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CLIFTON YAMBA MHE

EARTHWORKS MANAGEMENT PLAN

Manufactured Housing Estate (MHE) Development

110 – 120 Carrs Drive, Yamba

LOT 2 DP733507 and Lot 32 DP1280863

FOR:

CLIFTON YAMBA LAND PTY LTD

ATF YAMBA LAND TRUST

JANUARY 2024

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Manage-Design-Engineer DOCUMENT CONTROL

PROJECT: CLIFTON YAMBA MHE

CLIENT: CLIFTON YAMBA LAND PTY LTD
ATF YAMBA LAND TRUST

AUTHOR: Andrew Smith

REVISION HISTORY

REVISION	DATE	CHECKED BY	
		NAME	SIGNATURE
0	13/11/23	Troy Ryden	
1	23/01/2024	Tory Ryden	

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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 detailed design, documentation and project management for a proposed 216 lot Manufactured Housing Estate at 110-120 Carrs Drive Yamba (LOT 2 DP733507 and Lot 32 DP1280863). The location of the site is highlighted in Figure 1 below.

The project involves bulk earthworks, roadworks, stormwater drainage, sewer reticulation, water reticulation and telecommunications & electrical reticulation to service the proposed 216 Lot manufactured house dwellings and communal facilities and associated structures. It is anticipated that construction of civil works and subsequent dwelling and communal facilities will be undertaken in multiple stages over a 3-5 year period.

FIGURE 1 – PROPOSED MHE DEVELOPMENT SITE

A Development Application was submitted on 18 April 2023 following DA phase investigations and designs for the proposed development. Following Council's Request for Information received on 22 June 2023, the detailed earthworks plans prepared by MDE were updated, a copy of these updated plans are provided in **Appendix A.**

A Preliminary Geotechnical Investigation (Revision A – 20 May 2022) was undertaken on 1 July 2021 by Geotech Investigations to examine site geotechnical conditions and provide geotechnical engineering advice on design and construction constraints and requirement. This report is included in **Appendix B**. This investigation and report builds on existing investigations and reporting undertaken at 90 Carrs Drive Yamba prior to the construction of a similar 197 lot MHE development at that address.

Finally, a detailed Acid Sulphate Soils Management Plan was prepared by Precise Environmental to assess the potential for acid sulphate soils associated with the proposed earthworks and provide recommendations on the management and treatment of any actual acid sulphate soils during construction. This management plan is provided for reference in **Appendix C** of this report.

The findings and recommendations of the Geotech Investigations report and the Precise Environmental report were relied upon during the design and documentation of the bulk earthworks model and have also been referenced in developing this site specific earthworks management plan.

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2.0 SITE ESTABLISHMENT & TRAFFIC MANAGEMENT

The contractor is to establish a site office and compound facility within the site boundary at a location approved by the Superintendent. The site office is to include a separate office for the use of the Principal, Superintendent and PCA when on site. Temporary perimeter security fencing of each stage of the works is to be provided for the full perimeter of the site specific to that stage of works under construction. The contractor is responsible for all costs associated with the provision of a site office and compound, site establishment and dis establishment and all associated temporary services required to complete the works.

Prior to any works commencing, the contractor is to undertake a Road Dilapidation Survey for Carrs Drive and advise the Superintendent of any existing road pavement defects.

The contractor must also submit a Dial Before You Dig application for existing services within the vicinity of the site and undertake all necessary non destructive investigations to physically locate and survey all existing underground infrastructure prior to works commencing.

The control of traffic around and into the site will be the responsibility of Contractor for the duration of the contract. The effective planning and management of vehicle movements is necessary to minimise any impact on the surrounding residential neighbourhood and to ensure the safety of the public and workers. To achieve this the Contractor is required to develop a site specific Construction & Traffic Management Plan and Traffic Control Plans which comply with RMS's Traffic Control at Worksites Manual. These documents are to be submitted to the Superintendent and Clarence Valley Council for approval prior to any works commencing on site.

Any traffic control on public roads is to be undertaken by suitably qualified traffic controllers under a traffic control plan developed by a suitably qualified designer in accordance with the Traffic Control at Worksites Manual.

It is proposed that construction access to the site is to be via Carrs Drive at the northern most access point that is practical to achieve safe site access. The Contractor is to submit to the Superintendent for approval details of the proposed location and construction of the preferred site access. The contractor is responsible for all costs associated with the provision and removal of temporary all weather access tracks (both within and external to the site) & stabilised site access points for the duration of the project. On receipt of all details relating to the proposed construction access, Manage-Design-Engineer Pty Ltd will make an application to Clarence Valley Council for a S138 approval for the construction of the temporary access.

The Contractor will be responsible for maintaining the pavement within Carrs Drive (including the costs associated with that maintenance) to an acceptable standard for the duration of their contract to ensure the safety of the community. A pavement inspection, maintenance and repair plan has been included in **Appendix D**.

3.0 BULK EARTHWORKS AND GEOTECHNICAL SUPERVISION

The proposed Development Application earthworks plan (**Appendix A**) details the import of approximately 240,000m3 (solid) of fill material to raise the level of the site sufficiently to achieve flood immunity and facilitate proper drainage and sewer reticulation for the allotments and site in general. It is proposed that the bulk filling be undertaken as one continuous operation using locally sourced fill material from an approved quarry or approved borrow site. There are currently no plans to undertake filling operations with dredge material.

Site bulk fill levels range from RL 3.3 to RL4.1, which will enable all habitable structures on site to achieve the required minimum finished floor level of RL 3.5m AHD. Pre filling levels show the site's existing ground level to be approximately RL 1m to RL 1.5m AHD which means fill depths will range from 1.8m to 3.1m.

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The proposed fill footprint is limited to the R1: General Residential zoned land and will not impact on the C3: Environmental Management or C2: Environmental Conservation zoned land. Within the General Residential zoned land, earthworks will not be undertaken within the bed and bank zone of the existing stream and therefor there are anticipated impacts on that watercourse.

Following award of the Bulk Earthworks Construction Contract, details of the fill type, source and suitability for use will be provided by the Contractor to the Superintendent and Clarence Valley Council for approval. As part of that submission material test reports completed by a NATA accredited laboratory detailing the following material characteristics as a minimum will be required:

- Material Gradings
- CBR (Minimum CBR 5 required)
- Shrink / Swell Index (Maximum Shrink Swell Index of 1.5%)
- PI & Liquid Limit (Maximum PI of 15% and Maximum LL of 35%)

The Contractor is to review and reference the Preliminary Geotechnical Investigation report by Geotech Investigations when sourcing proposed fill material for the project.

All site fill operations associated with this development must be undertaken under Level 1 Supervision and Testing in accordance with AS3798 - 2007. This includes fill to roads, allotments and common areas. Under the provisions of the contract, the Level 1 Geotechnical Consulting Engineer will be nominated by the Principal and engaged by the Contractor to complete the required works.

All other testing of roadworks gravels, trench subgrades, trench backfill, material quality (except for bulk fill), concrete pavements etc is the responsibility of the Contractor and their nominated NATA accredited tester under a Level 2 inspection and testing regime and in accordance with the Northern Rivers Design and Construction Manual.

The Contractor is required to notify the Superintendent of the following milestones during bulk earthworks operations to allow the Principal's surveyor to undertake site surveys:

- On completion of clearing operations prior to stripping
- On completion of stripping prior to filling
- On completion of bulk filling and detailed trimming but prior to topsoiling

The Principal's surveyor may from time to time undertake additional site surveys to confirm fill quantities for claim assessment and programming purposes.

Other inspection, witness and hold points required during bulk earthworks operations are outlined in the Bulk Earthworks ITP included in **Appendix E**, the Northern Rivers Design and Construction Manual and the contract specification.

Reference is made to Geotech Investigations Preliminary Geotechnical Investigation which is provided in **Appendix B**. This investigation was undertaken to assess the following aspects of the site:

(a) Subsurface Conditions
(b) Site preparation and requirements for filling
(c) Topsoil Stripping Depths
(d) Filling Procedures
(e) Assessment of soft soils and requirement for pre loading
(f) Broadscale footing recommendations and site classifications

The geotechnical investigation noted the following site characteristics:

- Up to 300mm of topsoil overlying alluvial sands
- Groundwater at depths ranging from 0.5m to 1.2m

- Alluvial soils comprising sandy clay and sand, fine to medium grained and medium to high plasticity, firm to stiff

The investigations also identified the following site characteristics which are relevant to the proposed bulk fill operation:

- The site is located within a low lying alluvial area with poor drainage and shallow groundwater
- The site is underlain primarily by sand rather than clay soils therefor consolidation settlement is considered negligible (<20mm-30mm with that settlement occurring during bulk filling activities). This limited magnitude of settlement will therefor have no impact on existing groundwater levels.
- Site trafficability will be a concern during initial stages of site stripping and placement of lower fill layers and following prolonged or heavy rainfall events. It is recommended that a crushed rock or similar layer be placed in areas of high construction traffic movement
- It is recommended that a 500mm thick 'bridging layer' of sand material be placed after stripping but prior to general filling to address any potential issues arising from the high water table and thin layer of alluvial clay in the upper subgrade layer
- Careful attention will need to be given to the maintenance of appropriate cross falls during and following site works to promote surface drainage. The surface of any exposed subgrade or fill layers should be sealed with a smooth drum roller at the end of each day's work, or prior to anticipated rainfall events, to reduce the potential for moisture ingress.

Based on the findings of Geotech Investigations report and field work, along with knowledge gained through other similar bulk earthworks operations in Carrs Drive, the following additional recommendations are made in relation to the proposed earthworks operation:

- Drainage swales, diversion mounds and silt fencing should be installed around the perimeter of the site to reduce sediment runoff
- Any material to be disposed of off site should be assessed for disposal requirements. Much of the material is likely to be classified as Virgin Excavated Natural Material (VENM), however any disturbed materials will require waste classification assessment prior to disposal.
- The use of heavy plant and compaction using vibratory methods may result in an increase in pore water pressures and subsequent 'pumping' of moisture into the lower fill layers. It is proposed that a 500mm bridging layer of sand be placed prior to bulk earthworks general fill material to limit the potential for this to occur
- Preference is for the use of granular over cohesive fill materials, particularly in lower fill areas
- All vegetation root affected material, topsoil, over wet material and uncontrolled fill or otherwise unsuitable material should be stripped and stockpiled for later reuse or landscaping purposes
- The exposed subgrade is to be proof rolled following stripping operations with any wet or excessively deflecting or otherwise deleterious materials to be excavated and replaced at the direction and to the satisfaction of the Level 1 Geotechnical Engineer
- Fill should be placed in layers not exceeding 250mm loose thickness and be compacted to a minimum dry density ratio of not less than 95% standard compaction and +/- 2% standard OMC.
- All site filling should be carried out in accordance with Level 1 construction monitoring and testing as defined in AS3798 – 2007.
- Temporary batters may be cut no steeper than 1H:1V for heights up to 1.5m and should be protected from rainfall by trimming smooth at the end of each days work. Surface water should be diverted away from the face of batters

Additional fill specifications are included in the Engineering Design plans prepared by Manage-Design-Engineer Pty Ltd and included in **Appendix A**.

