REPORTED TO THE ENGINEER IMMEDIATELY. THE CONTRACTOR SHALL ENSURE THAT ALL SERVICES ARE FULLY PROTECTED DURING CONSTRUCTION, ANY SERVICES DAMAGED DURING CONSTRUCTION SHALL BE REPAIRED AT THE CONTRACTORS EXPENSE.

ISSUE	DESCRIPTION	DATE
0	ISSUED FOR DEVELOPMENT APPLICATION	08.09.2022

DESIGNED: T.RYDEN | DATE: SEPT 2022
DRAWN: A.SCHMID | SCALE: AS SHOWN
SURVEYING: | SHEET SIZE: A1

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DEVELOPMENT APPLICATION CIVIL WORKS PLANS

CLIFTON YAMBA

PROJECT: PROPOSED MHE DEVELOPMENT
110 & 120 CARRS DRIVE
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LOT 2 DP733507 & LOT 32 DP128863

DA CIVIL DRAWING

DRAWING TITLE: STORMWATER LONGITUDINAL SECTION - SHEET 1

DWG No: D18 | SHEET: 18 OF 45 | REV: 0

STRUCTURE NAME	P5-4	P6-4	P7-4	P8-4	P9-4	P10-4	P11-4	P12-4	P13-4
STRUCTURE DESCRIPTION	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	BCC MANHOLE 1500mm DIA	DETENTION TANK	HEADWALL
PIPE SIZE (mm)	375	450	600	675	675	750	750	375	
PIPE SIZE / CLASS	STORM-PRO	STORM-PRO	STORM-PRO	STORM-PRO	STORM-PRO	STORM-PRO	STORM-PRO	PVC	
PIPE GRADE (%)	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	
PIPE SLOPE (1 in X)	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	
PIPE FLOW (cumecs)	0.042	0.063	0.180	0.350	0.356	0.413	0.412	0.434	
CAPACITY FLOW (cumecs)	0.147	0.238	0.513	0.703	0.703	0.931	0.931	0.147	
FULL PIPE VELOCITY (m/s)	0.38	0.40	0.64	0.98	0.99	0.94	0.93	3.93	
NORMAL DEPTH VELOCITY (m/s)	1.15	1.27	1.66	1.96	1.97	2.04	2.04	3.93	
DATUM RL	-15.000								
HGL 10% AEP (10YR)	2.122 / 2.113	2.103 / 2.085	2.076 / 2.027	2.011 / 1.909	1.854 / 1.754	1.738 / 1.660	1.641 / 1.549	1.542 / 1.183	0.895
DEPTH TO INVERT	1.088 / 1.118	1.180 / 1.210	1.335 / 1.365	1.365 / 1.464	1.612 / 1.642	1.932 / 1.962	2.057 / 2.087	2.114 / 2.144	2.177 / 2.177
INVERT LEVEL AT PIT	1.649 / 1.619	1.497 / 1.467	1.343 / 1.313	1.185 / 1.086	0.868 / 0.838	0.774 / 0.744	0.651 / 0.621	0.586 / 0.556	0.523 / 0.523
DESIGN SURFACE LEVEL	2.736 (1.211)	2.677 (1.057)	2.679 (1.052)	2.550 (0.819)	2.480 (0.805)	2.706 (0.855)	2.707 (0.830)	2.700 (0.810)	2.700 (0.773)
SETOUT COORDINATES	531989.588E 6743107.899N	531985.801E 6743083.837N	532010.201E 6743079.998N	532035.589E 6743076.003N	532028.804E 6743032.887N	532019.167E 6743024.504N	532002.789E 6743015.509N	532006.203E 6743009.447N	532009.501E 6743003.835N
CHAINAGE	103.644	24.357 / 128.002	24.700 / 152.702	25.700 / 178.402	43.646 / 222.048	12.773 / 234.821	18.686 / 253.507	6.957 / 260.464	6.509 / 266.973

STORMWATER LINE

4

STRUCTURE NAME	P1-5	P2-5	P3-5	P4-5	P5-5	P6-5
STRUCTURE DESCRIPTION	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME
PIPE SIZE (mm)	225	300	300	750	750	
PIPE SIZE / CLASS	STORM-PRO	STORM-PRO	STORM-PRO	STORM-PRO	STORM-PRO	
PIPE GRADE (%)	0.50%	0.50%	0.50%	0.50%	0.50%	
PIPE SLOPE (1 in X)	200.0	200.0	200.0	200.0	200.0	
PIPE FLOW (cumecs)	0.009	0.019	0.028	0.314	0.318	
CAPACITY FLOW (cumecs)	0.038	0.081	0.081	0.931	0.931	
FULL PIPE VELOCITY (m/s)	0.24	0.27	0.39	0.71	0.72	
NORMAL DEPTH VELOCITY (m/s)	0.79	0.93	1.04	1.90	1.91	
DATUM RL	-14.000					
HGL 10% AEP (10YR)	2.487 / 2.467	2.462 / 2.456	2.448 / 2.436	2.422 / 2.433 / 2.364	2.356 / 2.348	2.330 / 2.332
DEPTH TO INVERT	0.752	0.752 / 0.833	0.839 / 0.869	0.873 / 1.304	1.304 / 1.334	1.454
INVERT LEVEL AT PIT	2.349	2.201 / 2.120	1.975 / 1.945	1.823 / 1.392	1.325 / 1.295	1.135
DESIGN SURFACE LEVEL	3.101 (1.150)	2.953 (1.455)	2.813 (1.145)	2.696 (1.080)	2.629 (1.039)	2.589 (0.941)
SETOUT COORDINATES	531948.912E 6743173.638N	531944.315E 6743144.423N	531939.796E 6743115.706N	531936.014E 6743091.672N	531933.929E 6743078.423N	531928.955E 6743046.812N
CHAINAGE	0.000	29.574 / 29.574	29.070 / 58.644	24.330 / 82.974	13.412 / 96.386	32.000 / 128.386

5

Horizontal Scale 1:250 (A1) 1:500 (A3)

Vertical Scale 1:50 (A1) 1:100 (A3)

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ISSUE	DESCRIPTION	DATE
0	ISSUED FOR DEVELOPMENT APPLICATION	08.09.2022

DESIGNED: T.RYDEN | DATE: SEPT 2022
DRAWN: A.SCHMID | SCALE: AS SHOWN
SURVEYING: | SHEET SIZE: A1

NOT FOR CONSTRUCTION

MDE Manage Design Engineer

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CLIENT: CLIFTON YAMBA LAND PTY LTD

TITLE: 110 & 120 CARRS DRIVE, YAMBA
DEVELOPMENT APPLICATION CIVIL WORKS PLANS

CLIFTON YAMBA

PROJECT: PROPOSED MHE DEVELOPMENT
110 & 120 CARRS DRIVE
YAMBA, NSW 2464
LOT 2 DP733507 & LOT 32 DP128863

DA CIVIL DRAWING

DRAWING TITLE: STORMWATER LONGITUDINAL SECTION - SHEET 2

DWG No: D19 | SHEET: 19 OF 45 | REV: 0

STRUCTURE NAME	P6-5	P7-5	P8-5	P9-5	P10-5	P11-5
STRUCTURE DESCRIPTION	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	DETENTION TANK	INTERALLOTMENT PIT 450x450mm PIT & GRATE
PIPE SIZE (mm)	750	750	900	900	325	
PIPE SIZE / CLASS	STORM-PRO	STORM-PRO	STORM-PRO	STORM-PRO	PVC	
PIPE GRADE (%)	0.50%	0.50%	0.50%	0.50%	0.50%	
PIPE SLOPE (1 in X)	200.0	200.0	200.0	200.0	200.0	
PIPE FLOW (cumecs)	0.323	0.334	0.421	0.418	0.440	
CAPACITY FLOW (cumecs)	0.931	0.931	1.513	1.513	0.100	
FULL PIPE VELOCITY (m/s)	0.73	0.76	0.66	0.66	5.31	
NORMAL DEPTH VELOCITY (m/s)	1.91	1.93	2.04	2.03	5.31	
DATUM RL	-15.000					
HGL 10% AEP (10YR)	2.330 2.332	2.310	2.296 2.305	2.235	2.228 2.232	2.176
	2.167 2.179	2.121	2.119 2.122	1.602		0.959
DEPTH TO INVERT	1.454	1.484	1.577	1.607	1.794	1.824
	1.941	1.971	2.002	2.032		2.065
						2.065
INVERT LEVEL AT PIT	1.135	1.105	0.990	0.960	0.907	0.877
	0.760	0.730	0.698	0.668		0.635
						0.635
DESIGN SURFACE LEVEL	2.589	(0.941)	2.567	(0.870)	2.701	(0.853)
	2.701	(0.866)	2.700	(0.846)		2.700
						(0.826)
SETOUT COORDINATES	531928.955E 6743046.812N		531922.824E 6743024.577N		531929.772E 6743016.625N	
	531952.936E 6743013.270N		531952.045E 6743006.907N			531951.095E 6743000.346N
CHAINAGE	128.386	23.065	151.451	10.560	162.011	23.405
	185.417	6.424	191.841	6.630		198.471

STORMWATER LINE 5

STRUCTURE NAME	P1-6	P2-6	P3-6	P4-6	P5-6	P6-6	P7-6	P8-6	P9-6	P10-6	P11-6	P12-6
STRUCTURE DESCRIPTION	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	DETENTION TANK	HEADWALL
PIPE SIZE (mm)	225	300	300	375	375	375	450	450	450	450	450	165
PIPE SIZE / CLASS	STORM-PRO	STORM-PRO	STORM-PRO	STORM-PRO	STORM-PRO	STORM-PRO	STORM-PRO	STORM-PRO	STORM-PRO	STORM-PRO	STORM-PRO	uPVC
PIPE GRADE (%)	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%
PIPE SLOPE (1 in X)	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0
PIPE FLOW (cumecs)	0.006	0.012	0.023	0.031	0.035	0.041	0.057	0.063	0.072	0.083	0.083	
CAPACITY FLOW (cumecs)	0.038	0.081	0.081	0.147	0.147	0.147	0.238	0.238	0.238	0.238	0.016	
FULL PIPE VELOCITY (m/s)	0.15	0.17	0.32	0.28	0.32	0.37	0.36	0.40	0.45	0.52	3.86	
NORMAL DEPTH VELOCITY (m/s)	0.69	0.81	0.98	1.05	1.09	1.14	1.23	1.26	1.31	1.36	3.86	
DATUM RL	-14.000											
HGL 10% AEP (10YR)	2.533 2.526	2.524	2.520	2.519 2.522	2.509	2.499 2.496	2.489 2.486	2.480	2.475	2.469 2.464	2.458 2.454	2.442 2.443
	2.433	2.427	2.418	2.410 2.439	2.147	-						1.128
DEPTH TO INVERT	0.752	0.752	0.782	0.756	0.786	0.917	0.947	1.078	1.108	1.108	1.138	1.138
	1.168	1.168	1.198	1.318	1.348	1.426	1.456	1.674	1.704	1.737	1.737	
INVERT LEVEL AT PIT	2.323	2.232	2.202	2.127	2.097	1.966	1.936	1.792	1.762	1.665	1.635	1.559
	1.529	1.429	1.399	1.234	1.204	1.131	1.101	1.033	1.003	0.963	0.963	
DESIGN SURFACE LEVEL	3.075 (1.104)	2.984 (1.176)	2.883 (1.242)	2.883 (1.476)	2.870 (1.849)	2.773 (1.119)	2.696 (1.068)	2.596 (1.001)	2.551 (0.893)	2.558 (0.849)	2.707 (0.809)	2.700 (0.784)
SETOUT COORDINATES	531927.320E 6743197.105N	531909.270E 6743199.945N	531900.169E 6743188.106N	531896.096E 6743162.222N	531891.626E 6743133.818N	531888.596E 6743114.563N	531886.227E 6743099.506N	531883.118E 6743079.750N	531877.988E 6743047.151N	531877.561E 6743032.628N	531876.883E 6743019.075N	531875.904E 6743011.077N
CHAINAGE	0.000	18.273	18.273	14.933	33.206	26.202	59.409	28.753	88.162	19.491	107.654	15.242
	122.896	20.000	142.896	33.000	175.896	14.529	190.425	13.570	203.995	8.058	212.052	

6

Horizontal Scale 1:250 (A1) 1:500 (A3)

Vertical Scale 1:50 (A1) 1:100 (A3)

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ISSUE	DESCRIPTION	DATE
0	ISSUED FOR DEVELOPMENT APPLICATION	08.09.2022

DESIGNED: T.RYDEN | DATE: SEPT 2022
DRAWN: A.SCHMID | SCALE: AS SHOWN
SURVEYING: | SHEET SIZE: A1

NOT FOR CONSTRUCTION

MDE Manage Design Engineer

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CLIENT: CLIFTON YAMBA LAND PTY LTD

TITLE: 110 & 120 CARRS DRIVE, YAMBA
DEVELOPMENT APPLICATION CIVIL WORKS PLANS

CLIFTON YAMBA

PROJECT: PROPOSED MHE DEVELOPMENT
110 & 120 CARRS DRIVE
YAMBA, NSW 2464
LOT 2 DP733507 & LOT 32 DP128863

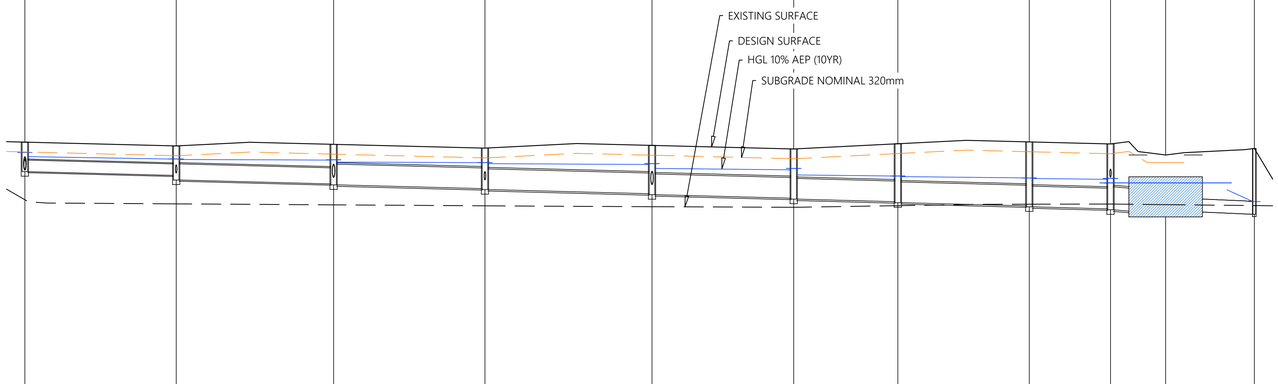
DA CIVIL DRAWING

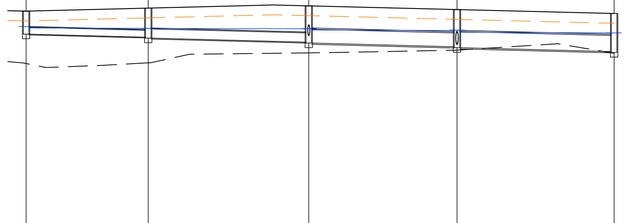
DRAWING TITLE: STORMWATER LONGITUDINAL SECTION - SHEET 3

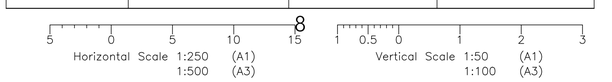
DWG No: D20 | SHEET: 20 OF 45 | REV: 0

STRUCTURE NAME	P1-7	P2-7	P3-7	P4-7	P5-7	P6-7	P7-7	P8-7	P9-7	P10-7	P11-7
STRUCTURE DESCRIPTION	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	DETENTION TANK	INTERALLOTMENT PIT 450x450mm PIT & GRATE
PIPE SIZE (mm)	375	525	675	675	675	675	675	675	750	425	
PIPE SIZE / CLASS	STORM-PRO	STORM-PRO	STORM-PRO	STORM-PRO	STORM-PRO	STORM-PRO	STORM-PRO	STORM-PRO	STORM-PRO	PVC	
PIPE GRADE (%)	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	
PIPE SLOPE (1 in X)	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	
PIPE FLOW (cumecs)	0.118	0.143	0.274	0.310	0.439	0.447	0.448	0.449	0.458	0.468	
CAPACITY FLOW (cumecs)	0.147	0.360	0.703	0.703	0.703	0.703	0.703	0.703	0.931	0.205	
FULL PIPE VELOCITY (m/s)	1.07	0.66	0.77	0.87	1.23	1.25	1.25	1.25	1.04	3.30	
NORMAL DEPTH VELOCITY (m/s)	1.48	1.56	1.84	1.90	2.07	2.08	2.08	2.08	2.10	3.30	
DATUM RL	-15.000										
HGL 10% AEP (10YR)	2.403 / 2.267	2.187 / 2.175	2.154 / 2.090	2.071 / 2.038	2.012 / 1.882	1.837 / 1.669	1.635 / 1.616	1.572 / 1.553	1.526 / 1.412	1.401 / 1.185	0.801
	2.039	2.162	2.076	2.039	1.881	1.668	1.568	1.410			
DEPTH TO INVERT	0.962	0.962 / 1.112	1.292 / 1.322	1.322 / 1.352	1.577 / 1.607	1.607 / 1.637	1.892 / 1.922	2.089 / 2.119	2.119 / 2.149	1.834 / 1.864	2.149 / 2.149
INVERT LEVEL AT PIT	1.778	1.655 / 1.505	1.377 / 1.347	1.223 / 1.193	1.057 / 1.027	0.911 / 0.881	0.796 / 0.766	0.659 / 0.629	0.562 / 0.532	0.487 / 0.457	0.385 / 0.385
DESIGN SURFACE LEVEL	2.740 (0.860)	2.617 (0.726)	2.668 (0.693)	2.545 (0.662)	2.633 (0.634)	2.518 (0.614)	2.688 (0.667)	2.748 (0.714)	2.681 (0.719)	2.321 (0.700)	2.534 (0.670)
SETOUT COORDINATES	531879.928E 6743224.809N	531855.528E 6743228.648N	531830.141E 6743232.643N	531805.741E 6743236.483N	531778.797E 6743240.723N	531755.954E 6743244.317N	531753.311E 6743227.523N	531749.975E 6743206.327N	531747.915E 6743193.232N	531739.050E 6743194.794N	531724.718E 6743196.851N
CHAINAGE	0.000	24.700 / 24.700	25.700 / 50.400	24.700 / 75.100	27.276 / 102.376	23.124 / 125.500	17.001 / 142.501	21.457 / 163.958	13.256 / 177.214	9.002 / 186.215	14.479 / 200.694

STRUCTURE NAME	P1-8	P2-8	P3-8	P4-8	P5-8
STRUCTURE DESCRIPTION	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME
PIPE SIZE (mm)	225	300	450	525	
PIPE SIZE / CLASS	STORM-PRO	STORM-PRO	RCP	STORM-PRO	
PIPE GRADE (%)	0.50%	0.50%	0.50%	0.50%	
PIPE SLOPE (1 in X)	200.0	200.0	200.0	200.0	
PIPE FLOW (cumecs)	0.014	0.022	0.091	0.157	
CAPACITY FLOW (cumecs)	0.038	0.081	0.238	0.360	
FULL PIPE VELOCITY (m/s)	0.36	0.31	0.57	0.72	
NORMAL DEPTH VELOCITY (m/s)	0.88	0.97	1.40	1.60	
DATUM RL	-14.000				
HGL 10% AEP (10YR)	2.259 / 2.213	2.200 / 2.195	2.186 / 2.145	2.139 / 2.073	2.051
	2.191		2.129		
DEPTH TO INVERT	0.750	0.949 / 0.979	1.183 / 1.213	1.213 / 1.243	1.244
INVERT LEVEL AT PIT	2.011	1.911 / 1.881	1.750 / 1.720	1.599 / 1.569	1.441
DESIGN SURFACE LEVEL	2.761 (1.052)	2.860 (1.074)	2.933 (1.398)	2.812 (1.488)	2.684 (1.386)
SETOUT COORDINATES	532113.240E 6743116.930N	532093.537E 6743120.030N	532067.656E 6743124.103N	532043.750E 6743127.865N	532039.762E 6743102.524N
CHAINAGE	-19.945 / 19.945	0.000 / 26.200	26.200 / 50.400	24.200 / 76.053	25.653







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STORMWATER LINE

ISSUE	DESCRIPTION	DATE
0	ISSUED FOR DEVELOPMENT APPLICATION	08.09.2022

NOT FOR CONSTRUCTION

DESIGNED: T.RYDEN | DATE: SEPT 2022
DRAWN: A.SCHMID | SCALE: AS SHOWN
SURVEYING: | SHEET SIZE: A1

MDE Manage Design Engineer

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CLIENT: CLIFTON YAMBA LAND PTY LTD

TITLE: 110 & 120 CARRS DRIVE, YAMBA
DEVELOPMENT APPLICATION CIVIL WORKS PLANS

CLIFTON YAMBA

PROJECT: PROPOSED MHE DEVELOPMENT
110 & 120 CARRS DRIVE
YAMBA, NSW 2464
LOT 2 DP733507 & LOT 32 DP128863

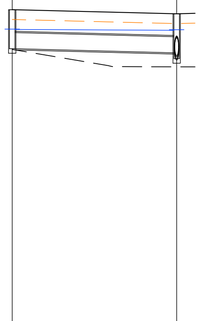
DA CIVIL DRAWING

DRAWING TITLE: STORMWATER LONGITUDINAL SECTION - SHEET 4

DWG No: D21 | SHEET: 21 OF 45 | REV: 0

STRUCTURE NAME	P5-8	P8-4
STRUCTURE DESCRIPTION	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME
PIPE SIZE (mm)	525	
PIPE SIZE / CLASS	STORM-PRO	
PIPE GRADE (%)	0.50%	
PIPE SLOPE (1 in X)	200.0	
PIPE FLOW (cumecs)	0.162	
CAPACITY FLOW (cumecs)	0.360	
FULL PIPE VELOCITY (m/s)	0.75	
NORMAL DEPTH VELOCITY (m/s)	1.62	
DATUM RL	-15.000	
HGL 10% AEP (10YR)	2.051 / 2.038	2.011 / 2.029 / 1.909
DEPTH TO INVERT	1.244 / 1.274	1.273 / 1.464
INVERT LEVEL AT PIT	1.441 / 1.411	1.276 / 1.086
DESIGN SURFACE LEVEL	2.684 / (1.386)	2.550 / (0.819)
SETOUT COORDINATES	532039.762E 6743102.524N	532035.589E 6743076.003N
CHAINAGE	76.053	26.847 / 102.900

STORMWATER LINE 8



	P1-9	P2-9	P3-9	P4-9	P5-9
	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	DETENTION TANK	HEADWALL
PIPE SIZE (mm)	225	300	375	120	
PIPE SIZE / CLASS	STORM-PRO	STORM-PRO	STORM-PRO	PVC	
PIPE GRADE (%)	0.50%	0.50%	0.50%	0.50%	
PIPE SLOPE (1 in X)	200.0	200.0	200.0	200.0	
PIPE FLOW (cumecs)	0.010	0.018	0.030	0.030	
CAPACITY FLOW (cumecs)	0.038	0.081	0.147	0.007	
FULL PIPE VELOCITY (m/s)	0.24	0.25	0.27	2.62	
NORMAL DEPTH VELOCITY (m/s)	0.79	0.92	1.04	2.62	
DATUM RL	-15.000				
HGL 10% AEP (10YR)	2.318 / 2.311	2.303 / 2.299	2.295 / 2.289	2.286 / 2.356 / 1.926	1.047
DEPTH TO INVERT	1.226	1.346 / 1.376	1.435 / 1.465	1.690 / 1.720	1.773 / 1.773
INVERT LEVEL AT PIT	1.346	1.221 / 1.191	1.094 / 1.064	1.006 / 0.976	0.927 / 0.927
DESIGN SURFACE LEVEL	2.572 / (0.842)	2.567 / (0.844)	2.530 / (0.776)	2.697 / (0.716)	2.700 / (0.662)
SETOUT COORDINATES	531832.553E 6743082.645N	531828.667E 6743057.946N	531822.426E 6743039.678N	531825.209E 6743028.438N	531823.707E 6743018.697N
CHAINAGE	0.000	25.003 / 25.003	19.305 / 44.307	11.579 / 55.886	9.856 / 65.742

9

	P1-10	P2-10	P3-10	P4-10	P5-10	P6-10	P7-10	P8-10
	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	DETENTION TANK	HEADWALL
PIPE SIZE (mm)	450	450	450	450	525	525	300	
PIPE SIZE / CLASS	STORM-PRO	STORM-PRO	STORM-PRO	STORM-PRO	STORM-PRO	STORM-PRO	PVC	
PIPE GRADE (%)	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	
PIPE SLOPE (1 in X)	200.0	200.0	200.0	200.0	200.0	200.0	200.0	
PIPE FLOW (cumecs)	0.123	0.155	0.193	0.212	0.248	0.279	0.279	
CAPACITY FLOW (cumecs)	0.238	0.238	0.238	0.238	0.360	0.360	0.081	
FULL PIPE VELOCITY (m/s)	0.78	0.98	1.21	1.33	1.15	1.29	3.94	
NORMAL DEPTH VELOCITY (m/s)	1.51	1.60	1.67	1.69	1.79	1.83	3.94	
DATUM RL	-15.000							
HGL 10% AEP (10YR)	2.546 / 2.469	2.436 / 2.442 / 2.383	2.328 / 2.340 / 2.243	2.162 / 2.164 / 2.107	2.005 / 2.015 / 1.937	1.879 / 1.889 / 1.811	1.786 / 1.794 / 1.597	1.073
DEPTH TO INVERT	1.088	1.153 / 1.183	1.397 / 1.427	1.467 / 1.497	1.697 / 1.727	1.777 / 1.807	1.930 / 1.960	1.028 / 1.028
INVERT LEVEL AT PIT	1.668	1.545 / 1.515	1.386 / 1.356	1.233 / 1.203	1.074 / 1.044	0.921 / 0.891	0.848 / 0.818	0.774 / 0.774
DESIGN SURFACE LEVEL	2.756 / (1.066)	2.697 / (0.870)	2.784 / (0.847)	2.699 / (0.808)	2.771 / (0.758)	2.697 / (0.709)	2.778 / (0.692)	1.803 / (0.675)
SETOUT COORDINATES	531860.839E 6743103.501N	531836.439E 6743107.341N	531811.052E 6743111.336N	531786.652E 6743115.175N	531761.264E 6743119.170N	531736.865E 6743123.010N	531728.493E 6743124.384N	531719.784E 6743125.661N
CHAINAGE	0.000	24.700 / 24.700	25.700 / 50.400	24.700 / 75.100	25.700 / 100.800	24.700 / 125.500	8.484 / 133.984	8.802 / 142.786

10

Horizontal Scale 1:250 (A1) 1:500 (A3)

Vertical Scale 1:50 (A1) 1:100 (A3)

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EXISTING SERVICES NOTE:
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ISSUE	DESCRIPTION	DATE
0	ISSUED FOR DEVELOPMENT APPLICATION	08.09.2022

DESIGNED: T.RYDEN | DATE: SEPT 2022
DRAWN: A.SCHMID | SCALE: AS SHOWN
SURVEYING: | SHEET SIZE: A1

NOT FOR CONFIDENCE

MDE Manage Design Engineer

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CLIENT: CLIFTON YAMBA LAND PTY LTD

TITLE: 110 & 120 CARRS DRIVE, YAMBA
DEVELOPMENT APPLICATION CIVIL WORKS PLANS

CLIFTON YAMBA

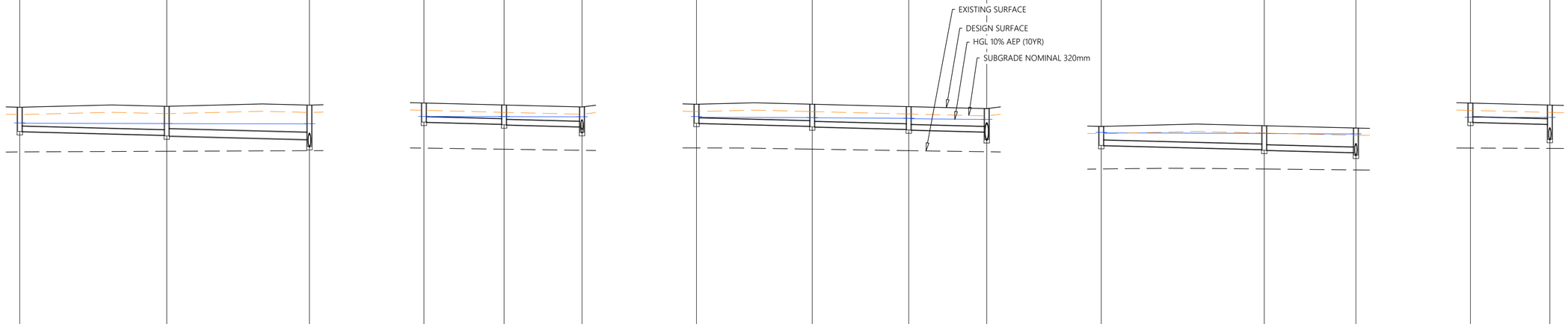
PROJECT: PROPOSED MHE DEVELOPMENT
110 & 120 CARRS DRIVE
YAMBA, NSW 2464
LOT 2 DP733507 & LOT 32 DP128863

DA CIVIL DRAWING

DRAWING TITLE: STORMWATER LONGITUDINAL SECTION - SHEET 5

DWG No: D22 | SHEET: 22 OF 45 | REV: 0

STRUCTURE NAME	P1-11	P2-11	P6-10	P1-12	P2-12	P2-7	P1-13	P2-13	P3-13	P4-7	P1-14	P2-14	P2-10	P1-15	P4-10
STRUCTURE DESCRIPTION	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME



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PIPE SIZE (mm)		225	300		225	225		225	225	225		225	225		225
PIPE SIZE / CLASS		STORM-PRO	STORM-PRO		STORM-PRO	STORM-PRO		STORM-PRO	STORM-PRO	STORM-PRO		STORM-PRO	STORM-PRO		STORM-PRO
PIPE GRADE (%)		0.50%	0.50%		0.50%	0.50%		0.50%	0.50%	0.50%		0.50%	0.50%		0.50%
PIPE SLOPE (1 in X)		200.0	200.0		200.0	200.0		200.0	200.0	200.0		200.0	200.0		200.0
PIPE FLOW (cumecs)		0.009	0.020		0.005	0.010		0.012	0.016	0.023		0.013	0.017		0.005
CAPACITY FLOW (cumecs)		0.038	0.081		0.038	0.038		0.038	0.038	0.038		0.038	0.038		0.038
FULL PIPE VELOCITY (m/s)		0.23	0.28		0.11	0.25		0.31	0.41	0.57		0.32	0.43		0.13
NORMAL DEPTH VELOCITY (m/s)		0.78	0.94		0.64	0.80		0.85	0.91	0.99		0.85	0.92		0.66
DATUM RL	-15.000			-15.000			-15.000				-14.000			-15.000	
HGL 10% AEP (10YR)	1.922 / 1.904	1.895	1.888 / 1.879 / 1.886	2.207 / 2.203	2.201	2.193 / 2.187 / 2.190	2.201 / 2.166	2.152	2.122 / 2.103 / 2.071 / 2.076	2.038	2.505 / 2.486	2.465	2.457 / 2.436 / 2.442	2.169 / 2.163	2.162 / 2.164 / 2.107
DEPTH TO INVERT	1.058	1.259	1.289 / 1.497	0.833	0.833	0.863 / 0.863	0.829	0.955 / 0.985	0.985 / 1.015	1.015 / 1.352	0.829	1.037	1.067 / 1.067	0.833	0.833 / 1.497
INVERT LEVEL AT PIT	1.546	1.386	1.356 / 1.200	1.956	1.869	1.839 / 1.753	1.907	1.780 / 1.750	1.645 / 1.615	1.530 / 1.193	1.939	1.761 / 1.731	1.631	1.953	1.866 / 1.203
DESIGN SURFACE LEVEL	2.605 / (0.655)	2.644 / (0.683)	2.697 / (0.709)	2.789 / (0.821)	2.702 / (0.773)	2.617 / (0.726)	2.735 / (0.829)	2.736 / (0.776)	2.630 / (0.710)	2.545 / (0.662)	2.767 / (0.911)	2.797 / (0.910)	2.697 / (0.870)	2.786 / (0.823)	2.699 / (0.808)
SETOUT COORDINATES	531727.035E 6743060.544N	531732.023E 6743092.240N	531736.865E 6743123.010N	531850.165E 6743194.565N	531852.883E 6743211.840N	531855.528E 6743228.648N	531795.891E 6745173.889N	531799.818E 6743198.843N	531803.093E 6743219.659N	531805.741E 6743236.483N	531845.081E 6743162.256N	531839.548E 6743127.098N	531836.439E 6743107.341N	531789.348E 6743132.305N	531786.652E 6743115.175N
CHAINAGE	0.000	32.086 / 32.086	31.149 / 63.235	0.000	17.488 / 17.488	17.015 / 34.502	0.000	25.261 / 25.261	21.072 / 46.333	17.031 / 63.364	0.000	35.591 / 35.591	20.000 / 55.591	0.000	17.340 / 17.340

STORMWATER LINE 11 12 13 14 15

5 0 5 10 15
Horizontal Scale 1:250 (A1) 1:500 (A3)

1 0.5 0 1 2 3
Vertical Scale 1:50 (A1) 1:100 (A3)

ISSUE	DESCRIPTION	DATE
0	ISSUED FOR DEVELOPMENT APPLICATION	08.09.2022

DESIGNED: T.RYDEN | DATE: SEPT 2022
DRAWN: A.SCHMID | SCALE: AS SHOWN
SURVEYING: | SHEET SIZE: A1

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MDE Manage Design Engineer

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CLIENT
CLIFTON YAMBA LAND PTY LTD

TITLE
110 & 120 CARRS DRIVE, YAMBA
DEVELOPMENT APPLICATION CIVIL WORKS PLANS

CLIFTON YAMBA

PROJECT
PROPOSED MHE DEVELOPMENT
110 & 120 CARRS DRIVE
YAMBA, NSW 2464
LOT 2 DP733507 & LOT 32 DP128863

DA CIVIL DRAWING

DRAWING TITLE:
STORMWATER LONGITUDINAL SECTION - SHEET 6

DWG No: D23 | SHEET: 23 OF 45 | REV: 0

EXISTING SERVICES NOTE:
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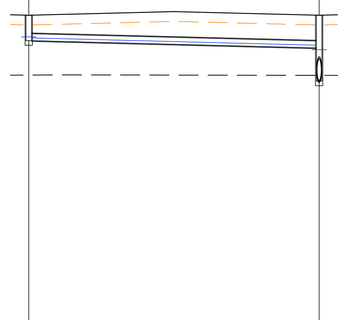

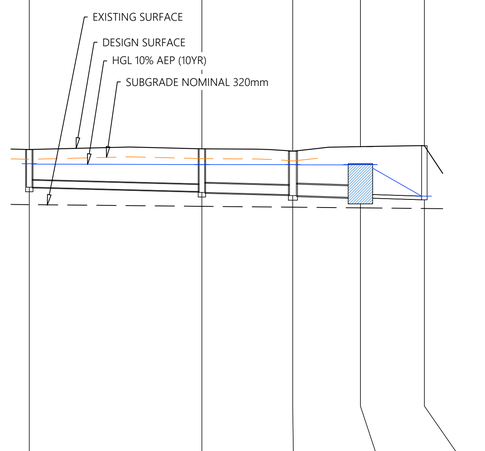

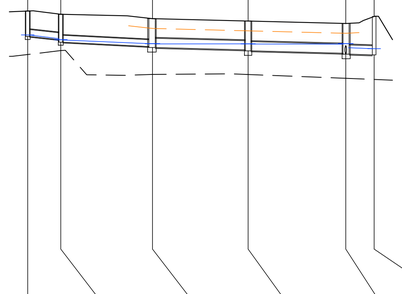

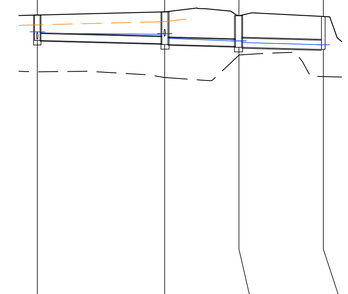

STRUCTURE NAME	P1-16								P9-7
STRUCTURE DESCRIPTION	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME								FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME
PIPE SIZE (mm)	225								
PIPE SIZE / CLASS	STORM-PRO								
PIPE GRADE (%)	0.50%								
PIPE SLOPE (1 in X)	200.0								
PIPE FLOW (cumecs)	0.012								
CAPACITY FLOW (cumecs)	0.038								
FULL PIPE VELOCITY (m/s)	0.30								
NORMAL DEPTH VELOCITY (m/s)	0.84								
DATUM RL	-15.000								
HGL 10% AEP (10YR)	1.975	1.942						1.783	1.558 1.412
DEPTH TO INVERT	0.829							1.066	2.149
INVERT LEVEL AT PIT	1.853							1.616	0.532
DESIGN SURFACE LEVEL	2.682	(0.729)						2.681	(0.719)
SETOUT COORDINATES	531740.546E 6743146.404N							531747.915E	6743193.232N
CHAINAGE	0.000	47.405						47.405	

STORMWATER LINE 16

STRUCTURE NAME	P1-17		P2-17	P3-17	P4-17	P5-17
STRUCTURE DESCRIPTION	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME		FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	DETENTION TANK	HEADWALL
PIPE SIZE (mm)	225		300	375	120	
PIPE SIZE / CLASS	STORM-PRO		STORM-PRO	STORM-PRO	uPVC	
PIPE GRADE (%)	0.50%		0.50%	0.50%	0.50%	
PIPE SLOPE (1 in X)	200.0		200.0	200.0	200.0	
PIPE FLOW (cumecs)	0.012		0.015	0.029	0.029	
CAPACITY FLOW (cumecs)	0.038		0.081	0.147	0.007	
FULL PIPE VELOCITY (m/s)	0.30		0.22	0.27	2.60	
NORMAL DEPTH VELOCITY (m/s)	0.84		0.88	1.04	2.60	
DATUM RL	-15.000					
HGL 10% AEP (10YR)	2.112	2.098	2.084	2.083 2.080	2.075 2.073	2.083 1.966 1.053
DEPTH TO INVERT	1.229		1.393	1.423 1.421	1.451 1.654	1.684 1.767
INVERT LEVEL AT PIT	1.346		1.205	1.175 1.101	1.071 1.015	0.985 0.933
DESIGN SURFACE LEVEL	2.574	(0.776)	2.597	(0.720) 2.521	(0.693) 2.669	(0.671) 2.700 (0.650)
SETOUT COORDINATES	531782.766E 6743090.479N		531778.387E 6743062.649N	531778.247E 6743047.824N	531776.408E 6743036.923N	531774.912E 6743026.594N
CHAINAGE	0.000	28.172	28.172	14.826 42.999	11.055 54.054	10.437 64.490

17

STRUCTURE NAME	P1-20	P2-20	P3-20	P4-20	P5-20	P6-20
STRUCTURE DESCRIPTION	INTERALLOTMENT PIT 600x600mm GRATE & FRAME	INTERALLOTMENT PIT 600x600mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	HEADWALL
PIPE SIZE (mm)	225	225	300	300	300	
PIPE SIZE / CLASS	STORM-PRO	STORM-PRO	STORM-PRO	STORM-PRO	STORM-PRO	
PIPE GRADE (%)	1.95%	0.96%	0.50%	0.50%	0.50%	
PIPE SLOPE (1 in X)	51.3	104.5	200.0	200.0	200.0	
PIPE FLOW (cumecs)	0.003	0.008	0.017	0.021	0.068	
CAPACITY FLOW (cumecs)	0.074	0.052	0.081	0.081	0.081	
FULL PIPE VELOCITY (m/s)	0.08	0.20	0.23	0.30	0.96	
NORMAL DEPTH VELOCITY (m/s)	0.94	0.94	0.90	0.97	1.28	
DATUM RL	-14.000					
HGL 10% AEP (10YR)	2.190	2.188 2.069 2.032	1.905	1.898 1.900	1.894 1.891 1.904	1.773 1.742
DEPTH TO INVERT	0.828	0.828 0.911	0.911	0.941 0.941	0.971 0.971	1.001 1.253 1.253
INVERT LEVEL AT PIT	2.142	2.037 1.954	1.810	1.780 1.702	1.672 1.593	1.563 1.539 1.539
DESIGN SURFACE LEVEL	2.970	(1.551) 2.865 (1.680)	2.722	(0.901) 2.644	(0.899) 2.564	(0.775) 2.793 (0.737)
SETOUT COORDINATES	532099.418E 6743105.018N	532102.070E 6743100.314N	532089.225E 6743092.626N	532086.798E 6743077.204N	532084.320E 6743061.457N	532086.292E 6743057.264N
CHAINAGE	0.000	5.400 5.400	14.970 20.370	15.612 35.982	15.941 51.922	4.633 56.555

