Prepared for Bega Valley Shire Council

Merimbula Boardwalk

Acid Sulphate Soils Management Plan

May 2024

Project Number: 220669

Document verification

Proposal Title	Acid Sulphate Soils Management Plan
Proposal Number:	220669
Proposal File Name:	220669 Acid Sulphate Soils Management Plan Final V.1.1

Revision	Date	Prepared by	Reviewed by	Approved by
Draft V.1	5/12/2023	Claire Hobbs Alyce Gill	Olivia Merrick	Olivia Merrick
Draft V.2	2/05/2024	Alyce Gill	Nicola Smith	Nicola Smith
Final V.1	3/05/2024	Alyce Gill	Nicola Smith	Nicola Smith
Final V.1.1	8/05/2024	Alyce Gill (minor updates)		

Table of contents

1. Introduction 5

1.1. Background 5

1.2. Purpose 5

1.3. Relevant legislation and guidelines 7

1.4. Approvals 7

1.5. Environmental Management System 7

2. Proposed methodology 8

3. Site description and surrounding land use 12

3.1. Site and surrounds 12

3.2. Environmental setting 12

3.2.1. Topography and hydrology 12

3.2.2. Geology and soils 12

3.2.3. Acid Sulfate Soils (ASS) 13

4. Acid sulfate soil indicators and assessment criteria 15

4.1. Acid Sulfate Soils 15

4.2. Identification 15

5. Environmental aspects and impacts 18

5.1. Construction activities 18

5.2. Aspects 18

5.3. Impacts 18

6. ASS management and mitigation measures 19

6.1. ASS mitigation principles 19

6.2. Management approach 19

6.3. Characterisation sampling 21

6.3.1. Soil sampling protocol 21

6.3.2. ASS distribution map 23

6.4. ASS management 23

6.4.1. Neutralising material and rates 25

6.4.2. Verification sampling 25

6.5. ASS management and mitigation measures 27

7. Compliance Management 32

7.1. Roles and Responsibilities 32

7.2. Toolbox talks, training and awareness 33

7.3. Monitoring and inspections 33

7.4. Reporting 35

8. Review and improvement 36

8.1. Continuous improvement 36

9. References 37

Figures

Figure 1-1 Proposed development location 6

Figure 3-1 ASS occurring within and nearby to the proposed development 14

Figure 4-1 Visual characteristics that can indicate ASS 17

Figure 6-1 Flowchart for testing for ASS 20

Figure 9-1 ASS management checklist ..... C-I

Tables

Table 2-1 Proposed works summary 8

Table 3-1 Soil landscapes occurring along the works area 12

Table 6-1 Minimum soil sampling requirements for ASS characterisation (Sullivan, Ward, Toppler, & Lancaster, 2018) 22

Table 6-2 Soils assessment criteria 23

Table 6-3 Adopted leachate criteria 25

Table 6-4 Minimum sampling requirements for verification testing (Sullivan, Ward, Toppler, & Lancaster, 2018) 26

Table 6-5 Acid Sulfate Soil mitigation and management measures for the excavation, handling, treatment and stockpiling of ASS 28

Table 7-1 Roles and responsibilities for the ASSMP 32

Table 7-2 Monitoring requirements relevant to the ASSMP 35

Appendices

Appendix A Construction methodology ..... A-I

Appendix B Types of analysis for ASS ..... B-I

Appendix C ASS management checklist ..... C-I

Acronyms and abbreviations

Aglime	Agricultural lime
AHD	Australian Height Datum
ASS	Acid Sulfate Soils
ASSMP	Acid Sulfate Soils Management Plan
ASSTA	Acid Sulfate Soil Treatment Area
BVSC	Bega Valley Shire Council
CRS	Chromium Reduceable Sulfur
DA	Development Application
DAWE	Department of Agriculture, Water and the Environment
EPA	Environmental Protection Authority
EWMS	Environmental Work Method Statement
LEP	Local Environment Plan
m	metres
NAG	Net Acid Generation
NAPP	Net Acid Producing Potential
NATA	National Association of Testing Authorities
PASS	Potential Acid Sulfate Soils
QA	Quality assurance
QC	Quality control
SEE	Statement of Environmental Effects
SPOCAS	Suspension Peroxide Oxidation Combined Acidity and Sulfur

1. Introduction

1.1. Background

NGH Pty Ltd (NGH) have prepared this Acid Sulfate Soils Management Plan (ASSMP) for Bega Valley Shire Council (BVSC) to support a Development Application (DA) for additions and alterations (upgrades) to the existing Merimbula Boardwalk (the proposed development), to provide for inclusive community use, safety improvements and environmental improvements to the surrounding connecting side tracks.

The Merimbula Boardwalk is located along the western edge of Merimbula Lake. The path provides access between Market Street bridge (the eastern extent of the boardwalk) and Lakewood Drive Top Lake carpark at (the western extent of the boardwalk). The proposal is located partly within the lake, on the lake edge, and on public and private land, refer to Figure 1-1.

This Acid Sulfate Soils Management Plan (ASSMP) has been prepared to satisfy the requirements of Part 6, Section 6.1 of the Bega Valley Local Environmental Plan (LEP) 2013, refer to Section 1.4.

1.2. Purpose

This ASSMP describes the acid sulfate management approach that will be utilised by BVSC and/or its delegated contractor in carrying out the proposed works.

The ASSMP has been prepared to reduce the potential for risk of environmental damage caused by acidic leachate from actual acid sulfate soil (ASS), potential acid sulfate soil (PASS) disturbance, if encountered.

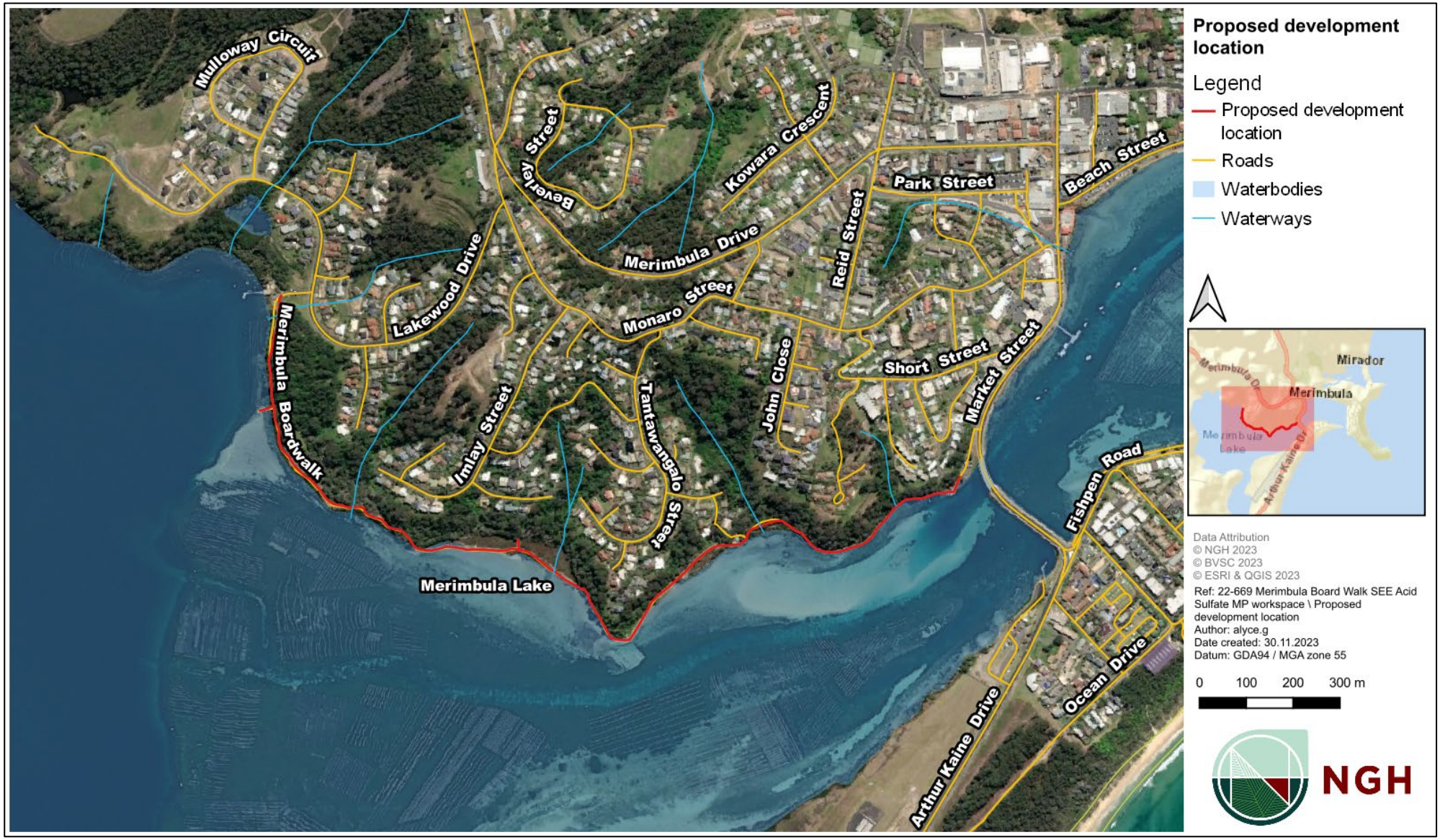


Figure 1-1 Proposed development location

1.3. Relevant legislation and guidelines

The following statutory provisions and guidelines are applicable to the proposed demolition with regards to Acid Sulfate Soils:

- *Environmental Planning and Assessment Act 1979*
- *Protection of the Environment Operations Act 1997*
- *Protection of the Environment Operations (General) Regulation 2022*
- *Protection of the Environment Operations (Waste) Regulation 2014*
- *Contaminated Land Management Act 1997*
- *Fisheries Management Act 1994*
- Bega Valley Local Environmental Plan (LEP) 2013
- State Environmental Planning Policy (Resilience and Hazards) 2021.

The main guidelines, specifications and policy documents relevant to this ASSMP include:

- National Acid Sulfate Soils guidance: National acid sulfate soils sampling and identification methods manual (DAWE, 2022)
- NSW Acid Sulfate Soils Manual (ASS Manual) (ASS Management Advisory Committee, 1998)
- EPA Waste Classification Guidelines Part 1: Classifying waste (EPA, 2014)
- EPA Waste Classification Guidelines Part 4: Acid sulfate soils (NSW EPA, 2014)

1.4. Approvals

This ASSMP has been prepared to address Part 6, Section 6.1 of the Bega Valley LEP (2013):

(3) *Development 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.*

1.5. Environmental Management System

This ASSMP will form part of the Project's overall Environmental Management System (EMS). Mitigation and management measures identified in this ASSMP will be incorporated into site or activity-specific Environmental Work Method Statements (EWMS).

2. Proposed methodology

The proposed methodology is detailed in Appendix A and summarised in Table 2-1.

Table 2-1 Proposed works summary

Works component	Description
Set up and early works including vegetation removal	• Set up of laydown areas at end of boardwalk and within the side streets. • Installation of site fencing, environmental controls, including sediment and erosion controls, sediment booms and vegetation exclusion areas. • Trimming of mangroves.
Upgrade boardwalk and gravel and concrete path areas	• Remove existing boardwalk decking timbers. • Install pile-driven pylons. The boardwalk sub-structure would be two posts and a hidden headstock (subject to detailed design), creating a slim profile and low visual impact. This option has longer durability. Piling works would be done at low tide. Where practicable, existing pylons will remain in situ and cut off at ground level • Install new decking timbers or composite material. The width of the boardwalk would be 2.5m and would be straight edged and not curved. Proposed materials for the boardwalk are: – Portal timber frame and posts. – Timber or FRP (Fibreglass Reinforced Polymer) headstocks. – Predominantly FRP boardwalk deck with timber in ‘special areas. – Recycled wharf timber may supplement the special areas. – Timber post balustrades with galvanised panel inserts where required (Type A). – Timber post and rail balustrades (Type C). – Timber lean rails. – Timber kickrails. • Additions at the eastern end provide a cantilevered boardwalk area over the lake with balustrade. • Upgrade path and gravel areas as needed using crushed local Rhyolite (Screened Mine Gravel). Compacted and stabilised. Timber flush edge to gravel path to match timber kickrail along boardwalk. • Install local Merimbula Split Stone Mine and Nullica Rock

Works component	Description
	stone paving and walls. • Any upgraded or new concrete areas would be non-coloured concrete to match existing detail.
Furniture	Proposed furniture would include: • Place defining timber seating and benches. • Place defining playful timber and stone furniture with lighting. • Timber bollards. • Council standard picnic tables, shelters, bins and bubblers.
Lighting	The boardwalk would have limited lighting at both entries and for the carpark at the eastern entry upgrade only. The Department of Fisheries prohibits lighting used elsewhere due to detrimental impact on marine life.
Jetties and look out platforms	• Jetty upgrades at the western end and eastern ends of the boardwalk retain the existing character and general location and provides more seating opportunities. • Existing seating areas would be removed and replaced with upgraded seating arrangements. • There are two additional small lookouts/platforms with seating proposed along the boardwalk.
Upgrade carpark areas	• The eastern carpark upgrades would formalise access to the boardwalk and provide 14 car spaces and 2 disabled car spaces. The works define pedestrian access from vehicle access. • The drainage and surface of the existing car park at the eastern end may be improved but would not be expanded. • There is a reconfigured car park midway at the sewer pump station (Bodalla Place) to support maintenance and operations. Proposed vehicle pavements in carparks are: • Bitumen seal to Council Standards. • Porous unit paving in parking bays. • Hardwood wheel stops. • Concrete paving to the Department of Fisheries driveway and boat ramp adjustments.