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4.0 ACID SULFATE SOILS MANAGEMENT

Precise Environmental were engaged to undertake a site acid sulfate soils investigation and prepare a detailed Acid Sulfate Soils Management Plan for the site. This management plan is included in **Appendix C**.

Precise Environmental have recommended the following be undertaken during earthworks operations:

- Place aglime at a rate of ≥ 5kg/m2 across all stripped surfaces
- Excavated ASS which have not been treated must be contained within a bunded area constructed din accordance with relevant design standards
- A guard layer of aglime is to be placed beneath and over the surface of untreated soils and surrounded by a lime enriched perimeter
- Leachate collection drains should be installed surrounding any ASS treatment pads within the bunded area
- Verification testing is required on all treated material not used as backfill on the day of excavation to verify that sufficient lime has been added to neutralise the soils net acidity

The contractor is to be aware of and adhere to the recommendations of the Acid Sulfate Soils Management Plan in Appendix D for all site earthworks operations. The Contractor's Environmental Management Plan and Construction Management Plan shall include provisions and procedures to ensure compliance with the Acid Sulfate Soils Management Plan.

5.0 DUST MANAGEMENT

Earthworks filling operations and general civil and site construction activities can generate dust which has the potential to cause nuisance to nearby residents and the general public. Typical construction activities that could result in dust emissions include:

- General earthworks particularly during site establishment
- Vegetation clearing and mulching
- Bulk earthworks
- Topsoil/material handling including stockpiling, material loading and material haulage
- Vehicular movements over unpaved surfaces
- Wind erosion of exposed areas and temporary stockpiles
- Tracking of dirt onto roads

The likelihood and severity of dust generation is influenced by Environmental factors such as:

- Wind Direction – determines whether dust is transported in the direction of sensitive receivers
- Wind Speed – governs the potential suspension and transport of dust
- Soil type – more erodible soil types have an invfreased soil or dust erosion potential
- Soil moisture – increased soil moisture reduces soil or dust erosion potential
- Renfall or dew – rainfall or dew wets the surface of the soil and reduces the risk of dust generation

The potential impacts of dust caused by construction activities might include:

- Deposition of dust on surfaces where it may cause damage and/or lead to a need for increased cleaning or repair
- Aesthetic effects that arise from visible airborne dust plumes and from deposits of dust on surfaces
- Need for increased maintenance of air filtering systems e.g. air conditioners

- Potential adverse health effects including eye, nose and throat irritation from excessive inhalation of fine particles
- Impacts on water quality and/or vegetation health from dust deposition
- Impacts on residential sensitive receivers, including impacts on living areas, swimming pools and general amenities
- Complaints from the public

The following dust management and mitigation measures must be implemented by all contractors engaged to undertake site works in relation to the MHE development. Costs associated with adherence to these measures should be included in the contractors lump sum pricing of the works:

1. Weather forecasts are to be reviewed daily with appropriate measures implemented where unfavourable conditions are anticipated e.g. dry weather and/or strong winds
2. Modify construction activities and works programs during periods of high winds if they have the potential to increase dust generation
3. Exposed surfaces with no scheduled work for two weeks or more will be managed to minimise dust generation. Exposed surfaces to be stabilised progressively as works are completed. The use of water carts and smooth drum rollers to suppress dust and covering exposed areas with geofabric (for short periods) or hydromulching and revegetation (for long periods) shall be undertaken as required.
4. Dust suppression measures such as the use of water carts, soil binders, sprinklers or dust screens (or a combination of measures) will be utilised where applicable to control dust emissions. The frequency of use will be modified to accommodate prevailing conditions.
5. Erosion control structures shall be maintained and accumulated sediment regularly removed to remove potential dust sources
6. Stockpiles of topsoil are to be stabilised with a suitable cover crop where stockpiles are to remain for longer than four weeks
7. Access roads are to be regularly watered and compacted to minimise dust generation
8. Stabilised site accesses must be maintained to minimise dust, soil or mud from being deposited by vehicles to public roads. Haulage of materials into the site during periods of wet weather will be avoided where the tracking of mud onto public roads cannot be managed through stabilised site access or manual cleaning of tyres. Any deposition of dust, soil or mud external to the site boundaries shall be cleaned using methods including brooms, street sweepers and bobcat broom attachments.
9. Vehicle movements are to be limited to designated site access points and site speed limits reduced to 40km/h or less, depending on site and weather conditions.
10. All haulage trucks are to be covered to prevent the release of dust and other materials at all times when on public roads

The Contractor will ensure regular inspections of the public road network in the vicinity of the site and will respond to any issues raised in relation to dust generation associated with the site works.

6.0 VIBRATION MANAGEMENT

As with dust generation, earthworks filling operations and general site civil works have the potential to generate vibration which can cause a nuisance to sensitive receivers. The risk for site generated vibration to impact on these sensitive receivers will be greatest during the bulk filling operation due to the use of heavy plant and equipment and vibratory compaction methods.

The use of heavy plant and equipment and construction activities in general have the potential to generate vibrations that can travel to nearby properties and cause a nuisance. The magnitude of the vibrations, the distance travelled and the severity of the impacts vary depending on a number of factors including the type of plant & equipment, the type of activity being undertaken, the soil profile in the area, the depth of the water table and the type of structure, age of structure and the quality of the construction of the structure.

The following vibration management and mitigation measures will be implemented for site activities to limit the impact on sensitive receivers:

1. The contractor is to ensure that sensitive receivers are notified of construction activities that have the potential to generate vibrations
2. Contact details for the site manager / construction manager are to be clearly displayed on the site signage at the entrance to the site and provided directly to sensitive receivers
3. Construction activities are to be planned to ensure appropriate sized plant and equipment are available for the works being undertaken
4. Where possible, the use of vibratory compaction equipment should be limited if there is a potential to cause unacceptable levels of vibration and impact on sensitive receivers

In the event of a valid vibration complaint or damage to structures, vibration monitoring is to be carried out as soon as possible. If exceedances are detected, work methodologies and selected plant and equipment will be further reviewed to reduce the impact to acceptable levels where practicable.

7.0 CONCLUSION

The development of 110-120 Carrs Drive to create 216 Manufactured Housing sites involves the import of approximately 240,000m3 of general fill material. This report outlines the requirements for the procurement, haulage and placement of that fill material on site to achieve the requirements of the design, relevant Australian Standards and Schedule X1 – Natural and Environmental Hazards: Flood and Fill Management' of the DCP.

Geotechnical and Acid Sulphate Soils site investigations have been undertaken to determine the existing site conditions and requirements for fill materials and processes. Those investigations are included in the Appendix to this report.

The proposed filling operation may have impacts on the surrounding road network and community. This report provides guidelines and strategies for the management of the bulk earthworks operation to ensure the works are undertaken efficiently and effectively and with minimal impacts on the environment, existing infrastructure and surrounding community.

The following table details the objectives and controls set out in Schedule X1 of the Clarence Valley Council Residential DCP 2011 along with details of how these controls and objectives have been met.

DCP OBJECTIVE / CONTROL NUMBER	DCP OBJECTIVE / CONTROL DESCRIPTION	
OBJECTIVE 1	Ensure that flood and drainage impacts are considered for the development of the entire WYURA and not just in relation to the development of individual land parcels within WYURA	The development application includes a Flood Impact Assessment undertaken by BMT to address Objective 1. This FIA assesses the flood and drainage impacts of both the individual land parcel as well as the entire WYURA.
OBJECTIVE 2	Minimise flood and drainage impacts to the	The development application includes a Flood

	development in the WYURA on adjoining residential neighbourhood and property including ensuring that there is no net increase in the number of existing dwellings whose habitable floor levels become inundated by the ultimate filling and development of the entire WYURA	Impact Assessment undertaken by BMT to address Objective 2. This FIA demonstrates that impacts are minimised and there is no net increase in the number of existing dwellings whose habitable floor levels become inundated.
OBJECTIVE 3	Ensure that future development of WYURA is undertaken in accordance with the 'Lower Clarence Flood Model Update 2013 – September 2013', adopted by Council in March 2014 or any subsequent model update that Council may adopt	The Bulk Earthworks design has been undertaken in accordance with the updated Lower Clarence Flood Model (2022). Earthworks have been designed to facilitate a minimum finished habitable floor level of RL3.5m AHD. The FIA undertaken by BMT has been updated to take into account the updated LCFM 2022
OBJECTIVE 4	Ensure that any stage of the overall WYURA development is successfully integrated and does not prejudice or detrimentally impact overland flow path/s, existing watercourses and stormwater management network	The proposed development has been designed to ensure all existing drainage paths are maintained and where appropriate, improved. All development stormwater flows discharge directly to the existing drainage channel within the development property and subsequently to Oyster Channel with no impact on neighbouring properties. Overland flow paths via existing drainage channel through the property will not be impacted.
OBJECTIVE 5	Ensure that Acids Sulphate Soil impacts are assessed and appropriately managed.	An Acid Sulphate Soils Assessment and Management Plan have bee completed for the proposed earthworks operation and has been provided with the Development Application. The Earthworks Contractor will be conditioned to comply with the requirements of the Management Plan during the construction phase of the project.
CONTROL C1	The Consent Authority must not grant consent to the commencement of land fill or other earthworks associated therewith unless an Earthworks Management Plan (EMP) is prepared to ensure that level of finished lots are at least at the level of the 1 in 100 year flood event, whilst also maintaining an effective drainage network, overland flow path/s and meeting other development standards of Council	An earthworks design has been completed for the proposed development that raises the level of the development site to above the revised (LCFM 2022) 1 in 100 year flood level. The Development Application design also details the proposed drainage network for the development demonstrating compliance with both Council drainage design requirements. Existing drainage networks and flow paths will be maintained and where appropriate, improved to meet required standards.
CONTROL C2	Where surface soils are stripped and there is a potential for sulphate soils to be disturbed, measures are to be identified in the EMP and are to be in place to manage this occurrence and neutralise any ASS contamination outside of the	An Acid Sulphate Soils investigation and subsequent Management Plan has been completed for the proposed development. The management plan will be implemented throughout the construction phase of the