20

STRUCTURE NAME	P1-21	P2-21	P3-21	P4-21
STRUCTURE DESCRIPTION	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	HEADWALL
PIPE SIZE (mm)	225	225	300	
PIPE SIZE / CLASS	STORM-PRO	STORM-PRO	STORM-PRO	
PIPE GRADE (%)	0.50%	0.50%	0.50%	
PIPE SLOPE (1 in X)	200.0	200.0	200.0	
PIPE FLOW (cumecs)	0.022	0.042	0.042	
CAPACITY FLOW (cumecs)	0.038	0.038	0.081	
FULL PIPE VELOCITY (m/s)	0.57	1.05	0.59	
NORMAL DEPTH VELOCITY (m/s)	0.99	1.05	1.15	
DATUM RL	-14.000			
HGL 10% AEP (10YR)	2.293	2.249 2.212 2.231	2.080 1.989 1.994	1.943 1.870
DEPTH TO INVERT	0.829	1.037	1.067 1.002	1.032 1.076 1.076
INVERT LEVEL AT PIT	2.010	1.906	1.876 1.816	1.786 1.717 1.717
DESIGN SURFACE LEVEL	2.839	(0.987) 2.943	(0.807) 2.818	(1.529) 2.793 (0.831)
SETOUT COORDINATES	532128.734E 6743114.492N	532149.277E 6743111.259N	532154.115E 6743100.144N	532147.068E 6743088.315N
CHAINAGE	-15.685	20.797 5.112	12.123 17.235	13.769 31.004

21

Horizontal Scale 1:250 (A1) 1:500 (A3)

Vertical Scale 1:50 (A1) 1:100 (A3)

ISSUE	DESCRIPTION	DATE
0	ISSUED FOR DEVELOPMENT APPLICATION	08.09.2022

DESIGNED: T.RYDEN | DATE: SEPT 2022
DRAWN: A.SCHMID | SCALE: AS SHOWN
SURVEYING: | SHEET SIZE: A1

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MDE Manage Design Engineer

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CLIENT
CLIFTON YAMBA LAND PTY LTD

TITLE
110 & 120 CARRS DRIVE, YAMBA
DEVELOPMENT APPLICATION CIVIL WORKS PLANS

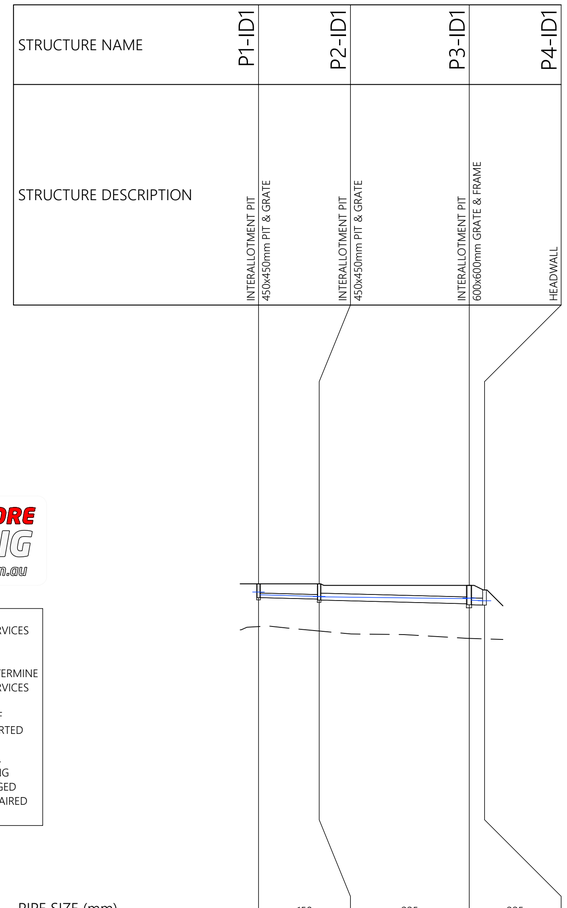
CLIFTON YAMBA

PROJECT
PROPOSED MHE DEVELOPMENT
110 & 120 CARRS DRIVE
YAMBA, NSW 2464
LOT 2 DP733507 & LOT 32 DP128863

DA CIVIL DRAWING

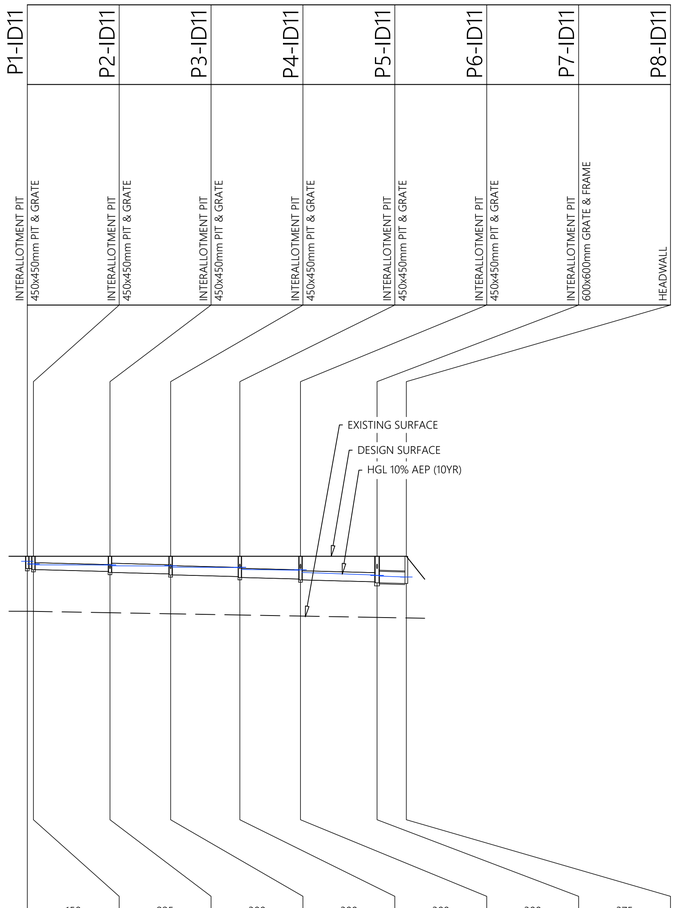
DRAWING TITLE:
STORMWATER LONGITUDINAL SECTION - SHEET 7

DWG No: D24 | SHEET: 24 OF 45 | REV: 0



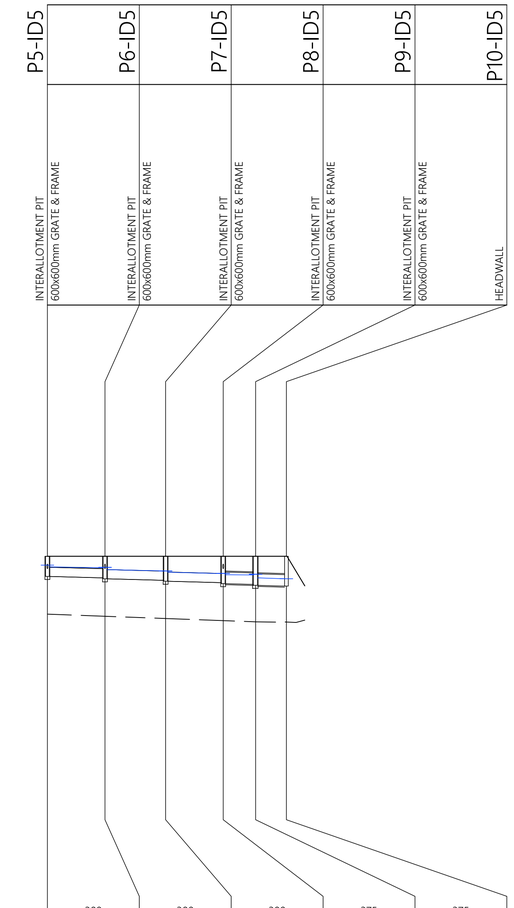
STRUCTURE NAME	P1-ID1	P2-ID1	P3-ID1	P4-ID1
STRUCTURE DESCRIPTION	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 600x600mm GRATE & FRAME	HEADWALL
PIPE SIZE (mm)	150	225	225	
PIPE SIZE / CLASS	uPVC	uPVC	uPVC	
PIPE GRADE (%)	0.50%	0.50%	0.50%	
PIPE SLOPE (1 in X)	200.0	200.0	200.0	
PIPE FLOW (cumecs)	0.009	0.016	0.029	
CAPACITY FLOW (cumecs)	0.013	0.038	0.038	
FULL PIPE VELOCITY (m/s)	0.51	0.41	0.73	
NORMAL DEPTH VELOCITY (m/s)	0.78	0.91	1.04	
DATUM RL	-14.000			
HGL 10% AEP (10YR)	2.633 / 2.544	2.488 / 2.486	2.476	2.417 / 2.433 / 2.367 / 2.348
DEPTH TO INVERT	0.450	0.499	0.530	0.602 / 0.632 / 0.494 / 0.494
INVERT LEVEL AT PIT	2.450	2.401	2.370	2.248 / 2.218 / 2.206 / 2.206
DESIGN SURFACE LEVEL	2.900 (1.533)	2.900 (1.360)		2.850 (1.119) / 2.700 (1.103)
SETOUT COORDINATES	532144.469E 6743008.698N	532146.010E 6743018.478N		532149.822E 6743042.679N / 532148.819E 6743044.963N
CHAINAGE	0.000	9.900	9.900 / 24.500	34.400 / 2.495 / 36.895

STORMWATER LINE ID1



STRUCTURE NAME	P1-ID11	P2-ID11	P3-ID11	P4-ID11	P5-ID11	P6-ID11	P7-ID11	P8-ID11
STRUCTURE DESCRIPTION	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 600x600mm GRATE & FRAME	HEADWALL
PIPE SIZE (mm)	150	225	300	300	300	300	375	
PIPE SIZE / CLASS	uPVC	uPVC	uPVC	uPVC	uPVC	uPVC	STORM-PRO	
PIPE GRADE (%)	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	
PIPE SLOPE (1 in X)	200.0	200.0	200.0	200.0	200.0	200.0	200.0	
PIPE FLOW (cumecs)	0.009	0.018	0.037	0.051	0.067	0.082	0.090	
CAPACITY FLOW (cumecs)	0.013	0.038	0.081	0.081	0.081	0.081	0.147	
FULL PIPE VELOCITY (m/s)	0.51	0.46	0.52	0.72	0.95	1.15	0.82	
NORMAL DEPTH VELOCITY (m/s)	0.78	0.94	1.11	1.21	1.28	1.30	1.39	
DATUM RL	-15.000							
HGL 10% AEP (10YR)	2.635 / 2.547	2.545 / 2.551	2.521	2.513 / 2.518	2.488	2.484 / 2.492	2.445 / 2.431 / 2.443	2.370 / 2.345 / 2.357 / 2.273 / 2.187 / 2.178 / 2.155 / 2.123
DEPTH TO INVERT	0.400	0.405	0.435	0.497	0.527	0.577	0.607 / 0.663	0.693 / 0.743 / 0.773 / 0.835 / 0.865 / 0.889
INVERT LEVEL AT PIT	2.400	2.395	2.365	2.303	2.272	2.223	2.193 / 2.136	2.107 / 2.057 / 2.027 / 1.964 / 1.935 / 1.911
DESIGN SURFACE LEVEL	2.800 (1.005)	2.800 (1.001)	2.800 (0.957)	2.800 (0.923)	2.800 (0.883)	2.800 (0.848)	2.800 (0.804)	2.800 (0.787)
SETOUT COORDINATES	531858.920E 6743084.873N	531857.932E 6743085.029N	531855.989E 6743072.681N	531854.450E 6743062.901N	531852.694E 6743051.738N	531851.155E 6743041.959N	531849.212E 6743029.611N	531848.444E 6743024.896N
CHAINAGE	0.000	1.000 / 1.000	12.500	13.500 / 9.900	23.400 / 11.300	34.700 / 9.900	44.600 / 12.500	57.100 / 4.777 / 61.877

ID11



STRUCTURE NAME	P5-ID5	P6-ID5	P7-ID5	P8-ID5	P9-ID5	P10-ID5
STRUCTURE DESCRIPTION	INTERALLOTMENT PIT 600x600mm GRATE & FRAME	INTERALLOTMENT PIT 600x600mm GRATE & FRAME	INTERALLOTMENT PIT 600x600mm GRATE & FRAME	INTERALLOTMENT PIT 600x600mm GRATE & FRAME	INTERALLOTMENT PIT 600x600mm GRATE & FRAME	HEADWALL
PIPE SIZE (mm)	300	300	300	375	375	
PIPE SIZE / CLASS	uPVC	uPVC	uPVC	STORM-PRO	STORM-PRO	
PIPE GRADE (%)	0.50%	0.50%	0.50%	0.50%	0.51%	
PIPE SLOPE (1 in X)	200.0	200.0	200.0	200.0	194.9	
PIPE FLOW (cumecs)	0.061	0.075	0.082	0.100	0.109	
CAPACITY FLOW (cumecs)	0.081	0.081	0.081	0.147	0.148	
FULL PIPE VELOCITY (m/s)	0.87	1.06	1.16	0.90	0.99	
NORMAL DEPTH VELOCITY (m/s)	1.26	1.30	1.30	1.43	1.47	
DATUM RL	-15.000					
HGL 10% AEP (10YR)	2.502 / 2.511	2.454	2.427 / 2.437	2.364	2.322	2.280 / 2.236 / 2.245 / 2.197 / 2.192 / 2.212 / 2.095 / 2.065
DEPTH TO INVERT	0.628	0.658	0.705	0.736	0.785	0.815 / 0.862 / 0.892 / 0.918 / 0.948 / 0.974 / 0.974
INVERT LEVEL AT PIT	2.171	2.142	2.095	2.064	2.015	1.985 / 1.938 / 1.908 / 1.882 / 1.852 / 1.826 / 1.826
DESIGN SURFACE LEVEL	2.800 (0.911)	2.800 (0.841)	2.800 (0.768)	2.800 (0.699)	2.800 (0.660)	2.800 (0.653)
SETOUT COORDINATES	532061.123E 6743079.375N	532059.662E 6743070.089N	532058.123E 6743060.309N	532056.662E 6743051.024N	532055.839E 6743045.793N	532058.169E 6743041.346N
CHAINAGE	29.700	9.400	39.100 / 9.900	49.000 / 9.400	58.400 / 5.295	63.695 / 5.020 / 68.715

STORMWATER LINE ID5

5 0 5 10 15
Horizontal Scale 1:250 (A1) 1:500 (A3)

1 0.5 0 1 2 3
Vertical Scale 1:50 (A1) 1:100 (A3)

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EXISTING SERVICES NOTE:
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ISSUE	DESCRIPTION	DATE
0	ISSUED FOR DEVELOPMENT APPLICATION	08.09.2022

DESIGNED: T.RYDEN | DATE: SEPT 2022
DRAWN: A.SCHMID | SCALE: AS SHOWN
SURVEYING: | SHEET SIZE: A1

NOT FOR CONSTRUCTION

MDE Manage Design Engineer

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CLIENT: CLIFTON YAMBA LAND PTY LTD

TITLE: 110 & 120 CARRS DRIVE, YAMBA
DEVELOPMENT APPLICATION CIVIL WORKS PLANS

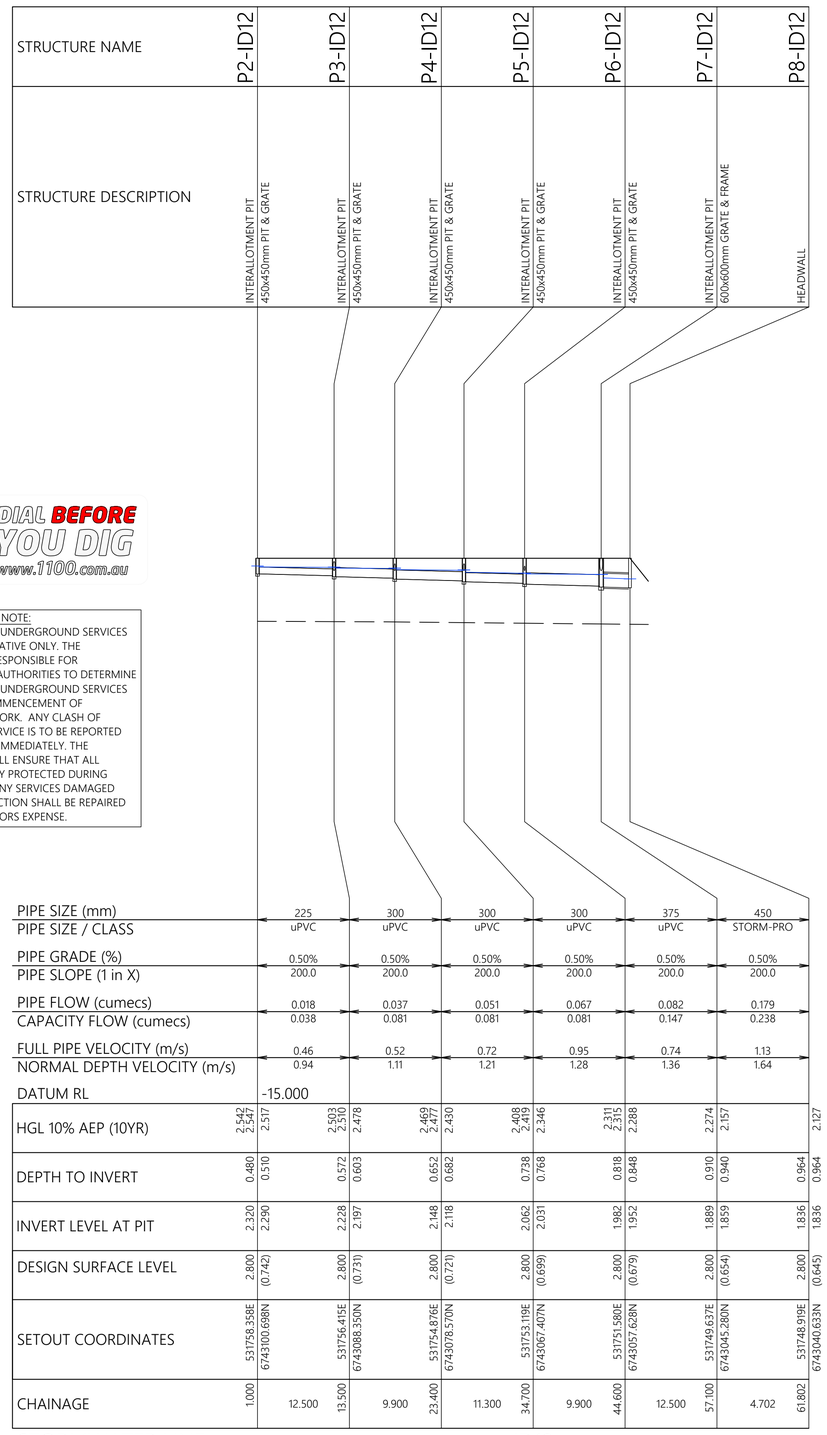
CLIFTON YAMBA

PROJECT: PROPOSED MHE DEVELOPMENT
110 & 120 CARRS DRIVE
YAMBA, NSW 2464
LOT 2 DP733507 & LOT 32 DP128863

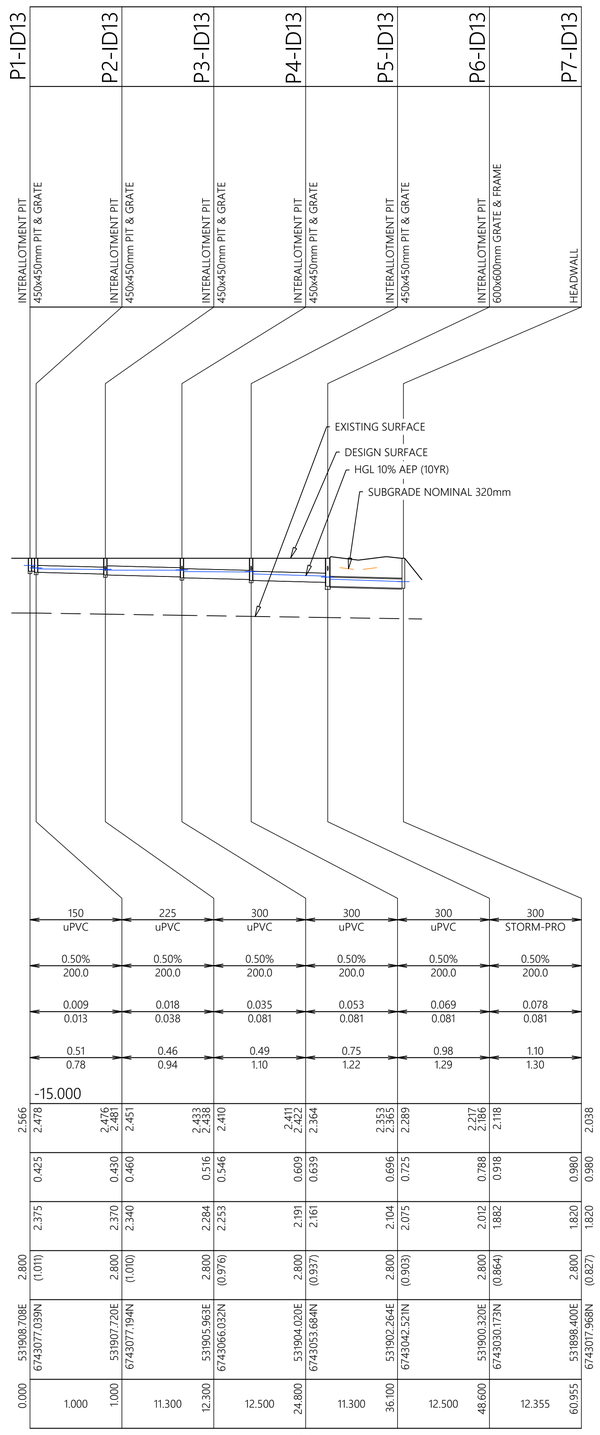
DA CIVIL DRAWING

DRAWING TITLE: STORMWATER LONGITUDINAL SECTION - SHEET 8

DWG No: D25 | SHEET: 25 OF 45 | REV: 0



STORMWATER LINE ID12



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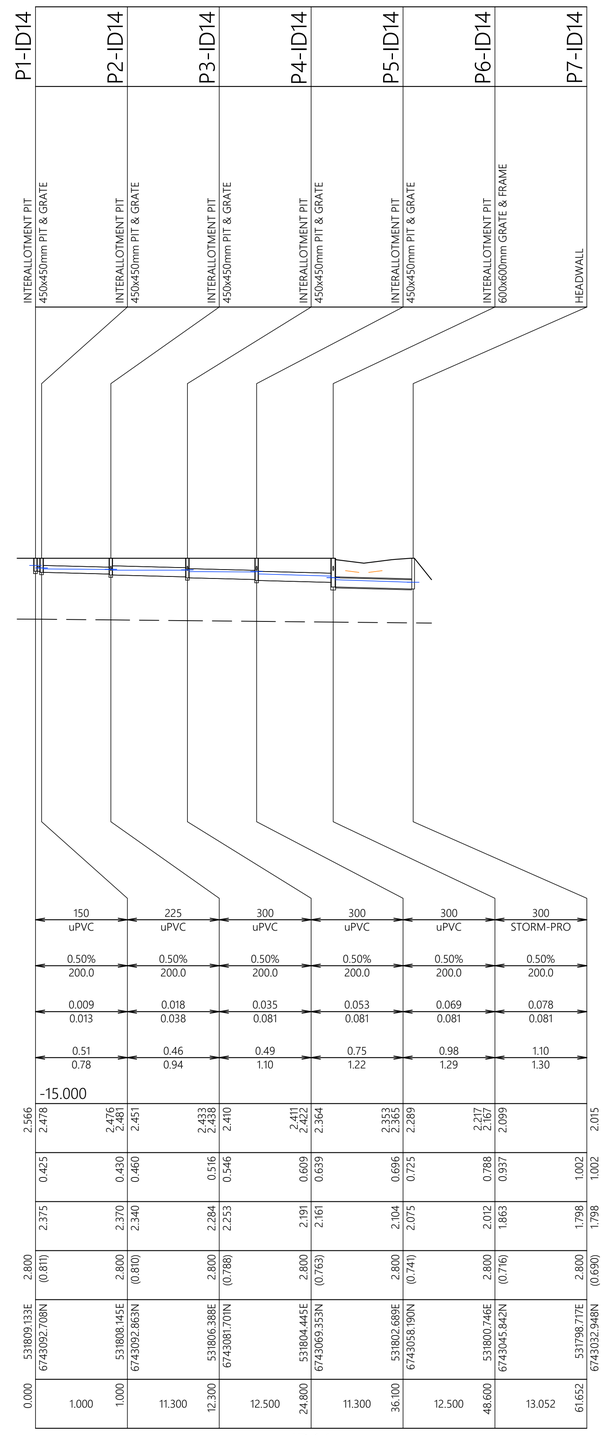
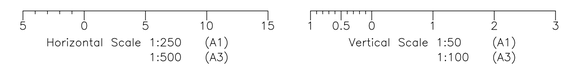


ID14



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ISSUE	DESCRIPTION	DATE
0	ISSUED FOR DEVELOPMENT APPLICATION	08.09.2022

DESIGNED: T.RYDEN | DATE: SEPT 2022
DRAWN: A.SCHMID | SCALE: AS SHOWN
SURVEYING: | SHEET SIZE: A1

NOT FOR CONFIRMATION

MDE Manage Design Engineer

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TITLE: 110 & 120 CARRS DRIVE, YAMBA
DEVELOPMENT APPLICATION CIVIL WORKS PLANS

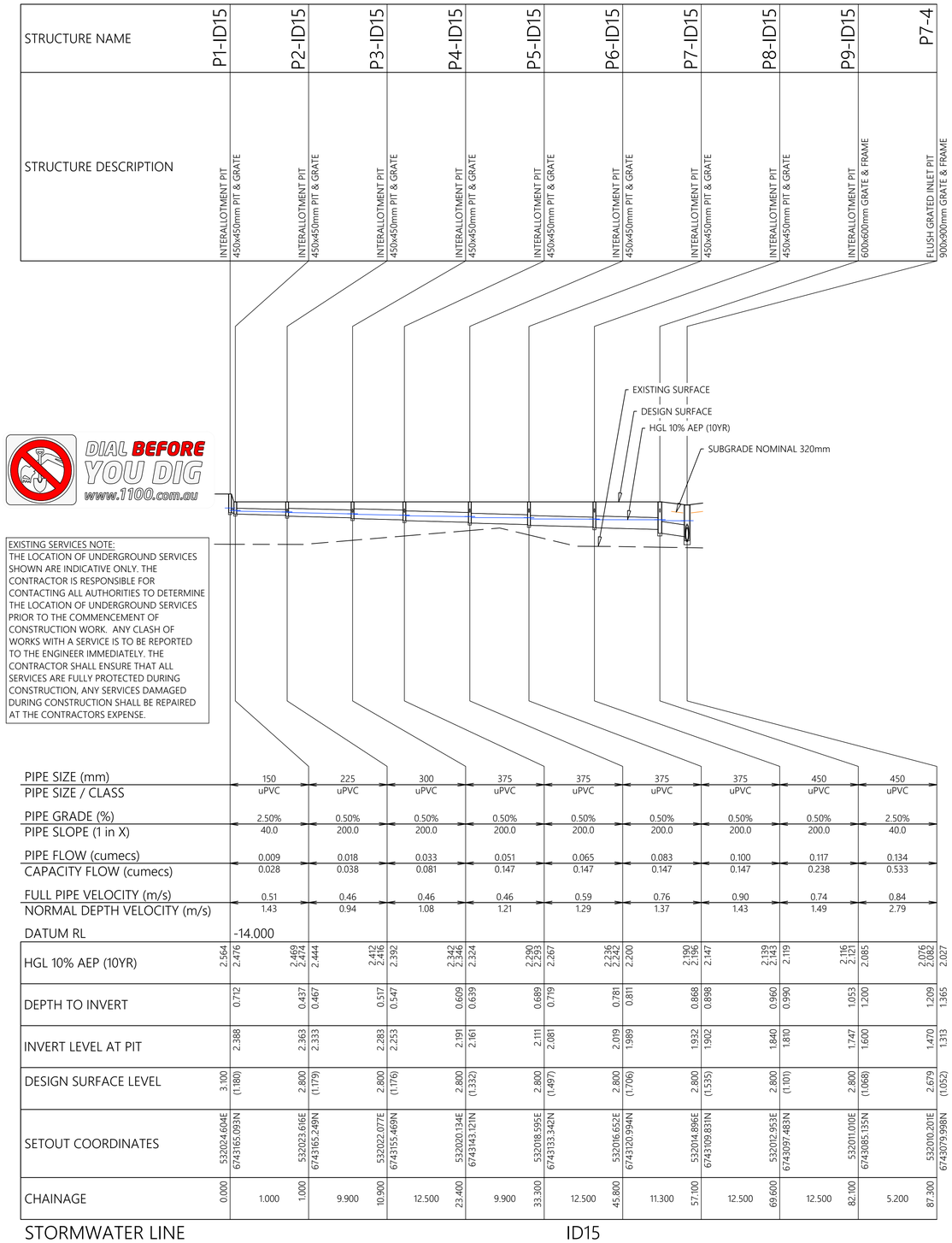
CLIFTON YAMBA

PROJECT: PROPOSED MHE DEVELOPMENT
110 & 120 CARRS DRIVE
YAMBA, NSW 2464
LOT 2 DP733507 & LOT 32 DP128863

DA CIVIL DRAWING

DRAWING TITLE: STORMWATER LONGITUDINAL SECTION - SHEET 9

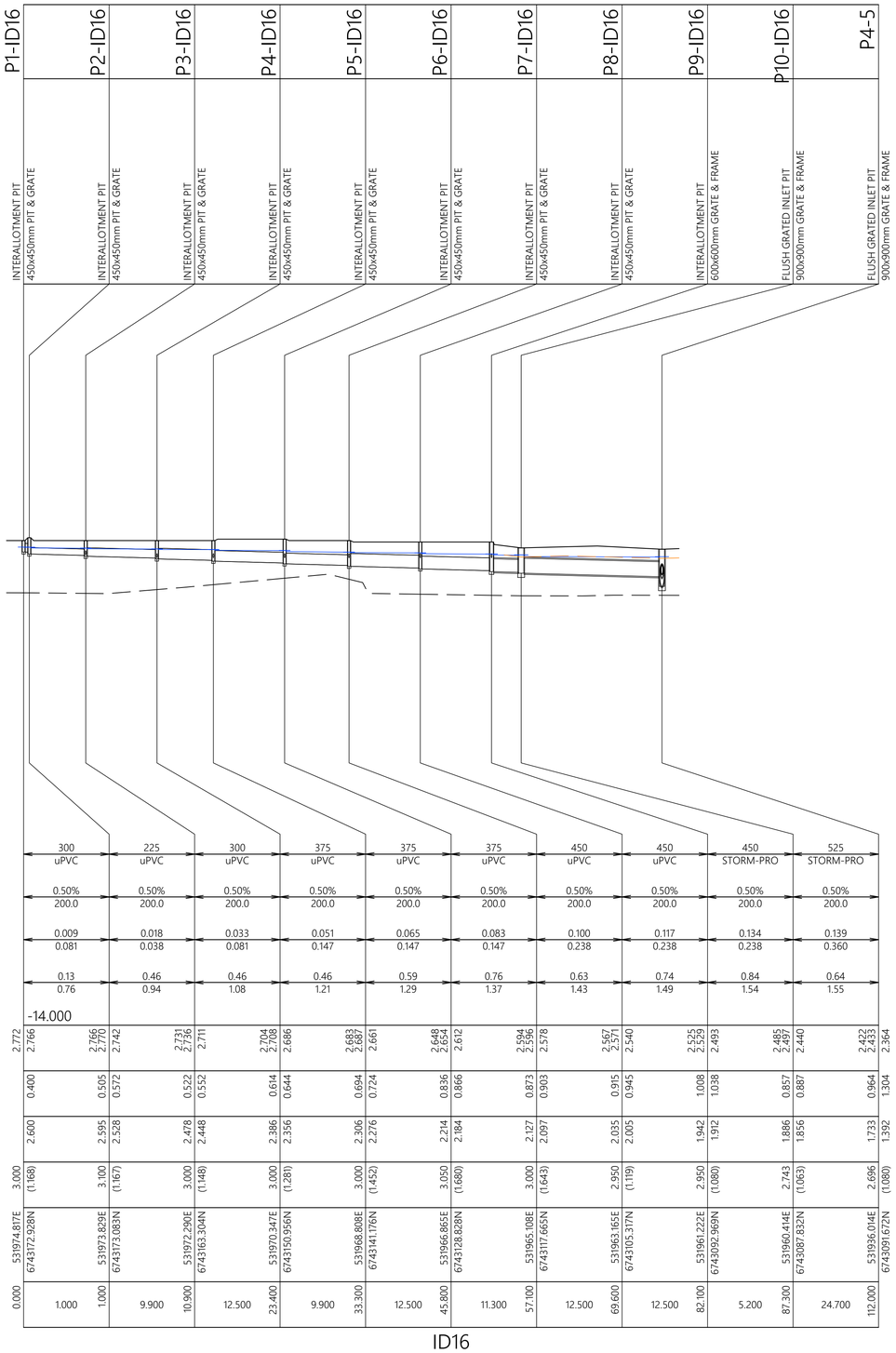
DWG No: D26 | SHEET: 26 OF 45 | REV: 0



STRUCTURE NAME	P1-ID15	P2-ID15	P3-ID15	P4-ID15	P5-ID15	P6-ID15	P7-ID15	P8-ID15	P9-ID15	P7-4
STRUCTURE DESCRIPTION	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 600x600mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME
PIPE SIZE (mm)		150	225	300	375	375	375	375	450	450
PIPE SIZE / CLASS		uPVC	uPVC	uPVC	uPVC	uPVC	uPVC	uPVC	uPVC	uPVC
PIPE GRADE (%)		2.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	2.50%
PIPE SLOPE (1 in X)		40.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	40.0
PIPE FLOW (cumecs)		0.009	0.018	0.033	0.051	0.065	0.083	0.100	0.117	0.134
CAPACITY FLOW (cumecs)		0.028	0.038	0.081	0.147	0.147	0.147	0.147	0.238	0.533
FULL PIPE VELOCITY (m/s)		0.51	0.46	0.46	0.46	0.59	0.76	0.90	0.74	0.84
NORMAL DEPTH VELOCITY (m/s)		1.43	0.94	1.08	1.21	1.29	1.37	1.43	1.49	2.79
DATUM RL		-14.000								
HGL 10% AEP (10YR)	2.564 2.476	2.469 2.474	2.444	2.412 2.416	2.392	2.342 2.346	2.324	2.290 2.293	2.267	2.236 2.242
	2.200	2.190 2.196	2.147	2.139 2.143	2.119	2.116 2.121	2.085	2.076 2.082	2.027	
DEPTH TO INVERT	0.712	0.437 0.467	0.517	0.547	0.609 0.639	0.689	0.719	0.781 0.811	0.868	0.898
	0.960	0.990	1.053	1.200	1.209	1.365				
INVERT LEVEL AT PIT	2.388	2.363 2.333	2.283	2.253	2.191 2.161	2.111	2.081	2.019 1.989	1.932	1.902
	1.840	1.810	1.747	1.600	1.470	1.313				
DESIGN SURFACE LEVEL	3.100 (1.180)	2.800 (1.179)	2.800 (1.176)	2.800 (1.332)	2.800 (1.497)	2.800 (1.706)	2.800 (1.555)	2.800 (1.101)	2.800 (1.068)	2.679 (1.052)
SETOUT COORDINATES	532024.604E 6743165.093N	532023.616E 6743165.249N	532022.077E 6743155.469N	532020.134E 6743143.121N	532018.595E 6743133.342N	532016.652E 6743120.994N	532014.896E 6743109.831N	532012.953E 6743097.483N	532011.010E 6743085.135N	532010.201E 6743079.998N
CHAINAGE	0.000	1.000	1.000 9.900	10.900 12.500	23.400 9.900	33.300 12.500	45.800 11.300	57.100 12.500	69.600 12.500	82.100 5.200	87.300

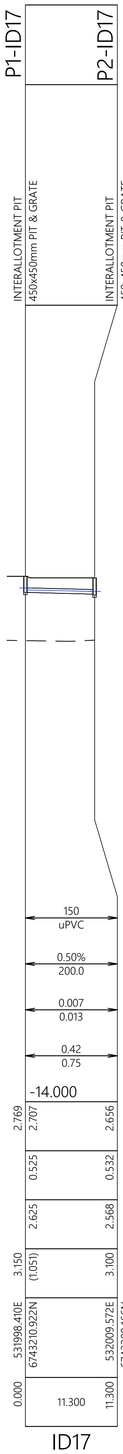
STORMWATER LINE

ID15



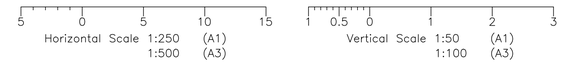
STRUCTURE NAME	P1-ID16	P2-ID16	P3-ID16	P4-ID16	P5-ID16	P6-ID16	P7-ID16	P8-ID16	P9-ID16	P10-ID16	P4-5
STRUCTURE DESCRIPTION	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 600x600mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME
PIPE SIZE (mm)	300	225	300	375	375	375	450	450	450	525	
PIPE SIZE / CLASS	uPVC	uPVC	uPVC	uPVC	uPVC	uPVC	uPVC	uPVC	STORM-PRO	STORM-PRO	
PIPE GRADE (%)	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	
PIPE SLOPE (1 in X)	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	
PIPE FLOW (cumecs)	0.009	0.018	0.033	0.051	0.065	0.083	0.100	0.117	0.134	0.139	
CAPACITY FLOW (cumecs)	0.081	0.038	0.081	0.147	0.147	0.147	0.238	0.238	0.238	0.360	
FULL PIPE VELOCITY (m/s)	0.13	0.46	0.46	0.46	0.59	0.76	0.63	0.74	0.84	0.64	
NORMAL DEPTH VELOCITY (m/s)	0.76	0.94	1.08	1.21	1.29	1.37	1.43	1.49	1.54	1.55	
DATUM RL	-14.000										
HGL 10% AEP (10YR)	2.772 2.766	2.766 2.770	2.742	2.731 2.736	2.711	2.704 2.708	2.686	2.683 2.687	2.661	2.648 2.654	2.612
	2.594 2.596	2.578	2.567 2.571	2.540	2.525 2.529	2.493	2.485 2.497	2.440	2.422 2.433	2.364	
DEPTH TO INVERT	0.400	0.505	0.572	0.522	0.552	0.614	0.644	0.694	0.724	0.836	0.866
	0.873	0.903	0.915	0.945	1.008	1.038	0.857	0.887	0.964	1.304	
INVERT LEVEL AT PIT	2.600	2.595 2.528	2.478 2.448	2.386 2.356	2.306 2.276	2.214 2.184	2.127 2.097	2.035 2.005	1.942 1.912	1.886 1.856	1.733 1.392
DESIGN SURFACE LEVEL	3.000 (1.168)	3.100 (1.167)	3.000 (1.148)	3.000 (1.281)	3.000 (1.452)	3.050 (1.680)	3.000 (1.643)	2.950 (1.119)	2.950 (1.080)	2.743 (1.063)	2.696 (1.080)
SETOUT COORDINATES	531974.817E 6743172.928N	531973.829E 6743173.083N	531972.290E 6743163.304N	531970.347E 6743150.956N	531968.808E 6743141.176N	531966.865E 6743128.828N	531965.108E 6743117.665N	531963.165E 6743105.317N	531961.222E 6743092.969N	531960.414E 6743087.832N	531936.014E 6743091.672N
CHAINAGE	0.000	1.000	1.000 9.900	10.900 12.500	23.400 9.900	33.300 12.500	45.800 11.300	57.100 12.500	69.600 12.500	82.100 5.200	87.300 24.700	112.000