Works component	Description
Upgrade side paths	Existing 'bush tracks' that connect the boardwalk to Otway Close, Kiama Place, Imlay Street and Terry Place are proposed to be upgraded. This would consist of 1.25m wide Class 2 walking tracks under the Australian Standard for Walking Tracks AS 2156.2-2001. Improved drainage, gravel, stone, and bridging over gullies/marsh would be provided where required to ensure mud-free/ bog-free access. They may remain in the current condition where there are no issues with drainage and access.
Install signage	Proposed materials for signage are: • Timber National Parks style direction signage. • Interpretive signage of recycled timber and local stone with routed and engraved text (to be developed further in an interpretative and cultural strategy).
Revegetation and completion works	• Complete landscaping and revegetation works along the boardwalk and within carpark areas. • Removal of environmental controls.

The construction approach would be tailored depending on ground surface conditions, with works typically involving as the following:

Land based construction

- This would include the above general works summary to construct the boardwalk upgrade (works would be from one end to the other)
- A 5-7 tonne (t) excavator would drive in the new piles. Track mats would be placed on the ground surface, minimising the potential for the excavator to disturb the ground when accessing the works area. Where practicable, piling will be conducted from constructed sections of the boardwalk, refer to Appendix A
- Work vehicles would transport tools and equipment close to work areas daily
- Generators will have secondary containment (e.g. double skinned) and spill bunds/ drip trays would be used in all refuelling activities, to reduce the risk of fuel spillages or oil leaks.

Water-based construction in inundated areas

The above general works summary would be followed to construct the boardwalk upgrades in inundated areas, with the following detail:

- An excavator would sit on a barge to drive piles at low tide. Other plant, personnel and materials would be placed/stored on the barge as needed
- Installation of headstocks, joists and decking would be from a motorised boat as required
- Hydrocarbon booms would be carried on the vessel in the event that any loss of containment to water occurs
- No refuelling would occur over water.

Carpark civil works

- Existing structures and surfaces (e.g. bitumen, concrete, furnishings, etc) would be removed as required, via the designated access routes
- Unsuitable material would be removed (ASS will be neutralised prior to removal)
- Clean fill and gravel materials would be brought to the site via the access routes
- Framing elements such as concrete kerbs, paths, and slabs would be installed
- Carpark pavement reconstruction would be carried out to Council engineering standards
- Landscape works, sealing and rehabilitation of disturbed areas would be undertaken.

The following plant and equipment would be used during construction:

- Truck and trailers
- Works lift/ platforms
- Barge
- Vibratory roller
- Static roller
- Grader
- Skid steer
- Loader
- Excavators (varying sizes)
- Bitumen truck
- Asphalt paver
- Concrete truck
- Line pump
- Crane (size depending on task)

3. Site description and surrounding land use

3.1. Site and surrounds

The proposed development is located along the western edge of Merimbula Lake. The existing path provides access between Market Street bridge (the eastern extent of the boardwalk) and Lakewood Drive Top Lake carpark at (the western extent of the boardwalk). The proposal is located partly within the lake, on the lake edge, and on public and private land.

The land surrounding the site comprises:

- North - native vegetation occurs immediately north of the proposed development. Urban residential development occurs approximately 60 m north
- South – Merimbula Lake occurs immediately south of the proposed development
- East – (moving east to west along the boardwalk) Merimbula Lake, native vegetation and urban residential development occur to the east of the proposed development
- West - (moving east to west along the boardwalk) native vegetation, urban residential development and Merimbula Lake occur to the west of the proposed development.

3.2. Environmental setting

3.2.1. Topography and hydrology

The proposed development area is generally flat and is located at an elevation of approximately 2 m above mean sea level. The proposal is located partly within Merimbula Lake, as well as on the lakes edge. Five (5) first order waterways pass under the existing boardwalk, before flowing into Merimbula Lake, refer to Figure 1-1.

3.2.2. Geology and soils

Underlying geology for the site includes the Solonchaks and Yellow Podzolic Soils Great Soil Groups (GSG) (NSW Government, 2023).

A description of the soil landscapes occurring along the works area is provided in Table 3-1.

Table 3-1 Soil landscapes occurring along the works area

Soil landscape	Description
Wapengo Lake	Very deep (>300 centimetres (cm)), very poorly drained estuarine sands (Uc1.21) over deep clayey sand on supratidal and intertidal sites (NSW Government, 2023a).
Yellow Pinch	Moderately deep (50–150 cm), moderately well-drained to imperfectly drained yellow Soloths and Yellow Podzolic Soils (Dy3.41; Dy5.41; Dy3.21; Dy5.21) on crests to midslopes on sandstones and conglomerates. Shallow (<50 cm), well-

Soil landscape	Description
	drained Lithosols (Uc1.24; Uc1.23) on sites with resistant rock strata. Moderately deep (50–150 cm), moderately well-drained to imperfectly drained Yellow Podzolic Soils (Dy3.41; Dy4.41) on crests to midslopes on siltstones and mudstones. Moderately deep (50–150 cm) to deep (>150 cm), moderately well-drained to imperfectly drained yellow Soloths and Yellow Podzolic Soils (Dy3.21) on lower slopes on sandstones and conglomerates. Moderately deep (50–150 cm) to deep (>150 cm), moderately well-drained to imperfectly drained yellow Soloths (Dy3.21) on lower slopes on siltstones and mudstones. Deep (>150 cm), well-drained to imperfectly drained yellow Soloths and Yellow Podzolic Soils (Dy3.41), Earthy Sands (Uc5.21) or Brown Earths (Gn4.31) on colluvial slopes (NSW Government, 2023a).

3.2.3. Acid Sulfate Soils (ASS)

The proposed development will be located along the western edge of Merimbula Lake, between Market Street bridge in the north and the carpark at Top Lake, Merimbula. The proposed development is located partly within the lake and on the lakes edge. As can be seen in Table 3-1, the proposed development falls within land classified as:

- Class 1 – ASS in these areas are likely to be found on and below the natural ground surface
- Class 2 – ASS in these areas are likely to be found below the natural ground surface

For the purposes of this ASSMP and in accordance with the precautionary principle, the entire Project site has been assumed to contain ASS. Once soil sampling has been undertaken (refer to section 6 of this report) this ASSMP will be updated.

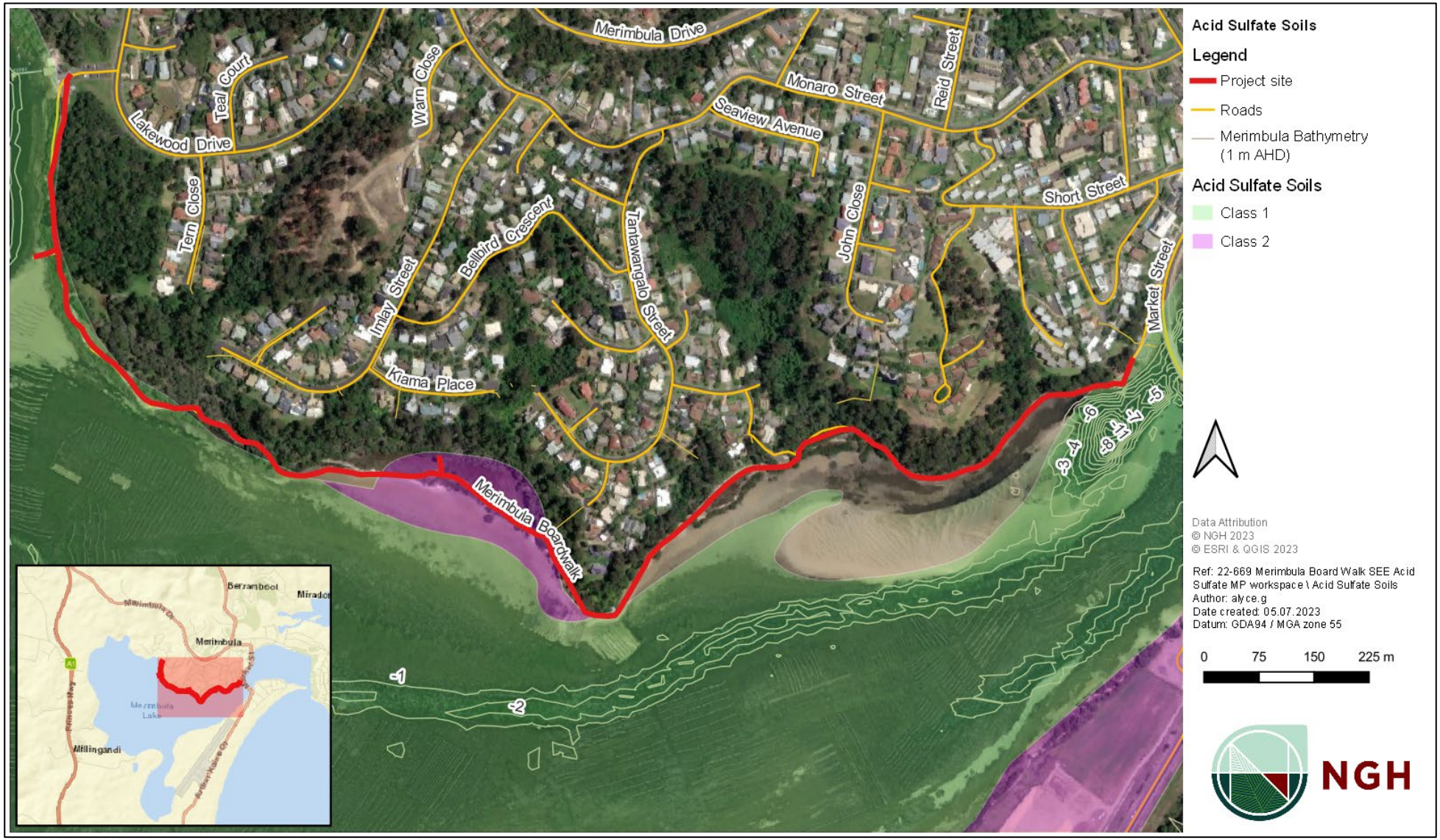


Figure 3-1 ASS occurring within and nearby to the proposed development

4. Acid sulfate soil indicators and assessment criteria

4.1. Acid Sulfate Soils

Acid sulfate soils are naturally occurring in sediments and soils, which contain sulfides, mainly iron sulfide and iron disulfide or their precursors. Exposure of soil born sulfides to oxygen, as a result of drainage or excavation, can produce sulfuric acid in the presence of water. Sulfuric acid can impact the environmental and human health. Leaching of sulfuric acid into waterways impacts water quality, resulting in fish kills and damage to infrastructure such as floodgates and bridges.

ASS include “Actual ASS” and “Potential ASS” and both types may be found in one soil profile.

Actual ASS are soils containing highly acidic soil horizons or layers resulting from the oxidation of soil materials that are rich in iron sulfides. This oxidation produces hydrogen ions in a greater volume than the sediment has capacity to neutralise and therefore, acidic conditions. This results in soils of pH 4 or less during dry seasonal conditions. These soils can usually be recognised by the presence of pale-yellow mottles and coatings of jarosite (ochre-yellow or brown mineral ($KFe_3(SO_4)2(OH)_6$).

Potential ASS are soils which contain iron sulfides or sulfidic material, which has not been exposed to air and oxidised, and occurs generally below the water table. The field pH of these soils in their undisturbed state is usually 4 or more and may be neutral or even slightly alkaline.

This ASSMP will refer to “ASS” that refers to both actual and potential acid sulfate soils.