	treatment site	development. This EMP identifies measures required to manage and neutralise any potential or actual acid sulphate soils.
CONTROL C3	An EMP must include: (a) A SOEE / impacts including assessment and management of acid sulphate soils (b) All required licencing approvals from State Government Authorities (c) Staging plans and detail of finished survey levels for fill (d) Area and extent of fill requirements, supported by engineering design detail (e) Dredge location/s and proposed pipe routes to WYURA (f) Maintenance and management plan for the period of the dredging at and in the vicinity of the URA (g) The design and location of all stormwater drainage corridors (h) Overland flow paths to reach local estuaries/waterways (including Oyster Channel) and the URA drainage reserve / floodways (i) The required widths/depths of overland flow paths (j) A program of works detailed actions and duration of filling activity and compaction	(a) The Acid Sulphate Soils Management plan prepared by Precise Environmental provides an assessment of and management plan for acid sulphate soils relating to this proposed development (b) All required licencing approvals will be obtained prior to commencement of works following detailed design (c) Bulk earthworks are proposed to be undertaken in one stage of works. Proposed finished surface levels of fill are detailed in MDE's DA Bulk Earthworks design plans (d) Refer to MDE's DA Design plans and certification (e) NA – it is anticipated that fill will be sourced from a licenced quarry or similar licenced or approved fill source. There are currently no applications or plans to undertake filling of the site with dredge material. (f) NA – refer item (e) response above (g) The design and location of all stormwater drainage corridors has been detailed in MDE's DA Civil Engineering design plans (h) The development drainage design allows for overland flow paths that discharge to the existing drainage channel within the development site that flows to the Oyster Channel. Existing overland flow paths external to the site will not be impacted, nor will the drainage channel/path through the site to Oyster Channel. (i) The overland flow paths within the development site are detailed in MDE's DA design plans. The width and depth of the existing drainage channel through the development site will be maintained. (j) It is anticipated that the earthworks operation will be undertaken over a period of approximately 8-10 months. A detailed program of works will be developed prior to construction once detailed designs are complete and a suitable fill source has been identified

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		and approved.
CONTROL C4	The consent authority must not grant consent to the erection of a building or the carrying out of works on land to which this plan applies, if the carrying our of the proposed development would: (a) Be inconsistent with an EMP; and, (b) Detrimentally increase the potential flood affectation on other development or property in WYURA or result in a risk to human life	This EMP has been prepared in conjunction with MDE's bulk earthworks design. The proposed works are consistent with this EMP. A Flood Impact Assessment has also been completed which takes into account the proposed fill operation and other development sites within the WYURA.

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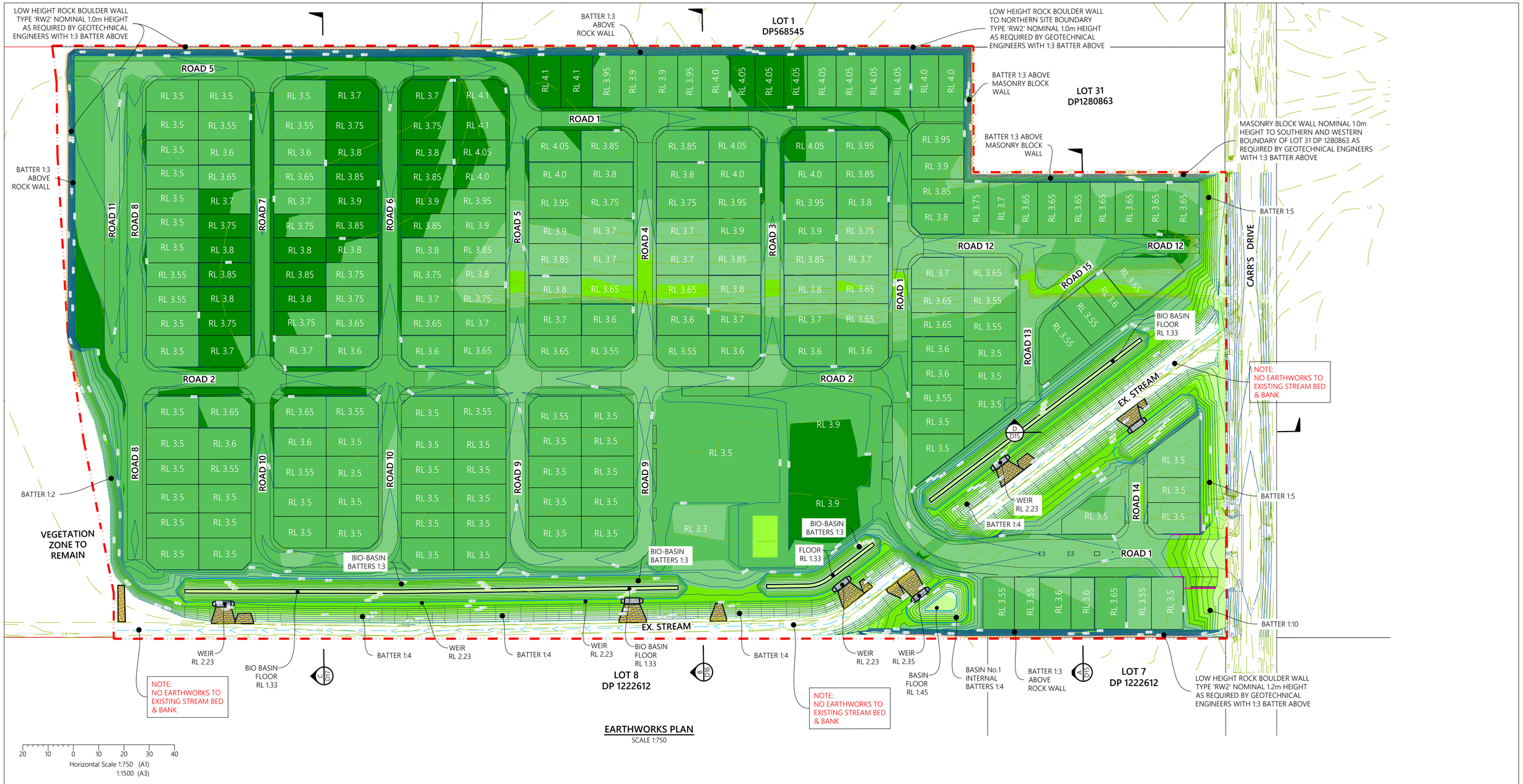
APPENDIX A – DA BULK EARTHWORKS PLANS



EARTHWORKS PLAN

SCALE 1:750

Horizontal Scale 1:750 (A1)
1:1500 (A3)

LEGEND

- 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 - 3.0m DEPTH
- FILL 3.0- 3.2m DEPTH
- 6.6 EXISTING SITE CONTOURS 0.1m INTERVAL
- 2.6 PROPOSED RE-GRADING CONTOURS 0.2m 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 =9.67Ha (EXCL. CARRS DRIVE RECONSTRUCTION)
TOPSOIL STRIPPED TO STOCKPILE = 9,670m^3

GENERAL BULK EARTHWORKS
TOTAL CUT = 0m^3
TOTAL FILL = 239,700m^3 (IMPORTED FROM APPROVED SOURCE or QUARRY)

* NOTES:
AMENDED LOWER CLARENCE FLOOD MODEL 2022 WITH 1% AEP FLOOD LEVEL RL=3.5m AHD

ALLOTMENT EARTHWORKS LEVELS TO BE NO LESS THAN THE 100 YEAR (1% AEP) FLOOD LEVEL RL=3.5m AHD.

PLANS TO BE PRINTED IN COLOUR

PRELIMINARY PLANS FOR DA PURPOSES ONLY NOT FOR CONSTRUCTION

ISSUE	DESCRIPTION	DATE
1	ISSUED FOR DEVELOPMENT APPLICATION - AMENDED SITE FORMATION HEIGHTS	23.01.2024
0	ISSUED FOR DEVELOPMENT APPLICATION	08.09.2022