ID16



STRUCTURE NAME	P1-ID17	P2-ID17
STRUCTURE DESCRIPTION	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE
PIPE SIZE (mm)		150
PIPE SIZE / CLASS		uPVC
PIPE GRADE (%)		0.50%
PIPE SLOPE (1 in X)		200.0
PIPE FLOW (cumecs)		0.007
CAPACITY FLOW (cumecs)		0.013
FULL PIPE VELOCITY (m/s)		0.42
NORMAL DEPTH VELOCITY (m/s)		0.75
DATUM RL	-14.000	
HGL 10% AEP (10YR)	2.769 2.707	2.656
DEPTH TO INVERT	0.525	0.532
INVERT LEVEL AT PIT	2.625	2.568
DESIGN SURFACE LEVEL	3.150 (1.051)	3.100
SETOUT COORDINATES	531998.410E 6743210.922N	532009.572E 6743209.166N
CHAINAGE	0.000	11.300

ID17



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EXISTING SERVICES NOTE:
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ISSUE	DESCRIPTION	DATE
0	ISSUED FOR DEVELOPMENT APPLICATION	08.09.2022

DESIGNED: T.RYDEN | DATE: SEPT 2022
DRAWN: A.SCHMID | SCALE: AS SHOWN
SURVEYING: | SHEET SIZE: A1

NOT FOR CONSTRUCTION

MDE Manage Design Engineer

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CLIENT: CLIFTON YAMBA LAND PTY LTD

TITLE: 110 & 120 CARRS DRIVE, YAMBA
DEVELOPMENT APPLICATION CIVIL WORKS PLANS

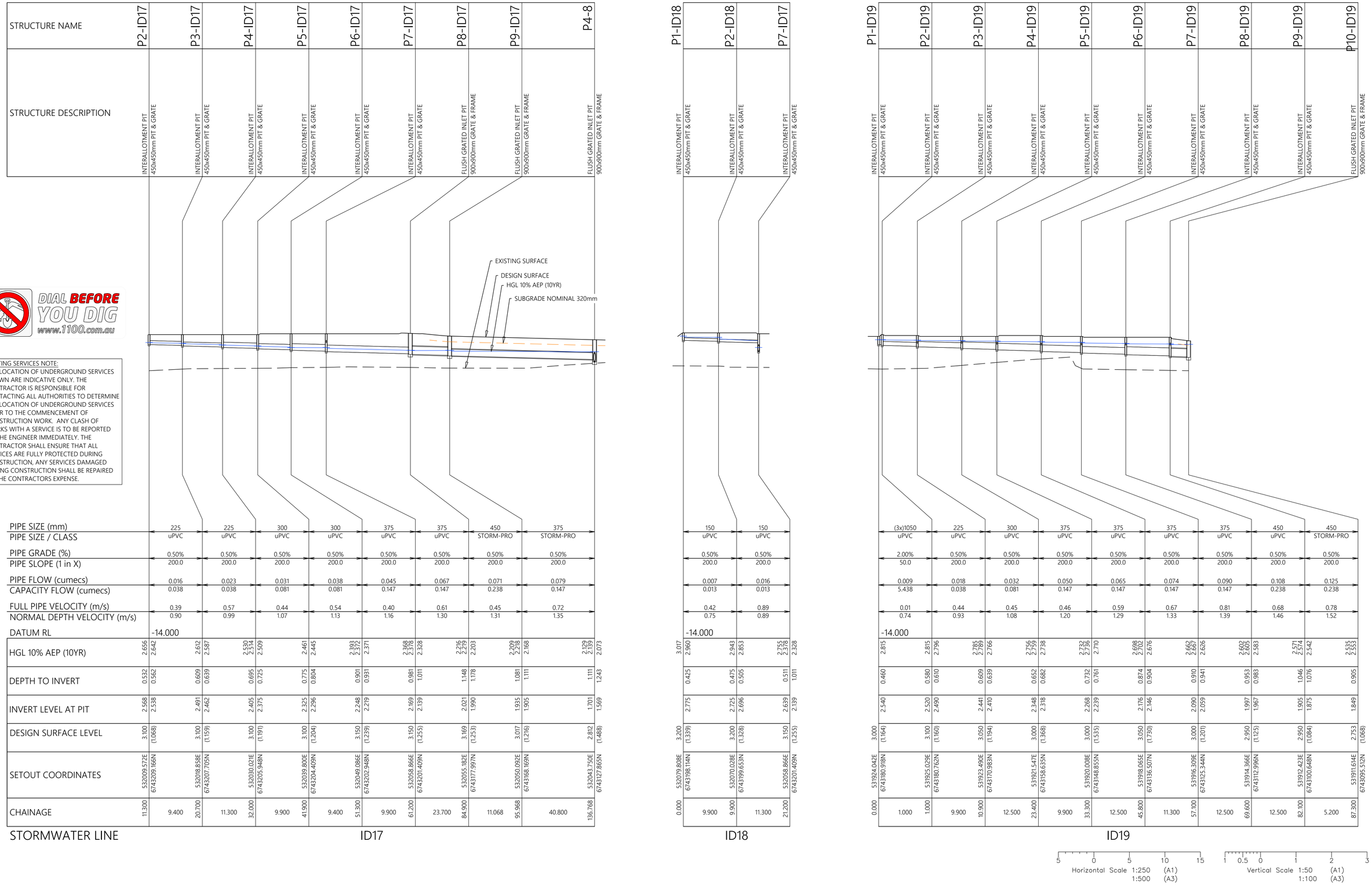
CLIFTON YAMBA

PROJECT: PROPOSED MHE DEVELOPMENT
110 & 120 CARRS DRIVE
YAMBA, NSW 2464
LOT 2 DP733507 & LOT 32 DP128863

DA CIVIL DRAWING

DRAWING TITLE: STORMWATER LONGITUDINAL SECTION - SHEET 10

DWG No: D27 | SHEET: 27 OF 45 | REV: 0



STRUCTURE NAME	P2-ID17	P3-ID17	P4-ID17	P5-ID17	P6-ID17	P7-ID17	P8-ID17	P9-ID17	P4-8
STRUCTURE DESCRIPTION	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME
PIPE SIZE (mm)	225	225	300	300	375	375	450	375	
PIPE SIZE / CLASS	uPVC	uPVC	uPVC	uPVC	uPVC	uPVC	STORM-PRO	STORM-PRO	
PIPE GRADE (%)	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	
PIPE SLOPE (1 in X)	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	
PIPE FLOW (cumecs)	0.016	0.023	0.031	0.038	0.045	0.067	0.071	0.079	
CAPACITY FLOW (cumecs)	0.038	0.038	0.081	0.081	0.147	0.147	0.238	0.147	
FULL PIPE VELOCITY (m/s)	0.39	0.57	0.44	0.54	0.40	0.61	0.45	0.72	
NORMAL DEPTH VELOCITY (m/s)	0.90	0.99	1.07	1.13	1.16	1.30	1.31	1.35	
DATUM RL	-14.000								
HGL 10% AEP (10YR)	2.656 / 2.642	2.612 / 2.587	2.530 / 2.514	2.509 / 2.461	2.445 / 2.393 / 2.372	2.371 / 2.368 / 2.328	2.216 / 2.219	2.203 / 2.209 / 2.218	2.168 / 2.129 / 2.159 / 2.073
DEPTH TO INVERT	0.532 / 0.562	0.609 / 0.639	0.695 / 0.725	0.775 / 0.804	0.901 / 0.931	0.981 / 1.011	1.148 / 1.178	1.081 / 1.111	1.111 / 1.243
INVERT LEVEL AT PIT	2.568 / 2.538	2.491 / 2.462	2.405 / 2.375	2.325 / 2.296	2.248 / 2.219	2.169 / 2.139	2.021 / 1.990	1.935 / 1.905	1.701 / 1.569
DESIGN SURFACE LEVEL	3.100 (1.068)	3.100 (1.159)	3.100 (1.191)	3.100 (1.204)	3.150 (1.239)	3.150 (1.255)	3.169 (1.253)	3.017 (1.216)	2.812 (1.488)
SETOUT COORDINATES	532009.572E 6743209.166N	532018.858E 6743207.705N	532030.021E 6743205.948N	532039.800E 6743204.409N	532049.086E 6743202.948N	532058.866E 6743201.409N	532055.182E 6743177.997N	532050.092E 6743168.169N	532043.750E 6743127.865N
CHAINAGE	11.300	9.400 / 20.700	11.300 / 32.000	9.900 / 41.900	9.400 / 51.300	9.900 / 61.200	23.700 / 84.900	11.068 / 95.968	40.800 / 136.768

STORMWATER LINE

STRUCTURE NAME	P1-ID18	P2-ID18	P7-ID17
STRUCTURE DESCRIPTION	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE
PIPE SIZE (mm)	150	150	
PIPE SIZE / CLASS	uPVC	uPVC	
PIPE GRADE (%)	0.50%	0.50%	
PIPE SLOPE (1 in X)	200.0	200.0	
PIPE FLOW (cumecs)	0.007	0.016	
CAPACITY FLOW (cumecs)	0.013	0.013	
FULL PIPE VELOCITY (m/s)	0.42	0.89	
NORMAL DEPTH VELOCITY (m/s)	0.75	0.89	
DATUM RL	-14.000		
HGL 10% AEP (10YR)	3.017 / 2.960	2.943 / 2.853	2.755 / 2.378 / 2.328
DEPTH TO INVERT	0.425	0.475 / 0.505	0.511 / 1.011
INVERT LEVEL AT PIT	2.775	2.725 / 2.696	2.639 / 2.139
DESIGN SURFACE LEVEL	3.200 (1.339)	3.200 (1.328)	3.150 (1.255)
SETOUT COORDINATES	532079.808E 6743198.114N	532070.028E 6743199.653N	532058.866E 6743201.409N
CHAINAGE	0.000	9.900 / 9.900	11.300 / 21.200

ID18

STRUCTURE NAME	P1-ID19	P2-ID19	P3-ID19	P4-ID19	P5-ID19	P6-ID19	P7-ID19	P8-ID19	P9-ID19	P10-ID19
STRUCTURE DESCRIPTION	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME
PIPE SIZE (mm)	(3x)1050	225	300	375	375	375	375	375	450	450
PIPE SIZE / CLASS	uPVC	uPVC	uPVC	uPVC	uPVC	uPVC	uPVC	uPVC	uPVC	STORM-PRO
PIPE GRADE (%)	2.00%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%
PIPE SLOPE (1 in X)	50.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0
PIPE FLOW (cumecs)	0.009	0.018	0.032	0.050	0.065	0.074	0.090	0.108	0.125	
CAPACITY FLOW (cumecs)	5.438	0.038	0.081	0.147	0.147	0.147	0.147	0.238	0.238	
FULL PIPE VELOCITY (m/s)	0.01	0.44	0.45	0.46	0.59	0.67	0.81	0.68	0.78	
NORMAL DEPTH VELOCITY (m/s)	0.74	0.93	1.08	1.20	1.29	1.33	1.39	1.46	1.52	
DATUM RL	-14.000									
HGL 10% AEP (10YR)	2.815	2.815 / 2.796	2.785 / 2.789	2.756 / 2.755	2.732 / 2.736 / 2.710	2.688 / 2.692	2.662 / 2.667 / 2.676	2.602 / 2.605 / 2.626	2.571 / 2.574 / 2.583	2.535 / 2.553 / 2.542
DEPTH TO INVERT	0.460	0.580 / 0.610	0.609 / 0.639	0.652 / 0.682	0.732 / 0.761	0.874 / 0.904	0.910 / 0.941	0.953 / 0.983	1.046 / 1.076	0.905
INVERT LEVEL AT PIT	2.540	2.520 / 2.490	2.441 / 2.410	2.348 / 2.318	2.268 / 2.239	2.176 / 2.146	2.090 / 2.059	1.997 / 1.967	1.905 / 1.875	1.849
DESIGN SURFACE LEVEL	3.000 (1.164)	3.100 (1.160)	3.050 (1.194)	3.000 (1.368)	3.000 (1.535)	3.050 (1.730)	3.000 (1.201)	2.950 (1.125)	2.950 (1.084)	2.753 (1.068)
SETOUT COORDINATES	531924.042E 6743180.918N	531925.029E 6743180.762N	531923.490E 6743170.983N	531921.547E 6743158.635N	531920.008E 6743148.855N	531918.065E 6743136.507N	531916.309E 6743125.344N	531914.366E 6743112.996N	531912.423E 6743100.648N	531911.614E 6743095.512N
CHAINAGE	0.000	1.000 / 1.000	9.900 / 10.900	12.500 / 23.400	9.900 / 33.300	12.500 / 45.800	11.300 / 57.100	12.500 / 69.600	12.500 / 82.100	5.200 / 87.300

ID19

Horizontal Scale 1:250 (A1) 1:500 (A3)

Vertical Scale 1:50 (A1) 1:100 (A3)

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ISSUE	DESCRIPTION	DATE
0	ISSUED FOR DEVELOPMENT APPLICATION	08.09.2022

DESIGNED: T.RYDEN | DATE: SEPT 2022
DRAWN: A.SCHMID | SCALE: AS SHOWN
SURVEYING: | SHEET SIZE: A1

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MDE Manage Design Engineer

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CLIENT: CLIFTON YAMBA LAND PTY LTD

TITLE: 110 & 120 CARRS DRIVE, YAMBA
DEVELOPMENT APPLICATION CIVIL WORKS PLANS

CLIFTON YAMBA

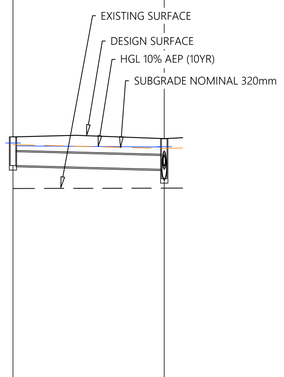
PROJECT: PROPOSED MHE DEVELOPMENT
110 & 120 CARRS DRIVE
YAMBA, NSW 2464
LOT 2 DP733507 & LOT 32 DP128863

DA CIVIL DRAWING

DRAWING TITLE: STORMWATER LONGITUDINAL SECTION - SHEET 11

DWG No: D28 | SHEET: 28 OF 45 | REV: 0

STRUCTURE NAME	P10-ID19	P4-5
STRUCTURE DESCRIPTION	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME
PIPE SIZE (mm)	450	
PIPE SIZE / CLASS	STORM-PRO	
PIPE GRADE (%)	0.50%	
PIPE SLOPE (1 in X)	200.0	
PIPE FLOW (cumecs)	0.133	
CAPACITY FLOW (cumecs)	0.238	
FULL PIPE VELOCITY (m/s)	0.83	
NORMAL DEPTH VELOCITY (m/s)	1.54	
DATUM RL	-14.000	
HGL 10% AEP (10YR)	2.535 2.553	2.460 2.422 2.433 2.364
DEPTH TO INVERT	0.905	0.935 1.001 1.304
INVERT LEVEL AT PIT	1.849	1.819 1.695 1.392
DESIGN SURFACE LEVEL	2.753	(1.068) 2.696 (1.080)
SETOUT COORDINATES	531911.614E 6743095.512N	531936.014E 6743091.672N
CHAINAGE	87.300	24.700 112.000



STORMWATER LINE ID19

STRUCTURE NAME	P1-ID2	P2-ID2	P3-ID2	P4-ID2	P5-ID2	P6-ID2	P7-ID2	P8-ID2	P9-ID2
STRUCTURE DESCRIPTION	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 600x600mm GRATE & FRAME	INTERALLOTMENT PIT 600x600mm GRATE & FRAME	INTERALLOTMENT PIT 600x600mm GRATE & FRAME	INTERALLOTMENT PIT 600x600mm GRATE & FRAME	INTERALLOTMENT PIT 600x600mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME	HEADWALL
PIPE SIZE (mm)	150	225	225	225	300	300	300	300	
PIPE SIZE / CLASS	uPVC	uPVC	uPVC	uPVC	uPVC	uPVC	uPVC	uPVC	
PIPE GRADE (%)	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	
PIPE SLOPE (1 in X)	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	
PIPE FLOW (cumecs)	0.009	0.017	0.026	0.033	0.042	0.049	0.057	0.057	
CAPACITY FLOW (cumecs)	0.013	0.038	0.038	0.038	0.081	0.081	0.081	0.081	
FULL PIPE VELOCITY (m/s)	0.53	0.42	0.65	0.82	0.59	0.69	0.81	0.81	
NORMAL DEPTH VELOCITY (m/s)	0.79	0.91	1.02	1.06	1.15	1.20	1.24	1.24	
DATUM RL	-14.000								
HGL 10% AEP (10YR)	2.637 2.545	2.489 2.487 2.477	2.453	2.418	2.402	2.363	2.290 2.270	2.266	2.221	2.200	2.155	2.124	2.097 2.108	2.031	2.009
DEPTH TO INVERT	0.350	0.399 0.429	0.492	0.522	0.569	0.599	0.661 0.691	0.740	0.770	0.833	0.863	1.025	1.055	0.831	0.831
INVERT LEVEL AT PIT	2.450	2.401 2.370	2.308	2.278	2.231	2.201	2.139 2.109	2.059	2.030	1.967	1.937	1.875	1.845	1.823	1.823
DESIGN SURFACE LEVEL	2.800 (1.310)	2.800 (1.259)	2.800 (1.200)	2.800 (1.168)	2.800 (1.127)	2.800 (1.094)	2.800 (1.052)	2.900 (1.009)	2.655 (1.003)
SETOUT COORDINATES	532125.478E 6742961.984N	532115.699E 6742963.525N	532103.351E 6742965.470N	532094.065E 6742966.933N	532081.816E 6742968.862N	532072.037E 6742970.403N	532059.689E 6742972.348N	532047.342E 6742974.293N	532044.480E 6742977.389N
CHAINAGE	0.000	9.900 9.900	12.500 22.400	9.400 31.800	12.400 44.200	9.900 54.100	12.500 66.600	12.500 79.100	4.216 83.316

ID2

STRUCTURE NAME	P1-ID20	P2-ID20	P2-21
STRUCTURE DESCRIPTION	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME
PIPE SIZE (mm)	150	225	
PIPE SIZE / CLASS	uPVC	uPVC	
PIPE GRADE (%)	0.50%	2.50%	
PIPE SLOPE (1 in X)	200.0	40.0	
PIPE FLOW (cumecs)	0.007	0.016	
CAPACITY FLOW (cumecs)	0.013	0.084	
FULL PIPE VELOCITY (m/s)	0.40	0.41	
NORMAL DEPTH VELOCITY (m/s)	0.74	1.63	
DATUM RL	-14.000		
HGL 10% AEP (10YR)	2.635 2.579	2.572 2.409	2.380	2.316 2.231	2.080
DEPTH TO INVERT	0.450	0.505	0.725	0.794	1.067
INVERT LEVEL AT PIT	2.500	2.495	2.275	2.149	1.876
DESIGN SURFACE LEVEL	2.950 (0.687)	3.000 (0.654)	2.943 (0.801)
SETOUT COORDINATES	532148.448E 6743116.451N	532149.436E 6743116.296N	532149.277E 6743111.259N
CHAINAGE	0.000	1.000 1.000	5.039 6.039

ID20

STRUCTURE NAME	P1-ID21	P2-ID21	P1-21
STRUCTURE DESCRIPTION	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME
PIPE SIZE (mm)	150	225	
PIPE SIZE / CLASS	uPVC	uPVC	
PIPE GRADE (%)	0.50%	2.50%	
PIPE SLOPE (1 in X)	200.0	40.0	
PIPE FLOW (cumecs)	0.007	0.016	
CAPACITY FLOW (cumecs)	0.013	0.084	
FULL PIPE VELOCITY (m/s)	0.42	0.40	
NORMAL DEPTH VELOCITY (m/s)	0.75	1.62	
DATUM RL	-14.000		
HGL 10% AEP (10YR)	2.544 2.482	2.474 2.303	2.278	2.287 2.281	2.249
DEPTH TO INVERT	0.450	0.505	0.725	0.790	0.829
INVERT LEVEL AT PIT	2.400	2.395 2.175	2.049	2.010
DESIGN SURFACE LEVEL	2.850 (0.988)	2.900 (0.989)	2.839 (0.987)
SETOUT COORDINATES	532128.000E 6743119.669N	532128.988E 6743119.513N	532128.734E 6743114.492N
CHAINAGE	0.000	1.000 1.000	5.028 6.028

ID21

STRUCTURE NAME	P1-ID22	P2-ID22	P3-ID22
STRUCTURE DESCRIPTION	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE
PIPE SIZE (mm)	150	225	
PIPE SIZE / CLASS	uPVC	uPVC	
PIPE GRADE (%)	0.50%	0.50%	
PIPE SLOPE (1 in X)	200.0	200.0	
PIPE FLOW (cumecs)	0.014	0.022	
CAPACITY FLOW (cumecs)	0.013	0.038	
FULL PIPE VELOCITY (m/s)	0.81	0.54	
NORMAL DEPTH VELOCITY (m/s)	0.81	0.98	
DATUM RL	-14.000		
HGL 10% AEP (10YR)	2.817 2.661	2.586 2.575	2.568	2.552
DEPTH TO INVERT	0.425	0.525	0.554	0.567
INVERT LEVEL AT PIT	2.525	2.475	2.446	2.383
DESIGN SURFACE LEVEL	2.950 (0.921)	3.000 (0.902)	2.950 (0.811)
SETOUT COORDINATES	532131.735E 6743088.972N	532123.173E 6743084.003N	532112.361E 6743077.729N
CHAINAGE	0.000	9.900 9.900	12.500 22.400

ID22

Horizontal Scale 1:250 (A1) 1:500 (A3)

Vertical Scale 1:50 (A1) 1:100 (A3)

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ISSUE	DESCRIPTION	DATE
0	ISSUED FOR DEVELOPMENT APPLICATION	08.09.2022

DESIGNED: T.RYDEN | DATE: SEPT 2022
DRAWN: A.SCHMID | SCALE: AS SHOWN
SURVEYING: | SHEET SIZE: A1

NOT FOR CONSTRUCTION

MDE Manage Design Engineer

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CLIENT: CLIFTON YAMBA LAND PTY LTD

TITLE: 110 & 120 CARRS DRIVE, YAMBA
DEVELOPMENT APPLICATION CIVIL WORKS PLANS

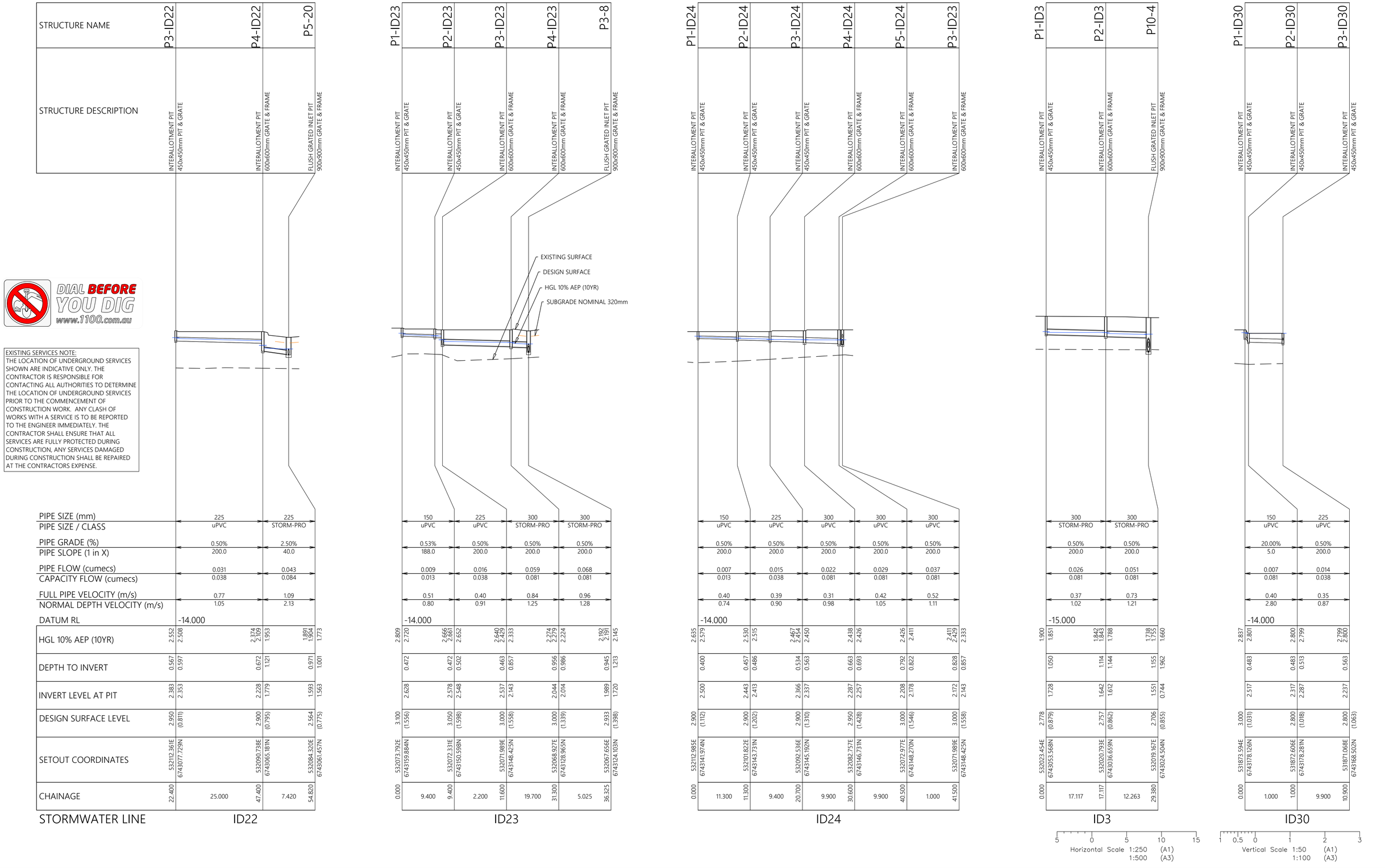
CLIFTON YAMBA

PROJECT: PROPOSED MHE DEVELOPMENT
110 & 120 CARRS DRIVE
YAMBA, NSW 2464
LOT 2 DP733507 & LOT 32 DP128863

DA CIVIL DRAWING

DRAWING TITLE: STORMWATER LONGITUDINAL SECTION - SHEET 12

DWG No: D29 | SHEET: 29 OF 45 | REV: 0



STRUCTURE NAME	P3-ID22		P4-ID22		P5-20
STRUCTURE DESCRIPTION	INTERALLOTMENT PIT 450x450mm PIT & GRATE		INTERALLOTMENT PIT 600x600mm GRATE & FRAME		FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME
PIPE SIZE (mm)	225		225		
PIPE SIZE / CLASS	uPVC		STORM-PRO		
PIPE GRADE (%)	0.50%		2.50%		
PIPE SLOPE (1 in X)	200.0		40.0		
PIPE FLOW (cumecs)	0.031		0.043		
CAPACITY FLOW (cumecs)	0.038		0.084		
FULL PIPE VELOCITY (m/s)	0.77		1.09		
NORMAL DEPTH VELOCITY (m/s)	1.05		2.13		
DATUM RL	-14.000				
HGL 10% AEP (10YR)	2.552	2.508	2.374	2.109	1.953	1.891	1.904	1.773
DEPTH TO INVERT	0.567	0.597	0.672	1.121	0.971	1.001
INVERT LEVEL AT PIT	2.383	2.353	2.228	1.779	1.593	1.563
DESIGN SURFACE LEVEL	2.950	(0.811)	2.900	(0.795)	2.564	(0.775)
SETOUT COORDINATES	532112.361E 6743077.729N		532090.738E 6743065.181N		532084.320E 6743061.457N
CHAINAGE	22.400	25.000	47.400	7.420	54.820

STORMWATER LINE ID22

STRUCTURE NAME	P1-ID23		P2-ID23		P3-ID23		P4-ID23		P3-8
STRUCTURE DESCRIPTION	INTERALLOTMENT PIT 450x450mm PIT & GRATE		INTERALLOTMENT PIT 450x450mm PIT & GRATE		INTERALLOTMENT PIT 600x600mm GRATE & FRAME		INTERALLOTMENT PIT 600x600mm GRATE & FRAME		FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME
PIPE SIZE (mm)	150		225		300		300		
PIPE SIZE / CLASS	uPVC		uPVC		STORM-PRO		STORM-PRO		
PIPE GRADE (%)	0.53%		0.50%		0.50%		0.50%		
PIPE SLOPE (1 in X)	188.0		200.0		200.0		200.0		
PIPE FLOW (cumecs)	0.009		0.016		0.059		0.068		
CAPACITY FLOW (cumecs)	0.013		0.038		0.081		0.081		
FULL PIPE VELOCITY (m/s)	0.51		0.40		0.84		0.96		
NORMAL DEPTH VELOCITY (m/s)	0.80		0.91		1.25		1.28		
DATUM RL	-14.000								
HGL 10% AEP (10YR)	2.809	2.720	2.666	2.661	2.652	2.640	2.429	2.333	2.274	2.279	2.224	2.192	2.191	2.145
DEPTH TO INVERT	0.472	0.472	0.502	0.463	0.857	0.956	0.986	0.945	1.213
INVERT LEVEL AT PIT	2.628	2.578	2.548	2.537	2.143	2.044	2.014	1.989	1.720
DESIGN SURFACE LEVEL	3.100	(1.556)	3.050	(1.598)	3.000	(1.558)	3.000	(1.339)	2.933	(1.398)
SETOUT COORDINATES	532073.792E 6743159.884N		532072.331E 6743150.598N		532071.989E 6743148.425N		532068.927E 6743128.965N		532067.656E 6743124.103N
CHAINAGE	0.000	9.400	9.400	2.200	11.600	19.700	31.300	5.025	36.325

ID23

STRUCTURE NAME	P1-ID24		P2-ID24		P3-ID24		P4-ID24		P5-ID24		P3-ID23
STRUCTURE DESCRIPTION	INTERALLOTMENT PIT 450x450mm PIT & GRATE		INTERALLOTMENT PIT 450x450mm PIT & GRATE		INTERALLOTMENT PIT 450x450mm PIT & GRATE		INTERALLOTMENT PIT 600x600mm GRATE & FRAME		INTERALLOTMENT PIT 600x600mm GRATE & FRAME		INTERALLOTMENT PIT 600x600mm GRATE & FRAME
PIPE SIZE (mm)	150		225		300		300		300		
PIPE SIZE / CLASS	uPVC		uPVC		uPVC		uPVC		uPVC		
PIPE GRADE (%)	0.50%		0.50%		0.50%		0.50%		0.50%		
PIPE SLOPE (1 in X)	200.0		200.0		200.0		200.0		200.0		
PIPE FLOW (cumecs)	0.007		0.015		0.022		0.029		0.037		
CAPACITY FLOW (cumecs)	0.013		0.038		0.081		0.081		0.081		
FULL PIPE VELOCITY (m/s)	0.40		0.39		0.31		0.42		0.52		
NORMAL DEPTH VELOCITY (m/s)	0.74		0.90		0.98		1.05		1.11		
DATUM RL	-14.000										
HGL 10% AEP (10YR)	2.635	2.579	2.530	2.515	2.467	2.454	2.450	2.438	2.426	2.426	2.411	2.411	2.409	2.333
DEPTH TO INVERT	0.400	0.457	0.486	0.534	0.563	0.663	0.693	0.792	0.822	0.828	0.857
INVERT LEVEL AT PIT	2.500	2.443	2.413	2.366	2.337	2.287	2.257	2.208	2.178	2.172	2.143
DESIGN SURFACE LEVEL	2.900	(1.112)	2.900	(1.202)	2.900	(1.310)	2.950	(1.428)	3.000	(1.546)	3.000	(1.558)
SETOUT COORDINATES	532112.985E 6743141.974N		532101.822E 6743143.731N		532092.536E 6743145.192N		532082.757E 6743146.731N		532072.977E 6743148.270N		532071.989E 6743148.425N
CHAINAGE	0.000	11.300	11.300	9.400	20.700	9.900	30.600	9.900	40.500	1.000	41.500

ID24

STRUCTURE NAME	P1-ID3		P2-ID3		P10-4
STRUCTURE DESCRIPTION	INTERALLOTMENT PIT 450x450mm PIT & GRATE		INTERALLOTMENT PIT 600x600mm GRATE & FRAME		FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME
PIPE SIZE (mm)	300		300		
PIPE SIZE / CLASS	STORM-PRO		STORM-PRO		
PIPE GRADE (%)	0.50%		0.50%		
PIPE SLOPE (1 in X)	200.0		200.0		
PIPE FLOW (cumecs)	0.026		0.051		
CAPACITY FLOW (cumecs)	0.081		0.081		
FULL PIPE VELOCITY (m/s)	0.37		0.73		
NORMAL DEPTH VELOCITY (m/s)	1.02		1.21		
DATUM RL	-15.000				
HGL 10% AEP (10YR)	1.900	1.851	1.842	1.843	1.788	1.738	1.735	1.660
DEPTH TO INVERT	1.050	1.114	1.144	1.155	1.962
INVERT LEVEL AT PIT	1.728	1.642	1.612	1.551	0.744
DESIGN SURFACE LEVEL	2.778	(0.879)	2.757	(0.862)	2.706	(0.855)
SETOUT COORDINATES	532023.454E 6743053.568N		532020.793E 6743036.659N		532019.167E 6743024.504N
CHAINAGE	0.000	17.117	17.117	12.263	29.380

ID3

STRUCTURE NAME	P1-ID30		P2-ID30		P3-ID30
STRUCTURE DESCRIPTION	INTERALLOTMENT PIT 450x450mm PIT & GRATE		INTERALLOTMENT PIT 450x450mm PIT & GRATE		INTERALLOTMENT PIT 450x450mm PIT & GRATE
PIPE SIZE (mm)	150		225		
PIPE SIZE / CLASS	uPVC		uPVC		
PIPE GRADE (%)	20.00%		0.50%		
PIPE SLOPE (1 in X)	5.0		200.0		
PIPE FLOW (cumecs)	0.007		0.014		
CAPACITY FLOW (cumecs)	0.081		0.038		
FULL PIPE VELOCITY (m/s)	0.40		0.35		
NORMAL DEPTH VELOCITY (m/s)	2.80		0.87		
DATUM RL	-14.000				
HGL 10% AEP (10YR)	2.837	2.801	2.800	2.799	2.799	2.800
DEPTH TO INVERT	0.483	0.483	0.513	0.563
INVERT LEVEL AT PIT	2.517	2.317	2.287	2.237
DESIGN SURFACE LEVEL	3.000	(1.031)	2.800	(1.018)	2.800	(1.063)
SETOUT COORDINATES	531873.594E 6743178.126N		531872.606E 6743178.281N		531871.068E 6743168.502N
CHAINAGE	0.000	1.000	1.000	9.900	10.900

ID30

Horizontal Scale 1:250 (A1) 1:500 (A3)

Vertical Scale 1:50 (A1) 1:100 (A3)

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ISSUE	DESCRIPTION	DATE
0	ISSUED FOR DEVELOPMENT APPLICATION	08.09.2022

DESIGNED: T.RYDEN | DATE: SEPT 2022
DRAWN: A.SCHMID | SCALE: AS SHOWN
SURVEYING: | SHEET SIZE: A1

NOT FOR CONSTRUCTION

MDE Manage Design Engineer

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CLIENT: CLIFTON YAMBA LAND PTY LTD