4.2. Identification

ASS occur predominantly on coastal lowlands, with elevations generally below 5 metres (m) Australian Height Datum (AHD). The Acid Sulfate Soil Manual (ASS Management Advisory Committee, 1998) (ASSMAC) notes that ASS are generally associated with Holocene age (last 10,000 years) sediments deposited in specific conditions. Those conditions include mangrove areas, saltmarsh, floodplain backswamps, coastal flats, seasonal or permanent freshwater swamps that were once saline or brackish, and open tidal waters such as the beds of coastal rivers or lakes.

Any of the following characteristics may indicate the presence of ASS:

- A sulphurous odour following soil disturbance
- Pale yellow surface encrustations (jarosite)
- Excessive iron staining on drain surfaces or stream banks
- Iron-stained drain water and orange red ochre deposits around water bodies
- Excessive corrosion of concrete or steel structures exposed to ground or drainage waters, or rapid corrosion of fresh steel in the soil
- Blue-grey, blue-green or grey waterlogged soils which smell of rotten eggs
- Jarosite, milky white substance, iron staining and acidic runoff.

Refer to Figure 4-1 for visual characteristics that can indicate ASS.

High risk indicators for ASS could include:

- Low position in the landscape

- Excavating soil beneath the water table
- Heavy textured soils
- Dark soil colours.

Jarosite in a soil core (Queensland Government 2013b)

Clear blue-green water with acid conditions and high aluminium content (Queensland Government 2013b)

Iron-contaminated water from ASS-affected land meeting tidal waters (Queensland Government 2013b)

Figure 4-1 Visual characteristics that can indicate ASS

5. Environmental aspects and impacts

5.1. Construction activities

The proposed development will involve a range of construction activities incorporating various heavy machinery, plant and equipment that will operate in several locations. Environmental Work Method Statements (EWMS) will be prepared prior to the commencement of the following works:

- Topsoil stripping
- Vegetation removal
- Culvert and drainage works
- Dewatering
- Earthworks
- Stockpiling
- Fencing installation
- Boardwalk / jetty installation (including piling works).

5.2. Aspects

Construction activities can cause the exposure of ASS material. This in turn can lead to environmental impacts. Some of the causes of exposure and / or oxidation are:

- Excavation and exposure of ASS material
- Exposure of subsurface ASS material due to dewatering activities
- Discharge of subsurface water as a result of settlement and a reduction in available pore space (during settlement water is ‘squeezed’ out of the soil material), producing acidic leachate as it flows through oxidised ASS.
- Oxidation of pyrite in site-won (rock from cuttings) or imported fill material.

5.3. Impacts

Impacts of ASS include:

- Release of aluminium, nutrients and heavy metals (particularly arsenic) stored within the soil matrix
- Death or stunted growth of aquatic flora and fauna
- Deoxygenation of waterways leading to suffocation of fish and other aquatic animals
- Mass mortalities of microscopic organisms
- Increased light penetration due to water clarity
- Loss of habitat
- Persistent iron coatings
- Damage to infrastructure e.g. corrosion of concrete, metal, limestone.

6. ASS management and mitigation measures

6.1. ASS mitigation principles

The ASS Management Guideline (Ahern, McElnea, & Sullivan, 2004) identifies mitigation principles to manage potential impacts from ASS. The following should be applied:

- Avoid disturbing ASS wherever possible
- If ASS are present on the land, avoid disturbance by not disturbing the soil or lowering the water table
- If ASS will be disturbed:
  - Manage the acid generation potential
  - Neutralise any acid produced
  - Prevent any acid water leaving the site
  - Use acid resistant construction materials.

6.2. Management approach

A staged approach to the management of ASS is provided in Figure 6-1, noting that different construction methodologies may be required throughout the construction phase of the Project.

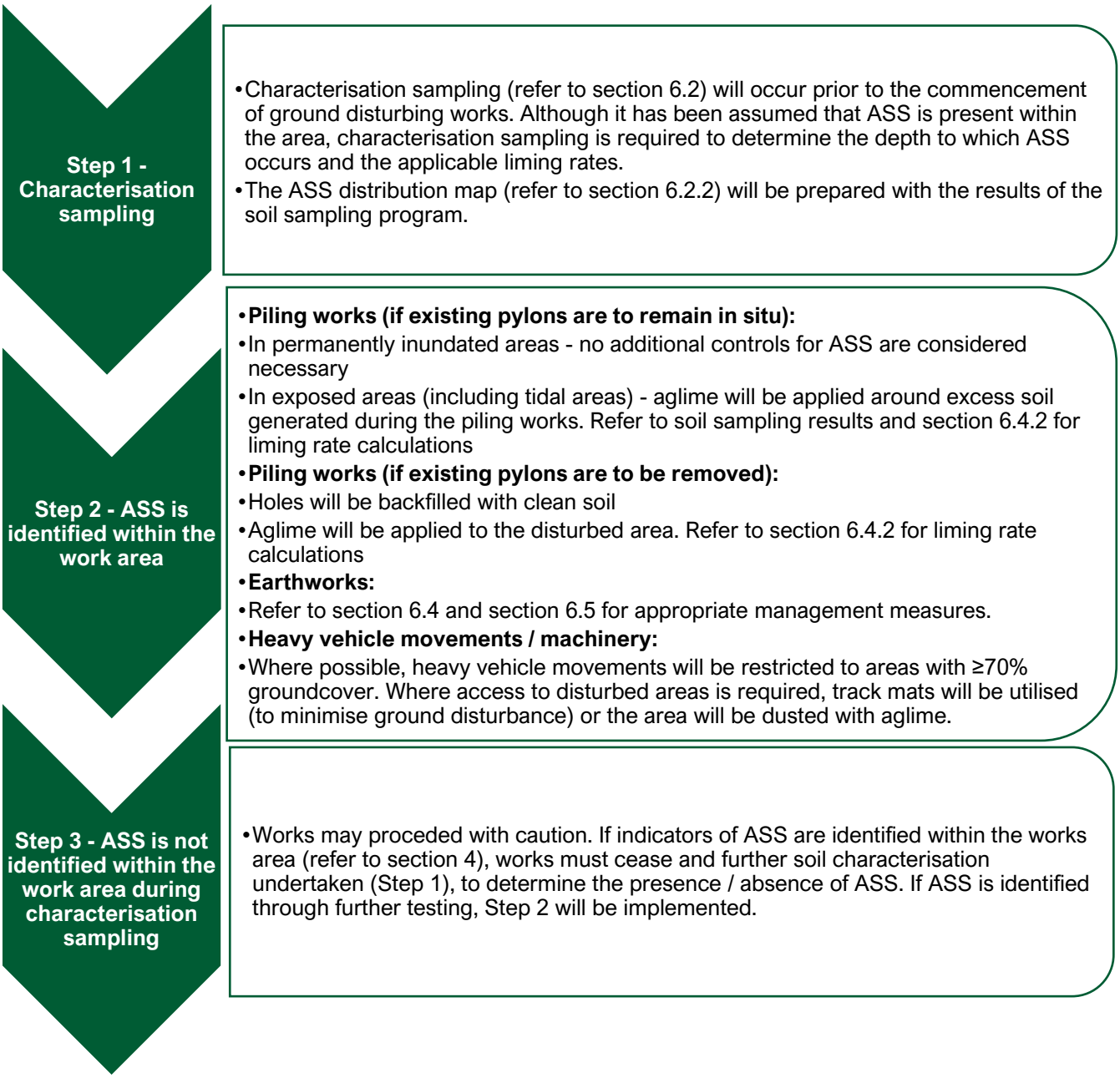


Figure 6-1 Flowchart for testing for ASS

6.3. Characterisation sampling

Characterisation sampling will be undertaken prior to the commencement of ground disturbing works. Sampling will be carried out in accordance with the National acid sulfate soils sampling and identification methods manual (Sullivan, Ward, Toppler, & Lancaster, 2018).

The intention of characterisation sampling is to determine the spatial distribution of ASS onsite. Where present, characterisation sampling will provide the relevant calculations to determine the amount of neutralising agent required to manage any excavated material within the proposed development.

The characterisation sampling shall be undertaken by a suitably qualified environmental scientist with the required experience and training to perform both field-based soil tests and have the ability to understand and interpret soil laboratory analysis, thereby advising the neutralising regime as necessary.

6.3.1. Soil sampling protocol

During the characterisation sampling process, soil samples would be collected and laboratory analysed using Chromium Reduceable Sulfur (CRS) or Suspension Peroxide Oxidation Combined Acidity and Sulfur (SPOCAS) method with the results assessed against the Acid Sulfate Soils Laboratory Methods Guidelines (Ahern, McElnea, & Sullivan, 2004). Ahern et al. (2004) methods and analysis supersede those in the Acid Sulfate Soil Assessment Guidelines (ASSMAC, 1998a). The following soil sampling protocol would be followed:

- Collect soil samples from soil where visual characteristics have been observed, as well as in areas proposed for ground disturbance, refer to Table 6-1 for minimum sampling requirements for ASS characterisation.
- Undertake sampling to capture Quality Assurance and Quality Control (QA/QC) that includes the collection of one field duplicate for every 20 investigative samples, use of standardised field sampling forms, methods and Chains of Custody, documented calibration of field instruments (refer to Appendix B)
- Dispatch samples to a National Association of Testing Authorities (NATA) for analysis
- Provide summary report of the fieldwork program
- Analyse and interpret laboratory results
- Provide a verification summary to determine if the ASS material has been neutralised, and recommendations for reuse/ disposal of the spoil.

Table 6-1 Minimum soil sampling requirements for ASS characterisation (Sullivan, Ward, Toppler, & Lancaster, 2018)

Type of disturbance	Extent of site	Sample point frequency
Small volumes (≤ 1000 m) – prior to disturbance	**Volume m**	**Number of boreholes**
	<250	2
	251 – 500	3
	501 – 1000	4
Large volumes (> 1000 m^3) – prior to disturbance	**Project area (hectares)**	**Number of boreholes**
	<1	4
	1 – 2	6
	2 – 3	8
	3 – 4	10
	>4	10 plus 2 per additional hectare
Linear	**Width and volume**	**Intervals (m)**
	Minor[1]	100
	Major[2]	50

[1] Minor Linear Disturbance – for example underground services, narrow shallow drains (less than 1 m below ground surface)

[2] Major Linear Disturbance – for example roads, railways, canals, deep sewer, wide drains, deep drains and dredging

The soil assessment criteria is provided in Table 6-2.

Table 6-2 Soils assessment criteria

Texture range	Approximate clay content (%)	1-1000 tonnes material disturbed		>1000 tonnes material disturbed	
		%S-equivalent (oven dried basis)	Mol H+/tonnes (oven dried basis)	%S-equivalent (oven dried basis)	Mol H+/tonnes (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 to loamy sands and peats	<5	0.03	18		
Draft action criteria for poorly buffered sands					
Coarse Sands, poorly buffered	<5	0.01	6	0.01	6

Notes: The highest laboratory result(s) should always be used to decide if the relevant action criterion level has been met or exceeded; using the average or mean of a set of results is not appropriate or acceptable.

An example of the types of analysis for ASS is provided in Appendix B.

6.3.2. ASS distribution map

If the results of the characterisation sampling show that ASS are present within the proposed development site, a map will be produced that depicts the required liming rates for each area of ASS. This will enable each area to be treated with the liming rate it requires to effectively neutralise ASS.

6.4. ASS management

If characterisation sampling results return the presence of ASS within the proposed development site and disturbance to the soils cannot be avoided, follow the ASS management measures provided in the following sections.

Dedicated treatment pad

If the results of the characterisation sampling show that ASS are present across the proposed development site and a laboratory liming rate is provided, a dedicated impermeable treatment pad will be constructed. In order to establish a dedicated ASS treatment pad, the following steps would be required:

- **Pre-commissioning soils samples**: These would be taken at the soil surface and down to 0.3 m. The pre-commissioning samples are required to ensure that following decommissioning of the treatment pad on completion of the Proposal, the levels of heavy metals and other contaminants, as a consequence of ASS treatment reactions, have not adversely impacted the ground surface below the pad.
- **Clay capping (or HDPE liner)**: Clay capping (or HDPE liner) and crushed limestone to a minimum thickness of 0.3 millimetres (mm) will be used to form an impermeable treatment pad that has been graded to a sump to receive any leachate runoff and/ or rainwater.
- **Signage**: Signage on the treatment pad would be installed to show the excavation date, liming rate and date the Aglime was applied. Soil samples would be taken form the excavated ASS to determine if the spoil had been effectively neutralised (refer to Section 6.4.1).

This dedicated treatment pad will receive the excavated ASS material where it will be mechanically mixed with the required rate of Aglime within in one calendar day of excavation.