ISSUED FOR DEVELOPMENT APPROVAL
NOT FOR CONSTRUCTION

DESIGNED: T.RYDEN | DATE: JAN 2024
DRAWN: A.SCHMID | SCALE: AS SHOWN
SURVEYING: MACRO SURVEYING | SHEET SIZE: A1

MDE Manage Design Engineer

CLIENT: CLIFTON YAMBA LAND PTY LTD

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

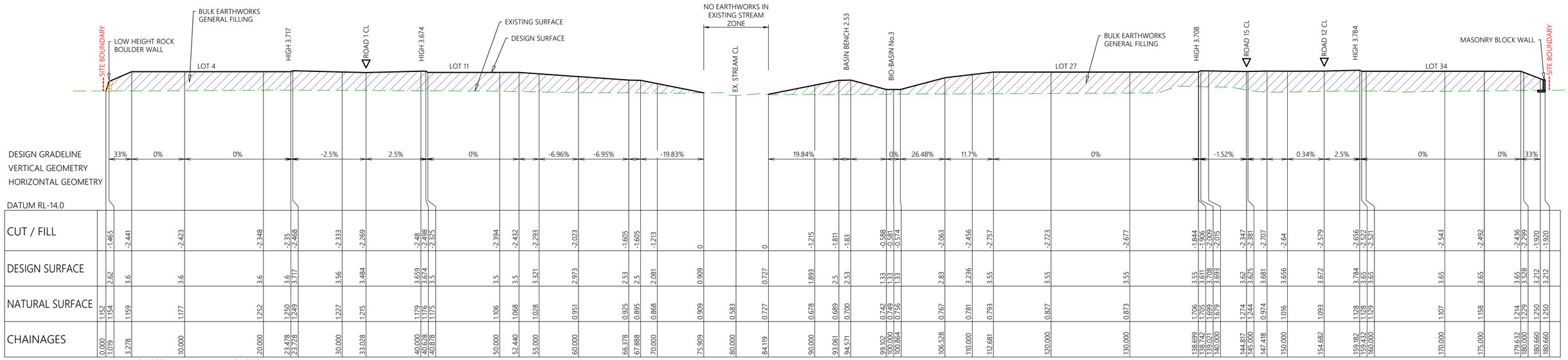
CLIFTON YAMBA

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

DA CIVIL DRAWING

DRAWING TITLE: EARTHWORKS PLAN

DWG No: D14 | SHEET: 14 OF 43 | REV: 1



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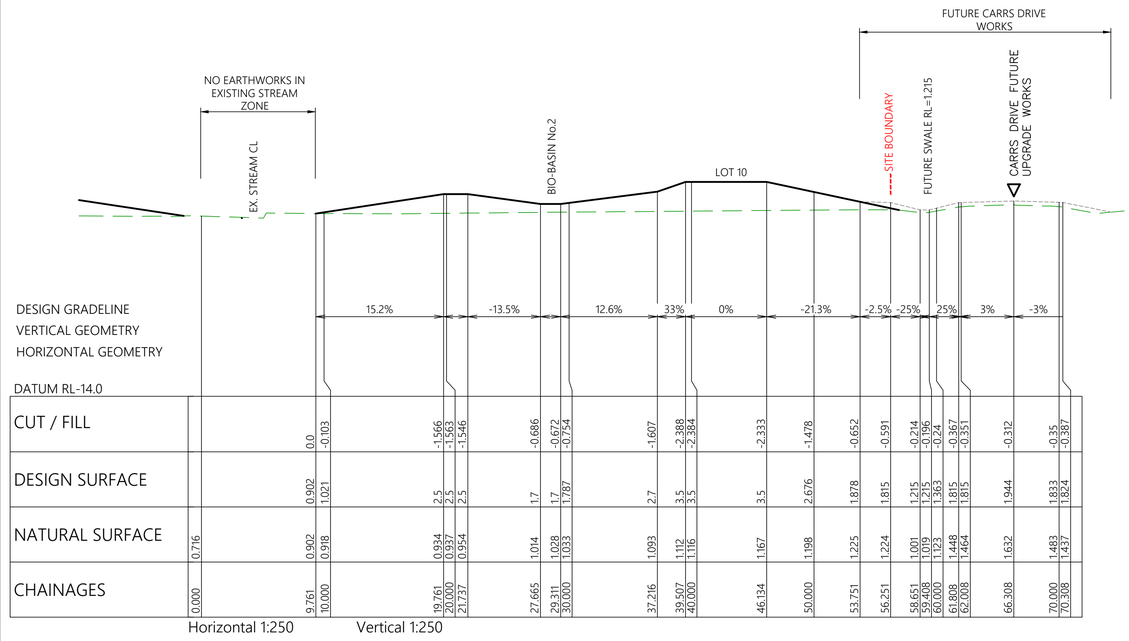
BULK EARTHWORKS SECTION - A



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BULK EARTHWORKS SECTION - D

ISSUE	DESCRIPTION	DATE
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0	ISSUED FOR DEVELOPMENT APPLICATION	08.09.2022

DESIGNED: T.RYDEN | DATE: JAN 2024
DRAWN: A.SCHMID | SCALE: AS SHOWN
SURVEYING: MACRO SURVEYING | SHEET SIZE: A1

ISSUED FOR DEVELOPMENT APPROVAL
NOT FOR CONSTRUCTION

MDE Manage Design Engineer
www.md-engineer.com.au

CLIENT: CLIFTON YAMBA LAND PTY LTD

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

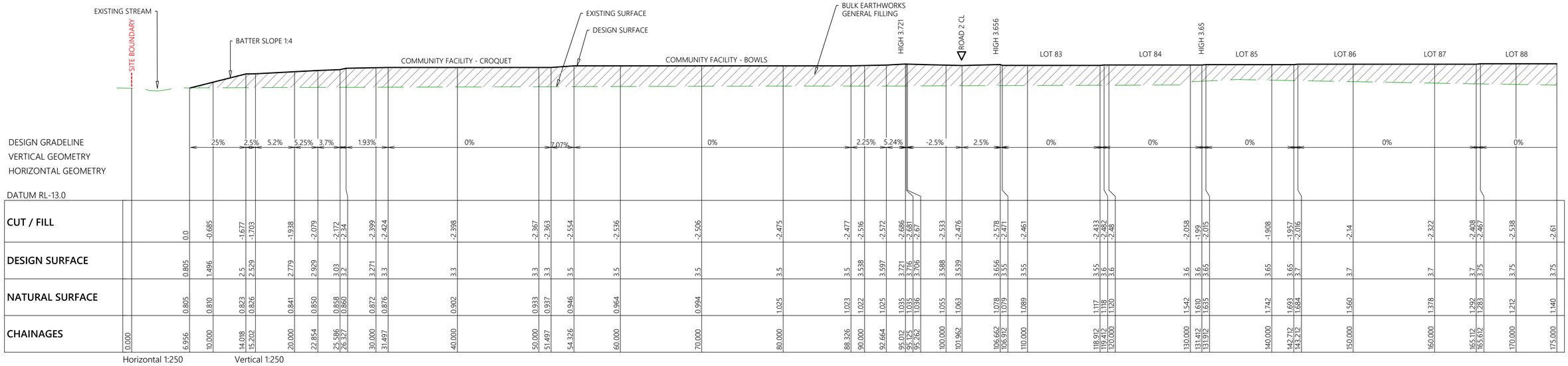
CLIFTON YAMBA

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

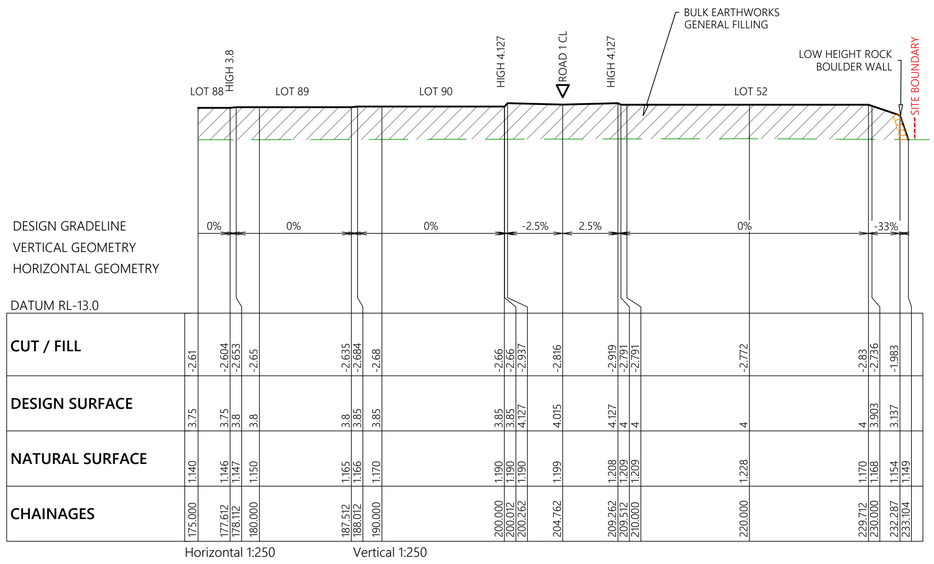
DA CIVIL DRAWING

DRAWING TITLE: EARTHWORKS SECTIONS - SHEET 1 OF 3

DWG No: D15 | SHEET: 15 OF 43 | REV: 1



BULK EARTHWORKS SECTION - B



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ISSUE	DESCRIPTION	DATE
1	ISSUED FOR DEVELOPMENT APPLICATION - AMENDED SITE FORMATION HEIGHTS	23.01.2024
0	ISSUED FOR DEVELOPMENT APPLICATION	08.09.2022

DESIGNED: T.RYDEN | DATE: JAN 2024
DRAWN: A.SCHMID | SCALE: AS SHOWN
SURVEYING: MACRO SURVEYING | SHEET SIZE: A1

ISSUED FOR DEVELOPMENT APPROVAL
NOT FOR CONSTRUCTION

MDE Manage Design Engineer

CLIENT: CLIFTON YAMBA LAND PTY LTD

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

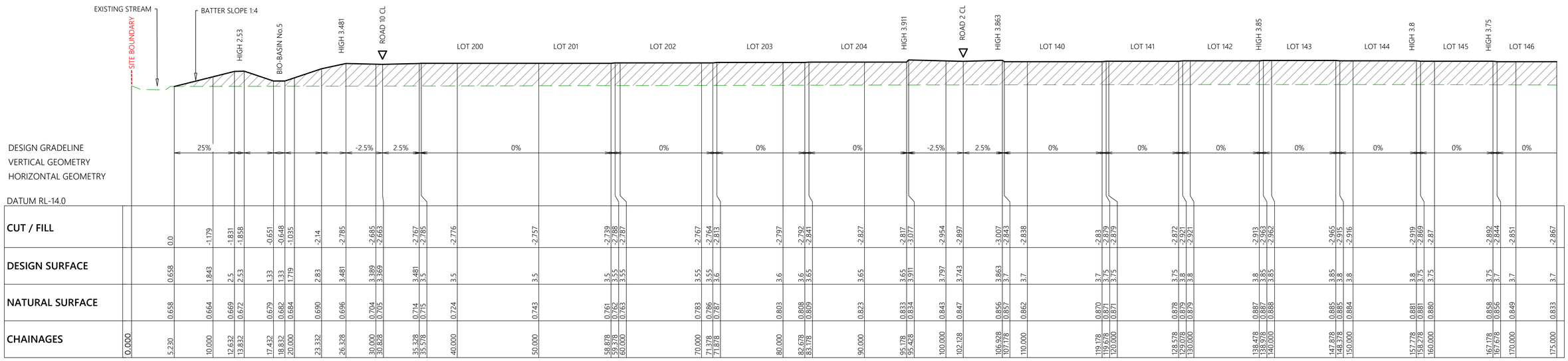
CLIFTON YAMBA

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

DA CIVIL DRAWING

DRAWING TITLE: EARTHWORKS SECTIONS - SHEET 2 OF 3

DWG No: D16 | SHEET: 16 OF 43 | REV: 1



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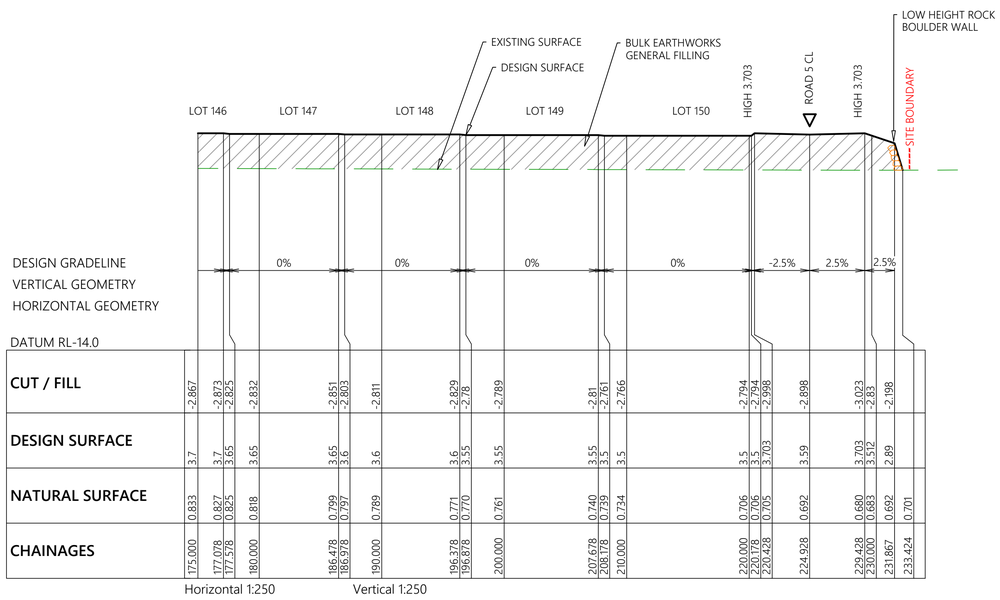
BULK EARTHWORKS SECTION - C