TITLE: 110 & 120 CARRS DRIVE, YAMBA
DEVELOPMENT APPLICATION CIVIL WORKS PLANS

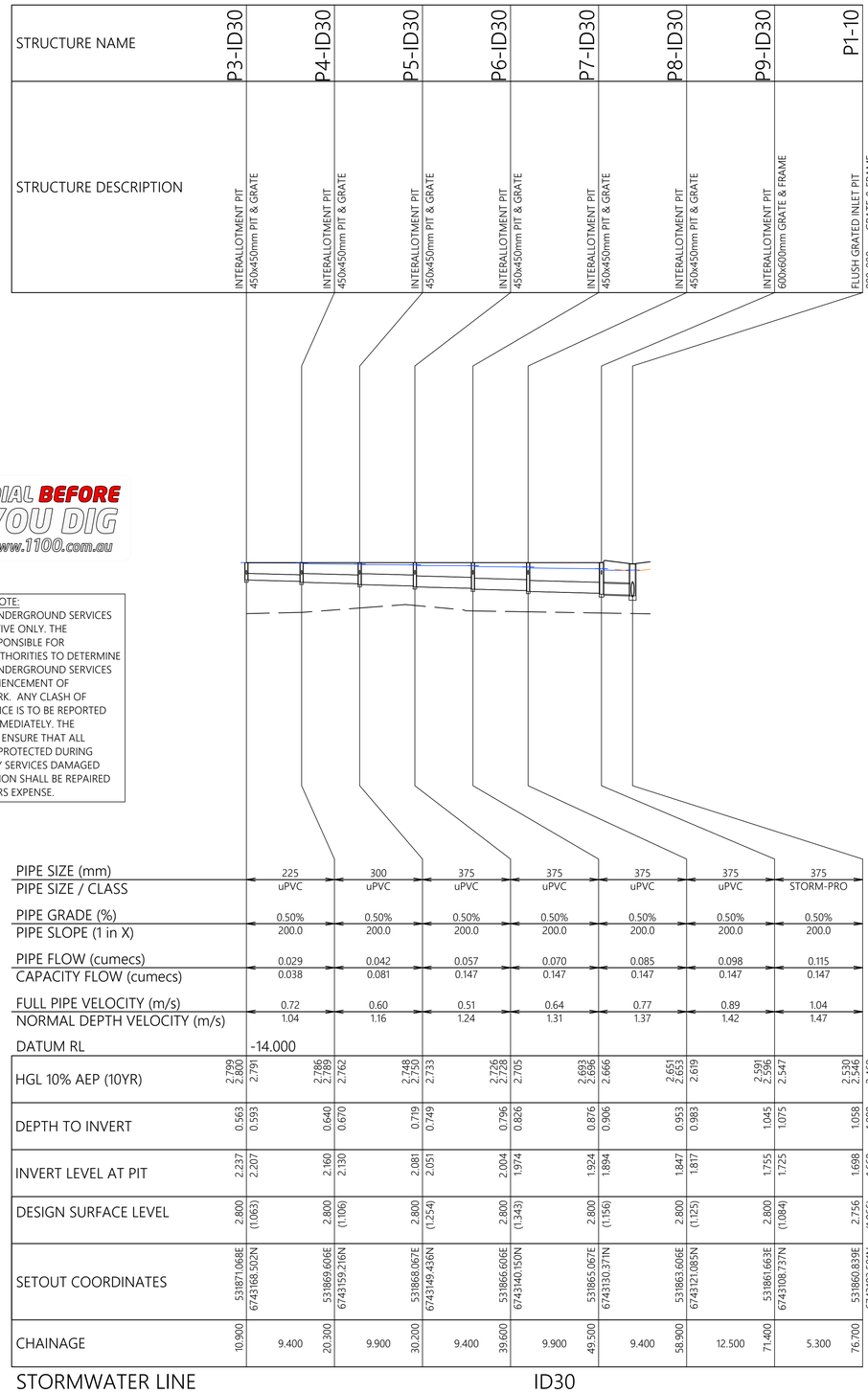
CLIFTON YAMBA

PROJECT: PROPOSED MHE DEVELOPMENT
110 & 120 CARRS DRIVE
YAMBA, NSW 2464
LOT 2 DP733507 & LOT 32 DP128863

DA CIVIL DRAWING

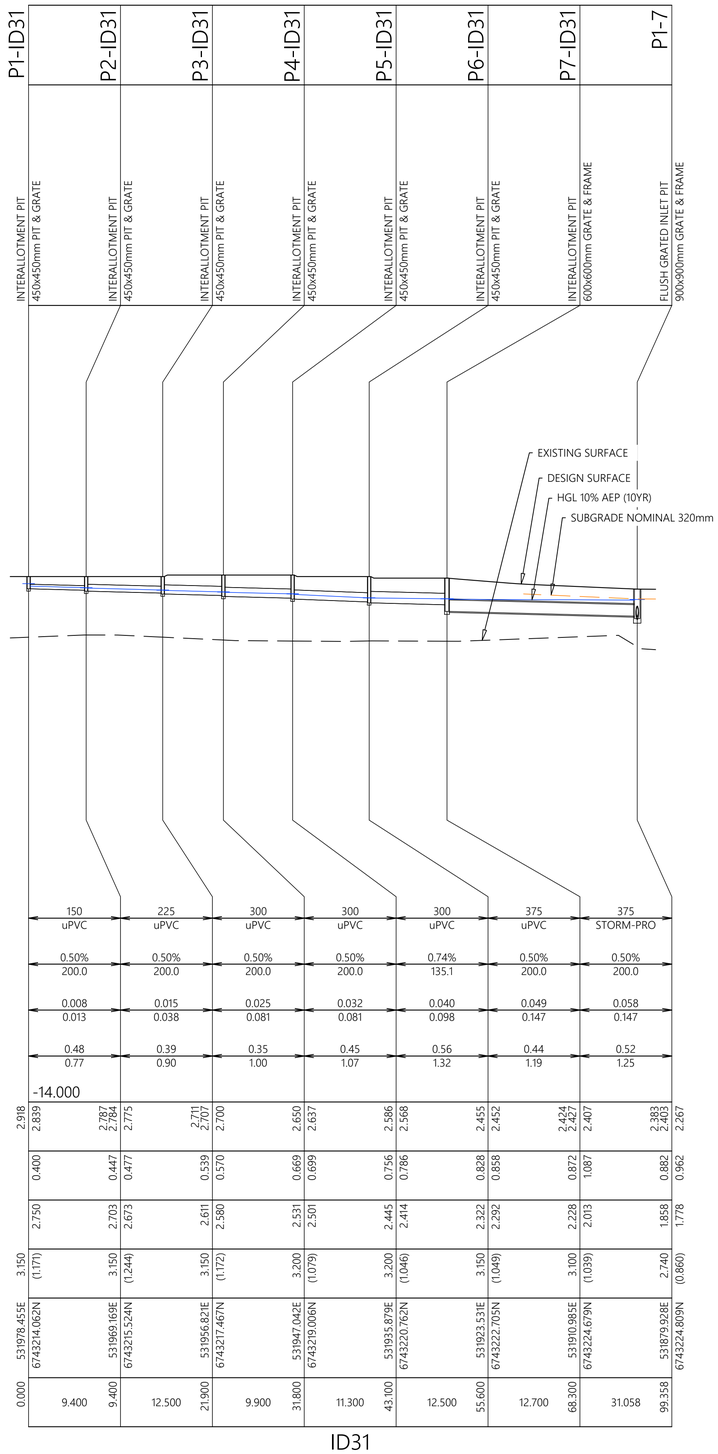
DRAWING TITLE: STORMWATER LONGITUDINAL SECTION - SHEET 13

DWG No: D30 | SHEET: 30 OF 45 | REV: 0



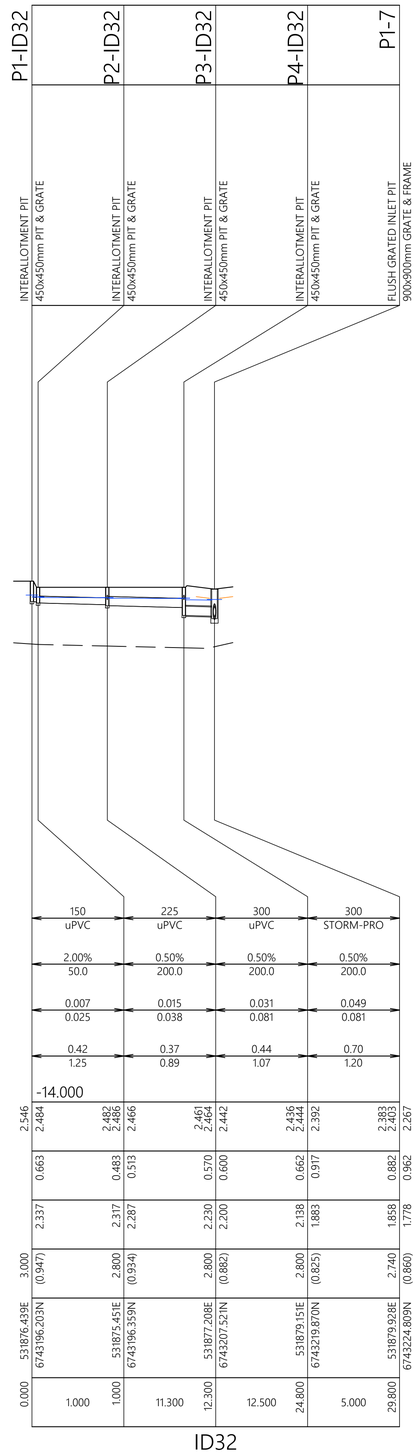
STRUCTURE NAME	P3-ID30	P4-ID30	P5-ID30	P6-ID30	P7-ID30	P8-ID30	P9-ID30	P1-10
STRUCTURE DESCRIPTION	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 600x600mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME
PIPE SIZE (mm)	225	300	375	375	375	375	375	
PIPE SIZE / CLASS	uPVC	uPVC	uPVC	uPVC	uPVC	uPVC	STORM-PRO	
PIPE GRADE (%)	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	
PIPE SLOPE (1 in X)	200.0	200.0	200.0	200.0	200.0	200.0	200.0	
PIPE FLOW (cumecs)	0.029	0.042	0.057	0.070	0.085	0.098	0.115	
CAPACITY FLOW (cumecs)	0.038	0.081	0.147	0.147	0.147	0.147	0.147	
FULL PIPE VELOCITY (m/s)	0.72	0.60	0.51	0.64	0.77	0.89	1.04	
NORMAL DEPTH VELOCITY (m/s)	1.04	1.16	1.24	1.31	1.37	1.42	1.47	
DATUM RL	-14.000							
HGL 10% AEP (10YR)	2.799 2.800	2.791	2.786 2.789	2.762	2.748 2.750	2.733	2.726 2.728	2.705
	2.693 2.696	2.666	2.651 2.653	2.619	2.591 2.596	2.547	2.530 2.536	2.469
DEPTH TO INVERT	0.563	0.593	0.640	0.670	0.719	0.749	0.796	0.826
	0.876	0.906	0.953	0.983	1.045	1.075	1.058	1.088
INVERT LEVEL AT PIT	2.237	2.207	2.160	2.130	2.081	2.051	2.004	1.974
	1.924	1.894	1.847	1.817	1.755	1.725	1.698	1.668
DESIGN SURFACE LEVEL	2.800	(1.063)	2.800	(1.106)	2.800	(1.254)	2.800	(1.343)
	2.800	(1.156)	2.800	(1.125)	2.800	(1.084)	2.756	(1.066)
SETOUT COORDINATES	531871.068E 6743168.502N	531869.606E 6743159.216N	531868.067E 6743149.436N	531866.606E 6743140.150N	531865.067E 6743130.371N	531863.606E 6743121.085N	531861.663E 6743108.737N	531860.839E 6743103.501N
CHAINAGE	10.900	9.400	20.300	9.900	30.200	9.400	39.600	9.900
	49.500	9.400	58.900	12.500	71.400	5.300	76.700	

STORMWATER LINE ID30



STRUCTURE NAME	P1-ID31	P2-ID31	P3-ID31	P4-ID31	P5-ID31	P6-ID31	P7-ID31	P1-7
STRUCTURE DESCRIPTION	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 600x600mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME
PIPE SIZE (mm)	150	225	300	300	300	375	375	
PIPE SIZE / CLASS	uPVC	uPVC	uPVC	uPVC	uPVC	uPVC	STORM-PRO	
PIPE GRADE (%)	0.50%	0.50%	0.50%	0.50%	0.74%	0.50%	0.50%	
PIPE SLOPE (1 in X)	200.0	200.0	200.0	200.0	135.1	200.0	200.0	
PIPE FLOW (cumecs)	0.008	0.015	0.025	0.032	0.040	0.049	0.058	
CAPACITY FLOW (cumecs)	0.013	0.038	0.081	0.081	0.098	0.147	0.147	
FULL PIPE VELOCITY (m/s)	0.48	0.39	0.35	0.45	0.56	0.44	0.52	
NORMAL DEPTH VELOCITY (m/s)	0.77	0.90	1.00	1.07	1.32	1.19	1.25	
DATUM RL	-14.000							
HGL 10% AEP (10YR)	2.918 2.839	2.787 2.784	2.775	2.711 2.707	2.700	2.650	2.637	2.586
	2.568	2.455	2.452	2.424 2.427	2.407	2.383 2.403	2.267	
DEPTH TO INVERT	0.400	0.447	0.477	0.539	0.570	0.669	0.699	0.756
	0.786	0.828	0.858	0.872	1.087	0.882	0.962	
INVERT LEVEL AT PIT	2.750	2.703	2.673	2.611	2.580	2.531	2.501	2.445
	2.414	2.322	2.292	2.228	2.013	1.858	1.778	
DESIGN SURFACE LEVEL	3.150	(1.171)	3.150	(1.244)	3.150	(1.172)	3.200	(1.079)
	3.200	(1.046)	3.150	(1.049)	3.100	(1.039)	2.740	(0.860)
SETOUT COORDINATES	531978.455E 6743214.062N	531969.169E 6743215.524N	531956.821E 6743217.467N	531947.042E 6743219.006N	531935.879E 6743220.762N	531923.531E 6743222.705N	531910.985E 6743224.679N	531879.928E 6743224.809N
CHAINAGE	0.000	9.400	9.400	12.500	21.900	9.900	31.800	11.300
	43.100	12.500	55.600	12.700	68.300	31.058	99.358	

ID31



STRUCTURE NAME	P1-ID32	P2-ID32	P3-ID32	P4-ID32	P1-7
STRUCTURE DESCRIPTION	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME
PIPE SIZE (mm)	150	225	300	300	
PIPE SIZE / CLASS	uPVC	uPVC	uPVC	STORM-PRO	
PIPE GRADE (%)	2.00%	0.50%	0.50%	0.50%	
PIPE SLOPE (1 in X)	50.0	200.0	200.0	200.0	
PIPE FLOW (cumecs)	0.007	0.015	0.031	0.049	
CAPACITY FLOW (cumecs)	0.025	0.038	0.081	0.081	
FULL PIPE VELOCITY (m/s)	0.42	0.37	0.44	0.70	
NORMAL DEPTH VELOCITY (m/s)	1.25	0.89	1.07	1.20	
DATUM RL	-14.000				
HGL 10% AEP (10YR)	2.546 2.484	2.482 2.486	2.466	2.461 2.461	2.442	2.436 2.444	2.392	2.383 2.403	2.267
DEPTH TO INVERT	0.663	0.483	0.513	0.570	0.600	0.662	0.917	0.882	0.962
INVERT LEVEL AT PIT	2.337	2.317	2.287	2.230	2.200	2.138	1.883	1.858	1.778
DESIGN SURFACE LEVEL	3.000	(0.947)	2.800	(0.934)	2.800	(0.882)	2.800	(0.825)	2.740	(0.860)
SETOUT COORDINATES	531876.439E 6743196.203N	531875.451E 6743196.359N	531877.208E 6743207.521N	531879.151E 6743219.870N	531879.928E 6743224.809N				
CHAINAGE	0.000	1.000	1.000	11.300	12.300	12.500	24.800	5.000	29.800	

ID32

Horizontal Scale 1:250 (A1) 1:500 (A3)

Vertical Scale 1:50 (A1) 1:100 (A3)

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ISSUE	DESCRIPTION	DATE
0	ISSUED FOR DEVELOPMENT APPLICATION	08.09.2022

DESIGNED: T.RYDEN | DATE: SEPT 2022
DRAWN: A.SCHMID | SCALE: AS SHOWN
SURVEYING: | SHEET SIZE: A1

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MDE Manage Design Engineer

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CLIENT: CLIFTON YAMBA LAND PTY LTD

TITLE: 110 & 120 CARRS DRIVE, YAMBA
DEVELOPMENT APPLICATION CIVIL WORKS PLANS

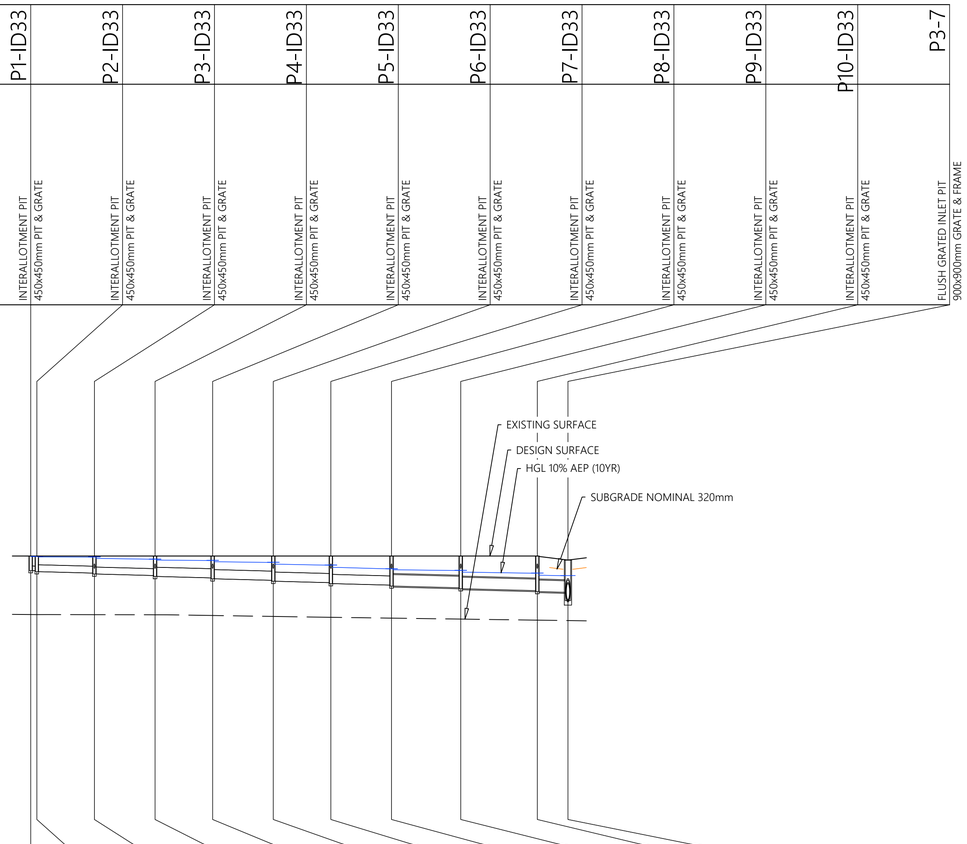
CLIFTON YAMBA

PROJECT: PROPOSED MHE DEVELOPMENT
110 & 120 CARRS DRIVE
YAMBA, NSW 2464
LOT 2 DP733507 & LOT 32 DP128863

DA CIVIL DRAWING

DRAWING TITLE: STORMWATER LONGITUDINAL SECTION - SHEET 14

DWG No: D31 | SHEET: 31 OF 45 | REV: 0



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STRUCTURE NAME	P1-ID33	P2-ID33	P3-ID33	P4-ID33	P5-ID33	P6-ID33	P7-ID33	P8-ID33	P9-ID33	P10-ID33	P3-7
STRUCTURE DESCRIPTION	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME
PIPE SIZE (mm)	150	225	225	300	300	300	300	375	375	375	
PIPE SIZE / CLASS	uPVC	uPVC	uPVC	uPVC	uPVC	uPVC	uPVC	STORM-PRO	STORM-PRO	STORM-PRO	
PIPE GRADE (%)	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	
PIPE SLOPE (1 in X)	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	
PIPE FLOW (cumecs)	0.007	0.015	0.029	0.043	0.057	0.071	0.085	0.099	0.115	0.132	
CAPACITY FLOW (cumecs)	0.013	0.038	0.038	0.081	0.081	0.081	0.081	0.147	0.147	0.147	
FULL PIPE VELOCITY (m/s)	0.42	0.37	0.72	0.61	0.80	1.01	1.20	0.89	1.04	1.19	
NORMAL DEPTH VELOCITY (m/s)	0.75	0.89	1.04	1.16	1.24	1.29	1.30	1.42	1.47	1.50	
DATUM RL	-15.000										
HGL 10% AEP (10YR)	2.800 / 2.785	2.784 / 2.787	2.770 / 2.763	2.723 / 2.695	2.699 / 2.667	2.654 / 2.630	2.614 / 2.590	2.595 / 2.536	2.499 / 2.506	2.433 / 2.379	2.383 / 2.351
	2.326 / 2.332	2.276 / 2.238	2.245 / 2.175	2.154 / 2.162	2.090						
DEPTH TO INVERT	0.475	0.480	0.510	0.557	0.587	0.636	0.666	0.713	0.743	0.793	0.823
	0.870	0.900	0.949	0.979	1.036	1.066	1.128	1.158	1.052	1.322	
INVERT LEVEL AT PIT	2.325	2.320	2.290	2.243	2.213	2.163	2.134	2.087	2.057	2.007	1.977
	1.930	1.900	1.851	1.821	1.764	1.734	1.671	1.641	1.617	1.347	
DESIGN SURFACE LEVEL	2.800 (0.889)	2.800 (0.888)	2.800 (0.886)	2.800 (0.883)	2.800 (0.859)	2.800 (0.828)	2.800 (0.800)	2.800 (0.773)	2.800 (0.742)	2.800 (0.707)	2.668 (0.693)
SETOUT COORDINATES	531817.651E 6743146.842N	531816.663E 6743146.997N	531818.125E 6743156.283N	531819.664E 6743166.063N	531821.125E 6743175.348N	531822.664E 6743185.128N	531824.125E 6743194.414N	531825.664E 6743204.193N	531827.420E 6743215.356N	531829.363E 6743227.704N	531830.141E 6743232.643N
CHAINAGE	0.000	1.000	1.000	9.400	10.400	9.900	20.300	9.400	29.700	9.900	39.600
	9.400	49.000	9.900	58.900	11.300	70.200	12.500	82.700	5.000	87.700	

STORMWATER LINE — ID33

STRUCTURE NAME	P1-ID34	P2-ID34	P3-ID34	P3-10
STRUCTURE DESCRIPTION	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME
PIPE SIZE (mm)	150	225	300	
PIPE SIZE / CLASS	uPVC	uPVC	STORM-PRO	
PIPE GRADE (%)	0.50%	0.50%	0.50%	
PIPE SLOPE (1 in X)	200.0	200.0	200.0	
PIPE FLOW (cumecs)	0.007	0.014	0.032	
CAPACITY FLOW (cumecs)	0.013	0.038	0.081	
FULL PIPE VELOCITY (m/s)	0.40	0.35	0.45	
NORMAL DEPTH VELOCITY (m/s)	0.74	0.87	1.08	
DATUM RL	-14.000			
HGL 10% AEP (10YR)	2.461 / 2.405	2.402 / 2.405	2.387 / 2.354	2.359 / 2.333
	2.328 / 2.243			
DEPTH TO INVERT	0.475	0.480	0.510	0.572
	0.981	0.991	1.427	
INVERT LEVEL AT PIT	2.325	2.320	2.290	2.228
	1.819	1.792	1.356	
DESIGN SURFACE LEVEL	2.800 (0.874)	2.800 (0.872)	2.800 (0.858)	2.784 (0.847)
SETOUT COORDINATES	531814.807E 6743128.764N	531813.819E 6743128.920N	531811.876E 6743116.571N	531811.052E 6743111.336N
CHAINAGE	0.000	1.000	1.000	12.500
	13.500	5.300	18.800	

ID34

STRUCTURE NAME	P1-ID35	P2-ID35	P3-ID35	P5-10
STRUCTURE DESCRIPTION	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME
PIPE SIZE (mm)	150	225	300	
PIPE SIZE / CLASS	uPVC	uPVC	STORM-PRO	
PIPE GRADE (%)	0.50%	0.50%	0.50%	
PIPE SLOPE (1 in X)	200.0	200.0	200.0	
PIPE FLOW (cumecs)	0.007	0.014	0.032	
CAPACITY FLOW (cumecs)	0.013	0.038	0.081	
FULL PIPE VELOCITY (m/s)	0.40	0.35	0.45	
NORMAL DEPTH VELOCITY (m/s)	0.74	0.87	1.08	
DATUM RL	-15.000			
HGL 10% AEP (10YR)	2.461 / 2.405	2.402 / 2.405	2.387 / 2.333	2.034 / 2.006
	2.005 / 2.015	1.937		
DEPTH TO INVERT	0.475	0.480	0.510	0.572
	0.981	0.979	1.727	
INVERT LEVEL AT PIT	2.325	2.320	2.290	2.228
	1.819	1.792	1.044	
DESIGN SURFACE LEVEL	2.800 (0.775)	2.800 (0.773)	2.800 (0.762)	2.771 (0.758)
SETOUT COORDINATES	531765.019E 6743136.599N	531764.031E 6743136.754N	531762.088E 6743124.406N	531761.264E 6743119.170N
CHAINAGE	0.000	1.000	1.000	12.500
	13.500	5.300	18.800	

ID35

STRUCTURE NAME	P1-ID36	P2-ID36	P3-ID36
STRUCTURE DESCRIPTION	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE
PIPE SIZE (mm)	150	225	
PIPE SIZE / CLASS	uPVC	uPVC	
PIPE GRADE (%)	0.50%	0.50%	
PIPE SLOPE (1 in X)	200.0	200.0	
PIPE FLOW (cumecs)	0.007	0.015	
CAPACITY FLOW (cumecs)	0.013	0.038	
FULL PIPE VELOCITY (m/s)	0.42	0.37	
NORMAL DEPTH VELOCITY (m/s)	0.75	0.89	
DATUM RL	-15.000		
HGL 10% AEP (10YR)	2.780 / 2.753	2.751 / 2.754	2.737 / 2.730
	2.732		
DEPTH TO INVERT	0.475	0.480	0.510	0.557
INVERT LEVEL AT PIT	2.325	2.320	2.290	2.243
DESIGN SURFACE LEVEL	2.800 (0.786)	2.800 (0.784)	2.800 (0.780)
SETOUT COORDINATES	531767.864E 6743154.676N	531766.876E 6743154.832N	531768.337E 6743164.117N
CHAINAGE	0.000	1.000	1.000	9.400	10.400

ID36

Horizontal Scale 1:250 (A1) 1:500 (A3)

Vertical Scale 1:50 (A1) 1:100 (A3)

ISSUE	DESCRIPTION	DATE
0	ISSUED FOR DEVELOPMENT APPLICATION	08.09.2022

DESIGNED: T.RYDEN | DATE: SEPT 2022
DRAWN: A.SCHMID | SCALE: AS SHOWN
SURVEYING: | SHEET SIZE: A1

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MDE Manage Design Engineer

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CLIENT: CLIFTON YAMBA LAND PTY LTD

TITLE: 110 & 120 CARRS DRIVE, YAMBA
DEVELOPMENT APPLICATION CIVIL WORKS PLANS

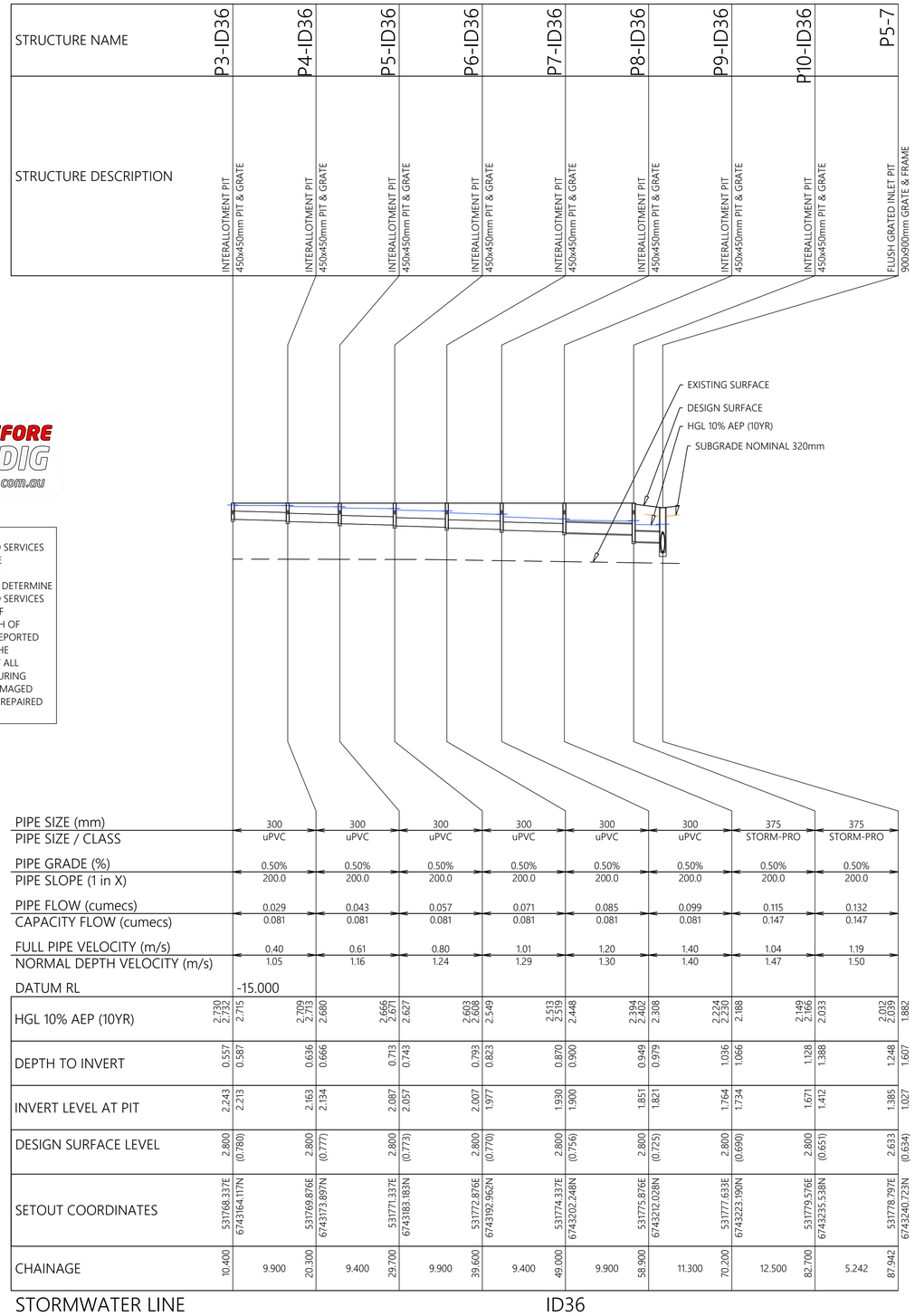
CLIFTON YAMBA

PROJECT: PROPOSED MHE DEVELOPMENT
110 & 120 CARRS DRIVE
YAMBA, NSW 2464
LOT 2 DP733507 & LOT 32 DP128863

DA CIVIL DRAWING

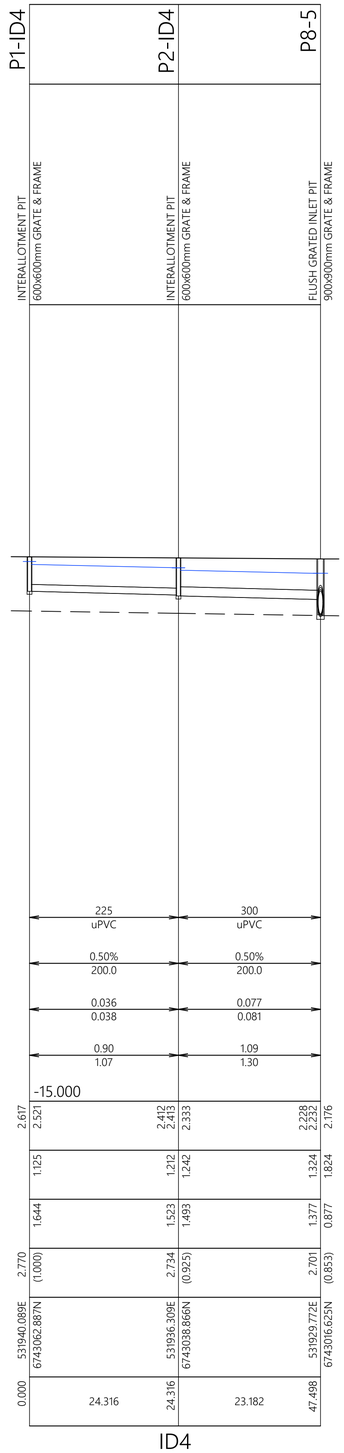
DRAWING TITLE: STORMWATER LONGITUDINAL SECTION - SHEET 15

DWG No: D32 | SHEET: 32 OF 45 | REV: 0



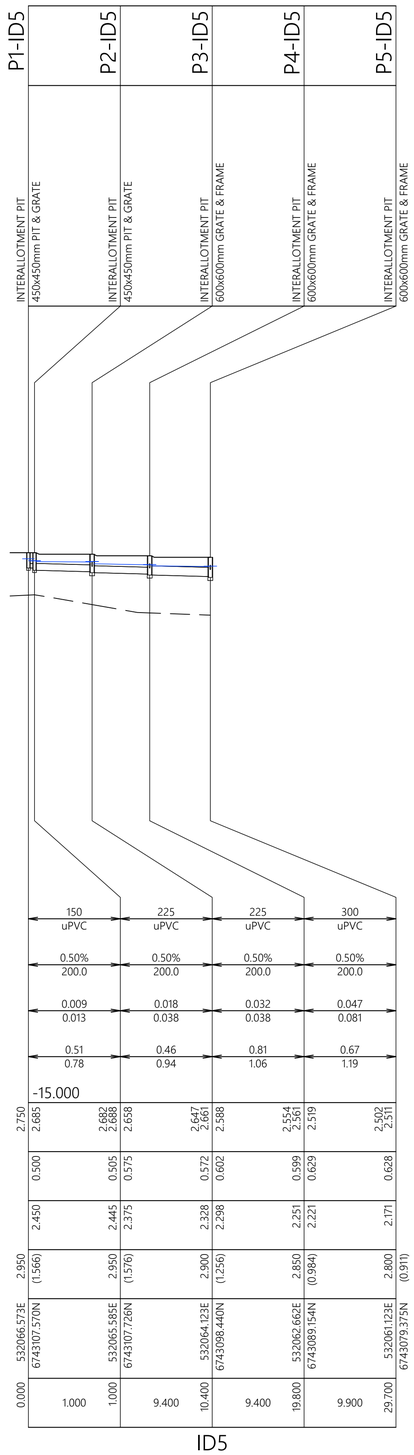
STRUCTURE NAME	P3-ID36	P4-ID36	P5-ID36	P6-ID36	P7-ID36	P8-ID36	P9-ID36	P10-ID36	P5-7
STRUCTURE DESCRIPTION	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME
PIPE SIZE (mm)	300	300	300	300	300	300	300	375	375
PIPE SIZE / CLASS	uPVC	uPVC	uPVC	uPVC	uPVC	uPVC	uPVC	STORM-PRO	STORM-PRO
PIPE GRADE (%)	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%
PIPE SLOPE (1 in X)	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0
PIPE FLOW (cumecs)	0.029	0.043	0.057	0.071	0.085	0.099	0.115	0.132	
CAPACITY FLOW (cumecs)	0.081	0.081	0.081	0.081	0.081	0.081	0.147	0.147	
FULL PIPE VELOCITY (m/s)	0.40	0.61	0.80	1.01	1.20	1.40	1.04	1.19	
NORMAL DEPTH VELOCITY (m/s)	1.05	1.16	1.24	1.29	1.30	1.40	1.47	1.50	
DATUM RL	-15.000								
HGL 10% AEP (10YR)	2.730 2.732	2.715	2.709 2.713	2.680	2.666 2.671	2.627	2.603 2.608	2.549	2.513 2.519	2.448	2.394 2.402	2.308	2.224 2.230	2.188	2.149 2.156	2.033	2.012 2.039	1.882
DEPTH TO INVERT	0.557	0.587	0.636	0.666	0.713	0.743	0.793	0.823	0.870	0.900	0.949	0.979	1.036	1.066	1.128	1.388	1.248	1.607
INVERT LEVEL AT PIT	2.243	2.213	2.163	2.134	2.087	2.057	2.007	1.977	1.930	1.900	1.851	1.821	1.764	1.734	1.671	1.412	1.385	1.027
DESIGN SURFACE LEVEL	2.800 (0.780)		2.800 (0.777)		2.800 (0.773)		2.800 (0.770)		2.800 (0.756)		2.800 (0.725)		2.800 (0.690)		2.800 (0.651)		2.633 (0.634)	
SETOUT COORDINATES	531768.337E 6743164.117N		531769.876E 6743173.897N		531771.337E 6743183.183N		531772.876E 6743192.962N		531774.337E 6743202.248N		531775.876E 6743212.028N		531777.633E 6743223.190N		531779.576E 6743235.538N		531778.797E 6743240.723N	
CHAINAGE	10.400	9.900	20.300	9.400	29.700	9.900	39.600	9.400	49.000	9.900	58.900	11.300	70.200	12.500	82.700	5.242	87.942	

STORMWATER LINE — ID36



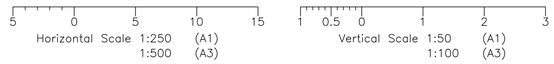
STRUCTURE NAME	P1-ID4	P2-ID4	P8-5
STRUCTURE DESCRIPTION	INTERALLOTMENT PIT 600x600mm GRATE & FRAME	INTERALLOTMENT PIT 600x600mm GRATE & FRAME	FLUSH GRATED INLET PIT 900x900mm GRATE & FRAME
PIPE SIZE (mm)	225	300	
PIPE SIZE / CLASS	uPVC	uPVC	
PIPE GRADE (%)	0.50%	0.50%	
PIPE SLOPE (1 in X)	200.0	200.0	
PIPE FLOW (cumecs)	0.036	0.077	
CAPACITY FLOW (cumecs)	0.038	0.081	
FULL PIPE VELOCITY (m/s)	0.90	1.09	
NORMAL DEPTH VELOCITY (m/s)	1.07	1.30	
DATUM RL	-15.000		
HGL 10% AEP (10YR)	2.617	2.521	2.412 2.415	2.333	2.228 2.232	2.176
DEPTH TO INVERT	1.125	1.212	1.242	1.324	1.824
INVERT LEVEL AT PIT	1.644	1.523	1.493	1.377	0.877
DESIGN SURFACE LEVEL	2.770 (1.000)	2.734 (0.925)	2.701 (0.853)
SETOUT COORDINATES	531940.089E 6743062.887N	531936.309E 6743038.866N	531929.772E 6743016.625N
CHAINAGE	0.000	24.316	24.316	23.182	47.498

ID4



STRUCTURE NAME	P1-ID5	P2-ID5	P3-ID5	P4-ID5	P5-ID5
STRUCTURE DESCRIPTION	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 450x450mm PIT & GRATE	INTERALLOTMENT PIT 600x600mm GRATE & FRAME	INTERALLOTMENT PIT 600x600mm GRATE & FRAME	INTERALLOTMENT PIT 600x600mm GRATE & FRAME
PIPE SIZE (mm)	150	225	225	300	
PIPE SIZE / CLASS	uPVC	uPVC	uPVC	uPVC	
PIPE GRADE (%)	0.50%	0.50%	0.50%	0.50%	
PIPE SLOPE (1 in X)	200.0	200.0	200.0	200.0	
PIPE FLOW (cumecs)	0.009	0.018	0.032	0.047	
CAPACITY FLOW (cumecs)	0.013	0.038	0.038	0.081	
FULL PIPE VELOCITY (m/s)	0.51	0.46	0.81	0.67	
NORMAL DEPTH VELOCITY (m/s)	0.78	0.94	1.06	1.19	
DATUM RL	-15.000				
HGL 10% AEP (10YR)	2.750	2.685	2.682 2.688	2.658	2.647 2.661	2.588	2.554 2.561	2.519	2.502 2.511
DEPTH TO INVERT	0.500	0.505	0.575	0.572	0.602	0.599	0.629	0.628
INVERT LEVEL AT PIT	2.450	2.445	2.375	2.328	2.298	2.251	2.221	2.171
DESIGN SURFACE LEVEL	2.950 (1.566)	2.950 (1.576)	2.900 (1.256)	2.850 (0.984)	2.800 (0.911)
SETOUT COORDINATES	532066.573E 6743107.570N	532065.585E 6743107.726N	532064.123E 6743098.440N	532062.662E 6743089.154N	532061.123E 6743079.375N
CHAINAGE	0.000	1.000	1.000	9.400	10.400	9.400	19.800	9.900	29.700

ID5



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ISSUE	DESCRIPTION	DATE
0	ISSUED FOR DEVELOPMENT APPLICATION	08.09.2022

DESIGNED: T.RYDEN | DATE: SEPT 2022
DRAWN: A.SCHMID | SCALE: AS SHOWN
SURVEYING: | SHEET SIZE: A1

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MDE Manage Design Engineer

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CLIENT: CLIFTON YAMBA LAND PTY LTD

TITLE: 110 & 120 CARRS DRIVE, YAMBA
DEVELOPMENT APPLICATION CIVIL WORKS PLANS

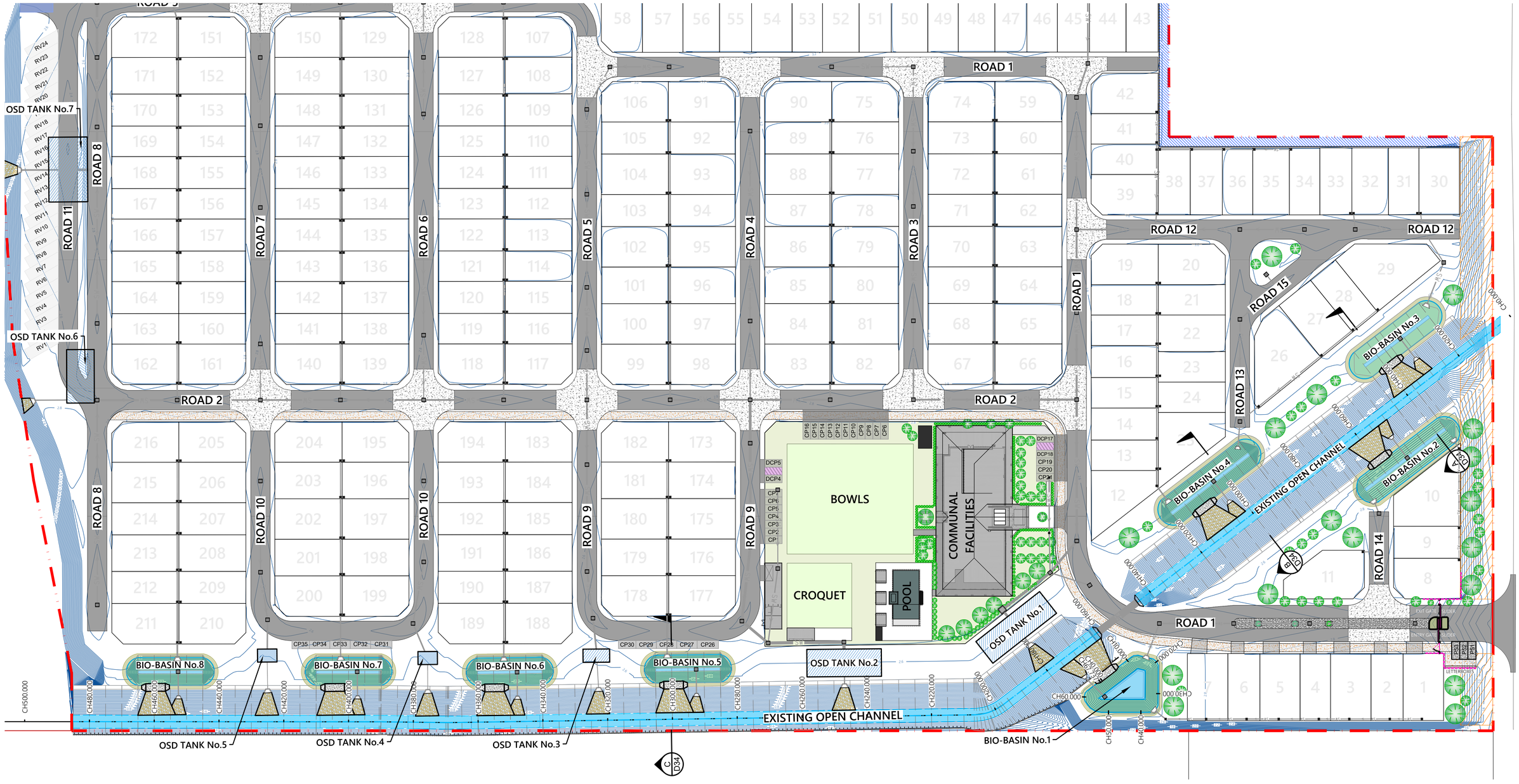
CLIFTON YAMBA

PROJECT: PROPOSED MHE DEVELOPMENT
110 & 120 CARRS DRIVE
YAMBA, NSW 2464
LOT 2 DP733507 & LOT 32 DP128863

DA CIVIL DRAWING

DRAWING TITLE: STORMWATER LONGITUDINAL SECTION - SHEET 16

DWG No: D33 | SHEET: 33 OF 45 | REV: 0



OPEN CHANNEL DETAIL PLAN

SCALE 1:600

PLANS TO BE PRINTED IN COLOUR

PRELIMINARY PLANS FOR DA PURPOSES ONLY NOT FOR CONSTRUCTION

ARCHITECTURAL INFORMATION FOR CLUB HOUSE SUPPLIED BY MARK SHAPIRO ARCHITECTS DRAWING NUMBER DA1002WIP REV 2

LEGEND

- DEVELOPMENT BOUNDARY
- INTERNAL LOT BOUNDARY
- BIO - BASIN TOP
- CHANNEL TOP OF BANK
- CHANNEL CENTRE LINE
- PROPOSED STORMWATER DRAINAGE
- RETAINING WALL
- STORMWATER DRAINAGE PIT
- HEADWALL
- NEW INTERNAL CONCRETE ROAD PAVEMENT
- NEW INTERNAL CONCRETE INTERSECTION TREATMENTS & DRIVEWAYS
- NEW 2.5m WIDE SHARED PATH WITHIN SITE BOUNDARY
- MHE BOUNDARY SETBACK 3m WIDE 'NO BUILD ZONE'
- MHE BOUNDARY SETBACK 10m WIDE 'NO BUILD ZONE'
- VISITOR AND RECREATIONAL VEHICLE PARKING
- SCOUR PROTECTION
- BIO-BASIN BREM
- BIO-BASIN GRASSED AREA
- BIO-BASIN WEIR
- BIO-BASIN FLOOR
- GRASSED AREA