Soil stockpiles

Where required, excavated ASS will be stockpiled on a dedicated treatment pad and to a height no greater than 1.0 m to ensure vertical mixing of lime can be achieved consistently through the soil stockpile.

Leachate

The treatment and management of leachate should be done in accordance with this ASSMP. Surface water flows from areas where ASS has been identified, or stockpiled on an impermeable ASS treatment pad, shall be retained and prevented from discharging offsite. Leachate will be treated so it meets the quality of the surface water of the receiving environment.

The minimum requirements in relation to ASS leachate management and discharge are provided in Table 6-3 and are in accordance with the Australia and New Zealand Environment and Conservation Council Guidelines (ANZG 2018).

Table 6-3 Adopted leachate criteria

Indicator	Fresh water	Marine water
pH	6.5 – 9.0	< 2.0 unit change
Iron (total))	500 µg/L	NA
Total dissolved solids	0-1500 mg/L	> 1500 mg/L
Aluminium (total)	5 µg/L for pH < 6.5 100 µg/L for pH > 6.5	NA

6.4.1. Neutralising material and rates

Agricultural lime sand (Aglime) is the most commonly used neutralising agent for the treatment of ASS due to its fine particle size and therefore more rapid uptake and neutralisation of exposed ASS material. It is recommended that BVSC (or the Contractor) obtain procurement arrangements for Aglime product that can be confirmed (documented evidence from the supplier) as having a Neutralising Value (NV) of >95% with a particle size <800 microns.

In the event that the characterisation sampling shows the presence of ASS, liming rate will be determined for each zone of ASS encountered (i.e., each differing level of ASS). Alternatively, if there is no clear distinction between ASS areas based on the characterisation sampling, the highest liming rate would be applied across all areas to ensure that effective neutralisation of excavated material is achieved.

In accordance with the precautionary principle, where characterisation sampling has occurred, the laboratory established liming rate and bulk density will be used to calculate the required Liming Rate, refer to Equation 1.

Equation 1 Required Liming Rate

Site Area Proposal Liming Rate
= Adopted laboratory liming rate (***A***) x safety factor (1.5) x adopted bulk density (***B***). The safety factor is required to allow for inefficient mixing of the lime and its low reactivity.
= ***A*** kg CaCO3/t x 1.5 x ***B*** t/m3

= *X* kg CaCO3/m3

The laboratory liming rate will likely assume a bulk density of 1 t/m³ and does not include a safety factor. Laboratory data from the preliminary site investigation will be required to derive a mean bulk density across the site, this will be the adopted bulk density.

6.4.2. Verification sampling

All ASS material treated on site shall be verified as neutralised with 14 calendar days form excavation. In order to confirm that excavated ASS material has been effectively neutralised, verification sampling is required. According to the National Acid Sulfate Soils guidance: National acid sulfate soils sampling and

identification methods manual (Sullivan *et al.* 2018) the minimum number of soil sampling densities for existing stockpiles and verification testing are provided in Table 6-4.

Table 6-4 Minimum sampling requirements for verification testing (Sullivan, Ward, Toppler, & Lancaster, 2018)

Type of disturbance	Extent of site (volume m^3)	Sample point frequency (number of samples)
Existing stockpiles and verification testing	<250	2
	251 – 500	3
	1000	4
	>1000	4 plus 1 per additional 500 m^3

Verification sampling protocol

Verification soil testing will be conducted by a qualified and experienced Environmental Consultant (consultant). Verification sampling will be undertaken using field testing, oxidised field pH (pHF) and peroxide test (pHFOX), and in accordance with the Sullivan *et al.* (1998). The accuracy of the field-testing program will be 'calibrated' by sending 25 per cent of samples (one out of every four) to a laboratory for confirmatory analysis (SPOCAS or CRS).

The consultant will provide laboratory analysis and a report/ email confirmation of the verification results before any material is reused or disposed of offsite. If required, unsuccessfully verified ASS material will be retreated.

The following performance criteria should be met to confirm effective neutralisation of soils:

- The neutralising capacity of the treated soil must exceed the existing plus potential acidity of the soil (e.g., pHFOX must be >5)
- The neutralising material has been thoroughly mixed with the soil
- Soil pH must be in the range 6.0 to 8.5; and
- Excess neutralising agent must remain within the soil until all acid generation reactions are complete and the soil has no further capacity to generate acidity.

Disposal

If treated ASS material is not going to be reused onsite (i.e. landform shaping), adhere to the following:

Following neutralisation, the generator of the waste must chemically assess the soil in accordance with Step 5 of Part 1 of the NSW EPA Waste Classification Guidelines (NSW EPA, 2014). 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 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.

6.5. ASS management and mitigation measures

The ASS mitigation and management measures for the excavation, handling, treatment and stockpiling of ASS are provided in Table 6-5.

Table 6-5 Acid Sulfate Soil mitigation and management measures for the excavation, handling, treatment and stockpiling of ASS

ID	Measure/ requirement	Resource needed	When to implement	Responsibility	Reference
General					
1	The ASS Management Plan shall be prepared in accordance with the Acid Sulfate Soils Manual (developed and included as an appendix / subplan of the Demolition Environmental Management Plan (DEMP).	This ASSMP	Pre-construction		ASSMP
2	All site-based demolition personnel and contractors will be made aware of the risk of encountering ASS. Training will provide instruction on the requirements of this ASSMP (refer to Section 7.2).	Induction Induction register	Pre-construction	Project Manager/ delegate	DEMP
Demolition works and ground disturbing works					
3	During the Project, ASS management will follow the flowchart provided in Figure 6-1. Characterisation sampling will be required prior to the commencement of ground disturbing works.	This ASSMP Induction	Construction	All personnel	ASSMP
4	The following measures will be implemented to reduce disturbance caused by vehicle movements during the works: • Track mats, or • Disturbed areas will be dusted with Aglime. Aglime used onsite must meet the specifications outlined in Section 6.4.1.	This ASSMP	Construction	All personnel	ASSMP
5	Where characterisation sampling is required, stop work and take soil samples and submit to a NATA accredited laboratory for analysis.	This ASSMP	Construction	Consultant	ASSMP

ID	Measure/ requirement	Resource needed	When to implement	Responsibility	Reference
6	Where characterisation samples have returned the confirmed presence of ASS and a laboratory liming rate, during excavations, apply a guard layer of agricultural lime evenly along the floors and sides of the excavation at a rate as confirmed using the liming rate and Equation 1.	This ASSMP	Construction	Environmental Site Representative	ASSMP
7	Unexpected ASS/PASS finds will be managed in accordance with the above controls and mitigation measures.	Toolbox talks (Section 7.2)	Construction	Project Manager / Delegate	Best Practice
Dedicated treatment area					
8	Where ASS are identified on-site, excavated impacted material will be stockpiled on a dedicated, bunded and impermeable treatment pad with a leachate collection system. The treatment pad will be constructed to enable the impacted material to be spread evenly to a height no greater than 1.0 m to enable sufficient mechanical mixing of neutralising lime.	This ASSMP	Construction	Environmental Site Representative	ASSMP ASSMAC 1998
9	Leachate will be neutralised or removed and disposed of at a licenced facility to receive such type of waste.	This ASSMP	Construction	Environmental Site Representative	ASSMAC 1998
Treatment and verification of ASS					
10	A stockpile of agricultural lime will be stored on site and covered with tarpaulin/ similar (to prevent the Aglime from wind and rain). The volume of Aglime stored will be not less than the amount needed to treat the predicted volume of excavated spoil at the calculated liming rates, as per the characterisation mapping.	Aglime Laydown space for the Aglime stockpile Tarpaulin/similar	Construction	Environmental Site Representative	Best Practice
11	An ASS tracking register will be used to track the excavation location, date and volume of ASS spoil removed, as well as liming rate (kg/m^3), treatment location, date, validation results and reinstatement location or offsite disposal.	ASS tracking register	Construction	Environmental Site Representative	Best Practice
12	Ongoing monitoring of the pH of the ASS stockpile/s undergoing treatment will continue until the material is neutralised.	Monitoring	Construction	Environmental Site Representative	ASSMAC 1998

ID	Measure/ requirement	Resource needed	When to implement	Responsibility	Reference
13	Treated ASS, which has been neutralised with confirmation following verification testing, will be reused as clean-fill onsite, or removed offsite.	Stockpile management plan Stockpile covers Skip bin Bunded stockpile area Impervious liner Agricultural line and spreader	Construction	Project Manager / Delegate	Best Practice
Disposal or reuse of ASS					
14	ASS must be treated by the generator of the waste before it can be considered for disposal. Treatment should be in accordance with the neutralising techniques outlined in the ASSMP and ASS Manual (ASSMAC 1998).	Waste classification Waste tracking register	Construction	Project Manager / Delegate	NSW EPA *Waste Classification Guidelines Part 4: Acid Sulfate Soils* (2014) (NSW EPA 2014) ASSMP ASSMAC 1998
15	Any treated ASS stockpiles that have been verified as neutralised may be used as clean fill, buried at least 0.5 m from the finished surface level or disposed offsite to a suitably licenced facility capable of taking that type of waste. Treated ASS suitability for load-bearing applications will require geotechnical assessment prior to being utilised in those situations.		Construction	Project Manager / Delegate	ASSMP Waste Classification Guidelines (NSW)
Reporting					
16	A verification report describing the results of verification sampling and analysis and final location of excavated ASS material will be prepared	This ASSMP	Construction	Consultant	ASSMP ASSMAC 1998
Monitoring and inspections					

ID	Measure/ requirement	Resource needed	When to implement	Responsibility	Reference
17	The Environmental Site Representative will undertake a weekly site inspection for visual indicators of ASS and acidic runoff in the receiving environment.	Weekly inspection checklist	Construction	Environmental Site Representative	Best Practice

7. Compliance Management

7.1. Roles and Responsibilities

Relevant roles and responsibilities for the ASSMP are provided in Table 7-1.

Table 7-1 Roles and responsibilities for the ASSMP

Role	Responsibility
Proposed development Manager - BVSC	• Ensure all works comply with relevant regulatory and proposal requirements • Ensure the requirements of this ASSMP are fully implemented, and environmental requirements are not secondary to other construction requirements • Liaise with the Contractor and Government authorities, as required • Participate and provide guidance in the regular review of this ASSMP and supporting documentation • Provide adequate resources (personnel, financial and technological) to ensure effective development, implementation and maintenance of this ASSMP • Ensure that complaints received by BVSC are appropriately investigated by the Contractor, to ensure an efficient and effective resolution is achieved.
Construction Manager	• Plan construction works in a manner that avoids or minimises impact to environment • Ensure the requirements of this ASSMP are fully implemented • Ensure construction personnel manage construction works in accordance with statutory and approval requirements • Support the Site Environmental Representative in achieving the proposal's environmental objectives • Ensure environmental management procedures and protection measures are implemented • Ensure that all personnel receive appropriate induction training • Stop work immediately if an unacceptable impact on the environment is likely to occur.
Environmental Site Representative	• Control field works and implement / maintain effective environmental controls • Ensure site activities comply with EWMS and relevant records are kept • Attend to any environmental incidents that may occur on-site • Ensuring that the EWMS is established, implemented and maintained in compliance with all Environmental Assessment documents and approvals, including all sub-plans, procedures and supplementary EWMS, and upgrades to these documents (as needed) remain current with the progress of the Works • Overall responsibility for the establishment, management, monitoring and maintenance of erosion and sediment controls within the site • Carrying out weekly inspections to ensure that the management measures provided in this ASSMP are adhered to

Role	Responsibility
	• Identifying where the implemented management measures in this ASSMP are not meeting the targets set, and identifying areas where improvement can be achieved • Preparing reports following weekly inspections, pre-work sampling events, prior to offsite disposal of ASS and after an environmental incident has occurred onsite • Facilitating and developing the material for all environmental induction and toolbox talks for site personnel • Specific authority to stop work on any activity where the Construction Manager deems it necessary to prevent environmental non-conformities • Notification of environmental incidents and reportable events, including associated reporting.
Project / Site Engineers	• Ensure that instructions are issued and adequate information provided to employees that relate to environmental risks on-site • Ensure that the works are carried out in accordance with the requirements of the ASSMP and supporting documentation, including the implementation of all environmental controls • Report any activity that has resulted, or has the potential to result, in an environmental incident or reportable event immediately to the Construction Manager and Site Environmental Representative • Take action in the event of an emergency and allocate the required resources to minimise the environmental impact.

7.2. Toolbox talks, training and awareness

The Environmental Site Representative is responsible for ensuring that all personnel are competent to perform tasks that affect the performance and effectiveness of the ASSMP.