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CONTINUATION SECTION - C

ISSUE	DESCRIPTION	DATE
1	ISSUED FOR DEVELOPMENT APPLICATION - AMENDED SITE FORMATION HEIGHTS	23.01.2024
0	ISSUED FOR DEVELOPMENT APPLICATION	08.09.2022

DESIGNED: T.RYDEN | DATE: JAN 2024
DRAWN: A.SCHMID | SCALE: AS SHOWN
SURVEYING: MACRO SURVEYING | SHEET SIZE: A1

ISSUED FOR DEVELOPMENT APPROVAL
NOT FOR CONSTRUCTION

MDE Manage Design Engineer

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: EARTHWORKS SECTIONS - SHEET 3 OF 3

DWG No: D17 | SHEET: 17 OF 43 | REV: 1

1/64 Ballina Street
(PO Box 44)
Lennox Head NSW 2478
www.mde.au

APPENDIX B – PRELIMINARY GEOTECHNICAL INVESTIGATION REPORT

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

Document Details

Project Number	GI 5952
Report Title	Report on Preliminary Geotechnical Investigation Proposed Manufactured Housing Estate
Site Address	Carrs Road, Yamba, NSW described as Lot 2 on DP 733507
Prepared for	Clifton Yamba Land Pty Ltd ATF Yamba Land Trust

Revision	Date	Prepared By	Checked by	Approved for Issue
Final	7/7/21	A O'Carroll	J Walle	J Walle
Revision A	20/05/22	J Walle		J Walle

Report Distribution

Revision	Recipient	Method
Final	Richard Volpe chesney@cliftonlifestyle.com.au Andrew Smith andrew@md-engineer.com.au	Email
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

TABLE OF CONTENTS

APPENDICES

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.

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.

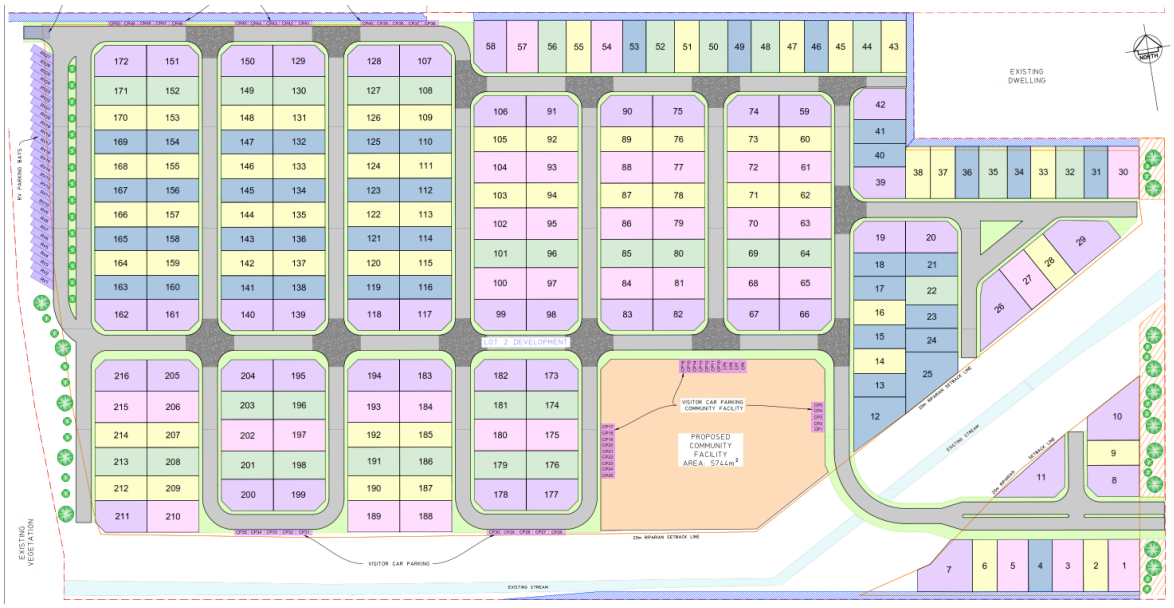

Figure 1 – Concept Site Plan

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.

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.

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

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

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

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.

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.

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.

APPENDIX A

CONCEPTUAL SITE PLANS BY MDE

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

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

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.

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

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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		(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	
	▼	0.5		(SP) SAND: Fine sand, Trace of silt, Wet, Pale grey	MD		3 3 4 4 5	
		1.0		(SM) Silty SAND: Fine sand, Moist, Grey	L		4 4 3 3 3 3 3 3 3 3 3 2 2 2 2 3 3 4 4	
		1.5						
		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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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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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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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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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						
		8.5						
		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

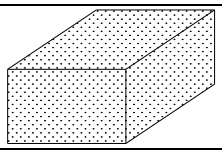
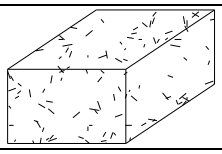
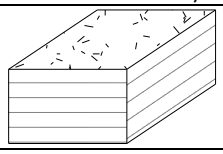
Rock Material Defect Shapes are summarised in Table 7.

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

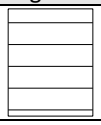
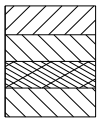
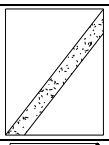
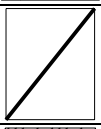
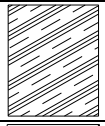
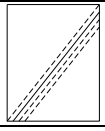
Rock Material Texture and Fabric are summarised in Table 8.

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	

1/64 Ballina Street
(PO Box 44)
Lennox Head NSW 2478
www.mde.au

APPENDIX C – ACID SULFATE SOILS MANAGEMENT PLAN

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

July 2023

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
File reference	PE3394.22_110 - 120 Carrs Dr_ASSI_v1.1		
Title:	Acid Sulfate Soil Investigation and Management Plan Lot 2 DP733507 and Lot 32 DP1280863, 110 - 120 Carrs Drive, Yamba, New South Wales		
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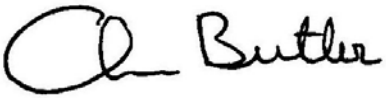
Issuing office

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

The scope of this ASSI and management measures described in this report have been prepared with reference to the Acid Sulfate Soil Manual (ASSMAC 1998). Other guidance information referenced in completing the scope of work included:

- Acid Sulfate Soils Laboratory Methods Guidelines (Ahern et al, 2004)
- Clarence Valley Local Environmental Plan (LEP) 2011

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 Acid Sulfate Soil Manual (ASSMAC, 1998) describes field pH_F / pH_{FOX} test results which indicate potential acid sulfate soils (PASS). Appendix 1 of the Acid Sulfate Soil Manual states that field pH provides a useful quick indication of the likely presence and severity of actual acid sulfate soils. The field pH is a qualitative method only that cannot be used as a substitute for laboratory analysis in the identification of acid sulfate soils for assessment purposes.

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

- pH readings of pH ≤ 5 indicates that actual acid sulfate soil are present with the sulfides having been oxidised in the past, resulting in acid soil conditions
- pH values > 4 and < 5.5 are acid and may be the result of some previous or limited oxidation of sulfides, but is not confirmatory of actual acid sulfate soils. Substantial exchangeable / soluble aluminium and hydrogen ions usually exist at these pH values. Other factors such as excessive fertiliser use, organic acids or strong leaching can cause pH >4 - <5.5 units. Field pH alone cannot indicate potential acid sulfate soils as they may be neutral to slightly alkaline when unoxidized
- In order to the for potential acid sulfate soils that contain unoxidized sulfides, peroxide is used to rapidly oxidise the iron sulfides (usually pyrite), resulting in the production of acid with a corresponding drop in pH.