ISSUE	DESCRIPTION	DATE
0	ISSUED FOR DEVELOPMENT APPLICATION	08.09.2022

DESIGNED: T.RYDEN | DATE: SEPT 2022
DRAWN: A.SCHMID | SCALE: AS SHOWN
SURVEYING: | SHEET SIZE: A1

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TITLE: 110 & 120 CARRS DRIVE, YAMBA
DEVELOPMENT APPLICATION CIVIL WORKS PLANS

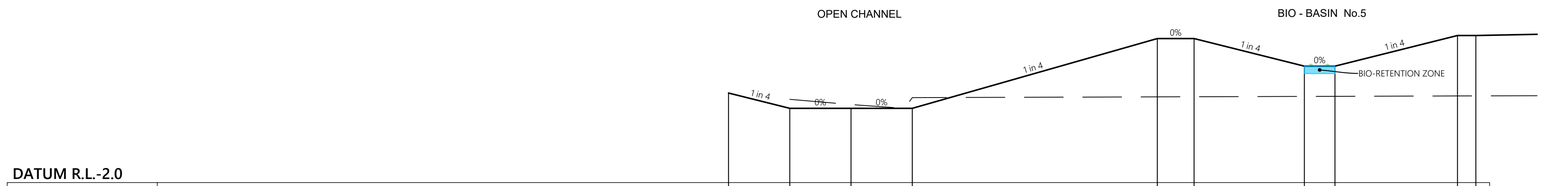
CLIFTON YAMBA

PROJECT: PROPOSED MHE DEVELOPMENT
110 & 120 CARRS DRIVE
YAMBA, NSW 2464
LOT 2 DP733507 & LOT 32 DP128863

DA CIVIL DRAWING

DRAWING TITLE: OPEN CHANNEL DETAIL PLAN

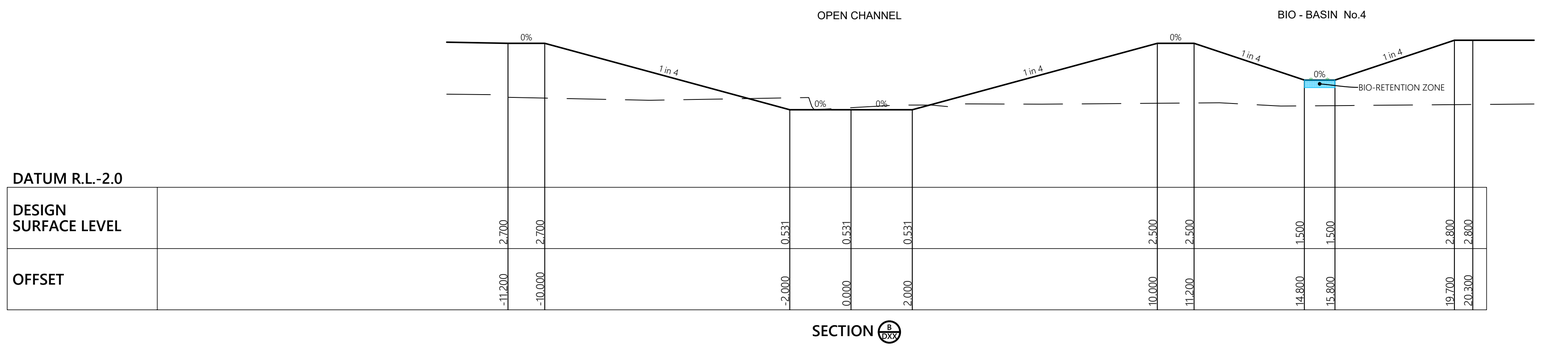
DWG No: D34 | SHEET: 34 OF 45 | REV: 0



SECTION C DWG

EXISTING OPEN CHANNEL - CH 300.000

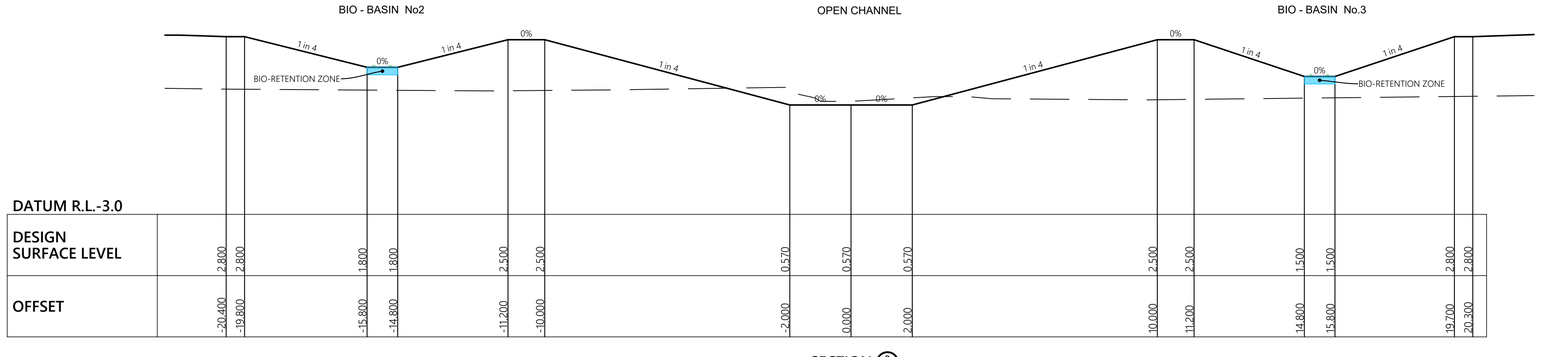
SCALE 1:100



SECTION B DWG

EXISTING OPEN CHANNEL - CH 100.000

SCALE 1:100



SECTION B DWG

EXISTING OPEN CHANNEL - CH 40.000

SCALE 1:100

2 1 0 2 4 6
Horizontal Scale 1:100 (A1)
1:200 (A3)

2 1 0 2 4 6
Vertical Scale 1:100 (A1)
1:200 (A3)

ISSUE	DESCRIPTION	DATE
0	ISSUED FOR DEVELOPMENT APPLICATION	08.09.2022

DESIGNED: T.RYDEN | DATE: SEPT 2022
DRAWN: A.SCHMID | SCALE: AS SHOWN
SURVEYING: | SHEET SIZE: A1

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MDE Manage Design Engineer

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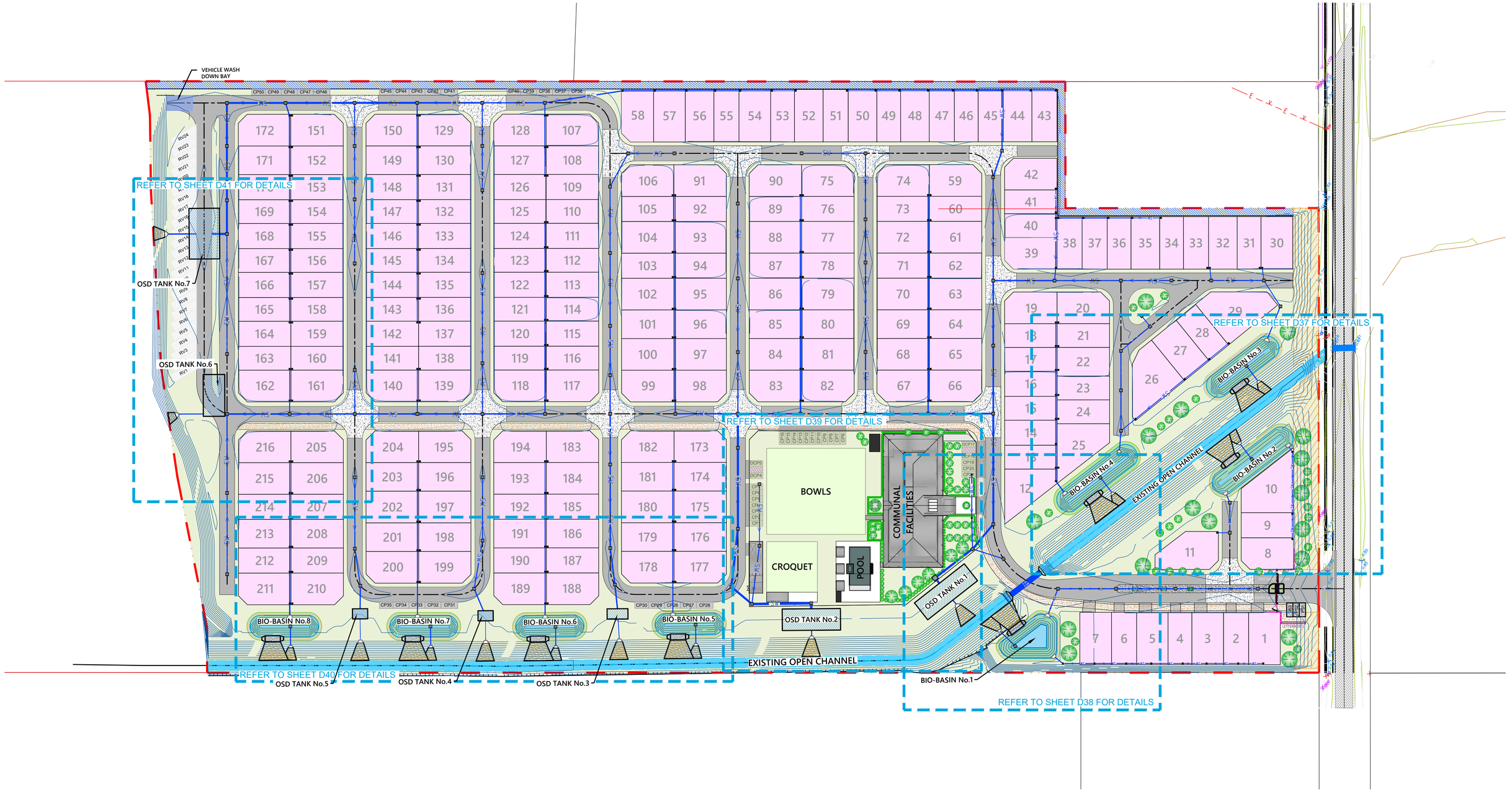
PROPOSED MHE DEVELOPMENT
110 & 120 CARRS DRIVE
YAMBA, NSW 2464
LOT 2 DP733507 & LOT 32 DP128863

DA CIVIL DRAWING

DRAWING TITLE:
OPEN CHANNEL TYPICAL SECTIONS

DWG No: D35 | SHEET: 35 OF 45 | REV: 0



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Horizontal Scale 1:750 (A1)
1:1500 (A3)

STORMWATER MANAGEMENT PLAN
SCALE 1:750

PLANS TO BE PRINTED IN COLOUR

PRELIMINARY PLANS FOR DA PURPOSES ONLY NOT FOR CONSTRUCTION

ARCHITECTURAL INFORMATION FOR CLUB HOUSE SUPPLIED BY MARK SHAPIRO ARCHITECTS DRAWING NUMBER DA1002WIP REV 2

LEGEND

- DEVELOPMENT BOUNDARY
- INTERNAL LOT BOUNDARY
- BIO - BASIN TOP
- CHANNEL TOP OF BANK
- CHANNEL CENTRE LINE
- PROPOSED STORMWATER DRAINAGE
- RETAINING WALL
- STORMWATER DRAINAGE PIT
- HEADWALL
- PROPOSED MHE ALLOTMENT
- NEW INTERNAL CONCRETE ROAD PAVEMENT
- NEW INTERNAL CONCRETE INTERSECTION TREATMENTS & DRIVEWAYS
- NEW 2.5m WIDE SHARED PATH WITHIN SITE BOUNDARY
- MHE BOUNDARY SETBACK 3m WIDE 'NO BUILD ZONE'
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- VISITOR AND RECREATIONAL VEHICLE PARKING
- SCOUR PROTECTION
- BIO-BASIN BREM
- BIO-BASIN GRASSED AREA
- BIO-BASIN WEIR
- BIO-BASIN FLOOR
- GRASSED AREA

ISSUE	DESCRIPTION	DATE
0	ISSUED FOR DEVELOPMENT APPLICATION	08.09.2022

DESIGNED: T.RYDEN | DATE: SEPT 2022
DRAWN: A.SCHMID | SCALE: AS SHOWN
SURVEYING: | SHEET SIZE: A1

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MDE Manage Design Engineer

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CLIENT: CLIFTON YAMBA LAND PTY LTD

TITLE: 110 & 120 CARRS DRIVE, YAMBA
DEVELOPMENT APPLICATION CIVIL WORKS PLANS

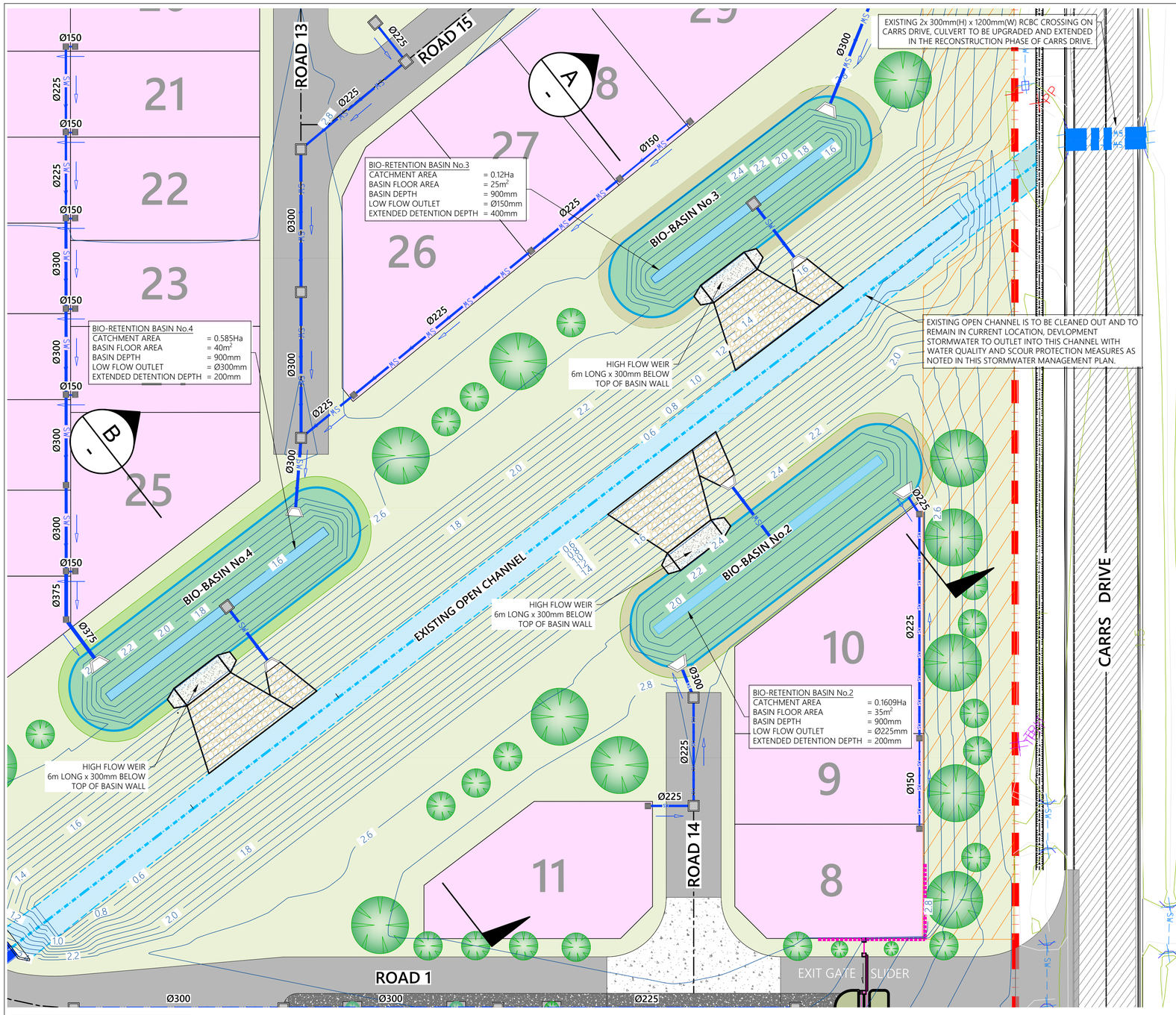
CLIFTON YAMBA

PROJECT: PROPOSED MHE DEVELOPMENT
110 & 120 CARRS DRIVE
YAMBA, NSW 2464
LOT 2 DP733507 & LOT 32 DP128863

DA CIVIL DRAWING

DRAWING TITLE: STORMWATER MANAGEMENT PLAN

DWG No: D36 | SHEET: 36 OF 45 | REV: 0



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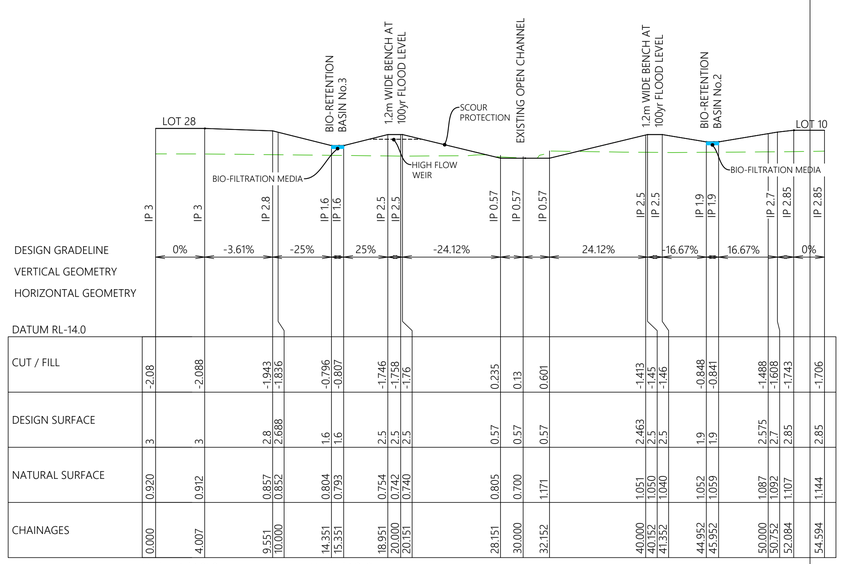
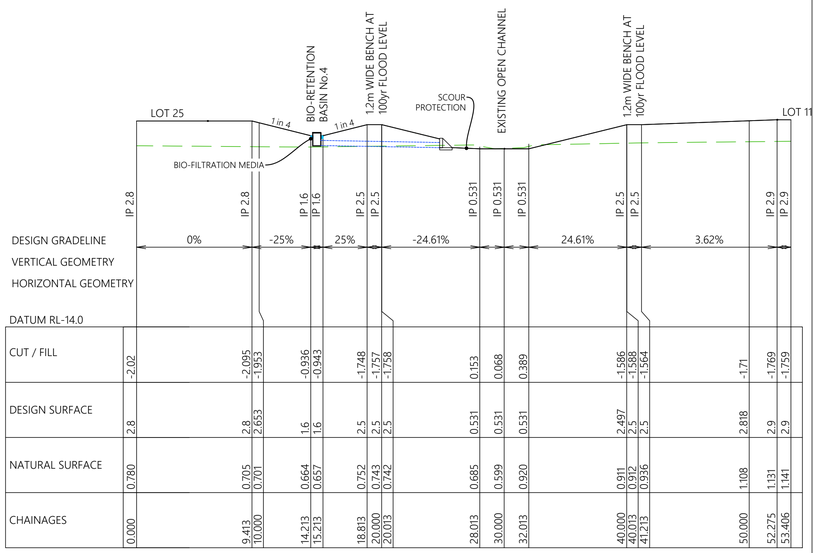
1:500 (A3)



SECTION - A



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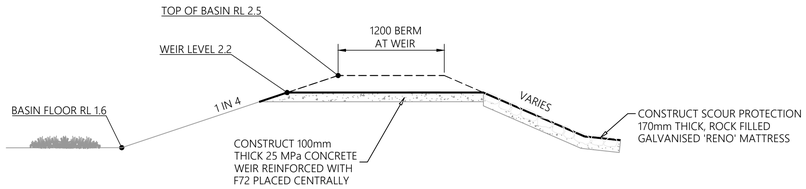

HIGH FLOW WEIR DETAIL

N.T.S

LEGEND

- DEVELOPMENT BOUNDARY
- INTERNAL LOT BOUNDARY
- BIO - BASIN TOP
- CHANNEL TOP OF BANK
- CHANNEL CENTRE LINE
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PLANS TO BE PRINTED IN COLOUR

PRELIMINARY PLANS FOR DA PURPOSES ONLY NOT FOR CONSTRUCTION

ARCHITECTURAL INFORMATION FOR CLUB HOUSE SUPPLIED BY MARK SHAPIRO ARCHITECTS DRAWING NUMBER DA1002WIP REV 2

ISSUE	DESCRIPTION	DATE
0	ISSUED FOR DEVELOPMENT APPLICATION	08.09.2022

DESIGNED: T.RYDEN | DATE: SEPT 2022
DRAWN: A.SCHMID | SCALE: AS SHOWN
SURVEYING: | SHEET SIZE: A1

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CLIENT: CLIFTON YAMBA LAND PTY LTD

TITLE: 110 & 120 CARRS DRIVE, YAMBA
DEVELOPMENT APPLICATION CIVIL WORKS PLANS

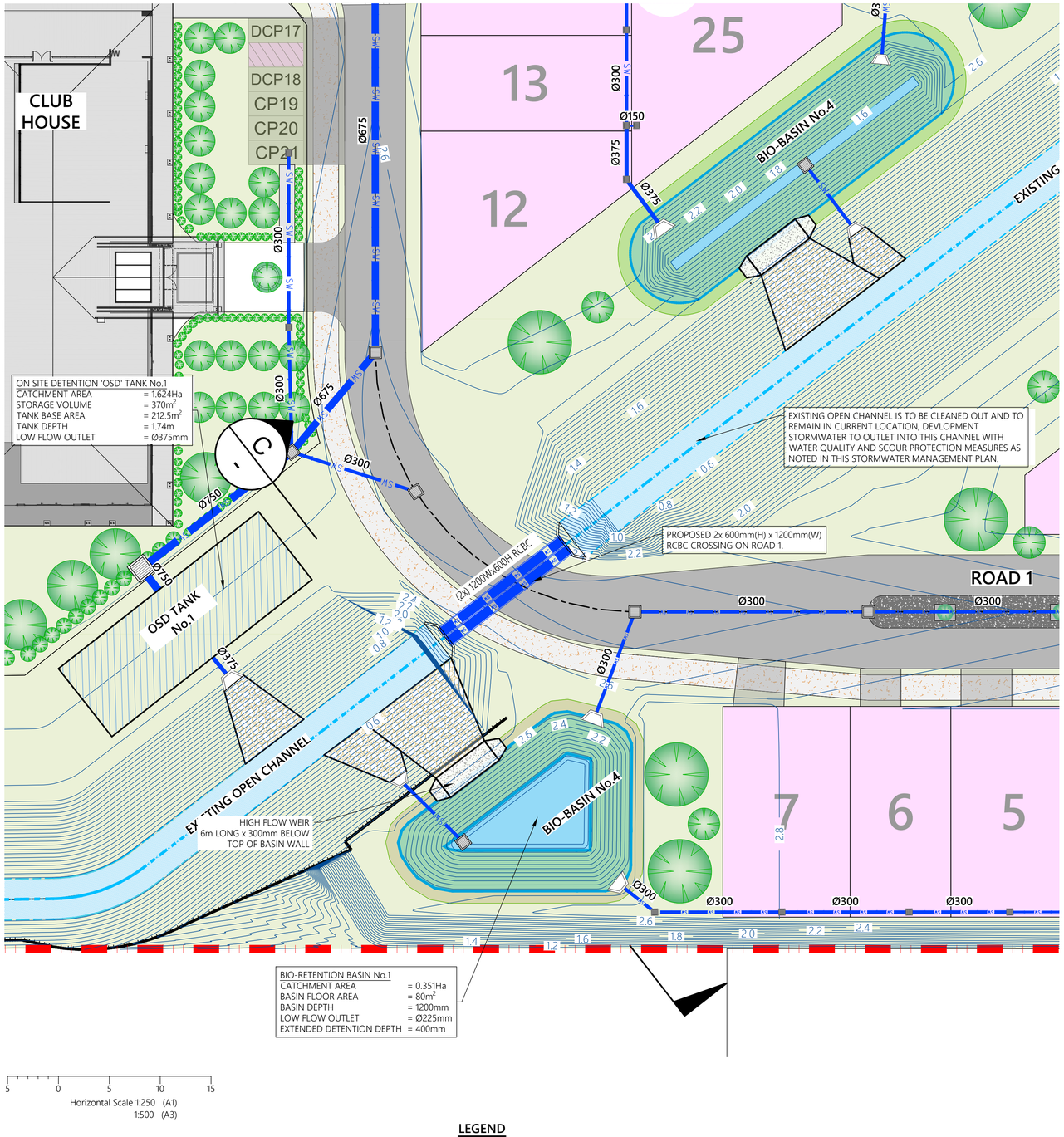
CLIFTON YAMBA

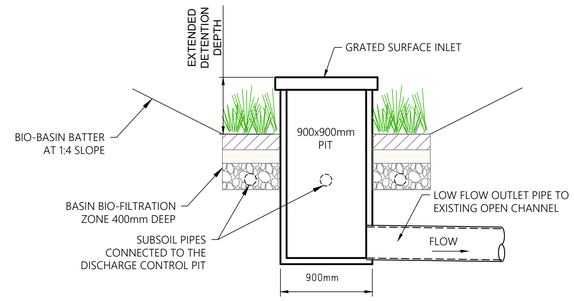
PROJECT: PROPOSED MHE DEVELOPMENT
110 & 120 CARRS DRIVE
YAMBA, NSW 2464
LOT 2 DP733507 & LOT 32 DP128863

DA CIVIL DRAWING

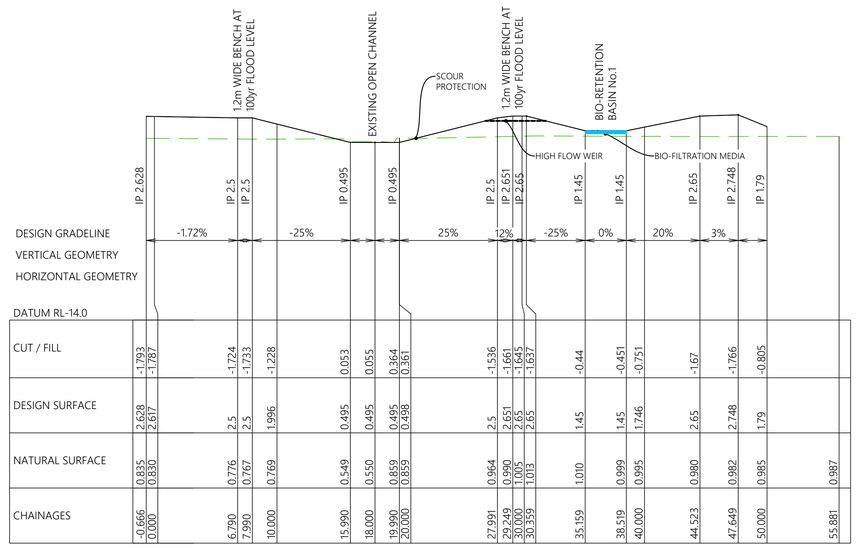
DRAWING TITLE: STORMWATER MANAGEMENT PLAN - SHEET 1

DWG No: D37 | SHEET: 37 OF 45 | REV: 0

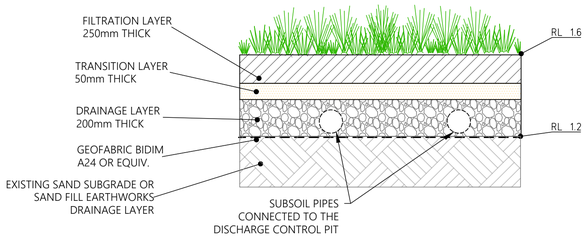




TYPICAL - BIO-RETENTION DISCHARGE CONTROL PIT
N.T.S



SECTION - C



TYPICAL BIO-FILTRATION ZONE PROFILE (400mm THICK)
N.T.S

FILTER MEDIA - GENERAL DESCRIPTION

THE MATERIAL CAN BE OF SILICEOUS OR CALCAREOUS ORIGIN.
THE MATERIAL MUST BE TESTED FOR DESIRED HYDRAULIC CONDUCTIVITY USING THE AUSTRALIAN STANDARD (AS4419-2003).

REFER TYPICAL SPECIFICATION BELOW.

SPECIFICATION FOR BIORETENTION FILTER MEDIA:

BIORETENTION FILTER MEDIA SHALL COMPRISE OF TWO LAYERS

1. THE FILTRATION LAYER IS TO BE 250mm THICK AND CONFORM TO THE FOLLOWING SOIL SPECIFICATIONS.

pH	5.5 - 7.5	(pH 1:5 IN WATER)
ELECTRICAL CONDUCTIVITY (dS/cm)	< 1.2	
TOTAL SALTS (ppm)	< 600	
CLAY	2 - 4%	(<0.002mm)
SILT	4 - 8%	(0.002 - 0.05mm)
VERY FINE SAND	5 - 10%	(0.05 - 0.15mm)
FINE SAND	10 - 25%	(0.15 - 0.25mm)
MEDIUM TO COARSE SAND	60 - 70%	(0.25 - 1.0mm)
COARSE SAND	7 - 10%	(1.0 - 2.0mm)
FINE GRAVEL	< 3%	(2.0 - 3.4mm)
HYDRAULIC CONDUCTIVITY (mm/hr)	200 (+/- 20%)	

THE FILTRATION LAYER WILL BE AMELIORATED TO PROVIDE ADEQUATE INITIAL GROWTH. THIS LAYER IS TO CONSIST OF PREMIXED ZEOLITE 20% BY VOLUME PRIOR TO DELIVERY AND PLACEMENT. PRIOR TO PLANTING THE FOLLOWING SHALL BE PLACED INTO THE TOP 75MM.

AGRICULTURAL LIME - RATE TO BE DETERMINED DEPENDING ON SELECTED FILTER MATERIAL

	10-30 kg/100sq.m INDICATIVE RANGE
SUPERPHOSPHATE AT	2 kg/100sq.m
MAGNESIUM SULPHATE AT	3 kg/100sq.m
POTASSIUM SULPHATE AT	2 kg/sq.m
TRACE ELEMENTS MIX	1 kg/100sq.m
FERTILISER NPK16.4.14 AT	4 kg/100sq.m

2. TRANSITION LAYER IS TO BE 50mm THICK WELL GRADED COARSE SAND

3. THE DRAINAGE LAYER IS TO BE 200mm THICK WITH 5-7mm WASHED AGGREGATE

* THERE SHOULD BE NO GEOFABRIC INTERFACE BETWEEN THE TWO LAYERS, ONLY AT THE INTERFACE WITH THE SAND SUBGRADE

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ARCHITECTURAL INFORMATION FOR CLUB HOUSE SUPPLIED BY MARK SHAPIRO ARCHITECTS DRAWING NUMBER DA1002WIP REV 2

LEGEND

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- INTERNAL LOT BOUNDARY
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- CHANNEL TOP OF BANK
- CHANNEL CENTRE LINE
- PROPOSED STORMWATER DRAINAGE
- RETAINING WALL
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DESIGNED: T.RYDEN | DATE: SEPT 2022
DRAWN: A.SCHMID | SCALE: AS SHOWN
SURVEYING: | SHEET SIZE: A1

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DEVELOPMENT APPLICATION CIVIL WORKS PLANS

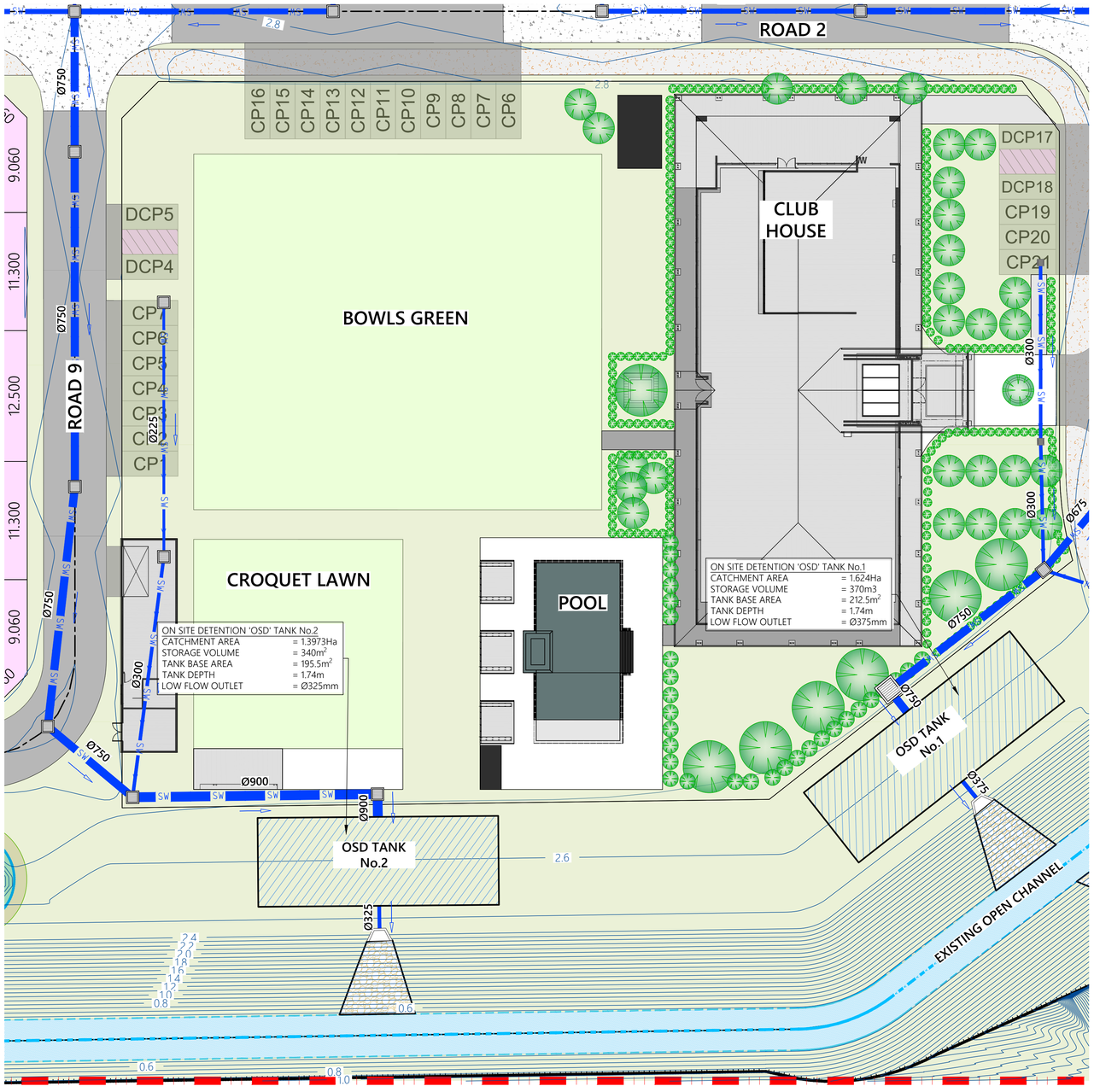
CLIFTON YAMBA

PROJECT: PROPOSED MHE DEVELOPMENT
110 & 120 CARRS DRIVE
YAMBA, NSW 2464
LOT 2 DP733507 & LOT 32 DP128863

DA CIVIL DRAWING

DRAWING TITLE: STORMWATER MANAGEMENT PLAN - SHEET 2

DWG No: D38 | SHEET: 38 OF 45 | REV: 0



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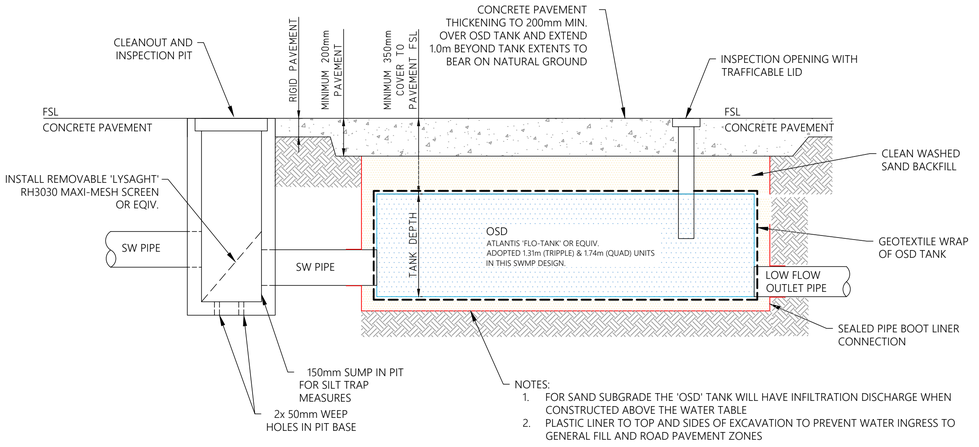
Horizontal Scale 1:250 (A1)
1:500 (A3)



TYPICAL DETAIL - SECTION VIEW
OSD ATLANTIS 'FLO-TANK'
N.T.S

PLANS TO BE PRINTED IN COLOUR

PRELIMINARY PLANS FOR DA PURPOSES ONLY NOT FOR CONSTRUCTION

ARCHITECTURAL INFORMATION FOR CLUB HOUSE SUPPLIED BY MARK SHAPIRO ARCHITECTS DRAWING NUMBER DA1002WIP REV 2

LEGEND

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DESIGNED: T.RYDEN | DATE: SEPT 2022
DRAWN: A.SCHMID | SCALE: AS SHOWN
SURVEYING: | SHEET SIZE: A1