Toolbox talks will be one method of raising awareness and educating personnel on issues related to all aspects of construction, including environmental issues. Toolbox talks are used to ensure environmental awareness continues throughout construction.

Toolbox talks will include, but not be limited to:

- A description of the activities to be undertaken
- Identification of ASS in the area
- Mitigation measures for the works and the area
- Details of EWMS for relevant personnel.

Toolbox attendance is mandatory, and attendees of toolbox talks are required to sign an attendance form and the records maintained.

7.3. Monitoring and inspections

Ongoing monitoring will be conducted throughout the construction phase of the proposed development. The purpose of such monitoring will be to provide feedback on the effectiveness of the ASSMP and to provide

early warnings of possible environmental degradation or impacts. Monitoring requirements relevant to the ASSMP are detailed in Table 7-2.

Table 7-2 Monitoring requirements relevant to the ASSMP

Monitoring requirement	Frequency	Responsibility	Record
Visual site inspection	Weekly	Site Environmental Representative	ASS management checklist (Appendix C)

7.4. Reporting

Waste classification reporting for disposal of ASS will be carried out in accordance with the Waste Classification Guidelines.

The suitably qualified validation consultant will prepare a verification report describing the results of validations sampling and analysis.

8. Review and improvement

8.1. Continuous improvement

This ASSMP will be reviewed and updated as required. Only the Environmental Representative has the authority to update this ASSMP.

Reasons for review include, but are not limited to the following:

- Confirmed uncontrolled disturbance of acid sulfate soils
- Confirmed release or generation of sulfuric acid or a resultant impact
- A change in legislation or permitting
- A major change in the construction method.

9. References

Ahern, C., McElnea, A., & Sullivan, L. (2004). *Acid Sulfate Soils Laboratory Methods Guidelines.*

ASS Management Advisory Committee. (1998). *Acid Sulfate Soil Manual.* Acid Sulfate Soil Management Advisory Committee.

ASSMAC. (1998a). *Acid Sulfate Soils Assessment Guidelines.* ASS Management Advisory Committee.

DAWE. (2018). *National Acid Sulfate Soils Guidance - National Acid Sulfate Soils Sampling and Identification Methods Manual.* Department of Agriculture and Water Resources.

DAWE. (2022). *National Acid Sulfate Soils Guidance - National Acid Sulfate Soils Identification and Laboratory Methods Manual.* Department of Agriculture, Water and the Environment.

DSITIA. (2014). *Queensland Acid Sulfate Soil Technical Manual.* Department of Science, Information Technology, Innovation and the Arts.

EPA. (2014). *Waste Classification Guidelines.* Environmental Protection Authority.

NSW EPA. (2014). *Waste Classification Guidelines Part 4: Acid Sulfate Soils.* NSW Environment Protection Authority.

NSW Government. (2023). *SEED*. Retrieved from NSW Government: https://geo.seed.nsw.gov.au/Public_Viewer/index.html?viewer=Public_Viewer&locale=en-AU&runWorkflow=AppendLayerCatalog&CatalogLayer=SEED_Catalog.108

NSW Government. (2023a). *eSpade*. Retrieved from Landscape information: https://www.environment.nsw.gov.au/eSpade2WebApp

Sullivan, L., Ward, N., Toppler, N., & Lancaster, G. (2018). *National Acid Sulfate Soils guidance: National acid sulfate soils sampling and identification methods manual.* Department of Agriculture and Water Resources.

Appendix A Construction methodology

A EXTENSION OF WORKS
scale: 1:5000

DESIGNED TO LANDSCAPE DRAWING:
20240402_L_base PLAN.DWG

Fleetwood
Experiences worth discovering

Fleetwood Urban Pty Ltd
www.fleetwoodurban.com.au
Ph: 1300 989 100

Images and drawings are for concept purposes only. Changes to structure may occur during detail design. All lighting, shadows and materials are simulated.

DRAWN BY
RP

ISSUE
29/4/ 2024

CLIENT

LOCI DESIGN

END CLIENT

BEGA VALLEY SHIRE COUNCIL

DESIGNER

FLEETWOOD URBAN

PROJECT

Merimbula Boardwalks

PRODUCT

FRP AND TIMBER BOARDWALK WITH BALUSTRADE ™

3D PRODUCT DRAWING

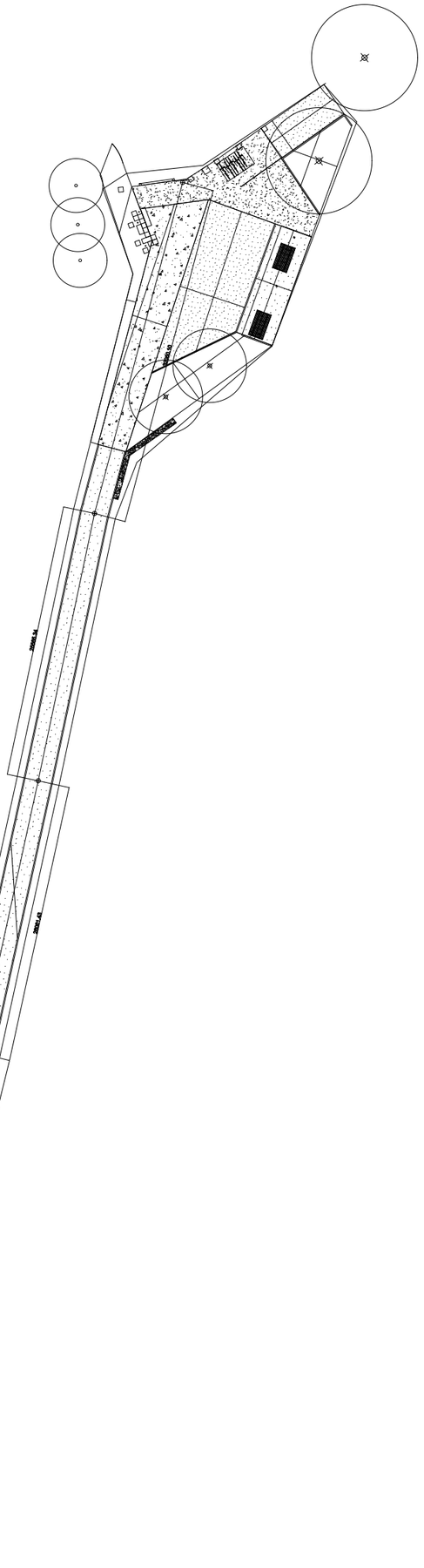
PAGE SIZE

A3

PAGE NAME

Extent Of Work Plan

11855 03 B



1 PLAN A1
scale: 1:500

Fleetwood
Experiences worth discovering

Fleetwood Urban Pty Ltd
www.fleetwoodurban.com.au
Ph: 1300 989 100

DRAWN BY
RP

ISSUE
29/4/ 2024

CLIENT
LOCI DESIGN
LOCI DESIGN COLLECTIVE

END CLIENT
BEGA VALLEY SHIRE COUNCIL
bega valley shire council

DESIGNER
FLEETWOOD URBAN
Fleetwood

PROJECT
Merimbula Boardwalks

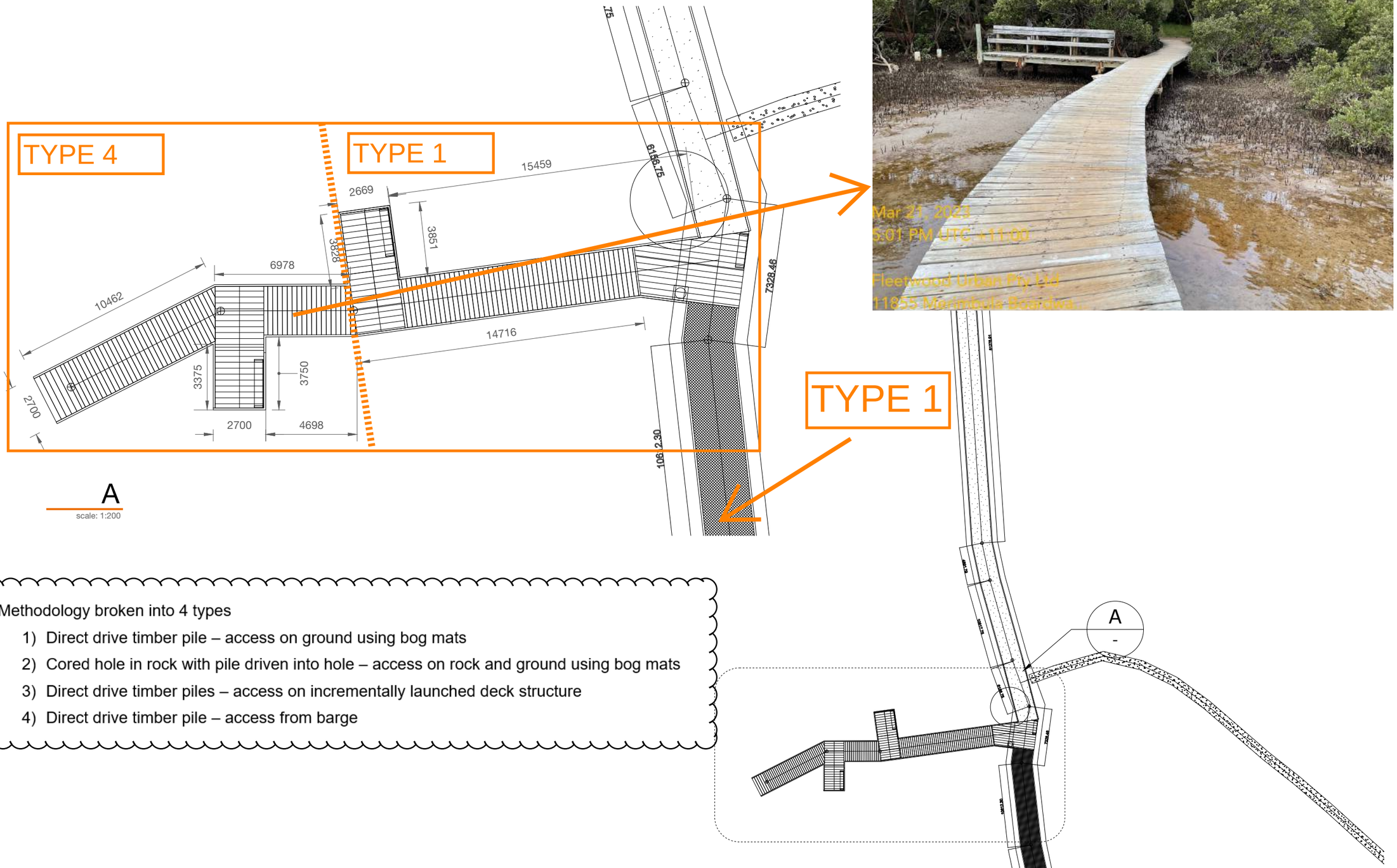
PRODUCT
FRP AND TIMBER BOARDWALK WITH BALUSTRADE ™

3D PRODUCT DRAWING

PAGE SIZE
A3

PAGE NAME
Plan 1

11855 04 B



A
scale: 1:200

Methodology broken into 4 types

1) Direct drive timber pile – access on ground using bog mats
2) Cored hole in rock with pile driven into hole – access on rock and ground using bog mats
3) Direct drive timber piles – access on incrementally launched deck structure
4) Direct drive timber pile – access from barge