The appropriate criteria, or action thresholds, are the texture-based action criteria from Table 4.4 of the Acid Sulfate Soil Manual (*ASSMAC*. 1998). 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		

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

Stone, Y., Ahern C R., Blunden B., (1998), Acid Sulfate Soil Manual 1998, Acid Sulfate Soil Management Advisory Committee (ASSMAC), Wollongbar, NSW, Australia

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

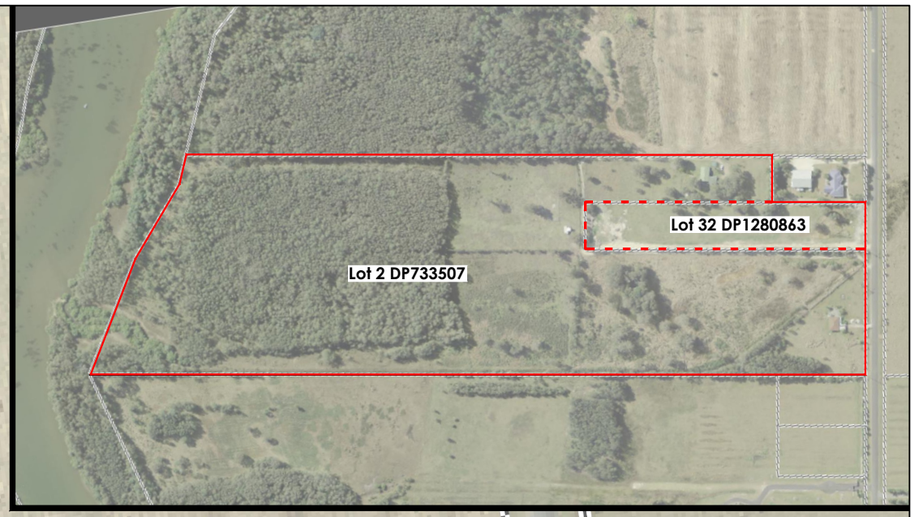
LEGEND

Site boundary

Borehole location

Image sourced and modified from Six Maps (2022)

All locations indicative only



Dilapidated shed and concrete slabs

BH10

BH9

BH7

BH5

BH4

Earthen access driveway (subject to filling)

BH11

BH8

BH6

Dilapidated shed

BH15

BH12

Development extent

BH13

BH2

BH14

Unoccupied dwelling

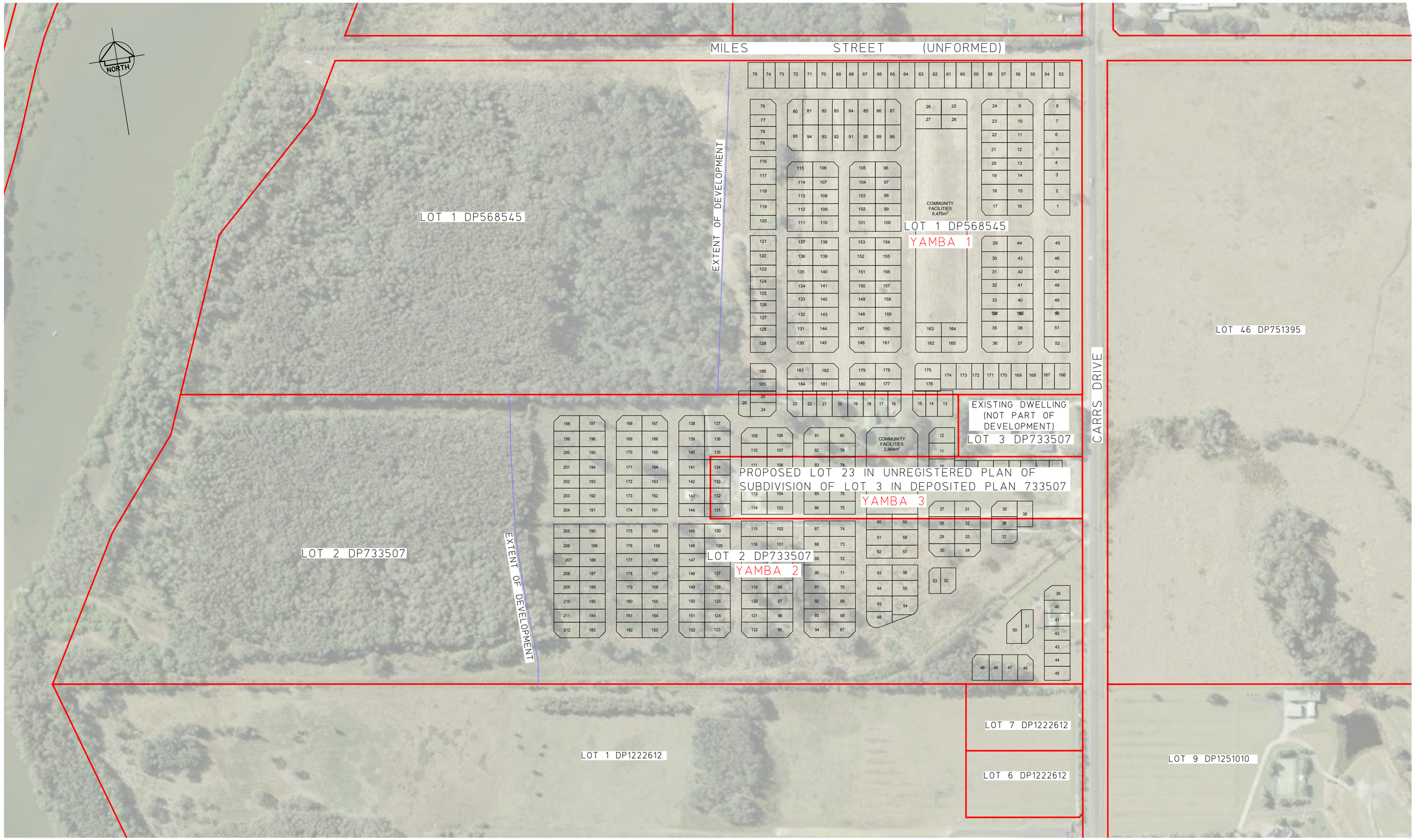
BH3

BH1

0 m 25 m 50 m 100 m

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	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
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	

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
www.md-engineer.com.au
ABN: 88 607 109 357

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

Property Report

120 CARRS DRIVE YAMBA 2464

Property Details

Address:	120 CARRS DRIVE YAMBA 2464
Lot/Section /Plan No:	2/-/DP733507
Council:	CLARENCE VALLEY COUNCIL

Summary of planning controls

Planning controls held within the Planning Database are summarised below. The property may be affected by additional planning controls not outlined in this report. Please contact your council for more information.

Local Environmental Plans	Clarence Valley Local Environmental Plan 2011 (pub. 23-12-2011)
Land Zoning	C2 - Environmental Conservation: (pub. 5-11-2021) C3 - Environmental Management: (pub. 5-11-2021) R1 - General Residential: (pub. 23-12-2011)
Height Of Building	9 m
Floor Space Ratio	NA
Minimum Lot Size	6 ha
Heritage	NA
Land Reservation Acquisition	NA
Foreshore Building Line	NA
Acid Sulfate Soils	Class 2
Local Provisions	Earthworks exclusion area
Urban Release Area	Urban Release Area

Greenfield Housing Code Area	Complying Development Code: https://www.planningportal.nsw.gov.au/greenfield-housing-code Building type: 1-2 storey homes, residential alterations and additions Development consent authority: Council or accredited certifier Note: Applications which meet all relevant requirements in the State Environmental Planning Policy (Exempt and Complying Development Codes) 2008 may be approved within 20 days. Exclusions may apply. https://legislation.nsw.gov.au/#/view/EPI/2008/572/full

Detailed planning information

State Environmental Planning Policies which apply to this property

State Environmental Planning Policies can specify planning controls for certain areas and/or types of development. They can also identify the development assessment system that applies and the type of environmental assessment that is required.

- State Environmental Planning Policy (Biodiversity and Conservation) 2021: Allowable Clearing Area (pub. 2-12-2021)
- State Environmental Planning Policy (Biodiversity and Conservation) 2021: Land Application (pub. 2-12-2021)
- State Environmental Planning Policy (Biodiversity and Conservation) 2021: Subject Land (pub. 2-12-2021)
- State Environmental Planning Policy (Building Sustainability Index: BASIX) 2004: Land Application (pub. 25-6-2004)
- State Environmental Planning Policy (Exempt and Complying Development Codes) 2008: Land Application (pub. 12-12-2008)
- State Environmental Planning Policy (Exempt and Complying Development Codes) 2008: Subject Land (pub. 6-5-2018)
- State Environmental Planning Policy (Housing) 2021: Land Application (pub. 26-11-2021)
- State Environmental Planning Policy (Industry and Employment) 2021: Land Application (pub. 2-12-2021)
- State Environmental Planning Policy (Planning Systems) 2021: Land Application (pub. 2-12-2021)
- State Environmental Planning Policy (Primary Production) 2021: Land Application (pub. 2-12-2021)
- State Environmental Planning Policy (Resilience and Hazards) 2021: Land Application (pub. 2-12-2021)
- State Environmental Planning Policy (Resilience and Hazards) 2021: Subject Land (pub. 2-12-2021)
- State Environmental Planning Policy (Resources and Energy) 2021: Land Application (pub. 2-12-2021)
- State Environmental Planning Policy (Transport and Infrastructure) 2021: Land Application (pub. 2-12-2021)
- State Environmental Planning Policy No 65—Design Quality of Residential Apartment Development: Land Application (pub. 26-7-2002)

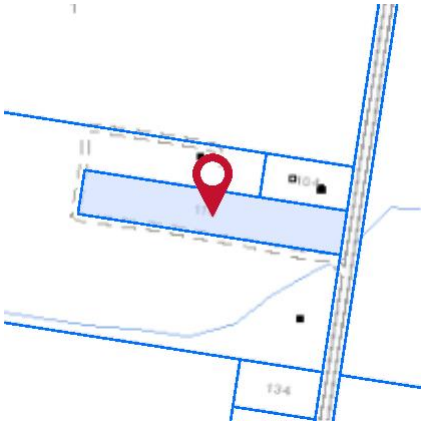
Other matters affecting the property

Information held in the Planning Database about other matters affecting the property appears below. The property may also be affected by additional planning controls not outlined in this report. Please speak to your council for more information

Land near Electrical Infrastructure	This property may be located near electrical infrastructure and could be subject to requirements listed under ISEPP Clause 45. Please contact Essential Energy for more information.
Local Aboriginal Land Council	BIRRIGAN GARGLE
Regional Plan Boundary	North Coast

Property Report

110 CARRS DRIVE YAMBA 2464



Property Details

Address:	110 CARRS DRIVE YAMBA 2464
Lot/Section /Plan No:	32/-/DP1280863
Council:	CLARENCE VALLEY COUNCIL

Summary of planning controls

Planning controls held within the Planning Database are summarised below. The property may be affected by additional planning controls not outlined in this report. Please contact your council for more information.