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DEVELOPMENT APPLICATION CIVIL WORKS PLANS

CLIFTON YAMBA

PROJECT: PROPOSED MHE DEVELOPMENT
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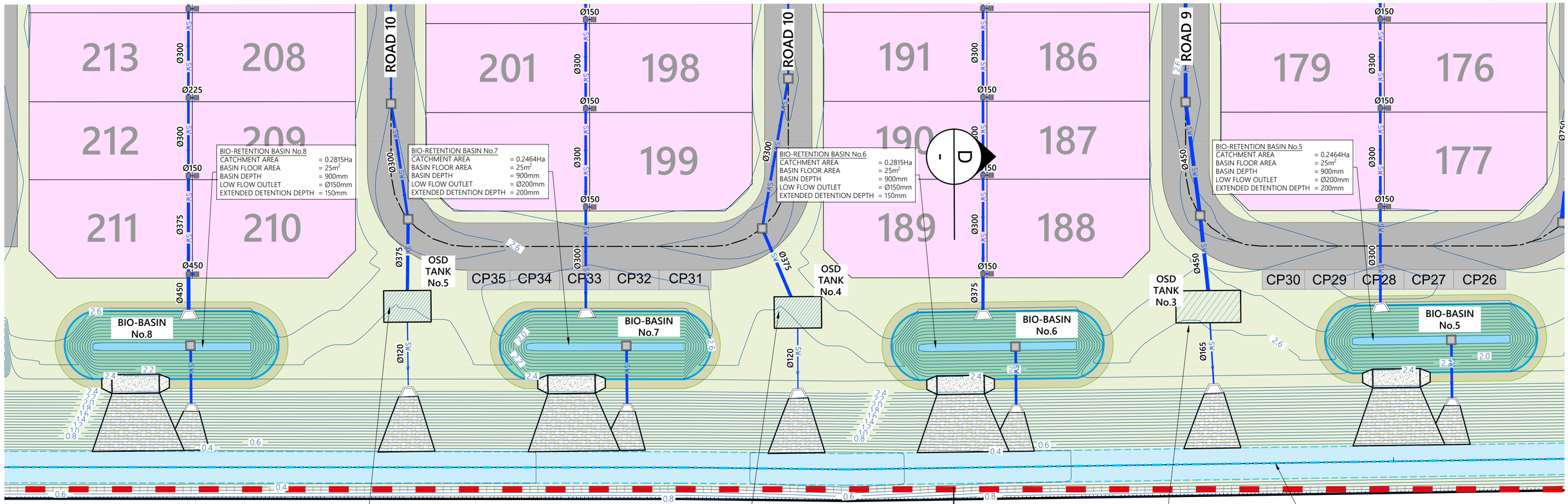
YAMBA, NSW 2464
LOT 2 DP733507 & LOT 32 DP128863

DA CIVIL DRAWING

DRAWING TITLE: STORMWATER MANAGEMENT PLAN - SHEET 3

DWG No: D39 | SHEET: 39 OF 45 | REV: 0



5 0 5 10 15

Horizontal Scale 1:250 (A1)
1:500 (A3)

ON SITE DETENTION 'OSD' TANK No.5

CATCHMENT AREA	= 0.973Ha
STORAGE VOLUME	= 31.4m³
TANK BASE AREA	= 24m²
TANK DEPTH	= 1.31m
LOW FLOW OUTLET	= Ø100mm

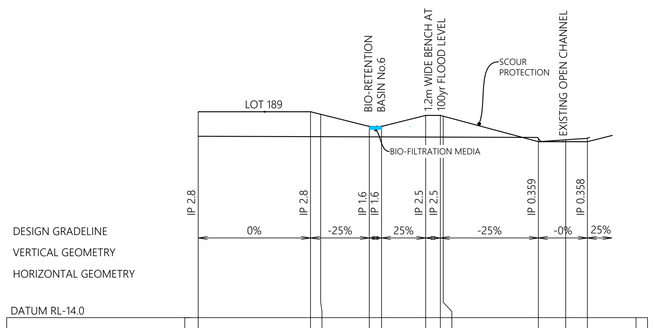
ON SITE DETENTION 'OSD' TANK No.4

CATCHMENT AREA	= 0.099Ha
STORAGE VOLUME	= 31.4m³
TANK BASE AREA	= 24m²
TANK DEPTH	= 1.31m
LOW FLOW OUTLET	= Ø100mm

ON SITE DETENTION 'OSD' TANK No.3

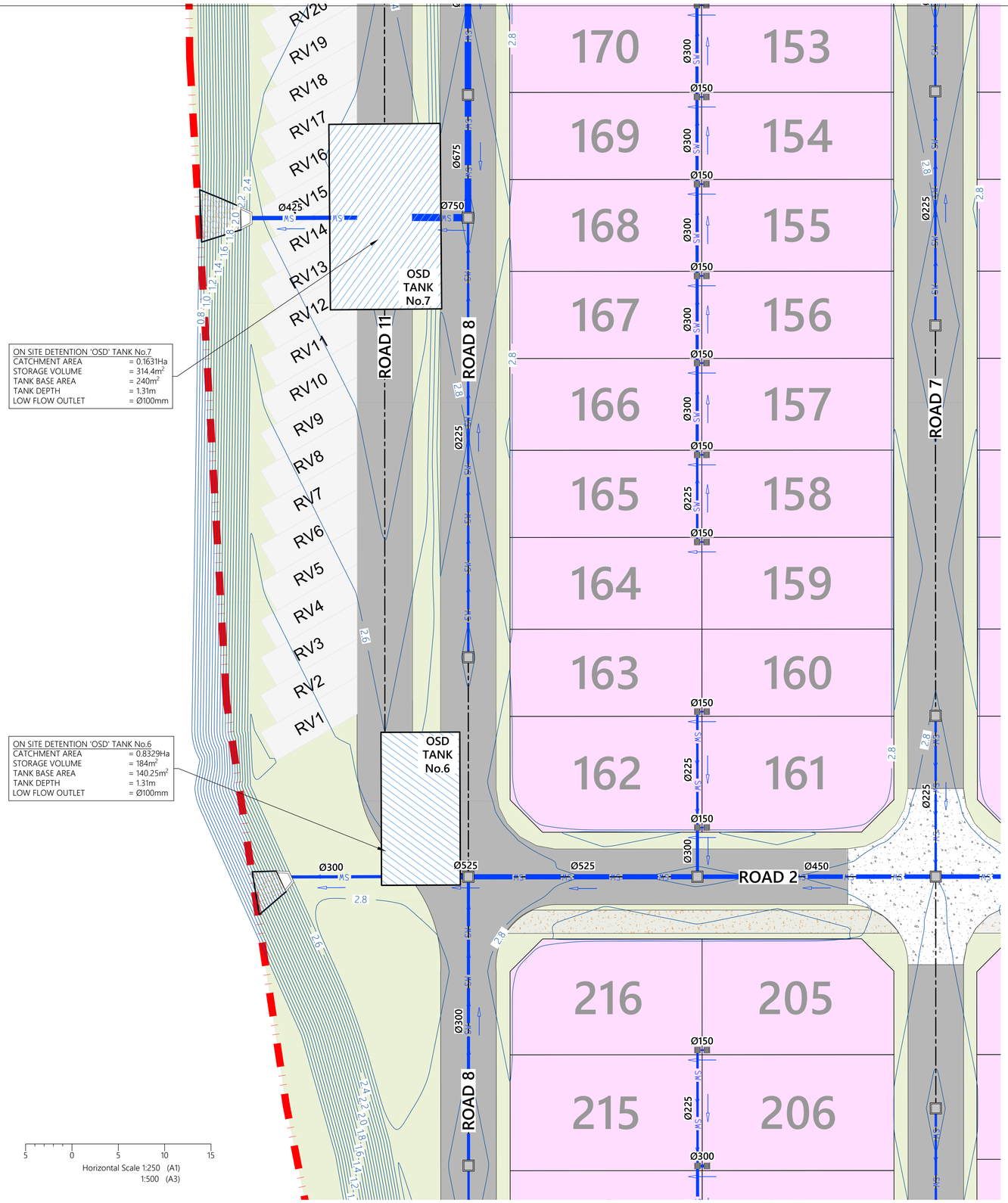
CATCHMENT AREA	= 0.2903Ha
STORAGE VOLUME	= 58.4m³
TANK BASE AREA	= 33.5m²
TANK DEPTH	= 1.74m
LOW FLOW OUTLET	= Ø100mm

EXISTING OPEN CHANNEL IS TO BE CLEANED OUT AND TO REMAIN IN CURRENT LOCATION, DEVLOPMENT STORMWATER TO OUTLET INTO THIS CHANNEL WITH WATER QUALITY AND SCOUR PROTECTION MEASURES AS NOTED IN THIS STORMWATER MANAGEMENT PLAN.



DATUM RL-14.0

| | | |



LEGEND

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PLANS TO BE PRINTED IN COLOUR

PRELIMINARY PLANS FOR DA PURPOSES ONLY NOT FOR CONSTRUCTION

ARCHITECTURAL INFORMATION FOR CLUB HOUSE SUPPLIED BY MARK SHAPIRO ARCHITECTS DRAWING NUMBER DA1002WIP REV 2

ISSUE	DESCRIPTION	DATE
0	ISSUED FOR DEVELOPMENT APPLICATION	08.09.2022

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DESIGNED: T.RYDEN | DATE: SEPT 2022
DRAWN: A.SCHMID | SCALE: AS SHOWN
SURVEYING: | SHEET SIZE: A1

MDE Manage Design Engineer

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DA CIVIL DRAWING

DRAWING TITLE: STORMWATER MANAGEMENT PLAN - SHEET 5

DWG No: D41 | SHEET: 41 OF 45 | REV: 0

10 5 0 10 20 30 40
Horizontal Scale 1:600 (A1)
1:1200 (A3)

SEWER AND WATER PLAN
SCALE 1:600

NOTE: DA CONCEPT DESIGN PHASE
SEWER AND WATERMAIN PIPE SIZES, PUMP & CHAMBER SIZES ARE PRELIMINARY ONLY AND SUBJECT TO DETAILED DESIGN

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LEGEND

- DEVELOPMENT BOUNDARY
- INTERNAL LOT BOUNDARY
- BIO - BASIN TOP
- CHANNEL TOP OF BANK
- CHANNEL CENTRE LINE
- DESIGN CONTOURS
- PROPOSED STORMWATER DRAINAGE
- WATERMAIN Ø100mm
- GRAVITY SEWER Ø150mm
- LOW PRESSURE SEWER
- SEWER HOUSE CONNECTION
- WATER MAIN TEE
- WATER METER
- STORMWATER DRAINAGE PIT
- HEADWALL
- DUAL PILLAR HYDRANT
- SLUICE VALVE
- LOW PRESSURE SEWER ISOLATION VALVE
- LOW PRESSURE SEWER FLOW METER
- LOW PRESSURE SEWER BOUNDARY KIT
- AQUATEC LOW PRESSURE SEWER CHAMBER
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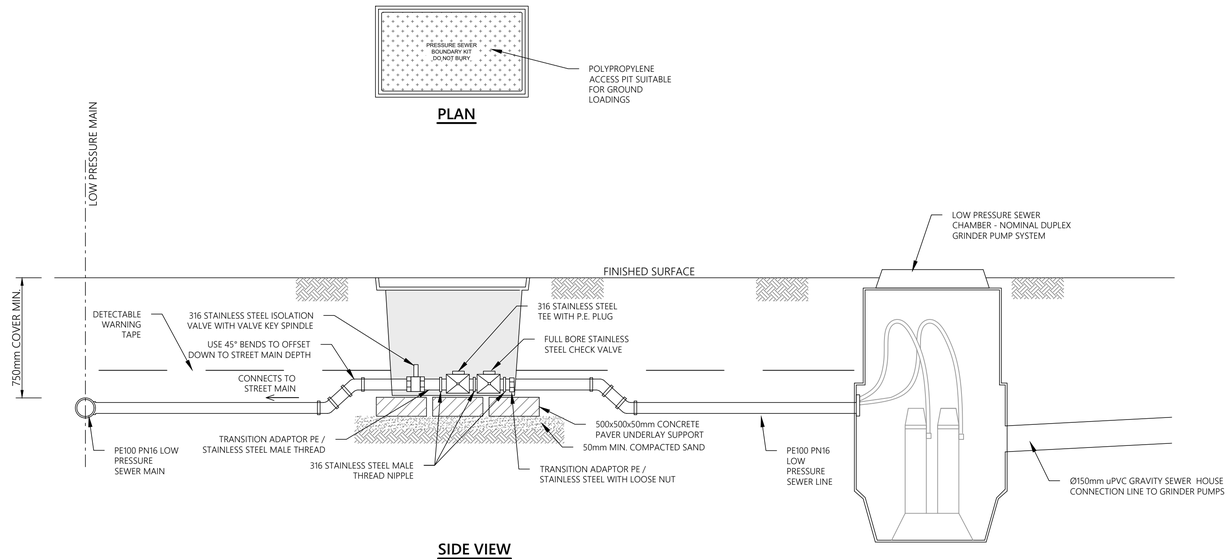
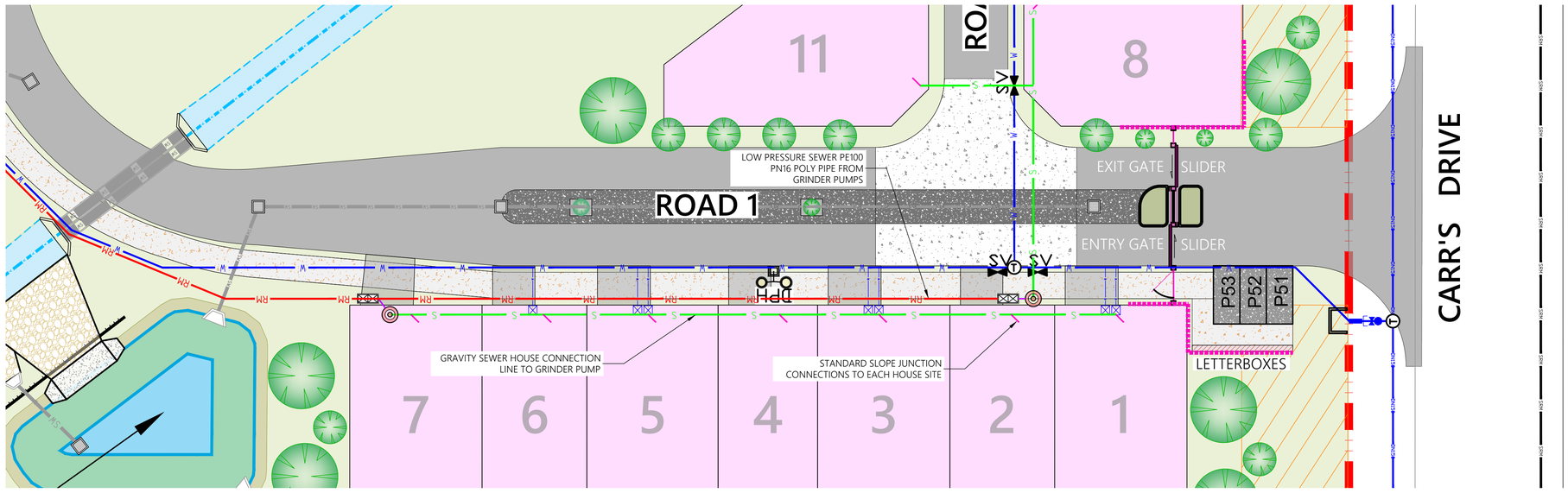
DA CIVIL DRAWING

DRAWING TITLE: SEWER AND WATER RETICULATION PLAN

DWG No: D42 | SHEET: 42 OF 45 | REV: 0





5 0 5 10 15
Horizontal Scale 1:250 (A1)
1:500 (A3)

TYPICAL SEWER CONNECTION LAYOUT
SCALE 1:250

NOTE: DA CONCEPT DESIGN PHASE
SEWER AND WATERMAIN PIPE SIZES, PUMP & CHAMBER SIZES ARE PRELIMINARY ONLY AND SUBJECT TO DETAILED DESIGN

LEGEND

- DEVELOPMENT BOUNDARY
- INTERNAL LOT BOUNDARY
- BIO - BASIN TOP
- CHANNEL TOP OF BANK
- CHANNEL CENTRE LINE
- DESIGN CONTOURS
- PROPOSED STORMWATER DRAINAGE
- WATERMAIN Ø100mm
- GRAVITY SEWER Ø150mm
- LOW PRESSURE SEWER
- RETAINING WALL
- STORMWATER DRAINAGE PIT
- HEADWALL
- LOW PRESSURE SEWER ISOLATION VALVE
- LOW PRESSURE SEWER FLOW METER
- LOW PRESSURE SEWER BOUNDARY KIT
- AQUATEC LOW PRESSURE SEWER CHAMBER
- SEWER HOUSE CONNECTION
- WATER MAIN TEE
- WATER METER
- DUAL PILLAR HYDRANT
- SLUICE VALVE
- MHE BOUNDARY SETBACK 10m WIDE 'NO BUILD ZONE'
- VISITOR AND RECREATIONAL VEHICLE PARKING
- SCOUR PROTECTION
- BIO-BASIN BREM
- BIO-BASIN GRASSED AREA
- BIO-BASIN WEIR
- BIO-BASIN FLOOR
- GRASSED AREA
- PROPOSED MHE ALLOTMENT
- NEW INTERNAL CONCRETE ROAD PAVEMENT
- NEW INTERNAL CONCRETE INTERSECTION TREATMENTS & DRIVEWAYS
- NEW 2.5m WIDE SHARED PATH WITHIN SITE BOUNDARY
- MHE BOUNDARY SETBACK 3m WIDE 'NO BUILD ZONE'

PLANS TO BE PRINTED IN COLOUR

PRELIMINARY PLANS FOR DA PURPOSES ONLY NOT FOR CONSTRUCTION

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DEVELOPMENT APPLICATION CIVIL WORKS PLANS

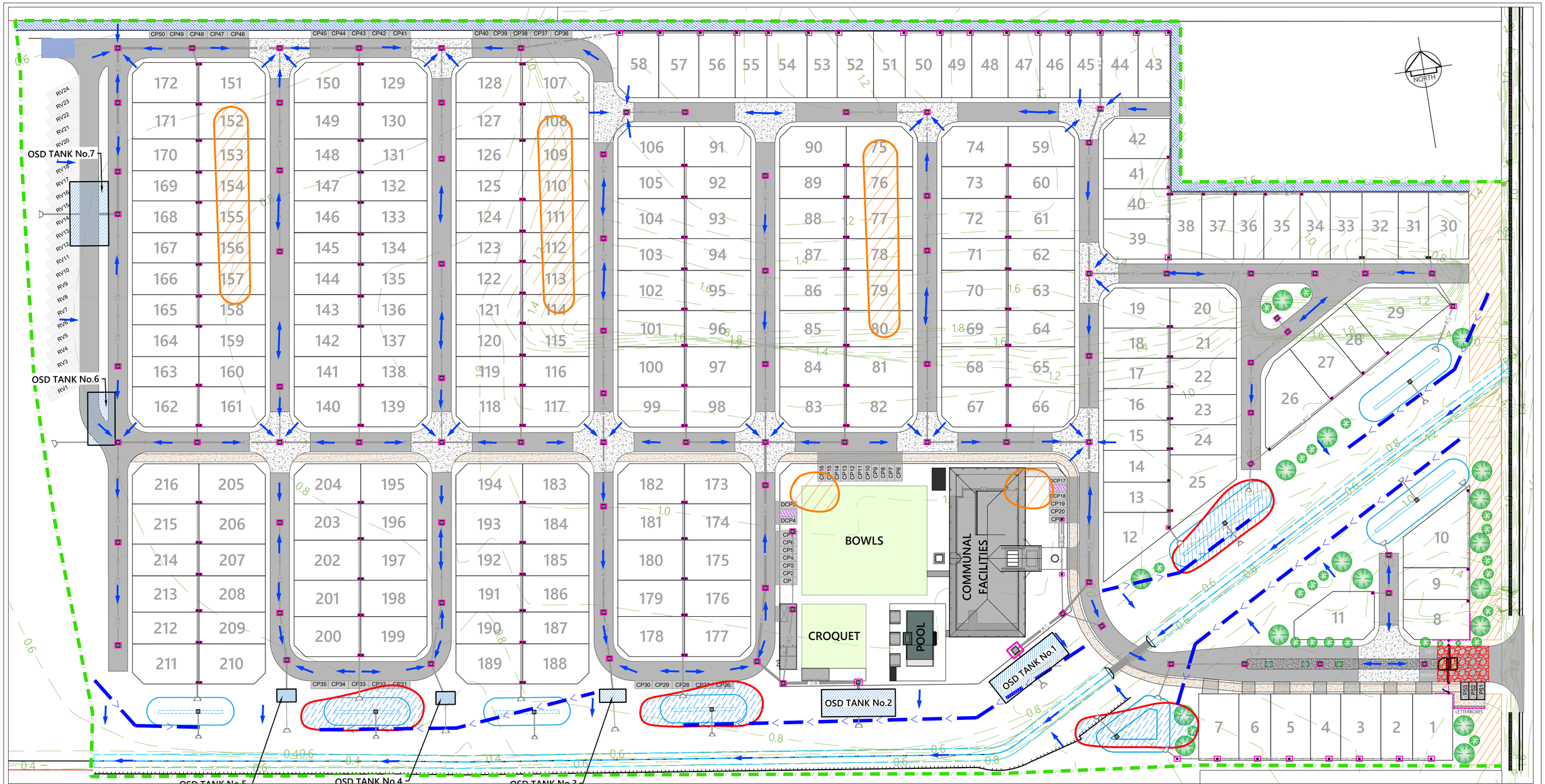
CLIFTON YAMBA

PROJECT: PROPOSED MHE DEVELOPMENT
110 & 120 CARRS DRIVE
YAMBA, NSW 2464
LOT 2 DP733507 & LOT 32 DP128863

DA CIVIL DRAWING

DRAWING TITLE: SEWER AND WATER RETICULATION DETAIL

DWG No: D43 | SHEET: 43 OF 45 | REV: 0



10 5 0 10 20 30 40
Horizontal Scale 1:600 (A1)
1:1200 (A3)

LEGEND

- GEOTEXTILE INLET FILTER FOR FIELD INLET PIT
- SEDIMENT FENCE - REFER TO SED 6-8 & 01.01 DETAILS SHEET D45
- HAY BALE SEDIMENT TRAP
- TOPSOIL WINDROW & DESIGN SWALE
- FLOW DIRECTION
- SUGGESTED STOCKPILE SITE - REFER TO SED 4-1 ON DETAILS SHEET D45
- STABILISED SITE ACCESS - REFER TO SED 09.01 ON DETAILS SHEET D45
- TEMPORARY SEDIMENT BASIN

EROSION & SEDIMENTATION CONTROL PLAN

SCALE 1:600

LEGEND

- INTERNAL LOT BOUNDARY
- BIO - BASIN TOP
- CHANNEL TOP OF BANK
- CHANNEL CENTRE LINE
- PROPOSED STORMWATER DRAINAGE
- RETAINING WALL
- NATURAL SURFACE CONTOURS
- STORMWATER DRAINAGE PIT
- HEADWALL
- VISITOR AND RECREATIONAL VEHICLE PARKING
- NEW INTERNAL CONCRETE ROAD PAVEMENT
- NEW INTERNAL CONCRETE INTERSECTION TREATMENTS & DRIVEWAYS
- NEW 2.5m WIDE SHARED PATH WITHIN SITE BOUNDARY
- MHE BOUNDARY SETBACK 3m WIDE 'NO BUILD ZONE'
- MHE BOUNDARY SETBACK 10m WIDE 'NO BUILD ZONE'

EROSION & SEDIMENT CONTROL NOTES:

1. SOIL STOCKPILES TO BE NO HIGHER THAN 2.0 METRES (1.0m PREFERABLE) IN LOCATIONS DIRECTED BY THE SUPERINTENDENT.
2. CONSTRUCT SEDIMENT FENCE AT LOCATIONS SHOWN AND AS DIRECTED BY SITE SUPERINTENDENT. SEDIMENT FENCE OR EQUIVALENT TO BE CONSTRUCTED AND MAINTAINED IN ACCORDANCE WITH COUNCILS ENGINEERING REQUIREMENTS.
3. UPON COMPLETION OF FINAL EARTHWORKS OR AFTER WRITTEN DIRECTION OF COUNCIL, IMMEDIATE SOIL CONSERVATION TREATMENTS SHALL BE APPLIED SO AS TO RENDER AREAS THAT HAVE BEEN DISTURBED, EROSION PROOF IN 14 DAYS.
4. ALL PERIMETER AND SILTATION CONTROL MEASURES ARE TO BE THE FIRST STEP IN CLEARING OR EARTHWORKS.
6. TEMPORARY SEDIMENTATION BASIN TO BE FLOCCULATED AND PUMPED OUT AFTER EVERY STORM EVENT. ALL FLOCCULATED SEDIMENT TO BE REMOVED FROM THE BASIN AT THE CONCLUSION OF THE CONTRACT PERIOD.
7. ALL TEMPORARY EARTH BERMS AND DIVERSION BANKS ARE TO BE TRACK ROLLED AND SEEDED OR MULCHED FOR TEMPORARY VEGETATION COVER AS SOON AS THEY HAVE BEEN FORMED.
8. PROVIDE FILTER SAUSAGE KERB INLET SEDIMENT TRAPS OR EQUIVALENT (TO THE SATISFACTION OF THE SUPERINTENDENT) TO ALL CONSTRUCTED INLET PITS AND STORMWATER PIPING.
9. ALL TOPSOIL IS TO BE STOCKPILED ON SITE FOR RE-USE (AWAY FROM TREES AND DRAINAGE LINES). MEASURES SHALL BE APPLIED TO PREVENT EROSION FROM THE STOCKPILES.
10. SOIL/GRASS - TOPSOIL, 100mm THICK SHALL BE APPLIED TO ALL DISTURBED AREAS. ALL REMAINING EXPOSED TOPSOIL SHALL BE SEEDED IMMEDIATELY UPON COMPLETION OF THE SOIL SPREADING OPERATION.

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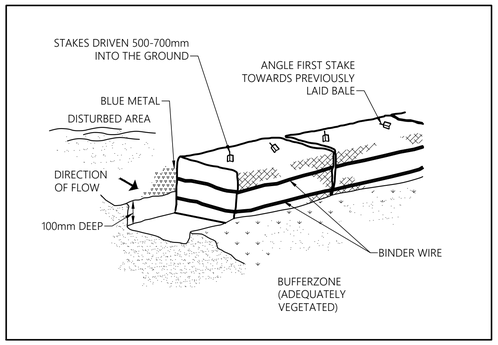
CLIFTON YAMBA

PROJECT: PROPOSED MHE DEVELOPMENT
110 & 120 CARRS DRIVE
YAMBA, NSW 2464
LOT 2 DP733507 & LOT 32 DP128863

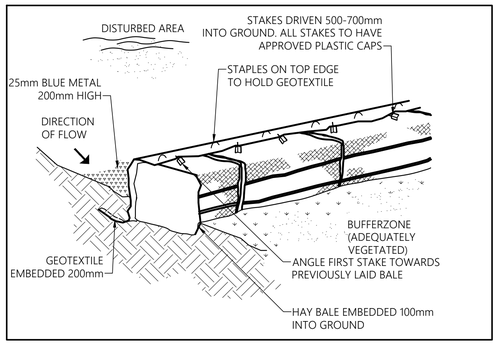
DA CIVIL DRAWING

DRAWING TITLE: EROSION & SEDIMENTATION CONTROL PLAN

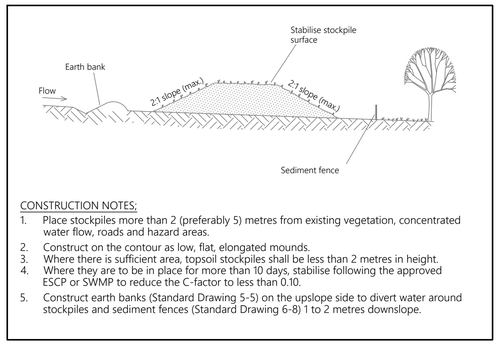
DWG No: D44 | SHEET: 44 OF 45 | REV: 0



SED_02.01: HAY BALE BARRIERS



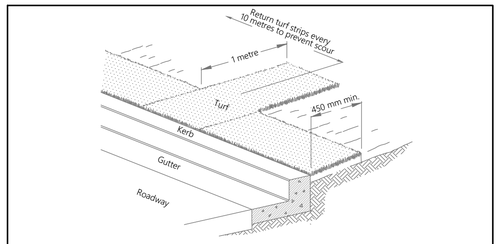
SED_02.02: HAY BALE & GEOTEXTILE FENCE



CONSTRUCTION NOTES:

1. Place stockpiles more than 2 (preferably 5) metres from existing vegetation, concentrated water flow, roads and hazard areas.
2. Construct on the contour as low, flat, elongated mounds.
3. Where there is sufficient area, topsoil stockpiles shall be less than 2 metres in height.
4. Where they are to be in place for more than 10 days, stabilise following the approved ESCP or SWMP to reduce the C-factor to less than 0.10.
5. Construct earth banks (Standard Drawing 5-5) on the upslope side to divert water around stockpiles and sediment fences (Standard Drawing 6-8) 1 to 2 metres downslope.

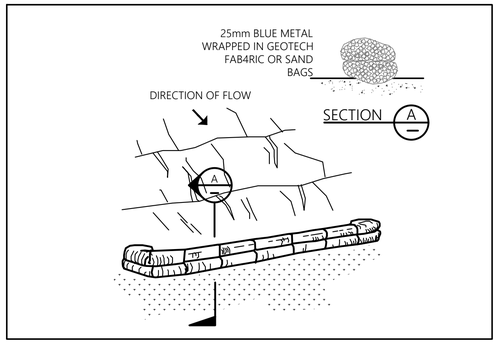
SED_4-1 STOCKPILES



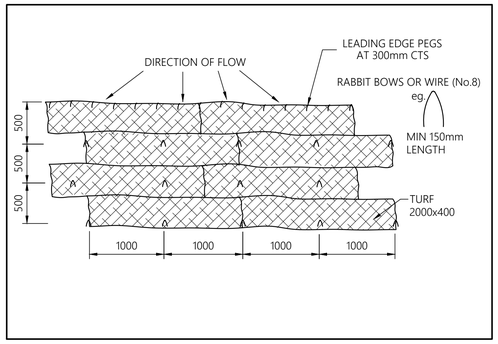
CONSTRUCTION NOTES:

1. Install a 450 mm minimum wide roll of turf on the footpath next to the kerb and at the same level as the top of the kerb.
2. Lay 1.4 metre long turf strips normal to the kerb every 10 metres.
3. Rehabilitate disturbed soil behind the turf strip following the ESCP/SWMP.

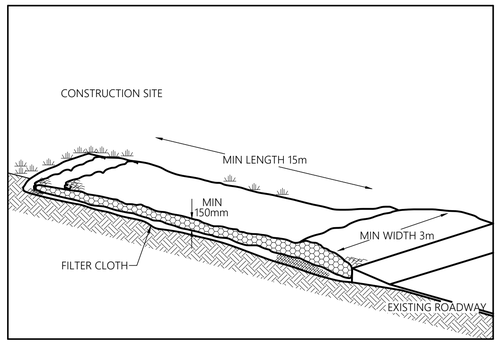
SED_6-13 KERBSIDE TURF STRIP



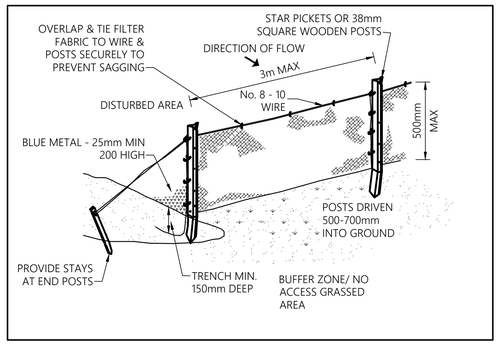
SED_03.01: ROCK GROYNE OR SAUSAGE



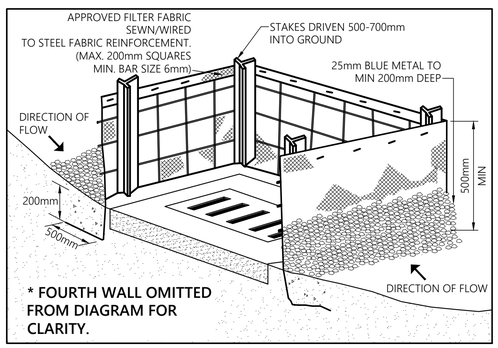
SED_07.02: TURF LAYING CONFIGURATION



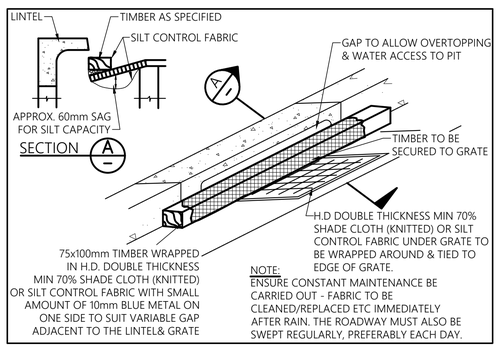
SED_09.01: STABILISED CONSTRUCTION ENTRANCE DETAILS



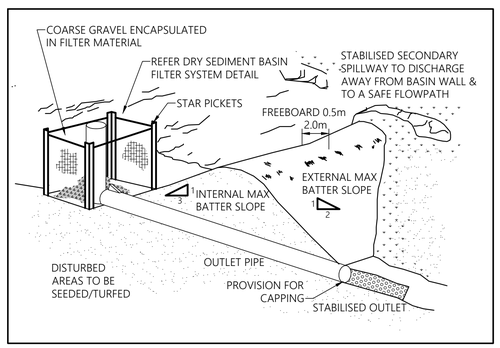
SED_01.01: SILT FENCE - TYPE 1



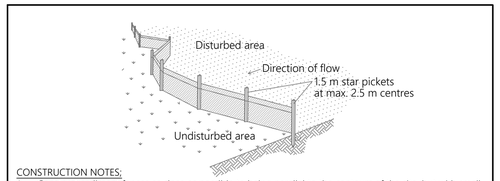
SED_11.05: STORM INLET SEDIMENT TRAP



SED_11.03: KERB INLET CONTROL



SED_10.01: SEDIMENT BASIN OUTLET



CONSTRUCTION NOTES:

1. Construct sediment fences as close as possible to being parallel to the contours of the site, but with small returns as shown in the drawing to limit the catchment area of any one section. The catchment area should be small enough to limit water flow if concentrated at one point to 50 litres per second in the design storm event, usually the 10-year event.
2. Cut a 150-mm deep trench along the upslope line of the fence for the bottom of the fabric to be entrenched.
3. Drive 1.5 metre long star pickets into ground at 2.5 metre intervals (max) at the downslope edge of the trench. Ensure any star pickets are fitted with safety caps.
4. Fix self-supporting geotextile to the upslope side of the posts ensuring it goes to the base of the trench. Fix the geotextile with wire ties or as recommended by the manufacturer. Only use geotextile specifically produced for sediment fencing. The use of shade cloth for this purpose is not satisfactory.
5. Join sections of fabric at a support post with a 150-mm overlap.
6. Backfill the trench over the base of the fabric and compact it thoroughly over the geotextile.

SED_6-8 SEDIMENT FENCE NOTES

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DA CIVIL DRAWING

DRAWING TITLE: EROSION & SEDIMENTATION CONTROL DETAIL

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(PO Box 44)
Lennox Head NSW 2478
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APPENDIX E – WEST YAMBA SEWER AND WATER DEVELOPMENT SERVICING PLANS

Clarence Valley Council

West Yamba
Development Servicing Plans
Water Supply Services

October 2020

Executive Summary

This Development Servicing Plan (DSP) covers water supply developer charges in regard to the West Yamba Urban Release Area (WYURA) served by Clarence Valley Council (CVC).

This DSP document has been prepared in accordance with the *2016 Developer Charges Guidelines for Water Supply, Sewerage and Stormwater* (2016) issued by the NSW Department of Primary Industries Office of Water (NSW DPI Office of Water), pursuant to section 306 (3) of the *Water Management Act, 2000*.

The area covered by this DSP and the existing and proposed works serving the area are shown in Section 12.

The timing and expenditure for works servicing the areas covered in this DSP are discussed in Section 4.

Levels of service to be provided in the DSP area are shown summarised in Section 5.

The water supply developer charge for the area covered by this DSP have been determined as summarised in Table E-1 below:

Table E-1 Water Supply Developer Charges

DSP Name	Calculated Developer Charge ($/ET)	Adopted Developer Charge ($/ET)	Cross-subsidy	Resulting Increase in the Typical Residential Bill ($)
West Yamba Water Supply Scheme	$5,679	$5,679	$0	$0

Developer charges relating to this DSP will be reviewed after a period of 4 to 8 years, concurrently with the review of the Clarence Valley Council Development Servicing Plan – Water Supply Services, GHD, 2016.

In the period between any review developer charges will be indexed annually on the basis of movements on the Consumer Price Index (CPI) for Sydney, excluding the impact of Goods and Services Tax (GST).

The Developer shall be responsible for the full cost of the design and construction of reticulation works within subdivisions. The design and construction of the works shall be in accordance with Council's development specifications for water supply services.

Background information containing all the critical data including calculation models behind this DSP is available from Council's offices by appointment. To review these documents, please contact Council on (02) 6643 0200.

This DSP should be read in conjunction with the adopted WYURA Water Supply and Sewer Servicing Strategy, by HunterH2O, July 2019.

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1. Introduction

Section 64 of the *Local Government Act, 1993* enables a local government Council to levy developer charges for water supply, sewerage and stormwater. This derives from a cross-reference in that Act to Section 306 of the *Water Management Act 2000*.

A Development Servicing Plan (DSP) details the water supply developer charges to be levied on development areas using a local utility's water supply infrastructure.

This DSP covers *water supply* developer charges for the development of the West Yamba Urban Release Area (WYURA)

This DSP has been prepared in accordance with the *2016 Developer Charges Guidelines for Water Supply, Sewerage and Stormwater* (2016) issued by the Minister for Lands and Water, pursuant to section 306 (3) of the *Water Management Act, 2000*.

This DSP document supersedes previous water supply DSPs and requirements related to water supply developer charges for the areas covered by this DSP adopted by the Council prior to the adoption of this DSP. This DSP document takes precedence over any of Council's codes or policies where there are any inconsistencies relating to the water supply developer charges.

1.1 Purpose of the Plan

The purpose of this DSP is to set out the contributions payable by developments to the authority responsible for providing infrastructure and other facilities.

In the development of this DSP and calculation of the contributions payable, the following aims and objectives are taken into consideration:

- Ensure that adequate water supply infrastructure, and in specific areas recycled water infrastructure, is provided for as part of new developments
- Provide a comprehensive strategy for the assessment, collection, expenditure accounting and review of contributions on an equitable basis
- Ensure that the existing community is not burdened by the provision of water supply infrastructure as a result of future development
- Enable Council to be both publicly and financially accountable in its assessment and administration of the DSP.

1.2 Disclaimer

This report has been prepared by GHD for Clarence Valley Council ('the Council') and may only be used and relied on by Clarence Valley Council for the purpose agreed between GHD and the Clarence Valley Council as set out in Section 1.1 of this report.

GHD otherwise disclaims responsibility to any person other than Clarence Valley Council arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD 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. GHD 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 GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

2. Administration

2.1 DSP Name and Area Covered

This DSP is known as *West Yamba Development Servicing Plan – Water Supply Services.*

It is noted that previously West Yamba was included in the CVC Development Servicing Plan – Water Supply Services (2017), however the 2017 DSP did not make revision for the specific infrastructure requirements in West Yamba. West Yamba therefore requires its own DSP. The area to which This DSP Applies is shown in Figure 12-1.

DSP Name	West Yamba Water Supply Scheme
DSP Area	The area covered by this DSP and a schematic of the water supply system is shown in Figure 12-1.
DSP Boundaries	The DSP area boundary is defined as the area included in the The West Yamba Urban Release Area (WYURA).

2.2 Date of DSP Commencement

Council approved this DSP on [28th July 2020] for public exhibition. The DSP will come into effect following adoption by Council after the public exhibition period. Once adopted, the DSP will be forwarded to the NSW Office of Water (NOW) for registration.

The charges in this Plan will apply to all Development Applications determined on or after the date Council resolves the Plan to commence.