2

PLAN A2
scale: 1:500

Fleetwood
Experiences worth discovering

Fleetwood Urban Pty Ltd
www.fleetwoodurban.com.au
Ph: 1300 989 100

DRAWN BY
RP

ISSUE
29/4/ 2024

CLIENT

LOCI DESIGN

LOCI DESIGN COLLECTIVE

END CLIENT

BEGA VALLEY SHIRE COUNCIL

bega valley shire council

DESIGNER

FLEETWOOD URBAN

Fleetwood

PROJECT

Merimbula Boardwalks

PRODUCT

FRP AND TIMBER BOARDWALK WITH BALUSTRADE ™

3D PRODUCT DRAWING

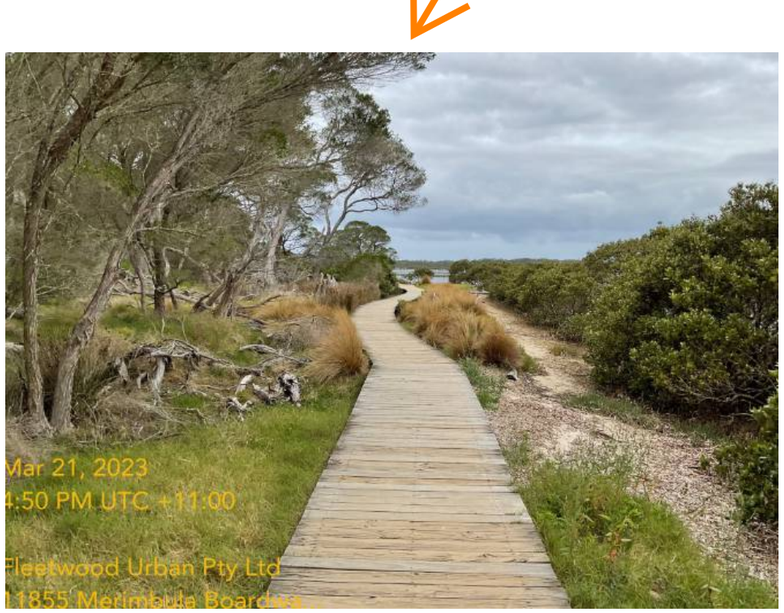
PAGE SIZE

A3

PAGE NAME

Plan 2

11855 05 B



3 PLAN A3
scale: 1:500

Fleetwood
Experiences worth discovering

Fleetwood Urban Pty Ltd
www.fleetwoodurban.com.au
Ph: 1300 989 100

DRAWN BY
RP

ISSUE
29/4/ 2024

CLIENT
LOCI DESIGN
LOCI DESIGN COLLECTIVE

END CLIENT
BEGA VALLEY SHIRE COUNCIL
bega valley shire council

DESIGNER
FLEETWOOD URBAN
Fleetwood

PROJECT
Merimbula Boardwalks

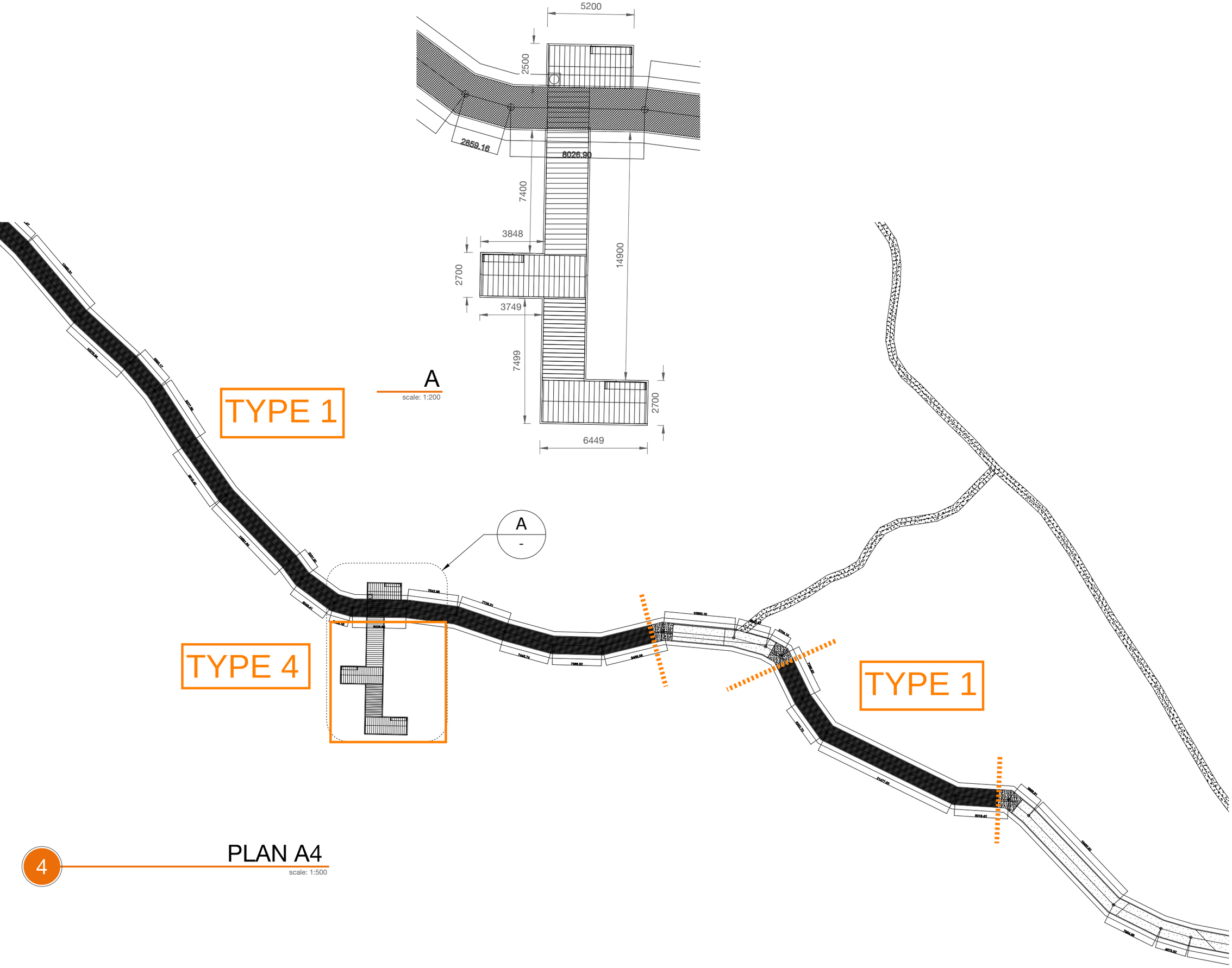
PRODUCT
FRP AND TIMBER BOARDWALK WITH BALUSTRADE ™

3D PRODUCT DRAWING

PAGE SIZE
A3

PAGE NAME
Plan 3

11855 06 B



4 PLAN A4
scale: 1:500

Fleetwood
Experiences worth discovering

Fleetwood Urban Pty Ltd
www.fleetwoodurban.com.au
Ph: 1300 989 100

DRAWN BY
RP

ISSUE
29/4/ 2024

CLIENT

LOCI DESIGN

LOCI DESIGN COLLECTIVE

END CLIENT

BEGA VALLEY SHIRE COUNCIL

bega valley shire council

DESIGNER

FLEETWOOD URBAN

Fleetwood

PROJECT

Merimbula Boardwalks

PRODUCT

FRP AND TIMBER BOARDWALK WITH BALUSTRADE ™

3D PRODUCT DRAWING

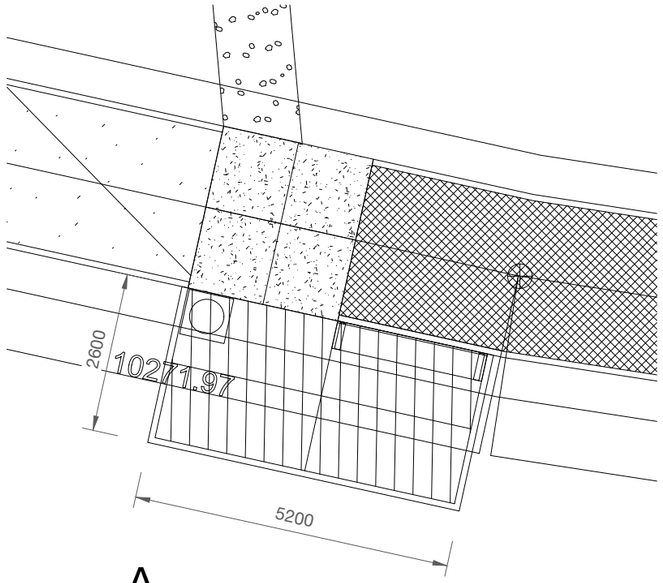
PAGE SIZE

A3

PAGE NAME

Plan 4

11855 07 B



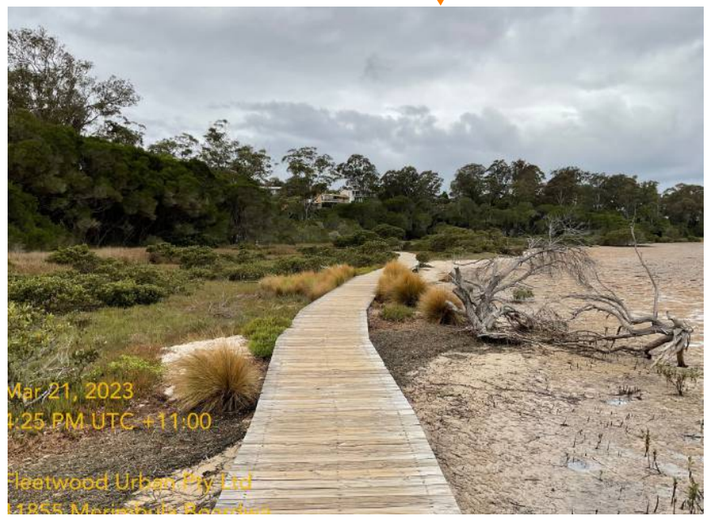
A
scale: 1:100

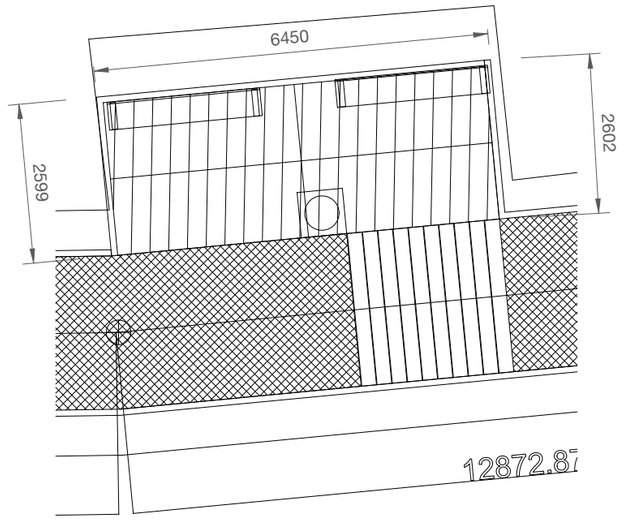
TYPE 4

TYPE 3

5

PLAN A5
scale: 1:500





A
scale: 1:100

Fleetwood
Experiences worth discovering

Fleetwood Urban Pty Ltd
www.fleetwoodurban.com.au
Ph: 1300 989 100

DRAWN BY
RP

ISSUE
29/4/ 2024

CLIENT
LOCI DESIGN COLLECTIVE

END CLIENT
BEGA VALLEY SHIRE COUNCIL

DESIGNER
FLEETWOOD URBAN

PROJECT
Merimbula Boardwalks