Local Environmental Plans	Clarence Valley Local Environmental Plan 2011 (pub. 23-12-2011)
Land Zoning	R1 - General Residential: (pub. 23-12-2011)
Height Of Building	9 m
Floor Space Ratio	NA
Minimum Lot Size	NA
Heritage	NA
Land Reservation Acquisition	NA
Foreshore Building Line	NA
Acid Sulfate Soils	Class 2
Urban Release Area	Urban Release Area
Greenfield Housing Code Area	Complying Development Code: https://www.planningportal.nsw.gov.au/greenfield-housing-code Building type: 1-2 storey homes, residential alterations and additions Development consent authority: Council or accredited certifier Note: Applications which meet all relevant requirements in the State Environmental Planning Policy (Exempt and Complying Development Codes) 2008 may be approved within 20 days. Exclusions may apply. https://legislation.nsw.gov.au/#/view/EPI/2008/572/full

Detailed planning information

State Environmental Planning Policies which apply to this property

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- State Environmental Planning Policy (Biodiversity and Conservation) 2021: Subject Land (pub. 2-12-2021)
- State Environmental Planning Policy (Building Sustainability Index: BASIX) 2004: Land Application (pub. 25-6-2004)
- State Environmental Planning Policy (Exempt and Complying Development Codes) 2008: Land Application (pub. 12-12-2008)
- State Environmental Planning Policy (Exempt and Complying Development Codes) 2008: Subject Land (pub. 6-5-2018)
- State Environmental Planning Policy (Housing) 2021: Land Application (pub. 26-11-2021)
- State Environmental Planning Policy (Industry and Employment) 2021: Land Application (pub. 2-12-2021)
- State Environmental Planning Policy (Planning Systems) 2021: Land Application (pub. 2-12-2021)
- State Environmental Planning Policy (Primary Production) 2021: Land Application (pub. 2-12-2021)
- State Environmental Planning Policy (Resilience and Hazards) 2021: Land Application (pub. 2 -12-2021)
- State Environmental Planning Policy (Resilience and Hazards) 2021: Subject Land (pub. 2-12 -2021)
- State Environmental Planning Policy (Resources and Energy) 2021: Land Application (pub. 2-12-2021)
- State Environmental Planning Policy (Transport and Infrastructure) 2021: Land Application (pub. 2-12-2021)
- State Environmental Planning Policy No 65—Design Quality of Residential Apartment Development: Land Application (pub. 26-7-2002)

Other matters affecting the property

Information held in the Planning Database about other matters affecting the property appears below. The property may also be affected by additional planning controls not outlined in this report. Please speak to your council for more information

Land near Electrical Infrastructure	This property may be located near electrical infrastructure and could be subject to requirements listed under ISEPP Clause 45. Please contact Essential Energy for more information.
Local Aboriginal Land Council	BIRRIGAN GARGLE
Regional Plan Boundary	North Coast

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)					Calculated liming rate (kg $CaCO_3$ / m^3)
Borehole	Sample depth	Predominant soil type	Wet	pH-KCl	Titratable actual acidity	S_{Cr}	Net acidity	Net acidity not including ANC (mol H^+/t)	
				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)					Calculated liming rate (kg $CaCO_3$ / m^3)
Borehole	Sample depth	Predominant soil type	Wet	pH-KCl	Titratable actual acidity	S_{Cr}	Net acidity	Net acidity not including ANC (mol H^+/t)	
				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)					Calculated liming rate (kg $CaCO_3$ / m^3)
Borehole	Sample depth	Predominant soil type	Wet	pH-KCl	Titratable actual acidity	S_{Cr}	Net acidity	Net acidity not including ANC (mol H^+/t)	
				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**		
Project:	Acid Sulfate Soil Investigation and Management Plan			**RPD:**	Lot 2 DP733507 and Lot 32 DP1280863		**Completed:**	12 July 2022			
Project Number:	PE3394.22			**Equipment Type:**	Track mounted rig solid stem augers		**Logged by:**	Chris Butler			
							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
☐ 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 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):	FOR LABO Custody Seal
OFFICE:	7/14 FREMANTLE ST, BURLEIGH HEADS 4220		☐ Non Standard or urgent TAT (List due date):	Free ice/froz receipt?
PROJECT:	PE3394.22	ALS QUOTE NO.: BN031/16 v4	COC SEQUENCE NUMBER (Circle)	Random San
ORDER NUMBER:	PE3394.22		COC: 1 2 3 4 5 6 7	Other comme
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:
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:
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 PLAN
Test Assoc. Batch No.
EB2220427

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
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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 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	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.
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

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
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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 9434 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@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.
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.

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 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.
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.

CHAIN OF CUSTODY CHAIN OF CUSTODY

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

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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): ☐ 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 (pH F 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.

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☐ **Perth:** 10 Hod Way, Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@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 (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;
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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 / N/A
PROJECT:	PE3394.22	**ALS QUOTE NO.:**	BN031/16 v4	Free ice / frozen ice bricks present upon receipt?	Yes / No / N/A
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 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: 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.
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.

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@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 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			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;
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	: **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**	**----**	**----**

ALS Environmental

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		

ilac-MRA NATA
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.**

ALS Environmental

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, BH11 - 1.00, BH11 - 1.50, BH11 - 2.50, BH15 - 0.0, BH15 - 0.50, BH15 - 1.00	**12-Jul-2022**	**20-Jul-2022**	12-Jul-2023	✓	**20-Jul-2022**	18-Oct-2022	✓
EA033-B: Potential Acidity							
Snap Lock Bag - frozen (EA033)							
BH11 - 0.0, BH11 - 0.50, BH11 - 1.00, BH11 - 1.50, BH11 - 2.50, BH15 - 0.0, BH15 - 0.50, BH15 - 1.00	**12-Jul-2022**	**20-Jul-2022**	12-Jul-2023	✓	**20-Jul-2022**	18-Oct-2022	✓
EA033-C: Acid Neutralising Capacity							
Snap Lock Bag - frozen (EA033)							
BH11 - 0.0, BH11 - 0.50, BH11 - 1.00, BH11 - 1.50, BH11 - 2.50, BH15 - 0.0, BH15 - 0.50, BH15 - 1.00	**12-Jul-2022**	**20-Jul-2022**	12-Jul-2023	✓	**20-Jul-2022**	18-Oct-2022	✓
EA033-D: Retained Acidity							
Snap Lock Bag - frozen (EA033)							
BH11 - 0.0, BH11 - 0.50, BH11 - 1.00, BH11 - 1.50, BH11 - 2.50, BH15 - 0.0, BH15 - 0.50, BH15 - 1.00	**12-Jul-2022**	**20-Jul-2022**	12-Jul-2023	✓	**20-Jul-2022**	18-Oct-2022	✓
EA033-E: Acid Base Accounting							
Snap Lock Bag - frozen (EA033)							
BH11 - 0.0, BH11 - 0.50, BH11 - 1.00, BH11 - 1.50, BH11 - 2.50, BH15 - 0.0, BH15 - 0.50, BH15 - 1.00	**12-Jul-2022**	**20-Jul-2022**	12-Jul-2023	✓	**20-Jul-2022**	18-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)							
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)	Bacto Black / Thio Grey	-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
	Frozen Wet Dry		1L	500mL	250mL	1L	Light Green (T)	Turquoise (F)		100 mL	500 mL	1L	60mL	250ml	500mL	STD F	STD T	ORC F	ORC T	STD F	STD T	ORC F	ORC T	F	T		UHS F	UHS 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	
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 LABORATO
Custody seal intact
Free ice/frozen ice
record
Random Sample Te
Other comments:

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

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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)**	Freeze/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: 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.
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.

CHAIN OF CUSTODY CHAIN OF CUSTODY

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

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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
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 sealed? 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.
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.

CHAIN OF CUSTODY CHAIN OF CUSTODY

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

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☐ **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):**	**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**	Free ice / frozen ice bricks present upon receipt?	Yes / No / N/A
ORDER NUMBER:	**PE3394.22**		**COC SEQUENCE NUMBER (Circle)** COC: 1 2 3 4 5 6 7 OF: 1 2 3 4 5 6 7	Random Sample Temperature on Receipt:	°C
PROJECT MANAGER:	**CHRIS BUTLER**	**CONTACT: 0431 565 210**		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: Chris 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.
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									

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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):	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		Free ice / frozen ice bricks present upon receipt?	Yes No N/A
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	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			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.
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.

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 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.
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 →*

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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: Chris Butler 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.

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 Divis
Brisbane
Work Order Referenc
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
Chilled / Seal Intact?
Free ice / frozen ice
receipt?
Random Sample Te
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 (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

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.

CHAIN OF CUSTODY CHAIN OF CUSTODY

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

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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): ☐ 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
Free ice / frozen ice packs 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.
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.

CHAIN OF CUSTODY CHAIN OF CUSTODY

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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):**
OFFICE:	7/14 FREMANTLE ST, BURLEIGH HEADS 4220		☐ Non Standard or urgent TAT **(List due date):**
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

Freeze / 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			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.

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@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			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.
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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☐ 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: 2-4 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):
OFFICE:	7/14 FREMANTLE ST, BURLEIGH HEADS 4220		☐ Non Standard or urgent TAT (List due date):
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 brick 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 (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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☐ Perth: 10 Hod Way, Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsenviro.com
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☐ 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 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; Free ice / frozen ice brick 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 (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.
46	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									

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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
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 (pH F and pH FOX)	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**	**----**

ALS Environmental

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		

ilac-MRA NATA
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,	**12-Jul-2022**	**18-Jul-2022**	08-Jan-2023	✓	**18-Jul-2022**	08-Jan-2023	✓
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							

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

Environmental Division
Brisbane
Work Order Reference
EB2222068

Telephone : + 61-7-3243 7222

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
☐ Perl Ph: 08
☐ Lau Ph: 03

CLIENT:	PRECISE ENVIRONMENTAL	TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	☐ Standard TAT (List due date):
OFFICE:	7/14 FREMANTLE ST, BURLEIGH HEADS 4220		☐ Non Standard or urgent TAT (List due date):
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	
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)	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 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.
C1	BH10	0.0	12.07.22	S	BAG/<4°C	1		X							
CL	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		

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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**	**----**	**----**

ALS Environmental

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		

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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, 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-D: Retained 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-E: Acid Base Accounting							
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	✓

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

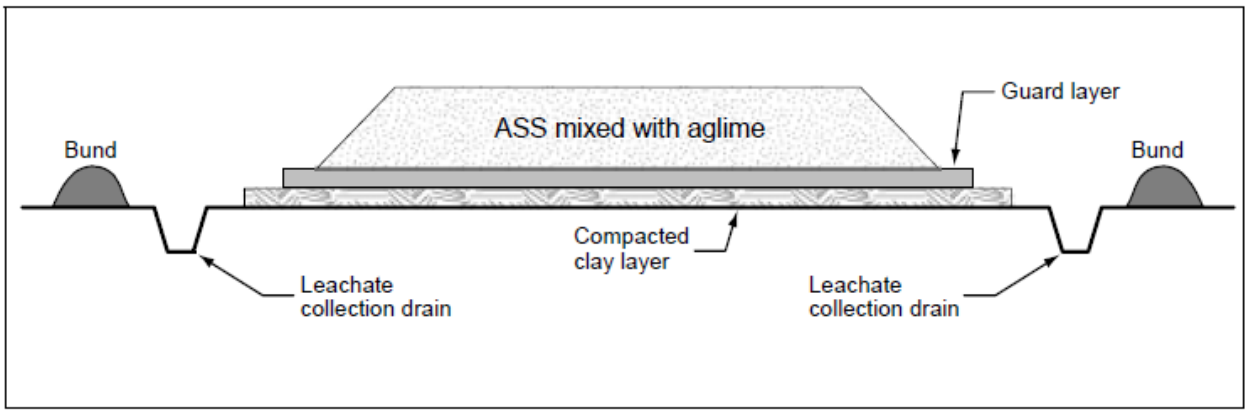

Figure 1. Schematic cross-section of a treatment pad, including a compacted clay layer, guard layer, leachate collection system and containment with bunding (Source: Soil Management Guidelines, DNRM, 2002).