2.3 Payment of Developer Charges

Developer charges will be determined and levied in accordance with the provisions of the current DSP at the time of considering an application for a compliance certificate under section 305 of the *Water Management Act 2000*, a construction certificate under section 109 of the *Environmental Planning and Assessment Act 1979* or at the time of issuing a notice or other form of written advice, e.g. Section 5.3, 5.5 or 5A.2 of the *State Environmental Planning Policy (Exempt and Complying Development Codes)* 2008..

A time limit for payment of developer charges must be included in any developer charge determination or advice provided to developers.

Council may elect to determine developer charges at the time of considering a development application. Such a determination would accompany the development consent, and must specify a time limit, subject to the development consent remaining valid, no further adjustment to the developer charges may be made at the time of considering an application for a Compliance Certificate. If the developer charges have not been paid in full within the specified time limit, the developer charges will be determined by the Local Water Utility (LWU) at the time of considering an application for a Compliance Certificate, using the LWU's then current DSP document.

It is noted that section 64 developer charges do not apply for developments serviced by a licenced operator under the *Water Industry Competition Act 2006* (WICA) or *Water Industry Competition Amendment (Review) Act 2014*. The capital cost of the infrastructure serving such developments would be recovered through annual access and usage charges.

2.4 Developer Charges for Crown Developments

Under section 306 (4) and (5), of the *Water Management Act 2000*, the Minister for Planning and Infrastructure may make a determination in respect of developer charges levied on Crown developments.

Crown developments for essential community services (education, health, community services, and law and order) are exempt from general developer charges. Council can only charge crown developments for the portion of cost associated with direct connection costs relating to the development.

2.5 Refunds

If this DSP is revised to correct a major error in the calculation, Council will provide a refund to developers for any resulting over-payments.

2.6 Developments outside the DSP Area

When considering development outside the boundaries of this DSP, Council may either:

- Apply the developer charges adopted for the DSP to the new development; or
- Prepare a new DSP for the new development.

Such a development is likely to require the construction of specific assets. Refer to Section 2.7 for discussion on funding of out-of-sequence development.

2.7 Out–of-Sequence Development

Council has assumed infrastructure development will occur in accordance with the sequence of development defined in the WYURA Water Supply and Sewer Servicing Strategy, prepared by HunterH2O, July 2019. If a Developer wishes to proceed with a development not in the same sequence, i.e. before essential assets are in place, the Council may require and/or approve construction of shared assets ahead of time provided that there are no other constraints to the development.

In such cases the assets will be designed and constructed by the Developer in accordance with the requirements of this DSP and the HunterH2O Servicing Strategy, and the full capital cost would initially be met by this Developer. If the asset funded by this Developer will serve other future development, the Developer shall receive a discount on their developer charges. The Council and the Developer must enter into an agreement stating how the Developer will be reimbursed for shared infrastructure.

2.8 Consultation and Dispute Resolution

A Developer who is dissatisfied with how the Council has calculated a developer charge has a right of appeal pursuant to the *2016 Developer Charges Guidelines for Water Supply, Sewerage and Stormwater* (NSW DPI Office of Water, 2016). The following process must be followed:

1. A Developer who is dissatisfied with how Council has calculated the developer charge for a particular development may lodge a formal complaint to the Council.
2. The CVC General Manager is to review the complaint or cause it to be reviewed.
3. CVC is not a member of the Energy and Water Ombudsman (EWON). If the developer is not satisfied with the General Manager's response, the matter may be referred to the Ombudsman.

4. If the complaint is on technical matters or issues of interpretation of *2016 Developer Charges Guidelines for Water Supply, Sewerage and Stormwater* (NSW DPI Office of Water, 2016), the Developer may refer the complaint to NOW. NOW will respond to the complaint. Where warranted, NOW may refer the matter to the expert technical panel, which includes representatives from NOW, Independent Pricing and Regulatory Tribunal (IPART), the NSW Water Directorate, local water utilities and the development industry.
5. The Developer, if still dissatisfied, may request that the matter be reviewed by way of arbitration by an arbitrator, who is to be appointed by agreement between the Developer and the Council (The *Commercial Arbitration Act 1984* applies to any such arbitration).
6. The decision of the arbitrator is binding on both the Developer and Council.
7. Costs of the arbitration are to be borne equally by the Developer and Council.

3. Demographic and Land Use Planning Information

3.1 Growth Projections

Growth projections for population and number of water Equivalent Tenements (ETs) are shown in Table 3-1 below. These projections are from the present year (2021) to 2050 (30 years).

ET calculations are included in Section 13.

Table 3-1 Growth Projections

Time Period	Cumulative Equivalent Tenements (ETs)	Number of New ETs/year
2020/21	0	0
2021/22	53	53
2022/23	106	53
2023/24	159	53
2024/25	212	53
2025/26	265	53
2026/27	318	53
2027/28	371	53
2028/29	424	53
2029/30	477	53
2030/31	530	53
2031/32	583	53
2032/33	637	54
2033/34	691	54
2034/35	745	54
2035/36	799	54
2036/37	853	54
2037/38	907	54
2038/39	961	54
2039/40	1,015	54
2040/41	1,069	54
2041/42	1,123	54
2042/43	1,177	54
2043/44	1,231	54
2044/45	1,285	54
2045/46	1,339	54
2046/47	1,339	0
2047/48	1,339	0
2048/49	1,339	0
2049/50	1,339	0
2050/51	1,339	0

3.2 Land Use Information

This DSP should be read in conjunction with the *CVC Strategic Business Plan for Sewerage Services* (GHD, 2019), the *Clarence Valley Local Environmental Plan* (CVC, 2011) and the WYURA Water Supply and Sewer Servicing Strategy (HunterH2O, July 2019).

The proposed water supply ring main serving the area covered by this DSP is shown in Section 12.

4. Water Supply Infrastructure

This DSP levies developer charges towards the cost of providing water supply infrastructure to service new development. This infrastructure includes the value of future water supply assets serving the new development area.

Assets covered by this DSP include, but are not limited to:

As the West Yamba Water Supply Scheme will connect into the Nymboida River Water Supply Scheme, the developer charges associated with existing and proposed water supply assets in the Nymboida River Water System (detailed in the CVC Development Servicing Plan – Water Supply Services, GHD 2017) are applicable to this DSP.

Assets covered by the previous DSP include, but are not limited to:

- Distribution and Trunk Mains.
- Water Pumping Stations.
- Water Treatment Works.
- Water Reservoirs.
- Shannon Creek Dam (off creek storage).

4.1 Existing and Future Water Supply Services

The water supply infrastructure required to serve the area covered by this DSP is detailed in the WYURA Water Supply and Sewer Servicing Strategy (HunterH2O, July 2019) including proposed connection to the existing Nymboida River Water Supply Scheme. In summary, the proposed water supply services include:

- A ring-main (closed-loop pipe network) as shown in Figure 12-1.
- Construction is proposed to occur in stages (“initial” and “future” stages).
- Initial stages include:
  - 704 metres of DN150 watermain in Carrs Drive, to the extent shown in Figure 12-1 allowing for connection of initial lots south of Miles Street.
  - Connection to the existing DN375 watermain in Harold Tory Drive.
  - Connection to the existing DN150 watermain in Carrs Drive.
- Future stages include:
  - 1,360 metres of DN250 watermain that completes the DN250 ring main (closed-loop) system for WYURA.
  - Connection to the existing DN375 in Yamba Road as shown in Figure 12-1.

Capital works specific to this DSP (including a description and MEERA costs) are summarised in Section 15.

A schematic of the proposed West Yamba Water Scheme is presented in Figure 12-1.

4.2 Existing Capital Cost

The estimated Modern Engineering Equivalent Replacement Asset (MEERA) capital cost of the existing assets in the Nymboida River Water System is detailed in the CVC Development Servicing Plan – Water Supply Services, GHD 2017.

Table 4-1 Summary of the Existing Capital Charge (from the 2017 CVC Development Servicing Plan - Water Services)

DSP Name	Existing (2017) Capital Charge ($ / ET)	Existing (2017) Reduction Amount ($ / ET)	Existing (2017) Calculated Maximum Developer Charge ($ / ET)	Existing (2017) Developer Charge Adopted for Exhibition Purposes ($ / ET)	Existing 2020[1] Developer Charge ($/ET)
Nymboida River Water System	$4,856	$137	$4,719	$4,719	$4,979

[1] This value has been taken from the CVC Adopted 2020/21 Fees and Charges, Section 7.11 (previously Section 94 contributions) Current Plans and Section 64 Contributions.

4.3 Future Capital Works Program

The timing and expenditure for future water supply capital works serving the area covered by this DSP and which contributed to the capital charge are provided in Section 15.

The timing and expenditure for future water supply capital works (including backlog works) in the Nymboida River Water System is detailed in the CVC Development Servicing Plan – Water Supply Services, GHD 2017.

Capital costs were estimated using the *NSW Office of Water (formerly Ministry of Energy and Utilities) NSW Reference Rates Manual Valuation of Water Supply, Sewerage and Stormwater Assets (2014)* in accordance with the requirements of the *2016 Developer Charges Guidelines for Water Supply, Sewerage and Stormwater* (NSW DPI Office of Water, 2016).

4.3.1 Backlog Works

There are no Backlog works to be considered for the WYURA. Only new developments are required to pay developer charges in accordance with this DSP.

4.3.2 Reticulation Works within a Development

The Developer shall be responsible for the full cost of the design and construction of water supply works within subdivisions that service only that development. The design and construction of the works shall be in accordance with Council's development specifications for water supply services.

5. Levels of Service

System design and operation are based on providing Council's current levels of service (LOS) as outlined below.

The water supply network is required to meet CVC's current LOS outlined in the Table 5-1. CVC are currently reviewing their LOS to ensure compliance with minimum legislative requirements outlined in the *NSW Water and Sewerage Strategic Business Planning Guidelines* (NSW Office of Water, 2011). This is discussed in detail in *CVC Strategic Business Plan – Water Supply Services* (GHD, 2017).

Table 5-1 Current Levels of Service – Water Supply[1]

Service Criteria	Service Target	Compliance Measure
Availability of supply - Connection	Provide point of connection for all allotments within defined service areas	Availability of point of connection for all allotments.
Availability of supply - Pressure	20 metres minimum	95% compliance
Availability of supply - Flow	48 litres/min 24 litres/min	85% compliance 95% compliance.
Response times to supply failures		
During Work Hours Out of Work Hours	2 hours from notification 3 hours from notification	95% compliance 95% compliance
Minor Problems/General Enquires		
Oral Written	5 working days 10 working days	95% compliance 95% compliance
Water Quality	NHRMC Australian Drinking Water Guidelines 2011.	95% compliance generally but 80% compliance for turbidity.
Water Restrictions	Restrictions that reduce demand by 20% being applied no more than once every 10 years for no more than 5% of the time.	Restriction history over a 10-year period.

CVC has different LOS for their raw water customers due to lack of water quality measures. These LOS are not currently being reviewed by CVC. CVC's current LOS for raw water consumers is detailed in Table 5-2.

[1] Hunter Water Australia, Clarence Valley Council Strategic Business Plan for Water Supply Services, 2006, page 12

Table 5-2 Current Levels of Service – Raw Water Consumers[2]

Service Criteria	Service Target Raw Water Supply
Availability of service	No new connections permitted. There are approximately 400 existing raw water consumers for which the grandfather clause applies.
Pressure	Pressure will fluctuate depending on consumption; hence a break pressure tank will be required to ensure consistent pressure.
Flow	Due to varying pressure the flow at the meter will also vary, however a minimum of 10 litres per minute will be provided wherever possible.
Response times to supply failures	Whenever a consumer is without water or damage is being caused by a leak the problem will be rectified as soon as possible, otherwise the repair will be programmed and affected customers notified prior to turning off the water.
Water Quality	NHRMC Australian Drinking Water Guidelines 2011 are not complied with.
Water Restrictions	Restrictions are applied whenever necessary

5.1 Further Information

Further information on standards of service is available from:

- *Clarence Valley Council Strategic Business Plan – Water Supply Services* (GHD, 2017), which is available on Council's website.
- *NSW Water and Sewerage Strategic Business Planning Guidelines* (NSW Office of Water, 2001) (available at www.water.nsw.gov.au).

[2] Hunter Water Australia, Clarence Valley Council Strategic Business Plan for Water Supply Services, 2006, page 13

6. Design Parameters

CVC's peak planning documents include the following:

- Draft Water Supply Asset Management Plan, CVC, 2015
- Integrated Water Cycle Management Simplified Strategy, CVC, 2009
- Clarence Valley Council Water Supply Strategic Business Plan, CVC September 2017.

These documents determine the LOS for designing and delivering CVC's water supply systems.

Investigation and design of water supply system components is based on the AUSPEC *Northern Rivers Local Government Development Design and Construction Manual, Development Design Specification D11 Water Supply* (CVC et al., 2009). This refers to the following for water supply design:

- Water Supply Code of Australia, Water Services Association of Australia (WSAA) 2002.

6.1 Planning and Design Parameters

The major components of the water supply network were planned according to the following:

- Regional Water Supply Strategy, Lower Clarence Country Council, 1997.
- WYURA Water Supply and Sewer Servicing Strategy, HunterH2O, July 2019.

7. Calculated Developer Charges

Developer charges are up-front charges used to recover infrastructure costs incurred through the provision of services to new developments and service changes to existing developed areas. Developer charges are comprised of the following components:

- Capital charge – the cost of providing the asset, and;
- Reduction amount – the cost recovered through annual charges.

The relationship between these components is as follows:

Developer Charge = Capital Charge – Reduction Amount

7.1 Summary

As the proposed ring main services all developments in the WYURA, development charges are to be paid as a proportion of ETs serviced by the new pipework, i.e. if a developer contributes 10% of the total ET load, they will contribute the equivalent of 10% of the costs associated with construction costs of the new pipes servicing the WYURA.

The developer charges for the area covered by this DSP are as follows:

Table 7-1 Summary of Developer Charges

DSP Name / Area	Capital Charge ($ / ET)	Reduction Amount ($ / ET)	Calculated Maximum Developer Charge ($ / ET)	Developer Charge Adopted for Exhibition Purposes ($ / ET)
West Yamba Water Supply Scheme	$5,697	$0[1]	$5,697	$5,697

[1] The reduction amount for this DSP was excluded from this developer charge. This is because the existing developer charge from the *2017 CVC DSP Water Services* report included a reduction amount for Yamba (inclusive of West Yamba).

These amounts have been calculated on the basis of Section 7.2 to Section 7.6 below. Background information containing all the critical data including calculation models behind this DSP is available from Council's offices by appointment. To review these documents, please contact Council on (02) 6643 0200.

7.2 Equivalent Tenements (ETs)

The basis of future development in WYURA has been adopted from the WYURAWater Supply and Sewer Servicing Strategy, HunterH2O, July 2019.

Actual populations will be subject to the ultimate Council Development Approval.

ET projections are shown in Section 3.1. ET calculation details are shown in Section 13.

7.3 Capital Charge

The capital charge for the service area covered by this DSP has been calculated using the net present value (NPV) spreadsheet method.

Under the NPV spreadsheet method, the capital cost of relevant assets and projected ET's served in the service area are identified. These capital costs represent only the share of the asset capacity used by the service area. The present value (PV) of capital cost and the PV of

new ETs are calculated. The capital charge per ET is the PV of the capital cost divided by the PV of new ETs.

The calculation of the capital charge is summarised in tables presented in Section 13. A summary of the capital charge calculations prior to any agglomeration or cross-subsidy is shown in Table 7-2 below.

Table 7-2 Capital Charge Calculation

DSP Name / Area	PV of New ETs for pre-1996 assets @ 3%	PV of New ETs for post-1996 assets @ 5%	PV of capital cost from pre-1996 assets @ 3%	PV of capital cost from post-1996 assets @ 5%	Capital charge for pre-1996 assets ($ / ET)	Capital charge for post-1996 assets ($ / ET)	Capital charge per ET ($ / ET)
West Yamba Water Supply Scheme	N/A	791	N/A	$567,624	N/A	$718	$718
Nymboida River Water System[1]	N/A	N/A	N/A	N/A	N/A	N/A	$4,979[2]
Total:							**$5,697**

[1] As noted in Section 4, key works included in the capital charge calculated for the Nymboida River Water System in the CVC Water Services DSP will support developments in the West Yamba Urban Release area, therefore this component of the capital charge has not been recalculated for this DSP.

[2] This value has been taken from the CVC Adopted 2020/21 Fees and Charges, Section 7.11 (previously Section 94 contributions) Current Plans and Section 64 Contributions.

7.4 DSP Areas

The *2016 Developer Charges Guidelines for Water Supply, Sewerage and Stormwater* (NSW DPI Office of Water 2016) permit the agglomeration of service areas into DSP areas which have capital charges that are within 30% of each other. Agglomeration is intended to minimise the number of different developer charges within the LGA.

As there is only one service area being considered no agglomeration was undertaken.

7.5 Reduction Amount

The reduction amount is defined as the NPV of the future net income expected from providing water-related services to the new residents in the DSP area.

The previous CVC Water Services DSP (GHD, 2017) included the WYURA, and the key works used in the existing developer charge for the Nymboida River Water System which will support future development within the WYURA. The existing developer charge has therefore been added to the new capital charge calculated in this DSP (which is for works specific to the WYURA only). As the existing developer charge already incorporates a reduction amount into its final developer charge calculation, no further reduction amount is applicable for the works in this DSP.

7.6 Cross-subsidy

In accordance with *2016 Developer Charges Guidelines for Water Supply, Sewerage and Stormwater* (NSW DPI Office of Water 2016), a utility may elect to levy less than the calculated developer charge.

The cross-subsidy is the percentage difference between the annual bill with the calculated maximum developer charge and the proposed lower developer charge.

No cross-subsidy has been applied as part of the considerations for the development areas in this DSP.

8. Reviewing / Updating of Calculated Developer Charges

In line with the *2016 Developer Charges Guidelines for Water Supply, Sewerage and Stormwater* (NSW DPI Office of Water 2016) the developer charges relating to this DSP will be reviewed after a period of 4 to 8 years from the implementation of this plan, concurrently with the review of the CVC Development Servicing Plan – Water Supply Services, GHD, 2017. If the review indicates that the developer charges in this DSP are still applicable this DSP will apply for a further five years once the Council releases a public notice to this effect. However, if the developer charges in this DSP are found to no longer apply and it is believed that a new DSP is warranted, a new DSP shall be prepared, audited, exhibited and registered.

If a major change occurs, such as a requirement for significant capital works, which was not considered in the DSP, Council may carry out a review in less than 4 years, subject to NOW approval. If the review identifies that a new DSP is required, the new DSP must to be prepared, audited, exhibited and registered.

In the period between any review, developer charges will be adjusted annually on 1 July on the basis of movements in the Consumer Price Index (CPI) for Sydney, in the preceding 12 months to December, excluding the impact of Goods and Services Tax (GST).

9. Background Information

Background information and calculations relating to this DSP are contained in the following documents:

1. West Yamba Urban Release Area Water Supply and Sewer Servicing Strategy, HunterH2O, July 2019.
2. 2011 Australian Census, Australian Bureau of Statistics, 2011
3. Clarence Valley Local Environmental Plan, CVC, 2011
4. Northern Rivers Local Government Development Design and Construction Manual, Development Design Specification D11 Water Supply, CVC, et. al, 2009
5. Clarence Valley Council Sewerage Water Supply Business Plan, GHD, 2016
6. Clarence Valley Council Development Servicing Plans for Water Supply Services, Hunter Water Australia, 2005
7. Clarence Valley Council Water Supply Strategic Business Plan, GHD, September 2017.
8. 2016 Developer Charges Guidelines for Water Supply, Sewerage and Stormwater, NSW Department of Primary Industries Office of Water, 2016
9. NSW Reference Rates Manual – Valuation of Water Supply, Sewerage and Stormwater Assets, NSW Government Office of Water, Ministry of Energy and Utilities, 2003 with amendments in 2010
10. NSW Water and Sewerage Strategic Business Planning Guidelines. NSW Office of Water, 2011
11. Section 64 Determinations of Equivalent Tenements Guidelines, Water Directorate, May 2009 Addendum
12. Water Supply Code of Australia, Water Services Association of Australia, 2002
13. Regional Water Supply Strategy, Lower Clarence Country Council, 1997
14. Excel spreadsheets used in calculating developer charges

All other documents can be reviewed in Council's offices by appointment. To review the documents, please contact Council on (02) 6643 0200.

10. Other DSPs and Related Contribution Plans

Other DSP's and related plans include:

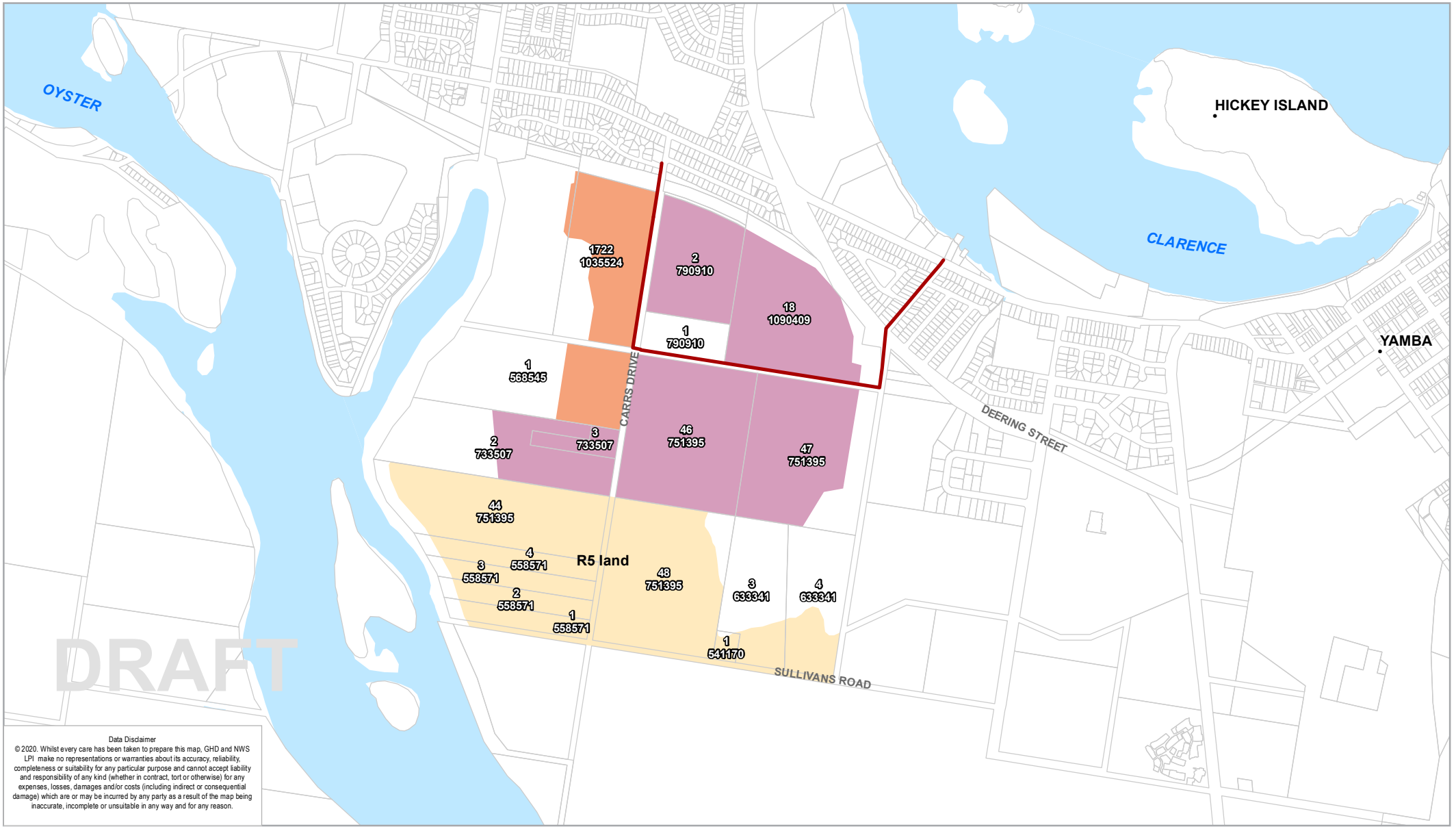
- Clarence Valley Council West Yamba Development Servicing Plan – Sewerage Services, GHD, 2020.
- Clarence Valley Council Development Servicing Plan – Water Supply Services, GHD, 2017.
- Clarence Valley Council Development Servicing Plan – Sewerage Services, GHD, 2016.

CVC also levies developer contributions for various public amenities under Section 94 of the *Environmental Planning and Assessment Act, 1979*.

11. Glossary

Capital Cost	The Present Value (MEERA basis) of assessment used to service the development.
Capital Charge	The capital cost per ET.
CPI	Consumer Price Index
CVC	Clarence Valley Council
Developer Charge	A charge levied on Developers to recover part of the capital cost incurred in providing infrastructure to a new development.
Discount Rate	The rate used to calculate the present value of money arising in the future.
DSP	Developer Servicing Plan
DCP	Development Control Plan
ET	Equivalent Tenement
et al.	et alia
EWON	Energy and Water Ombudsman
FU	Fixture Unit
GST	Goods and Services Tax
i.e.	id est
IPART	Independent Pricing and Regulatory Tribunal
LEP	Local Environmental Plan
LGA	Local Government Area
LOS	Level of Service
MEERA	Modern Equivalent Engineering Replacement Asset
ML	Megalitre
ML/day	Megalitre per day
NHRMC	National Health and Medical Research Council
NPV	Net Present Value
NSW	New South Wales
NSW DPI	NSE Department of Primary Industries
OMA	Operation, maintenance and administration (cost)
Post 1996 Asset	An Asset that was commissioned by a water utility on or after 1 January 1996 or that is yet to be commissioned
Pre-1996 Asset	An Asset that was commissioned by a water utility before 1 January 1996
PV	Present Value. The value now of money, or ETs, in the future.
Reduction Amount	The amount by which the capital charge is reduced to arrive at the developer charge. The amount reflects the present value of the capital contributions that will be paid by the occupier of a development as part of future annual charges.
RWSS	Regional Water Supply Scheme

Service Area	An area served by a separate water supply system, an area served by a separate sewerage treatment works, a separate small town or village, or a new development of over 500 lots.
WICA	Water Industry Competition Act
WSAA	Water Services Association of Australia



Legend

- Place names
- Proposed watermains
- Initial stages
- Future stages
- R5 land
- Waterways
- Cadastre

Paper Size ISO A4

0 100 200 300 400 500

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

Clarence Valley Council
Sewer and Water Development
Servicing Plan Update (DSP)

West Yamba Development Servicing Plan Areas – Water Overview

Project No. **12528667**
Revision No. **B**
Date **8/07/2020**

FIGURE 1

N:\AU\Brisbane\Projects\41\12528667\GIS\Maps\MXD\12528667_001_WaterOverview_revB.mxd
Print date: 08 Jul 2020 - 11:11

Data source: GHD - Initial and Future Stages, Proposed watermains (2020). Cadastre - NSW LPI DCDB 2012 (Date Extracted: 15 Jun 2020) . Created by: jcmatic

13. ET Projections

13.1 ET Projection Calculations

The basis of future development in WYURA has been adopted from the WYURA Water Supply and Sewer Servicing Strategy, by HunterH2O, July 2019. As such, the projected number of ETs is in accordance with the servicing strategy.

Table 13-1 ET Projections

DSP Name / Area	Stage / Development Area	Proposed number of Lots	Calculated ETs[1]
West Yamba Water Supply Scheme	Carrs Drive Stage 1	57	57
	Carrs Drive Stage 2	54	54
	Carrs Drive Stage 3	50	50
	Land south of Miles Street[2]	200	120
	All initial stages	**361**	**281**
	NE1 subsystem	170	170
	NE2 subsystem	256	256
	SE subsystem	480	480
	SW subsystem	110	110
	All future stages	**1,016**	**1,016**
	R5 land[3]	42[4]	42[4]
	Total	**1,419**	**1,339**

[1] For the development areas north of Miles Street (Carrs Drive stage 1, 2, and 3), 1 ET per lot is assumed for water planning purposes. This is based on 3-4 bedroom dwelling per lot (which is considered appropriate for the 450 to 560 sqm lot sizes).

[2.] Council advised HunterH20 in February 2018 that the land south of Miles Street could adopt a 0.6 ET per lot rate for water planning purposes. This rate is based on 2-bedroom dwellings per lot.

[3.] It is noted that the contribution from the R5 land area development has been considered for the water DSP only, as per CVC advice.

[4] The proposed number of lots in the R5 area has been revised down from the 104 lots listed in the WYURA Water Supply and Sewer Servicing Strategy (HunterH2O, 2019) to 62 lots, as per CVC advice. In addition, 20 lots have already paid contributions and/or been developed. As such, 42 lots remain for incorporation into this DSP.

13.1.1 Background

Background information provided to inform the population projection calculations included the following:

- West Yamba Urban Release Area Water Supply and Sewer Servicing Strategy (HunterH2O, 2019).

13.1.2 Assumptions

The following assumptions were made to produce the growth projections:

- Complete development within 25 years (2021 to 2046).
- A linear growth rate over the period.

A summary of the growth projections is provided in Table 13-2.

Table 13-2 Growth Projections

Time Period	Equivalent Tenements (ETs)	Number of New ETs/year
2020/21	0	0
2021/22	53	53
2022/23	106	53
2023/24	159	53
2024/25	212	53
2025/26	265	53
2026/27	318	53
2027/28	371	53
2028/29	424	53
2029/30	477	53
2030/31	530	53
2031/32	583	53
2032/33	637	54
2033/34	691	54
2034/35	745	54
2035/36	799	54
2036/37	853	54
2037/38	907	54
2038/39	961	54
2039/40	1,015	54
2040/41	1,069	54
2041/42	1,123	54
2042/43	1,177	54
2043/44	1,231	54
2044/45	1,285	54
2045/46	1,339	54
2046/47	1,339	0
2047/48	1,339	0
2048/49	1,339	0
2049/50	1,339	0
2050/51	1,339	0

14. Existing Capital Costs

A summary of assets and MEERA values is included in the CVC Development Servicing Plan – Water Supply Services, GHD, 2017. Below is a summary of the existing water costs for the Nymboida River Water System.

Table 14-1 Summary of the Existing Capital Charge (from the CVC Development Servicing Plan - Water Servicest, GHD 2017)

DSP Name	Existing (2017) Capital Charge ($ / ET)	Existing (2017) Reduction Amount ($ / ET)	Existing (2017) Calculated Maximum Developer Charge ($ / ET)	Existing (2017) Developer Charge Adopted for Exhibition Purposes ($ / ET)	Existing 2020[1] Developer Charge ($/ET)
Nymboida River Water System	$4,856	$137	$4,719	$4,719	$4,979

[1] This value has been taken from the CVC Adopted 2020/21 Fees and Charges, Section 7.11 (previously Section 94 contributions) Current Plans and Section 64 Contributions.

15. Future Capital Works Program

Future capital works including a description, construction year and MEERA costs are included in the CVC Development Servicing Plan – Water Supply Services, GHD, 2017 and Table 15-1 below.

Table 15-1 Future Water Supply Scheme Capital Expenditure (contributing to Capital Charge)

Amenity	Asset Name	DSP Name / Area	Stage / Development Area	Construction Year	Gross (2020/21$)	Capital Charge (2021$)
New System Asset	704 metres of DN150 ring main (initial stages)	West Yamba Water Supply Scheme	Initial stages / All	2021 - 2023	$230,610	$230,610
New System Asset	1,360 metres of DN250 ring main (future stages)	West Yamba Water Supply Scheme	Future stages / All	2026 - 2028	$451,309	$451,309
Total:					**$681,919**	**$681,919**

16. Calculation of Capital Charge

A summary of the calculated capital charge per ET for DSP Area: West Yamba Water Supply Scheme is provided in

Table 16-2.

Table 16-1 Capital Charge Net Present Value, Summary of Calculations

Year Number	Year	Estimated Expenditure	PV factor (@5%)	PV of Capital Expenditure (@5%)	New ETs per year	PV of New ETs (@5%)	Capital Charge
1	2021/2022	$65,860	1	$65,860	53	53	
2	2022/2023	$164,750	0.95	$156,512	53	50	
3	2023/2024		0.91	$-	53	48	
4	2024/2025		0.86	$-	53	46	
5	2025/2026		0.82	$-	53	43	
6	2026/2027	$225,654	0.78	$176,010	53	41	
7	2027/2028	$225,654	0.75	$169,241	53	40	
8	2028/2029		0.71	$-	53	38	
9	2029/2030		0.68	$-	53	36	
10	2030/2031		0.64	$-	53	34	
11	2031/2032		0.61	$-	53	32	
12	2032/2033		0.58	$-	54	31	
13	2033/2034		0.56	$-	54	30	
14	2034/2035		0.53	$-	54	29	
15	2035/2036		0.51	$-	54	28	
16	2036/2037		0.48	$-	54	26	
17	2037/2038		0.46	$-	54	25	
18	2038/2039		0.44	$-	54	24	
19	2039/2040		0.42	$-	54	23	
20	2040/2041		0.4	$-	54	22	
21	2041/2042		0.38	$-	54	21	
22	2042/2043		0.36	$-	54	19	
23	2043/2044		0.34	$-	54	18	
24	2044/2045		0.33	$-	54	18	
25	2045/2046		0.31	$-	54	17	
26	2046/2047	$-	0.3	$-	0	0	
27	2047/2048	$-	0.28	$-	0	0	
28	2048/2049	$-	0.27	$-	0	0	
29	2049/2050	$-	0.26	$-	0	0	
30	2050/2051	$-	0.24	$-	0	0	
End		$681,919		$567,624	1,339	791	$718

Table 16-2 Capital Charge per ET, Summary of Calculations

DSP Area	Future Works ($/ET)	Existing Works ($/ET)		Total Capital Cost per ET ($/ET)
		Pre-1996	Post-1996	
West Yamba Water Supply Scheme	$718	-	-	$718
Nymboida River Water System[1]				4,979[2]
Total:				**$5,697**

[1] As noted in Section 4, key works contributing to the capital charge calculated for the Nymboida River Water System in the CVC Water Services DSP will support developments in the West Yamba Urban Release area, therefore this component of the capital charge has not been recalculated for this DSP

[2] This value has been taken from the CVC Adopted 2020/21 Fees and Charges, Section 7.11 (previously Section 94 contributions) Current Plans and Section 64 Contributions.

17. Calculation of the Reduction Amount

As discussed in section 7.5 no reduction amount was calculated for this DSP.

18. Cross-subsidy Calculations

No cross-subsidy has been applied to the DSP areas in this DSP.

19. Calculation of Developer Charge

The calculation of developer charges per ET is summarised in Table 19-1.

Table 19-1 Developer Charge per ET, Summary of Calculations

DSP Name / Area	Capital Charge for DSP Area ($/ET)	Reduction Amount ($/ET)	Calculated Developer Charge ($/ET)
West Yamba Water Supply Scheme	$5,697	$0	$5,697

GHD
145 Ann Street Brisbane QLD 4000
GPO Box 668 Brisbane QLD 4001
T: (07) 3316 3000 F: (07) 3316 3333 E: bnemail@ghd.com

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Clarence Valley Council

West Yamba
Development Servicing Plan
Sewerage Services

October 2020

Executive Summary

This Development Servicing Plan (DSP) covers sewerage developer charges in regard to the West Yamba Urban Release Area (WYURA) served by Clarence Valley Council (CVC).

This DSP document has been prepared in accordance with the *2016 Developer Charges Guidelines for Water Supply, Sewerage and Stormwater* (2016) issued by the NSW Department of Primary Industries Office of Water (NSW DPI Office of Water), pursuant to section 306 (3) of the *Water Management Act, 2000*.

The area covered by this DSP and the existing and proposed works serving the area are shown in Section 2.1.

The timing and expenditure for works servicing the areas covered in this DSP are discussed in Section 4.

Levels of service to be provided in the DSP areas are shown summarised in Section 5.

The sewerage developer charges for the areas covered by this DSP have been determined as summarised in Table E-1 below.

Table E-1 Sewerage Developer Charges

DSP Name	Calculated Developer Charge ($/ET)	Adopted Developer Charge ($/ET)	Cross-subsidy ($/ET)	Resulting Increase in the Typical Residential Bill ($)
West Yamba Sewerage Scheme	$13,419	$13,419	$0	$0

Developer charges relating to this DSP will be reviewed after a period of 4 to 8 years, concurrently with the review of the CVC Development Servicing Plan – Sewerage Services, GHD 2017.

In the period between any review, developer charges will be indexed annually on the basis of movements on the Consumer Price Index (CPI) for Sydney, excluding the impact of Goods and Services Tax (GST).

The Developer shall be responsible for the full cost of the design and construction of reticulation works within subdivisions. The design and construction of the works shall be in accordance with Council's development specifications for sewerage services. Background information containing all the critical data including calculation models behind this DSP is available from Council's offices by appointment. To review these documents, please contact Council on (02) 6643 0200.

This DSP should be read in conjunction with the adopted WYURA Water Supply and Sewer Servicing Strategy, by HunterH2O, July 2019.

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1. Introduction

Section 64 of the *Local Government Act, 1993* enables a local government Council to levy developer charges for water supply, sewerage and stormwater. This derives from a cross-reference in that Act to Section 306 of the *Water Management Act 2000*.

A Development Servicing Plan (DSP) details the sewerage developer charges to be levied on development areas using a local utility's sewerage infrastructure.

This DSP covers *sewerage* developer charges in respect of development of the West Yamba Urban Release Area (WYURA) served by Clarence Valley Council (CVC).

This DSP has been prepared in accordance with the *2016 Developer Charges Guidelines for Water Supply, Sewerage and Stormwater* (2016) issued by the Minister for Lands and Water, pursuant to section 306 (3) of the *Water Management Act, 2000*.

This DSP document supersedes previous sewerage DSPs and requirements related to sewerage developer charges for the areas covered by this DSP adopted by the Council prior to the adoption of this DSP. This DSP document takes precedence over any of Council's codes or policies where there are any inconsistencies relating to the sewerage developer charges.

1.1 Purpose of the Plan

The purpose of this DSP is to set out the contributions payable by developments to the authority responsible for providing infrastructure and other facilities.

In developing this DSP and calculation of the contributions payable, the following aims and objectives have been taken into consideration:

- Ensure that adequate sewerage infrastructure is provided as part of new developments
- Provide a comprehensive strategy for the assessment, collection, expenditure accounting and review of contributions on an equitable basis
- Ensure that the existing community is not burdened by the provision of sewerage infrastructure as a result of future development
- Enable Council to be both publicly and financially accountable in its assessment and administration of the DSP.

1.2 Disclaimer

This report has been prepared by GHD for Clarence Valley Council and may only be used and relied on by Clarence Valley Council for the purpose agreed between GHD and the Clarence Valley Council as set out in Section 1.1 of this report.

GHD otherwise disclaims responsibility to any person other than Clarence Valley Council arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD 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. GHD 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 GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

2. Administration

2.1 DSP Name and Area Covered

DSP Name and Area Covered in this DSP is known as *West Yamba Development Servicing Plan – Sewerage Services.*

It is noted that previously West Yamba was included in the CVC Development Servicing Plan – Sewerage Services (2017), however the 2017 DSP did not make provision for the specific infrastructure requirements in West Yamba. West Yamba therefore requires its own DSP. The area to which this DSP applies is shown in Figure 12-1.

DSP Name	West Yamba Sewerage Scheme
DSP Area	The area covered by this DSP is shown in Figure 12-1.
DSP Boundaries	The DSP area boundary is defined as the area included in the The West Yamba Urban Release Area (WYURA), with the exception of the R5 land.

2.2 Date of DSP Commencement

Council approved this DSP on 28 July 2020 for public exhibition. The DSP will come into effect once adopted by Council after the public exhibition period. Once adopted, the DSP will be forwarded to the NSW Office of Water (NOW) for registration.

The charges in this Plan will apply to all Development Applications determined on or after the date Council resolves the plan to commence.

2.3 Payment of Developer Charges

Developer charges will be determined and levied in accordance with the provisions of the current DSP at the time of considering an application for a compliance certificate under section 305 of the *Water Management Act 2000*, a construction certificate under section 109 of the *Environmental Planning and Assessment Act 1979* or at the time of issuing a notice or other form of written advice, e.g. Section 5.3, 5.5 or 5A.2 of the *State Environmental Planning Policy (Exempt and Complying Development Codes) 2008*.

A time limit for payment of developer charges must be included in any developer charge determination or advice provided to developers.