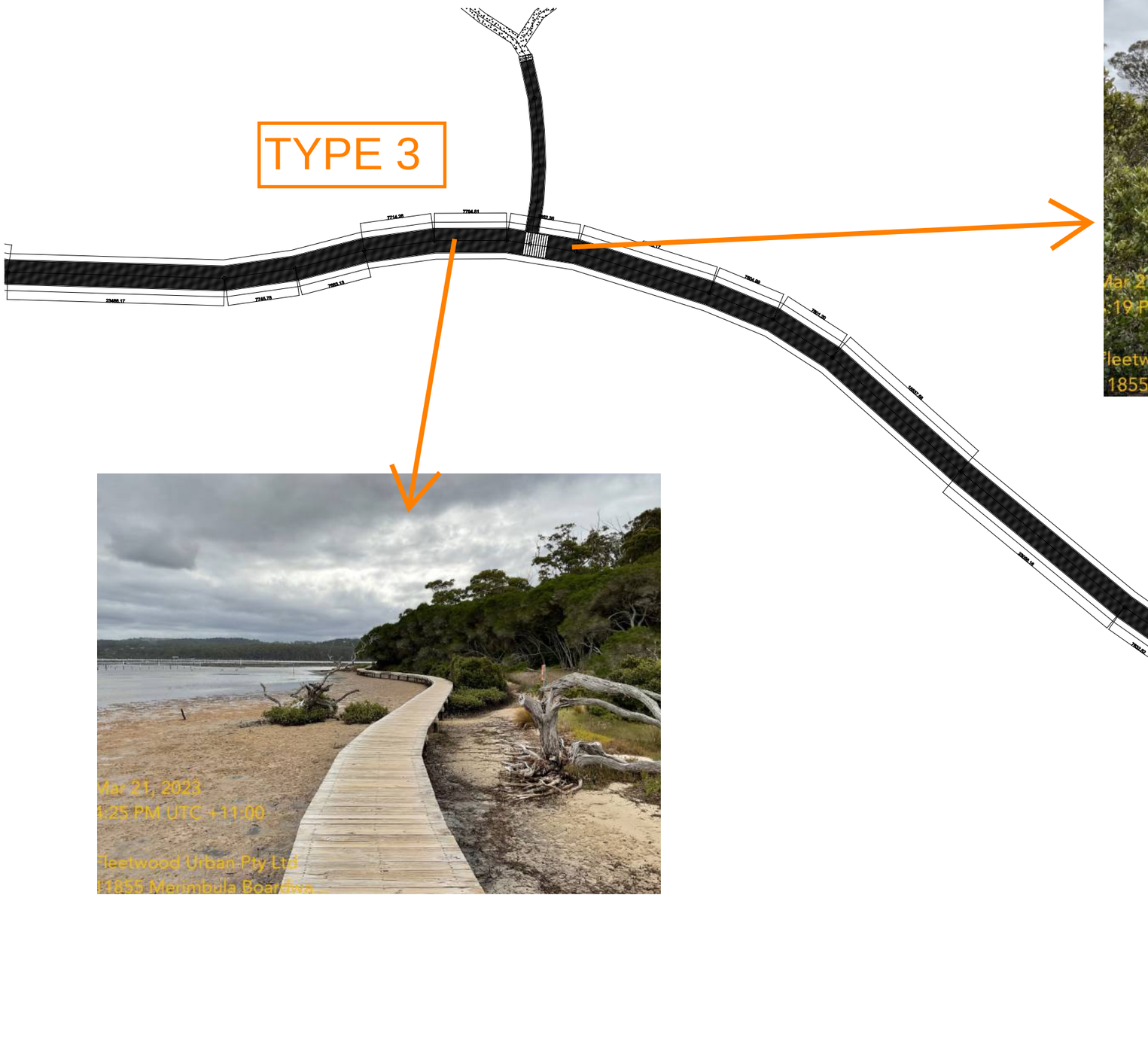
PRODUCT
FRP AND TIMBER BOARDWALK WITH BALUSTRADE ™

3D PRODUCT DRAWING

PAGE SIZE
A3

PAGE NAME
Plan 5

11855 08 B



6

PLAN A6

scale: 1:500

Fleetwood

Experiences worth discovering

Fleetwood Urban Pty Ltd
www.fleetwoodurban.com.au
Ph: 1300 989 100

DRAWN BY
RP

ISSUE
29/4/ 2024

CLIENT

LOCI DESIGN

LOCI DESIGN COLLECTIVE

END CLIENT

BEGA VALLEY SHIRE COUNCIL

bega valley shire council

DESIGNER

FLEETWOOD URBAN

Fleetwood

PROJECT

Merimbula Boardwalks

PRODUCT

FRP AND TIMBER BOARDWALK WITH BALUSTRADE ™

3D PRODUCT DRAWING

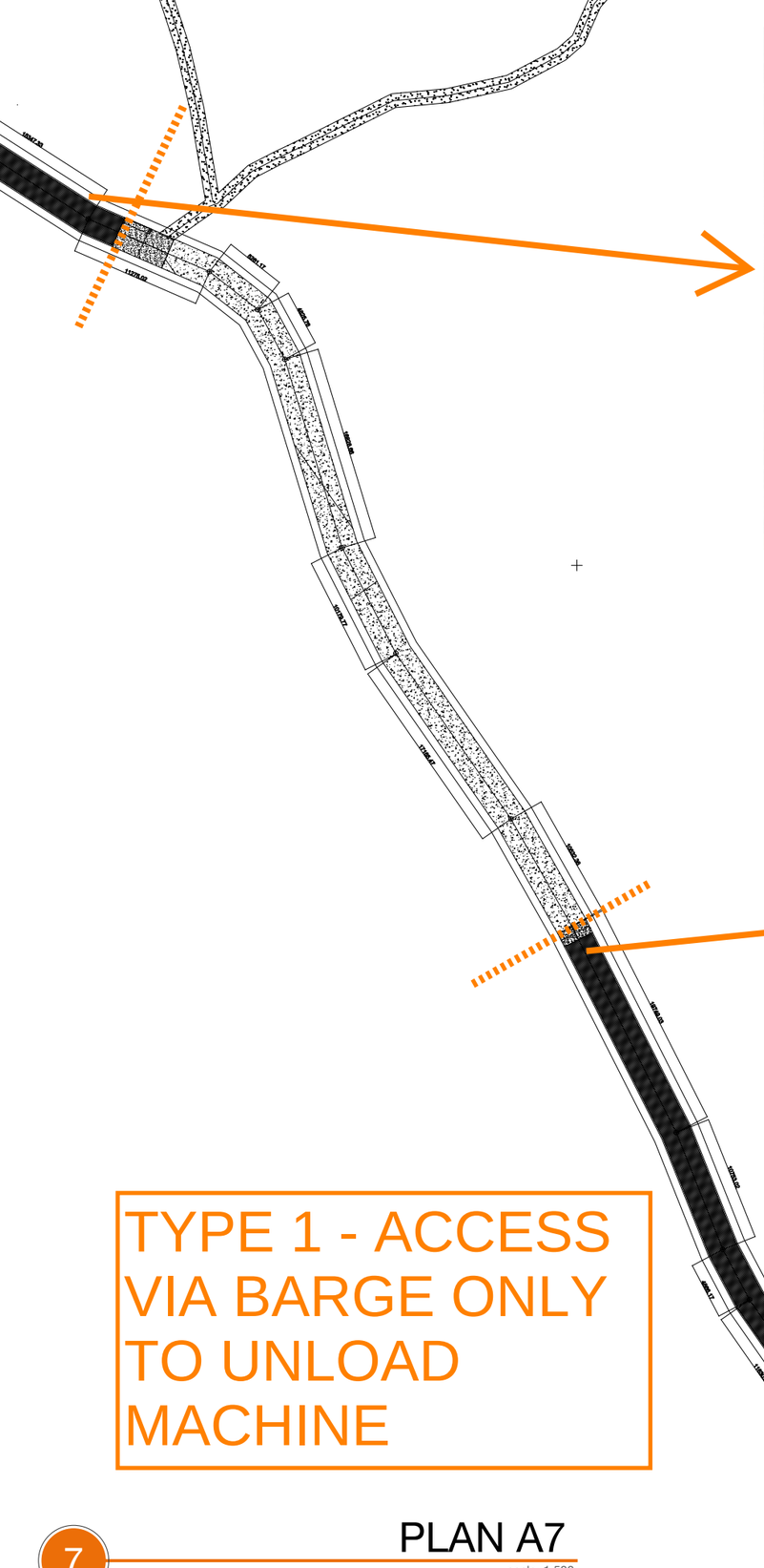
PAGE SIZE

A3

PAGE NAME

Plan 6

11855 09 B



TYPE 1 - ACCESS VIA BARGE ONLY TO UNLOAD MACHINE

7

PLAN A7
scale: 1:500

A
scale: 1:200

Fleetwood
Experiences worth discovering

Fleetwood Urban Pty Ltd
www.fleetwoodurban.com.au
Ph: 1300 989 100

DRAWN BY
RP

ISSUE
29/4/ 2024

CLIENT

LOCI DESIGN

END CLIENT

BEGA VALLEY SHIRE COUNCIL

DESIGNER

FLEETWOOD URBAN

PROJECT

Merimbula Boardwalks

PRODUCT

FRP AND TIMBER BOARDWALK WITH BALUSTRADE ™

3D PRODUCT DRAWING

PAGE SIZE

A3

PAGE NAME

Plan 7

11855 10 B

ACCESS FOR PLANT & MACHINARY + MATERIALS STORAGE

8

PLAN A8

scale: 1:500

Fleetwood
Experiences worth discovering

Fleetwood Urban Pty Ltd
www.fleetwoodurban.com.au
Ph: 1300 989 100

DRAWN BY
RP

ISSUE
29/4/ 2024

CLIENT

LOCI DESIGN

END CLIENT

BEGA VALLEY SHIRE COUNCIL

DESIGNER

FLEETWOOD URBAN

PROJECT

Merimbula Boardwalks

PRODUCT

FRP AND TIMBER BOARDWALK WITH BALUSTRADE ™

3D PRODUCT DRAWING

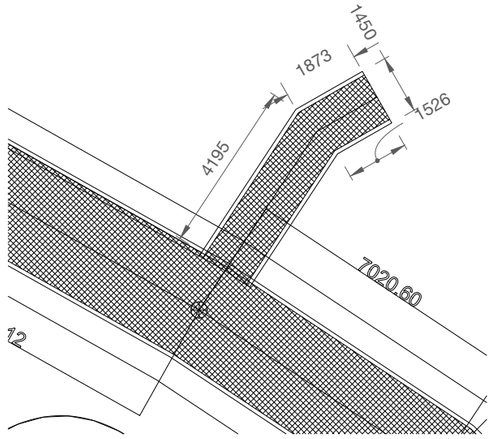
PAGE SIZE

A3

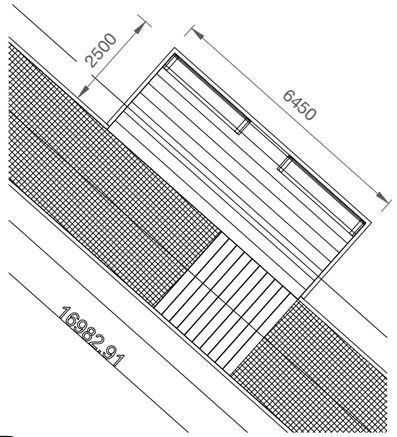
PAGE NAME

Plan 8

11855 11 B



A
scale: 1:150



B
scale: 1:150

Fleetwood
Experiences worth discovering

Fleetwood Urban Pty Ltd
www.fleetwoodurban.com.au
Ph: 1300 989 100

Images and drawings are for concept purposes only. Changes to structure may occur during detail design. All lighting, shadows and materials are simulated.