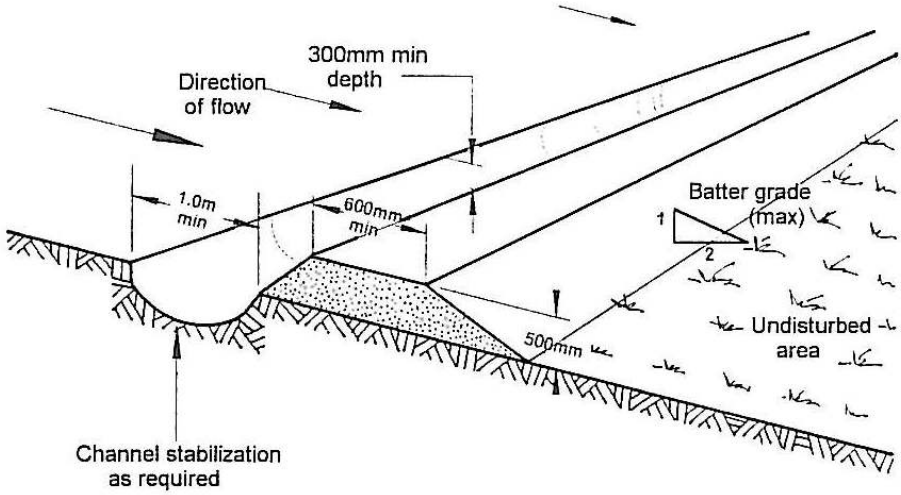

Figure 2. Cross-section of typical catch drain (Source: IE Aust, 1996).

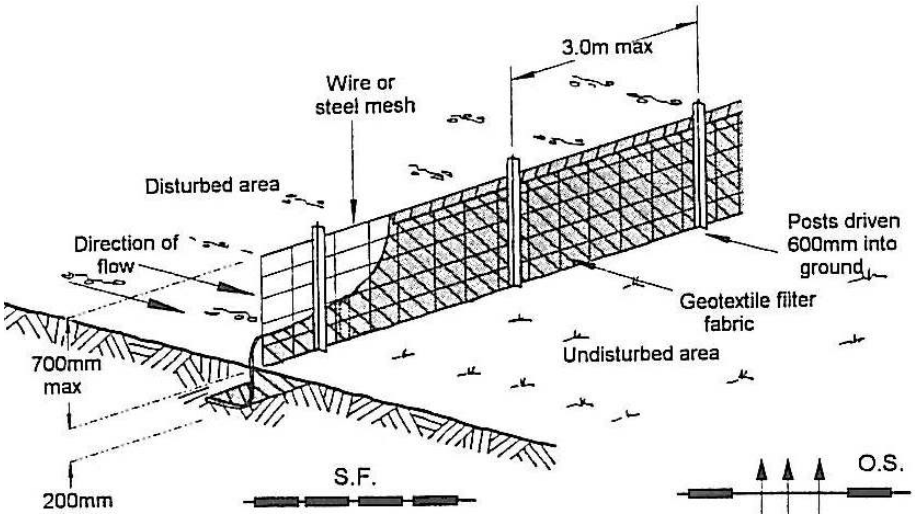

Figure 3. Cross-section of typical sediment fence (Source: IE Aust, 1996).

APPENDIX H – NSW WASTE CLASSIFICATION GUIDELINES

Waste classification guidelines

Part 4: Acid sulfate soils

www.epa.nsw.gov.au

Published by:

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

Report pollution and environmental incidents
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Email: info@environment.nsw.gov.au
Website: www.epa.nsw.gov.au

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Contents

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
www.mde.au

APPENDIX D – CARRS DRIVE INSPECTION, MAINTENANCE & REPAIR PLAN

1/64 Ballina Street
(PO Box 44)
Lennox Head NSW 2478
www.mde.au

Carrs Drive Inspection, Maintenance and Repair Plan

Flexible road pavements deteriorate over time due to a range of load impacts and environmental factors. The combination of these results in accelerated deterioration over time in the absence of maintenance programs and repairs to identified defects.

The deterioration of the northern portion of Carrs Drive appears to have been accelerated by the increased traffic generated by construction activities and a lack of maintenance and repairs during this period of increased activity.

A general hierarchy of road treatment activities to ensure proper maintenance and operation of roads includes the following:

1. **Routine maintenance** – routine maintenance involves regular inspections and minor works to prevent defects (such as street sweeping) or repair minor defects (such as pothole filling, crack sealing, edge break repair etc).
2. **Preventative maintenance** – Preventative maintenance includes activities such as resealing of roads, usually undertaken by Councils to restore function to the seal prior to failure of the seal and subsequent pavement failures
3. **Rehabilitation** – Rehabilitation works include full depth patching (removal and replacement of failed segments of pavement to the subgrade or lower to restore structural integrity), structural overlays, levelling courses to fill ruts and restore crossfall
4. **Reconstruction** – Full depth replacement of the pavement for the full length of the road.

Under Section 5.2 of Clarence Valley Council's Roads Policy, maintenance activities associated with existing sealed roads involve:

- Maintenance of sealed surface (pothole patching and edge break repair)
- Minor heavy patching of failures
- Shoulder grading and edge drop repair
- Kerb and gutter maintenance
- Street sweeping; and
- Pavement marking

The activities above are consistent with 'routine' maintenance of sealed roads.

It is understood that the intent of Condition 2 & 42 of DA Consent 2018/0373 is to establish a program of regular inspections and routine maintenance within Carrs Drive to ensure that during development construction, prior to the full reconstruction of Carrs Drive required under DA Condition 40, the pavement is maintained in a satisfactory and safe condition.

In light of the existing state of the pavement in Carrs Drive as documented in Section 3 above and Appendix 1, it is believed that Routine Maintenance has been generally insufficient to date with the pavement now exhibiting large areas of significant failure. This means that routine maintenance in the future will be ineffective in maintaining Carrs Drive to a safe and acceptable standard and it is therefor recommended that a combination of preventative maintenance (resealing) and rehabilitation (reconstruction of parts of Carrs Drive) be undertaken by the contractors currently active with Carrs Drive prior to the commencement of bulk earthworks operations relating to DA 2018/0373. Following

preventative maintenance and rehabilitation works, a routine inspection and maintenance program could be implemented by future contractors engaged to undertake works in relation to the MHE development, in conjunction with other contractors active within Carrs Drive.

The following table sets out the proposed inspection and maintenance routine to be implemented and paid for by future contractors engaged to undertake works on the approved MHE development:

DEFECT	INSPECTION FREQUENCY	INTERVENTION TRIGGER	REPAIR TIMEFRAME	REPAIR METHOD
Pothole	Daily – Civil Contractor Weekly - Superintendent	Pothole greater than 50mm in any direction horizontally or greater than 30mm deep	Within 24 hours of defect identification	For potholes <300mm in diameter – repair with tack coat and cold mix asphalt For potholes >300mm in diameter, or multiple potholes/failures in close proximity, repair with tack coat and 100mm thick hot mix asphalt (minor patching)
Seal Cracking	Weekly – Civil Contractor & Superintendent	Seal cracks >50mm in length	Within 7 days of defect identification	Apply crack sealant
Edge drop	Fortnightly – Civil Contractor and Superintendent	Variation in height of >50mm between edge of seal and shoulder gravels	Within 7 days of height variation exceeding 50mm	Localised removal and replacement of shoulder material to achieve uniform compaction over small areas. Regrading and compaction of road shoulder for extensive areas of edge drop.
Edge break	Fortnightly – Civil Contractor and Superintendent	>150mm wide and within 250mm of outer wheel path	Within 7 days of defect identification	Localised removal and replacement of shoulder materials, re sealing of surface
Loose material / gravel on roadway	Daily – Civil Contractor Weekly – Superintendent	Any visible mud, gravel or construction materials	Within 2 hours of defect identification	Manual or mechanical street sweeping

1/64 Ballina Street
(PO Box 44)
Lennox Head NSW 2478
www.mde.au

APPENDIX E – BULK EARTHWORKS ITP

MDE Manage Design Engineer

INSPECTION AND TEST PLAN FOR BULK EARTHWORKS

Project Manager…… Approved By Client…… DATE……..

Project: No: Activity: ***BULK EARTHWORKS*** Location:	ITP No: ..... Date:	Key: I Inspection — S/C Subcontract T Test — C Contractor H Hold — E Engineer/NATA W Witness — C/R Client Representative /Council

No.	Activity to be Inspected or Tested *Include Q H&S and E*	Frequency	Acceptance Criteria	Inspection/Test by:				Records / Evidence	Signed & Dated
				S/C	C	E	C/R		
1	No bulk earthworks to commence until trees and environmental protection measures erected.	Site	Trees – 24hrs notice prior to clearing Advise Council. Erosion controls approved by Council		I		I	Council inspection	
2	Carry out works to Work Method Statement requirements	Each Area	Verification by Site Supervisor		W			Daily Site Report entry by Site Supervisor	
3	Arrange for inspection to be made of areas stripped of topsoil prior to cut/fill	Each Area	Visual – no silt or non-compliant material		I	I		Geotechnical report	
4	Organise survey of stripped surfaces before placing fill.	Each Area	Survey has been undertaken prior to fill operations.		H			Plans prepared by others	
5	Compact surface 200mm deep prior to filling operations.	Each Area	Where required by Geotech inspection			I		NATA tests or Geotechnical signoff	
6	Approval given by / Geotech to commence	Each Area	Verification by report				H	Council / geotechnical sign off	
7	Filling compacted and tested for density and moisture.	1 test per 500 sqm per 200mm layer	Dry density ratio AS1289.E4.1 95% standard AS 1289.5.1.1			T		Geotechnical report.	
8	Final Inspection, All Records collated and satisfactory.	Each Area	All completed to satisfaction				W	Superintendents signoff	