Council may elect to determine developer charges at the time of considering a development application. Such a determination would accompany the development consent, and must specify a time limit for payment. If the developer charges have not been paid in full within the specified time limit, subject to the development consent remaining valid, no further adjustment to the developer charges may be made at the time of considering an application for a Compliance Certificate. If the developer charges have not been paid in full within the specified time limit, the developer charges will be determined by the Local Water Utility (LWU) at the time of considering an application for a Compliance Certificate using the LWU's then current DSP document.

It is noted that section 64 developer charges do not apply for developments serviced by a licenced operator under the *Water Industry Competition Act 2006* (WICA) or *Water Industry Competition Amendment (Review) Act 2014*. The capital cost of the infrastructure serving such developments would be recovered through annual access and usage charges.

2.4 Developer Charges for Crown Developments

Under section 306 (4) and (5), of the *Water Management Act, 2000*, the Minister for Planning and Infrastructure may make a determination in respect of developer charges levied on Crown developments.

Crown developments for essential community services (education, health, community services, and law and order) are exempt from general developer charges. Council can only charge crown developments for the portion of cost associated with direct connection costs relating to the development.

2.5 Refunds

If this DSP is revised to correct a major error in the calculation, Council will provide a refund to developers for any resulting over-payments.

2.6 Developments Outside the Development Servicing Areas

When considering development outside the boundaries of this DSP, Council may either:

- Apply the developer charges adopted for the DSP to the new development; or
- Prepare a new DSP for the new development.

Such a development is likely to require the construction of specific assets. Refer to Section 2.7 for discussion on funding of out-of-sequence development.

2.7 Out-of-Sequence Development

Council has assumed infrastructure development will occur in accordance with the sequence of development defined in the WYURA Water Supply and Sewer Servicing Strategy, prepared by HunterH2O, July 2019. If a Developer wishes to proceed with a development not in the same sequence, i.e. before essential assets are in place, the Council may require and/or approve construction of the shared assets ahead of time provided that there are no other constraints to the development.

In such cases the assets will be designed and constructed by the Developer in accordance with the requirements of this DSP and the HunterH2O Servicing Strategy, and the full capital cost would initially be met by this Developer. If the assets funded by this Developer will serve other future development, the Developer shall receive a discount on their developer charges. The Council and the Developer must enter into an agreement stating how the Developer will be reimbursed for shared infrastructure.

2.8 Consultation and Dispute Resolution

A Developer who is dissatisfied with how the Council has calculated a developer charge has a right of appeal pursuant to the *2016 Developer Charges Guidelines for Water Supply, Sewerage and Stormwater* (NSW DPI Office of Water, 2016). The following process must be followed:

1. A Developer who is dissatisfied with how Council has calculated the developer charge for a particular development may lodge a formal complaint to the Council
2. The CVC General Manager is to review the complaint or cause it to be reviewed
3. CVC is not a member of the Energy and Water Ombudsman (EWON). If the developer is not satisfied with the General Manager's response, the matter may be referred to the Ombudsman

4. If the complaint is on technical matters or issues of interpretation of the *2016 Developer Charges Guidelines for Water Supply, Sewerage and Stormwater* (NSW DPI Office of Water, 2016), the Developer may refer the complaint to NOW. NOW will respond to the complaint. Where warranted, NOW may refer the matter to the expert technical panel, which includes representatives from NOW, Independent Pricing and Regulatory Tribunal (IPART), the NSW Water Directorate, local water utilities and the development industry
5. The Developer, if still dissatisfied, may request that the matter be reviewed by way of arbitration by an arbitrator, who is to be appointed by agreement between the Developer and the Council (The *Commercial Arbitration Act, 1984* applies to any such arbitration)
6. The decision of the arbitrator is binding on both the Developer and Council
7. Costs of the arbitration are to be borne equally by the Developer and Council.

3. Demographic and Land Use Planning Information

3.1 Growth Projections

Growth projections for population and number of sewerage Equivalent Tenements (ETs) are shown in Table 3-1 below. These projections are from the present year (2021) to 2051 (30 years).

ET calculations are included in Section 13.

Table 3-1 Growth Projections

Time Period	Cumulative Equivalent Tenements (ETs)	Number of New ETs / year
2020/21	0	0
2021/22	53	53
2022/23	106	53
2023/24	159	53
2024/25	212	53
2025/26	265	53
2026/27	318	53
2027/28	371	53
2028/29	424	53
2029/30	477	53
2030/31	530	53
2031/32	583	53
2032/33	636	53
2033/34	689	53
2034/35	742	53
2035/36	795	53
2036/37	848	53
2037/38	901	53
2038/39	954	53
2039/40	1,007	53
2040/41	1,060	53
2041/42	1,113	53
2042/43	1,166	53
2043/44	1,219	53
2044/45	1,273	53
2045/46	1,327	54
2046/47	1,327	0
2047/48	1,327	0
2048/49	1,327	0
2049/50	1,327	0
2050/51	1,327	0

3.2 Land Use Information

This DSP should be read in conjunction with the *CVC Strategic Business Plan for Sewerage Services* (GHD, 2019), the *Clarence Valley Local Environmental Plan* (CVC, 2011) and the WYURA Water Supply and Sewer Servicing Strategy (HunterH2O, July 2019).

The proposed trunk sewerage assets serving the area covered by this DSP is outlined in Section 4.1.

4. Sewerage Infrastructure

This DSP levies developer charges towards the cost of providing sewerage infrastructure to service new development. This infrastructure includes the value of future sewerage assets serving the new development area.

Assets covered by this DSP include, but are not limited to:

- Trunk infrastructure.

As the West Yamba Sewerage Scheme will connect into the existing Yamba Sewage Treatment Plant (STP), the developer charges associated with existing and proposed sewerage assets in the (Greater) Yamba DSP Area (detailed in the CVC Development Servicing Plan – Sewerage Services, GHD 2017) are applicable to this DSP. Assets covered by the previous DSP include, but are not limited to:

- Distribution and Trunk Mains.
- Sewerage Pumping Stations.
- Wastewater Treatment Works.
- Trunk Infrastructure.
- Recycled Water Infrastructure.

4.1 Existing and Future Sewerage Services

The shared sewerage infrastructure required to serve the area covered by this DSP is detailed in the WYURA Water Supply and Sewer Servicing Strategy (HunterH2O, July 2019). In summary, the proposed sewerage infrastructure includes:

1. Pipe 1: 2,848 metres of DN200 pressure sewer main connecting into the Yamba STP.
2. Pipe 2: 313 metres of DN200 pressure sewer main.
3. Pipe 3: 237 metres of DN120 pressure sewer main.

These are described further in Section 15. The infrastructure required to be in place for each development has been tabulated in Table 4-1. Developments requiring common infrastructure (pipes, 1, 2 and 3 above) have been grouped into a development area.

Table 4-1 Proposed Sewerage Infrastructure by Development Area

Development Area	Development	Proposed Sewerage Infrastructure
A	Carrs Drive Stage 1	Pipe 1 and 2
	Carrs Drive Stage 2	
	Carrs Drive Stage 3	
	NE1 subsystem	
	SE subsystem	
B	Land south of Miles Street	Pipe 1, 2 and 3
	SW subsystem	
C	NE2 subsystem	Pipe 1

Capital works specific to this DSP (including a description and MEERA costs) are summarised in Section 15.

A schematic of the proposed West Yamba Sewerage Scheme is presented in Figure 12-1.

4.2 Existing Capital Cost

The estimated Modern Engineering Equivalent Replacement Asset (MEERA) capital cost of the existing sewerage assets serving the area covered by this DSP is detailed in the CVC Development Servicing Plan – Sewerage Services, GHD 2017.

Table 4-2 Summary of the Existing Capital Charge (from the 2017 CVC Development Servicing Plan - Sewerage Services)

DSP Name	Existing (2017) Capital Charge ($ / ET)	Existing (2017) Reduction Amount ($ / ET)	Existing (2017) Calculated Maximum Developer Charge ($ / ET)	Existing (2017) Adopted Developer Charge ($ / ET)	Existing 2020[1] Developer Charge ($/ET)
Yamba	$12,073	$557	$11,516	$11,516	$12,175

[1] This value has been taken from the CVC Adopted 2020/21 Fees and Charges, Section 7.11 (previously Section 94 contributions) Current Plans and Section 64 Contributions.

4.3 Future Capital Works Program

The timing and expenditure for future sewerage capital works serving the area covered by this DSP and which contribute to the capital charge are provided in Section 15.

The timing and expenditure for future sewerage capital works (including backlog works) in the greater Yamba area is detailed in the CVC Development Servicing Plan – Sewerage Services, GHD 2017.

Capital costs were estimated using the *NSW Office of Water (formerly Ministry of Energy and Utilities) NSW Reference Rates Manual Valuation of Water Supply, Sewerage and Stormwater Assets (2014)* in accordance with the requirements of the *2016 Developer Charges Guidelines for Water Supply, Sewerage and Stormwater* (NSW DPI Office of Water, 2016).

4.3.1 Backlog Works

There are no Backlog works to be considered for the WYURA. Only new developments are required to pay developer charges in accordance with this DSP.

4.3.2 Reticulation Works within a Development

The Developer shall be responsible for the full cost of the design and construction of sewerage works, including pump stations, within subdivisions that service only that development. The design and construction of the works shall be in accordance with Council's development specifications for sewerage services.

5. Level of Service

System design and operation are based on providing Council's current levels of service (LOS) as outlined below.

The sewerage network is required to meet CVC's current LOS outlined in the Table 5-1. CVC are currently reviewing their LOS to ensure compliance with minimum legislative requirements outlined in the *NSW Water and Sewerage Strategic Business Planning Guidelines* (NSW Office of Water, 2011). This is discussed in detail in *CVC Strategic Business Plan – Sewerage Services* (GHD, 2017).

Table 5-1 Current Levels of Service – Sewerage Services[1]

Service Criteria	Service Target	Compliance Measure
Availability of service	Provide point of connection for all allotments within defined service areas	Availability of point of connection for all allotments within defined service areas.
Overflow of Sewerage to the Environment		
Major Overflow	No more than 6 per year	99% compliance across system as measured from records for each event
Minor Overflow	No more than 600 per year	99% compliance across system as measured from records for each event
Response Time to System Failures		
Priority 1 (major spill)	During Working Hours: 30 minutes After Working Hours: 1 hour	
Priority 2 (moderate spill)	During Working Hours: 1 hour After Working Hours: 2 hours	
Priority 3 (minor spill)	During Working Hours: 2 hours After Working Hours: 8 hours	
Minor Problems/General Enquires		
Oral	Within 5 working days	95% compliance
Written	Within 10 working days	95% compliance
Number of Incidences Causing Complaints		
Sewerage Related Incidents	Written or telephone complaints about sewerage related incidents	Less than 50 per year
Odours	Odour should not be detectable outside buffer zone (400 meters) around treatment works	Less than 5 per year
Effluent Quality	Meet EPA licence conditions for all sewerage treatment plants	95% compliance as measured from records.

5.1 Further Information

Further information on standards of service is available from:

- *Clarence Valley Council Strategic Business Plan – Sewerage Services* (GHD, 2017), which is available on Council's website.
- *NSW Water and Sewerage Strategic Business Planning Guidelines* (NSW Office of Water, 2001) (available at www.water.nsw.gov.au).

[1] Hunter Water Australia, Clarence Valley Council Strategic Business Plan for Sewerage Services, 2006, page 15

6. Design Parameters

CVC's peak planning documents include the following:

- Draft Sewerage Asset Management Plan, CVC, 2015.
- Integrated Water Cycle Management Simplified Strategy, CVC, 2009.
- Clarence Valley Council Sewerage Strategic Business Plan, CVC September 2017.

These documents determine the LOS for designing and delivering CVC's sewerage systems.

Investigation and design of sewerage system components is also based on the AUSPEC *Northern Rivers Local Government Development Design and Construction Manual, Development Design Specification D12 Sewerage System* (CVC et al., 2009). This refers to the following for sewerage design:

- Gravity Sewer Code of Australia, Water Services Association of Australia (WSAA), 2014.
- Pumping Station Code of Australia, Water Services Association of Australia (WSAA), 2005.
- Pressure Sewerage Code of Australia, Water Services Association of Australia (WSAA), 2007.

6.1 Planning and Design Parameters

The major components of the sewerage network were planned according to the following:

- Maclean Sewerage Scheme Augmentation Concept Development Report, NSW Department of Land & Water Conservation and Maclean Shire Council, 2001
- Yamba Wastewater Strategy Part 1, Geolink, 2002
- West Yamba Urban Release Area Water Supply and Sewer Servicing Strategy, HunterH2O, July 2019.

7. Calculated Developer Charges

Developer charges are up-front charges used to recover infrastructure costs incurred through the provision of services to new developments and service changes to existing developed areas. Developer charges are comprised of the following components:

- Capital charge – the cost of providing the asset; and
- Reduction amount – the cost recovered through annual charges.

The relationship between these components is as follows:

- Developer Charge = Capital Charge – Reduction Amount.

7.1 Summary

The developer charges for the area covered by this DSP (as described in 2.1) are as follows:

Table 7-1 Summary of Developer Charges

Development Area	Capital Charge ($/ET)	Reduction Amount	Calculated Maximum Developer Charge ($/ET)	Adopted Developer Charge ($/ET)
West Yamba	$13,419	$0[1]	$13,419	$13,419

[1] The reduction amount for this DSP was excluded from this developer charge. This is because the existing developer charge from the *2017 CVC DSP Sewerage Services* report included a reduction amount for Yamba (inclusive of West Yamba).

These amounts have been calculated on the basis of Section 7.2 to Section 7.7 below. Background information containing all the critical data including calculation models behind this DSP is available from Council's offices by appointment. To review these documents, please contact Council on (02) 6643 0200.

7.2 Service Areas

Developer charges have been calculated for a number of development areas within the WYURA. It is noted that WYURA is within the Yamba service area.

7.3 Equivalent Tenements (ETs)

The basis of future development in WYURA has been adopted from the WYURA Water Supply and Sewer Servicing Strategy, HunterH2O, July 2019.

Actual populations will be subject to the ultimate Council Development Approval.

ET projections are shown in Section 3.1. ET calculation details are shown in Section 13.

7.4 Capital Charge

The capital charge for each development area covered by this DSP has been calculated using the net present value (NPV) spreadsheet method.

Under the NPV spreadsheet method, the capital cost of relevant assets and projected ET's served in a development area are identified. These capital costs represent only the share of the asset capacity used by a development area. The present value (PV) of capital cost and the PV

of new ETs are calculated. The capital charge per ET is the PV of the capital cost divided by the PV of new ETs.

The calculation of the capital charge is summarised in tables presented in Section 16. A summary of the capital charge calculations prior to any agglomeration or cross-subsidy is shown in Table 7-2 below.

Table 7-2 Capital Charge Calculation

Development Area	PV of New ETs for pre-1996 assets @ 3%	PV of New ETs for post-1996 assets @ 5%	PV of capital cost from pre-1996 assets @ 3%	PV of capital cost from post-1996 assets @ 5%	Capital charge for pre-1996 assets ($ / ET)	Brought forward Capital Charge from the adopted 2020/21 Fees and Charges ($/ET)[1]	Capital charge for post-1996 assets ($ / ET)	Capital charge per ET ($ / ET)[2]
West Yamba	N/A	786	N/A	N/A	N/A	$12,175	$1,244	$13,419

[1] As noted in Section 4, key works included in the capital charge calculated for the existing Yamba Sewerage DSP area will support developments in the West Yamba Urban Release area, therefore this component of the capital charge has not been recalculated for this DSP.

[2] The capital charge value for Yamba $12,175/ET (taken from the Clarence Valley Council Adopted 2020/21 Fees and Charges, Section 7.11 (previously Section 94 contributions) Current Plans and Section 64 Contributions) has been added to the calculated capital charge for WYURA of $1,244/ET to derive the total capital cost per ET for WYURA developments.

7.5 DSP Areas

The *2016 Developer Charges Guidelines for Water Supply, Sewerage and Stormwater* (NSW DPI Office of Water, 2016) permit the agglomeration of service areas into DSP areas which have capital charges that are within 30% of each other. Agglomeration is intended to minimise the number of different developer charges within the LGA. No agglomeration calculations were undertaken as West Yamba was identified as being a single development area.

7.6 Reduction Amount

The reduction amount is defined as the NPV of the future net income expected from providing sewer-related services to the new residents in the DSP area.

The previous CVC sewerage services DSP (GHD, 2017) included the WYURA, and the key works used in the existing developer charge for Yamba which will support future development within the release area. The existing developer charge has therefore been added to the new capital charge calculated in this DSP (which is for works specific to the WYURA). As the existing developer charge already incorporates a reduction amount into its final developer charge calculation, no further reduction amount is applicable for the works in this DSP.

7.7 Cross-Subsidy

The calculated developer charges are the maximum value that may be levied by a water utility. In accordance with *2016 Developer Charges Guidelines for Water Supply, Sewerage and Stormwater* (NSW DPI Office of Water 2016), a utility may elect to levy less than the calculated developer charge.

The cross-subsidy is the percentage difference between the annual bill with the calculated maximum developer charge and the proposed lower developer charge.

No cross-subsidy has been applied to the DSP areas in this DSP.

8. Reviewing / Updating of Calculated Developer Charges

In line with the *2016 Developer Charges Guidelines for Water Supply, Sewerage and Stormwater* (NSW DPI Office of Water, 2016) the developer charges relating to this DSP will be reviewed after a period of 4 to 8 years from the implementation of this plan, concurrently with the review of the CVC Development Servicing Plan – Sewerage Services, GHD, 2017. If the review indicates that the developer charges in this DSP are still applicable this DSP will apply for a further five years once the Council releases a public notice to this effect. However, if the developer charges in this DSP are found to no longer apply and it is believed that a new DSP is warranted, a new DSP shall be prepared, audited, exhibited and registered.

If a major change occurs, such as a requirement for significant capital works, which was not considered in the DSP, Council may carry out a review in less than 4 years, subject to NOW approval. If the review identifies that a new DSP is required, the new DSP must to be prepared, audited, exhibited and registered.

In the period between any review developer charges will be adjusted annually on 1st July on the basis of movements in the Consumer Price Index (CPI) for Sydney, in the preceding 12 months to December, excluding the impact of Goods and Services Tax (GST).

9. Background Information

Background information and calculations relating to this DSP are contained in the following documents:

1. 2011 Australian Census, Australian Bureau of Statistics, 2011
2. Clarence Valley Local Environmental Plan, Clarence Valley Council, 2011
3. Northern Rivers Local Government Development Design and Construction Manual, Development Design Specification D12 Sewerage System, CVC, et al, 2009
4. Yamba Wastewater Strategy Part 1, Geolink, 2002
5. Clarence Valley Council Sewerage Strategic Business Plan, GHD, 2016
6. West Yamba Urban Release Area Water Supply and Sewer Servicing Strategy, HunterH2O, July 2019
7. Clarence Valley Council Development Servicing Plans for Sewerage Services, Hunter Water Australia, 2005
8. Clarence Valley Council Sewerage Strategic Business Plan, GHD, September 2017
9. Maclean Sewerage Scheme Augmentation, NSW Department of Land & Water Conservation and Maclean Shire Council, 2001
10. 2016 Developer Charges Guidelines for Water Supply, Sewerage and Stormwater, NSW Department of Primary Industries Office of Water, 2016
11. NSW Reference Rates Manual – Valuation of Water Supply, Sewerage and Stormwater Assets, NSW Government Office of Water, Ministry of Energy and Utilities, 2003 with amendments in 2010
12. NSW Water and Sewerage Strategic Business Planning Guidelines. NSW Office of Water, 2011
13. Section 64 Determinations of Equivalent Tenements Guidelines, Water Directorate, May 2009 Addendum
14. Gravity Sewer Code of Australia, Water Services Association of Australia, 2014
15. Pressure Sewerage Code of Australia, Water Services Association of Australia, 2007
16. Pumping Station Code of Australia, Water Services Association of Australia, 2005
17. Excel spreadsheets used in calculating developer charges

All other documents can be reviewed in Council's offices by appointment. To review the documents, please contact Council on (02) 6643 0200.

10. Other DSPs and Related Contribution Plans

Other DSP's and related plans include:

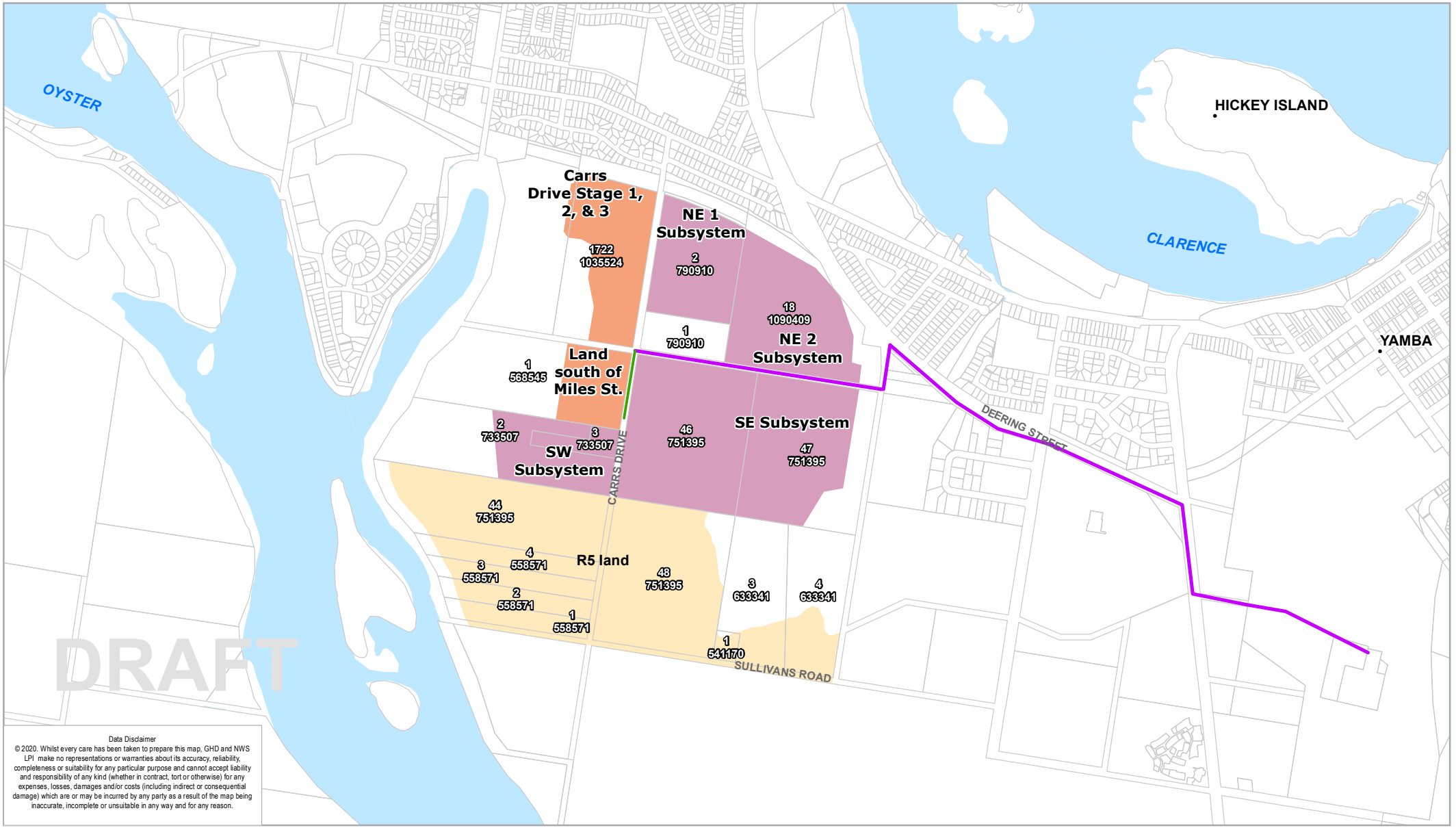
- Clarence Valley Council West Yamba Development Servicing Plan – Water Supply Services, GHD, 2020.
- Clarence Valley Council Development Servicing Plan – Sewerage Services, GHD, 2017
- Clarence Valley Council Development Servicing Plan – Water Supply Services, GHD, 2017.

CVC also levies developer contributions for various public amenities under Section 94 of the *Environmental Planning and Assessment Act, 1979*.

11. Glossary

ADWF	Average Dry Weather Flow
AMT	Accepted Modern Technology
Capital Cost	The Present Value (MEERA basis) of assessment used to service the development.
Capital Charge	The capital cost per ET.
CPI	Consumer Price Index
CVC	Clarence Valley Council
Developer Charge	A charge levied on Developers to recover part of the capital cost incurred in providing infrastructure to a new development.
Discount Rate	The rate used to calculate the present value of money arising in the future.
DSP	Developer Servicing Plan
DCP	Development Control Plan
EP	Equivalent Person
EPA	Environmental Protection Authority
ET	Equivalent Tenement
et al.	et alia
EWON	Energy and Water Ombudsman
FU	Fixture Unit
GCC	Grafton City Council
GST	Goods and Services Tax
i.e.	id est
IDEA	Intermittently Decanted Extended Aeration
IPART	Independent Pricing and Regulatory Tribunal
LEP	Local Environmental Plan
LGA	Local Government Area
LOS	Level of Service
MEERA	Modern Equivalent Engineering Replacement Asset
NPV	Net Present Value
NSW DPI	NSW Department of Primary Industries
OMA	Operation, maintenance and administration (cost)
Post 1996 Asset	An Asset that was commissioned by a water utility on or after 1 January 1996 or that is yet to be commissioned
Pre-1996 Asset	An Asset that was commissioned by a water utility before 1 January 1996

PRP	Pollution Reduction Program
PV	Present Value. The value now of money, or ETs, in the future.
Reduction Amount	The amount by which the capital charge Is reduced to arrive at the developer charge. The amount reflects the present value of the capital contributions that will be paid by the occupier of a development as part of future annual charges discounting OMA costs.
Service Area	An area served by a separate water supply system, an area served by a separate sewerage treatment works, a separate small town or village, or a new development of over 500 lots.
STP	Sewerage Treatment Plant
UV	Ultraviolet
WICA	Water Industry Competition Act
WSAA	Water Services Association of Australia
WWPS	Wastewater Pumping Station
WWTP	Wastewater Treatment Plant



Legend

- Place names
- DN120 pressure main
- DN200 pressure main
- Initial stages
- Future stages
- Waterways
- Cadastre

Paper Size ISO A4

0 100 200 300 400 500

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

Clarence Valley Council
Sewer and Water Development
Servicing Plan Update (DSP)

West Yamba Development Servicing Plan Areas – Sewerage Overview

Project No. **12528667**
Revision No. **B**
Date **8/07/2020**

FIGURE 1

N:\AU\Brisbane\Projects\41\12528667\GIS\Maps\MXD\12528667_001_SewerOverview_revB.mxd
Print date: 08 Jul 2020 - 11:15

Data source: GHD - Initial and Future Stages, pressure main (2020). Cadastre - NSW LPI DCDB 2012 (Date Extracted: 15 Jun 2020) . Created by: jcmatic

13. ET Projections

The basis of future development in WYURA has been adopted from the WYURA Water Supply and Sewer Servicing Strategy, by HunterH2O, July 2019. As such, the projected number of ETs is in accordance with the servicing strategy.

Table 13-1 ET Projections

Development	Proposed number of Lots	Calculated Sewerage ETs[1]
Carrs Drive Stage 1[1]	57	57
Carrs Drive Stage 2[1]	54	54
Carrs Drive Stage 3[1]	50	50
Land south of Miles Street[2]	200	150
All initial stages	**361**	**311**
NE1 subsystem	170	170
NE2 subsystem	256	256
SE subsystem	480	480
SW subsystem	110	110
All future stages	**1,016**	**1,016**
R5 land[3]	42	-
Total	**1,419**	**1,327**

[1] For the development areas north of Miles Street (Carrs Drive stage 1, 2, and 3), 1 ET per lot is assumed for sewer planning purposes. This is based on 3-4-bedroom dwelling per lot (which is considered appropriate for the 450 to 560 sqm lot sizes).

[2.] Council advised HunterH20 in February 2018 that the land south of Miles Street could adopt a 0.75 ET per lot rate for sewer planning purposes. This rate is based on 2 bedroom dwellings per lot.

[3.]It is noted that the associated load contribution from R5 land has only been considered for the water DSP, as per council advice, and as such has been excluded from the sewerage DSP.

13.1.1 Background

Background information provided to inform the population projection calculations included the following:

- West Yamba Urban Release Area Water Supply and Sewer Servicing Strategy (HunterH2O, 2019).

13.1.2 Assumptions

The following assumptions were made to produce the growth projections:

- Complete development within 25 years (2021 to 2046).
- A linear growth rate over the period.

A summary of the growth projections is provided in 3.1.

Table 13-2 Growth Projections

Time Period	Equivalent Tenements (ETs)	Number of New ETs / year
2020/21	0	0
2021/22	53	53
2022/23	106	53
2023/24	159	53
2024/25	212	53
2025/26	265	53
2026/27	318	53
2027/28	371	53
2028/29	424	53
2029/30	477	53
2030/31	530	53
2031/32	583	53
2032/33	636	53
2033/34	689	53
2034/35	742	53
2035/36	795	53
2036/37	848	53
2037/38	901	53
2038/39	954	53
2039/40	1,007	53
2040/41	1,060	53
2041/42	1,113	53
2042/43	1,166	53
2043/44	1,219	53
2044/45	1,273	53
2045/46	1,327	54
2046/47	1,327	0
2047/48	1,327	0
2048/49	1,327	0
2049/50	1,327	0
2050/51	1,327	0

14. Existing Capital Costs

A summary of assets and MEERA values is included in the CVC Development Servicing Plan – Sewerage Services, GHD, 2017. Below is a summary of the existing sewerage costs for Yamba.

Table 14-1 Summary of the Existing Capital Charge (from the CVC Development Servicing Plan - Sewerage Services, GHD 2017)

DSP Name	Existing (2017) Capital Charge ($ / ET)	Existing (2017) Reduction Amount ($ / ET)	Existing (2017) Calculated Maximum Developer Charge ($ / ET)	Existing (2017) Adopted Developer Charge ($ / ET)	Existing 2020[1] Developer Charge ($/ET)
Yamba	$12,073	$557	$11,516	$11,516	$12,175

[1] This value has been taken from the CVC Adopted 2020/21 Fees and Charges, Section 7.11 (previously Section 94 contributions) Current Plans and Section 64 Contributions.

15. Future Capital Works Program

Future capital works including a description, construction year and MEERA costs are included in the CVC Development Servicing Plan – Sewerage Services, GHD, 2017 and Table 15-1 below.

Table 15-1 Future Sewerage Scheme Capital Expenditure (contributing to Capital Charge)

Amenity	Asset Name	Development Area	Stage / Development Area	Construction Year	Gross (2020/21$)	Capital Charge (2021$)
New System Asset	**Pipe 1:** 2,848 metres of DN200 pressure sewer main connecting into the Yamba STP	A, B, C	Initial stages / All Future stages / All	2021 - 2023	$850,096	$850,096
New System Asset	**Pipe 2:** 313 metres of DN200 pressure sewer main in Miles Street	A, B	Initial stages / All Future stages / SW, NE1 and SE Subsystem	2021 - 2023	$93,427	$93,427
New System Asset	**Pipe 3:** 237 metres of DN120 pressure sewer main	B	Initial stages / Land South of Miles Street Future stages / SW subsystem	2021 - 2023	$59,292	$59,292
Total:					**$1,002,815**	**$1,002,815**

16. Calculation of Capital Charge

A summary of the calculated capital charge per ET is provided in Table 16-1.

Table 16-1 Capital Charge Net Present Value, Summary of Calculations

Year Number	Year	Estimated Expenditure	PV factor (@5%)	PV of Capital Expenditure (@5%)	New ETs per year	PV of New ETs (@5%)	Capital Charge
1	2021/2022	$501,407.85	1	$501,407.85	53	53	
2	2022/2023	$501,407.85	0.95	$476,337.46	53	50	
3	2023/2024		0.91	$-	53	48	
4	2024/2025		0.86	$-	53	46	
5	2025/2026		0.82	$-	53	44	
6	2026/2027		0.78	$-	53	41	
7	2027/2028		0.75	$-	53	40	
8	2028/2029		0.71	$-	53	38	
9	2029/2030		0.68	$-	53	36	
10	2030/2031		0.64	$-	53	34	
11	2031/2032		0.61	$-	53	32	
12	2032/2033		0.58	$-	53	31	
13	2033/2034		0.56	$-	53	30	
14	2034/2035		0.53	$-	53	28	
15	2035/2036		0.51	$-	53	27	
16	2036/2037		0.48	$-	53	25	
17	2037/2038		0.46	$-	53	24	
18	2038/2039		0.44	$-	53	23	
19	2039/2040		0.42	$-	53	22	
20	2040/2041		0.4	$-	53	21	
21	2041/2042		0.38	$-	53	20	
22	2042/2043		0.36	$-	53	19	
23	2043/2044		0.34	$-	53	18	
24	2044/2045		0.33	$-	53	18	
25	2045/2046		0.31	$-	53	16	
26	2046/2047		0.3	$-	0	0	
27	2047/2048		0.28	$-	0	0	
28	2048/2049		0.27	$-	0	0	
29	2049/2050		0.26	$-	0	0	
30	2050/2051		0.24	$-	0	0	
End		$1,002,815.70		$977,745.31	1327	786	$1,244

Table 16-2 Sewerage Capital Charge per ET, Summary of Calculations

Development Area	Future Works ($/ET)	Existing Works Pre-1996 ($/ET)	Existing Works Post-1996 ($/ET)	Total Capital Cost per ET ($/ET)[1]
West Yamba	$1,244	-	-	$13,419

[1] The capital charge value for Yamba $12,175/ET (taken from the Clarence Valley Council Adopted 2020/21 Fees and Charges, Section 7.11 (previously Section 94 contributions) Current Plans and Section 64 Contributions) has been added to the calculated capital charge for WYURA of $1,244/ET to derive the total capital cost per ET for WYURA developments.

17. Calculation of the Reduction Amount

As discussed in section 7.6 no reduction amount was calculated for this DSP.

18. Cross-subsidy Calculations

No cross-subsidy has been applied to the areas in this DSP.

19. Calculation of Developer Charge

The calculation of developer charges per ET is summarised in **Error! Reference source not found.**.

Table 19-1 Developer Charges per ET, Summary of Calculations

Development Area	Capital Charge ($/ET)	Reduction Amount	Adopted Developer Charge ($/ET)
West Yamba	$13,419	$0	$13,419

GHD

145 Ann Street Brisbane QLD 4000
GPO Box 668 Brisbane QLD 4001
T: (07) 3316 3000 F: (07) 3316 3333 E: bnemail@ghd.com

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Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
A	A Steele	R Savage		R Savage		10.07.2020
B	A Mojica	A Steele		R Savage		29.07.2020
0	A Mojica	A Steele		R Savage		4.08.2020
1	A Mojica	A Steele		R Savage		13.10.2020

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APPENDIX F – ELECTRICAL AND COMMUNICATIONS BYD PLANS

Overhead wires not shown
LOOK UP & LIVE!

LEGEND

- LV Underground Cable
- HV Underground Cable
- Underground Pipe
- Underground Earth or Wires
- Ground Substation
- Pole
- Cubicle
- Pit
- Area of Interest

Critical Assets

Contact Essential Energy on 13 23 91

- Zone Substation
- Underground Cable
- Underground Fibre

Proposed Works

- Area of proposed works

Proposed assets are shown as orange symbols

THE INFORMATION ON THIS MAP MAY NOT BE ACCURATE. If details are incorrect, please notify Essential Energy on 13 23 91 (or fax 1800 354 636)

ISSUE DATE: 07/09/2022

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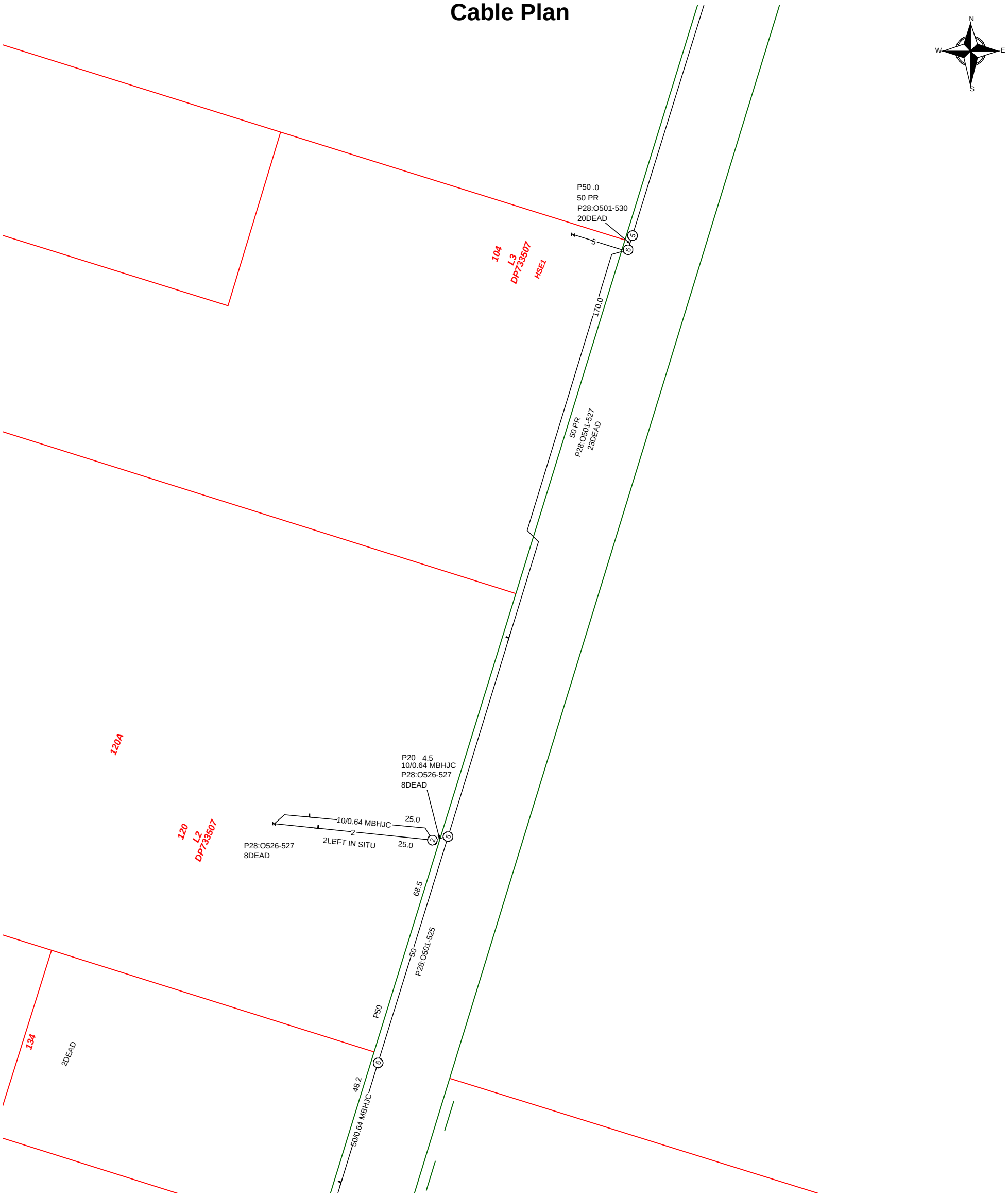
A4 | SCALE: 1:2476

essential energy

Job Number: 32678806 Sequence number: 215700100 Job location: 120 Carrs Drive, Yamba

Map Centre: 153° 19' 53.9", -29° 26' 28.7"

Cable Plan



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Please read Duty of Care prior to any excavating

WARNING
Telstra plans and location information conform to Quality Level "D" of the Australian Standard AS 5488-Classification of Subsurface Utility Information.
As such,Telstra supplied location information is indicative only.Spatial accuracy is not applicable to Quality Level D.
Refer to AS 5488 for further details. The exact position of Telstra assets can only be validated by physically exposing it.
Telstra does not warrant or hold out that its plans are accurate and accepts no responsibility for any inaccuracy.
Further on site investigation is required to validate the exact location of Telstra plant prior to commencing construction work.
A Certified Locating Organisation is an essential part of the process to validate the exact location of Telstra assets and to ensure the asset is protected during construction works.

See the Steps- Telstra Duty of Care that was provided in the email response.