DRAWN BY
RP

ISSUE
29/4/ 2024

CLIENT

LOCI DESIGN

LOCI DESIGN COLLECTIVE

END CLIENT

BEGA VALLEY SHIRE COUNCIL

bega valley shire council

DESIGNER

FLEETWOOD URBAN

Fleetwood

PROJECT

Merimbula Boardwalks

PRODUCT

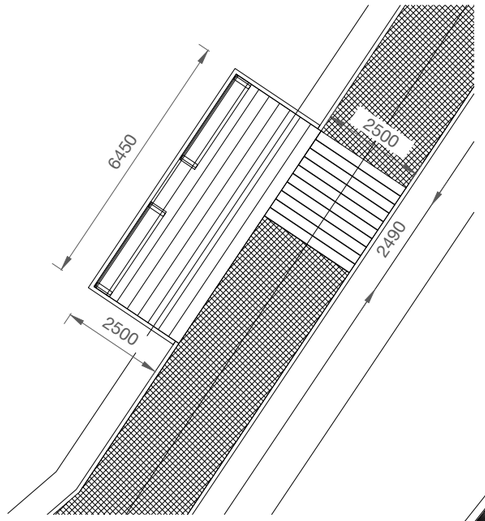
FRP AND TIMBER BOARDWALK WITH BALUSTRADE ™

3D PRODUCT DRAWING

PAGE SIZE
A3

PAGE NAME
Plan 9

11855 12 B



TYPE 4

PLAN A10

10

scale: 1:500

Fleetwood
Experiences worth discovering

Fleetwood Urban Pty Ltd
www.fleetwoodurban.com.au
Ph: 1300 989 100

DRAWN BY
RP

ISSUE
29/4/ 2024

CLIENT

LOCI DESIGN

END CLIENT

BEGA VALLEY SHIRE COUNCIL

DESIGNER

FLEETWOOD URBAN

PROJECT

Merimbula Boardwalks

PRODUCT

FRP AND TIMBER BOARDWALK WITH BALUSTRADE ™

3D PRODUCT DRAWING

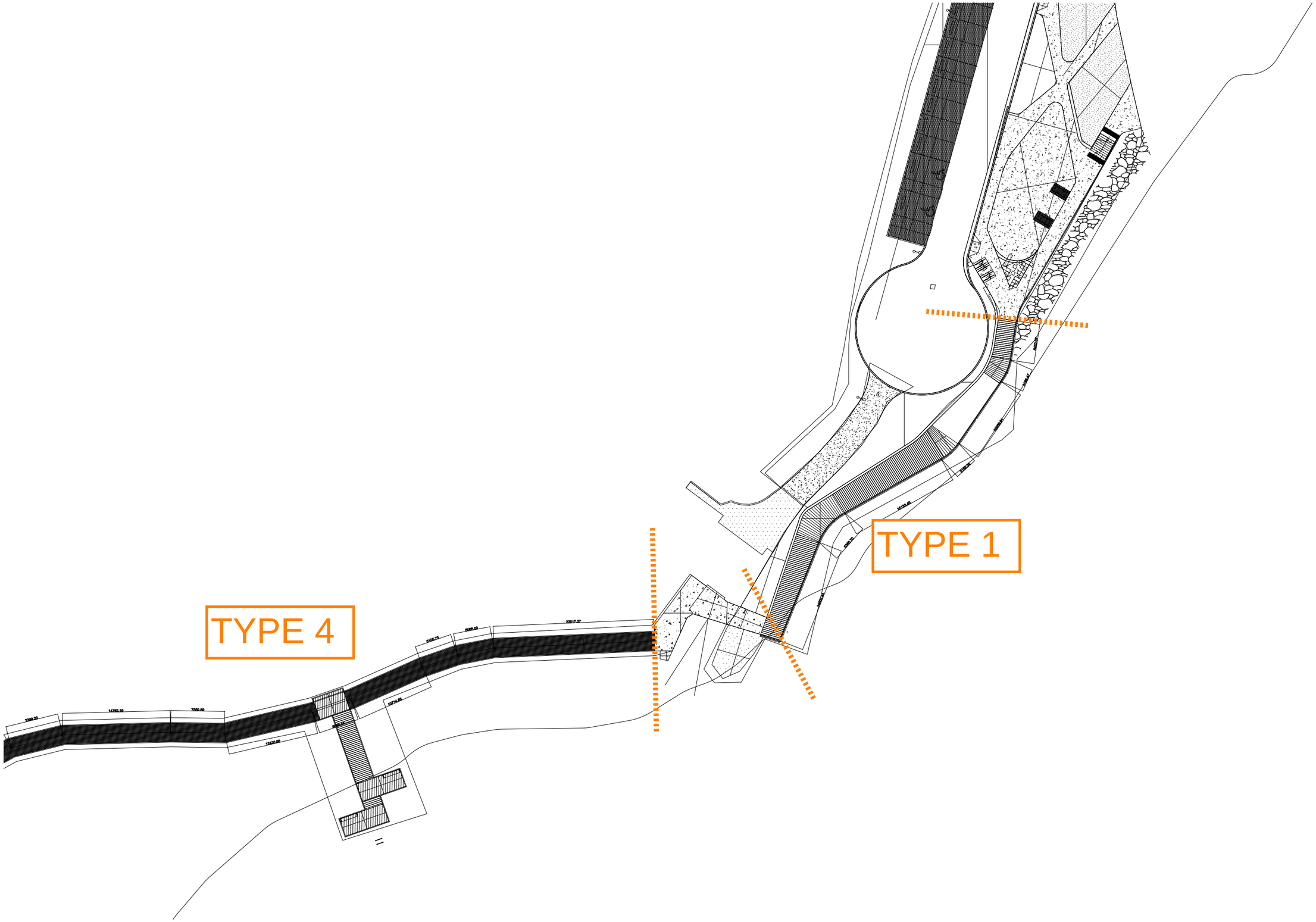
PAGE SIZE

A3

PAGE NAME

Plan 10

11855 13 B



11 PLAN A11
scale: 1:500

Fleetwood
Experiences worth discovering

Fleetwood Urban Pty Ltd
www.fleetwoodurban.com.au
Ph: 1300 989 100

DRAWN BY
RP

ISSUE
29/4/ 2024

CLIENT

LOCI DESIGN

END CLIENT

BEGA VALLEY SHIRE COUNCIL

DESIGNER

FLEETWOOD URBAN

PROJECT

Merimbula Boardwalks

PRODUCT

FRP AND TIMBER BOARDWALK WITH BALUSTRADE ™

3D PRODUCT DRAWING

PAGE SIZE

A3

PAGE NAME

Plan 11

11855 14 B

EFA Pty. Ltd.
T/As Engineered Floors of Australia

45 Doyle Ave. Unanderra NSW 2526
Mob. 0418 421 276 Ph. 42714788 Fax. 42716788
office@efapiling.com.au ABN 72 080 429 401

26/07/2023

Screw Pile Methodology

Project: Merimbula Boardwalk

Builder: Bega Valley Shire Council

Common environment considerations for all piling types.

- Any and all spoil generated will be collected and stockpiled offsite.

  If acid sulphate is an assessed this will be treated and disposed of according to the management plan
- Floating silt curtains will be utilised where there is any risk of sediment, caused by construction, entering the waterway.

  However silt curtains in shallow water can often cause more harm than good. Best practise will be to ensure that the work area is clean and free of debris before each tide movement.
- Silt fencing will be utilised in locations deemed necessary

Methodology broken into 4 types

1) Direct drive timber pile – access on ground using bog mats
2) Cored hole in rock with pile driven into hole – access on rock and ground using bog mats
3) Direct drive timber piles – access on incrementally launched deck structure
4) Direct drive timber pile – access from barge

Type 1

Access – Excavator will track within the construction corridor using bog mats as needed in wet areas

Pile type – 180mm diameter H6 treated hardwood timber pile, driven to minimum embedment requirement using hydraulic drop hammer on excavator

Methodology

a) Mobilize excavator to location of piles, starting in such a way the piles are installed and machine works its way out. All work and movements to remain inside work corridor.
b) Pile is pitched in position, pile driving commences with hammer installing pile until embedment requirement is met
c) Pile cut off using chainsaw, saw dust to be collected and disposed of appropriately
d) Excavator moves to next line of piles, above process continues.

Notes

i) Spill kits to be kept with work crew at all times
ii) All rubbish and debris from cutting/handling piles to be collected as soon as possible

Type 2

Access – Excavator to gain access within the construction corridor using bog mats as needed in wet areas

Pile type - 180mm diameter H6 treated hardwood timber pile driven into a cored/augered hole directly in rock.

Methodology

a) Mobilize excavator to location of piles, starting in such a way the piles are installed and machine works its way out. All work and movements to remain inside work corridor.
b) Excavator to use core barrel/auger attachment to drill an underside hole in pile locations
c) If pneumatic rock breaking/drilling equipment is required, this to be utilised within work corridor.
d) Once hole is generated pile is pitched in position, pile driving commences with hammer installing pile until embedment requirement is met
e) Pile cut off using chainsaw, saw dust to be collected and disposed of appropriately
f) Excavator moves to next line of piles, above process continues.

Notes

i) Spill kits to be kept with work crew at all times
ii) All rubbish and debris from cutting/handling piles to be collected as soon as possible
iii) All rock fragments and slurry to be collected and disposed as soon as possible

Worksite to be cleaned up completely before tide washes in

iv) In areas submerged, utilise silt curtains to contain rock until it settles
v) If water is required for any drilling or coring processes, slurry to be vacuumed up as process it being performed. No slurry to be stored onsite.
vi) Work to be performed once worksite becomes dry, work to occur only during low tide events. All equipment and personnel to leave work area before tide rises above again.

Type 3

Access – Excavator will track out on completed deck structure. Structure to be built and incrementally launched providing access above environmentally sensitive area's.

Pile type – 180mm diameter H6 treated hardwood timber pile, driven to minimum embedment requirement using hydraulic drop hammer on excavator

Methodology

a) Mobilize excavator to location of piles
b) Machine to reach out and pitch pile in position, pile driving commences with hammer installing pile until embedment requirement is met
c) Pile cut off using chainsaw, saw dust to be collected and disposed of appropriately
d) Machine remains in position until next section of deck is manufactured
e) Excavator moves to next line of piles, above process continues.

Notes

i) Work crew will need to walk/work on ground within work corridor. Movements to be kept to a minimum. Bog mats may be required in order to create a stable work platform for personnel and to minimise damage to environmentally sensitive areas
ii) Spill kits to be kept with work crew at all times
iii) All rubbish and debris from cutting/handling piles to be collected as soon as possible

Type 4

Access – Excavator will be positioned on a work barge

Pile type – 180mm diameter H6 treated hardwood timber pile, driven to minimum embedment requirement using hydraulic drop hammer on excavator

Methodology

f) Mobilize barge utilizing boat ramp on the south side of the inlet. Excavator, equipment and materials to be loaded on barge in this location

g) Barge to be pushed into location using tender vessel

h) Barge will only be afloat at high-mid tide so all movement to be restricted to that time frame

i) Barge to be positioned and spuds dropped to hold in position

j) Machine to reach out and pitch pile in position, pile driving commences with hammer installing pile until embedment requirement is met

k) Pile cut off using chainsaw, saw dust to be collected and disposed of appropriately

l) Barge to be repositioned for each pile location

m) Above process repeated.

Notes

i) Work crew will need to walk/work on ground within work corridor, using wetsuit or waders. Movements to be kept to a minimum.

ii) Working off tender boat may be required.

iii) Spill kits to be kept with work crew at all times

iv) All rubbish and debris from cutting/handling piles to be collected as soon as possible.

v) Floating silt curtain to be utilized around all work areas when afloat

Kind regards

Adam Groeneveld

0418 421 276

Appendix B Types of analysis for ASS

Table 4.3 Example of the types of analysis for Acid Sulfate Soils

Samples supplied by: ..... Date: ..... Lab Job No:.....

Sample Size Site No.	Depth interval (m)	Soil Description texture	pH_F	pH_{FOX}	Conductivity	Lab Bulk Density	Total Sulfur %S	S_T	S_{HCl}	S_{TOS}	S_P	S_{KCl}	S_{POS}	TPA	TAA	TSA	S_{TSA}	Potential Neutralising requirement

Excerpt from the (ASSMAC, 1998a)

Appendix C ASS management checklist

Figure 9-1 ASS management checklist

Merimbula Boardwalk Upgrade – ASS Management Checklist				
Inspection date:				
Location of inspection (lat/long):				
Construction stage / activity:				
Control measure	**Yes**	**No**	**N/A**	**Comments / corrective actions**
Have neutralisation rates been calculated based on the 'net acidity' of the materials being disturbed?				Liming rate =
Is there sufficient neutralising agent ready for areas that require treatment?				
Are immediate water treatments required? Are there sufficient containment and neutralising agents on site?				
Will the mixing process be adequate to neutralise all acidity present?				
Was the mixing process and containment adequate for the stage / activity?				
How many verification samples are required?				
Have verification samples been sent to a laboratory for the correct testing suite?				
Have verification samples passed?				
Control measure	**Yes**	**No**	**N/A**	**Comments / corrective actions**
Have materials been reused and where?				

Has the original disturbance site and containment area been inspected for any acidity issues?				
Is there evidence of unexplained scalding, degradation or death of surrounding vegetation?				
Is there evidence of unexplained death or disease in aquatic organisms?				
Is there evidence of the formation of the mineral jarosite and other acidic salts in exposed or excavated soils?				
Are there any areas of green-blue water or extremely clear water indicating high concentrations of aluminium?				
Are there any areas of black to very dark coloured waters indicating de-oxygenation?				
Are rust coloured deposits on plants and on the banks of drains, water bodies and watercourses, indicating iron precipitates, visible?				
Are there any areas of black ooze (potentially indicating monosulfidic black oozes) visible?				
Additional comments:				
Completed by:			**Role:**	
Signature:			**Company:**	

NGH Pty Ltd

NSW • ACT • QLD • VIC

ABN 31 124 444 622 ACN 124 444 622

E: ngh@nghconsulting.com.au

GOLD COAST

2B 34 Tallebudgera Creek Road
Burleigh Heads QLD 4220
(PO Box 424 West Burleigh QLD 4219)

T. (07) 3129 7633

SYDNEY REGION

Unit 17, 21 Mary Street
Surry Hills NSW 2010

T. (02) 8202 8333

BEGA

Suite 11, 89-91 Auckland Street
(PO Box 470)
Bega NSW 2550

T. (02) 6492 8333

MELBOURNE

Level 14, 10-16 Queen Street
Melbourne VIC 3000

T: (03) 7031 9123

TOWNSVILLE

Level 4, 67-75 Denham Street
Townsville QLD 4810

T. (07) 4410 9000

BRISBANE

T3, Level 7, 348 Edward Street
Brisbane QLD 4000

T. (07) 3129 7633

NEWCASTLE - HUNTER & NORTH COAST

Level 1, 31-33 Beaumont Street
Hamilton NSW 2303

T. (02) 4929 2301

WAGGA WAGGA - RIVERINA & WESTERN NSW

35 Kincaid Street (PO Box 5464)
Wagga Wagga NSW 2650

T. (02) 6971 9696

CANBERRA

Unit 8, 27 Yallourn Street
(PO Box 62)
Fyshwick ACT 2609

T. (02) 6280 5053

SUNSHINE COAST

Suite 101, Level 2/30 Main Drive
Birtinya QLD 4575

(07) 4410 9000

WODONGA

Unit 2, 83 Hume Street
(PO Box 506)
Wodonga VIC 3690

T. (02) 6067 2533