



Captain Cook Reserve Foreshore Stabilisation

Design Report



Gosford City Council

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1 INTRODUCTION

1.1 Study Area and Background

Captain Cook Memorial Reserve is situated on the eastern foreshore of Brisbane Water at Green Point. The reserve is utilised for passive recreation and boat launching. The Study Area extends from Orana Street Boat Ramp in the south to the dinghy storage racks opposite H13 Bayside Drive (refer **Figure 1**). The reserve exhibits varying levels of active shoreline erosion and there are a number of ad-hoc sea walls present with varying degrees of structural integrity. Council intends to carry out foreshore stabilisation works along this section of the reserve.

This project is being commissioned in line with the *Coastal Zone Management Plan for Brisbane Water* which has the following overarching aims:

- Protect, rehabilitate and improve the natural estuarine environment;
- Manage the estuarine environment in the public interest to ensure its health and vitality;
- Improve the recreational amenity of estuarine waters and foreshores;
- Recognise and accommodate natural processes and climate change; and,
- Ensure ecologically sustainable development and use of resources.

1.2 Scope of Work

Gosford City Council (Council) engaged Royal HaskoningDHV (RHDHV) for the concept and detailed design of foreshore stabilisation along Captain Cook Reserve, Green Point. The following activities were completed as part of the project and are presented in this report:

- Collation and review of background Information;
- Basis of Design;
- Inception meeting;
- Site survey;
- Site investigations;
- Conceptual options;
- Detailing of preferred option/s; and
- Drawing set with specification notes.



BRISBANE WATER

AREA C

AREA B

CAPTAIN COOK RESERVE

AREA A

BAYSIDE DRIVE

ORANA STREET

NOT TO SCALE

2 SITE DESCRIPTION

2.1 Site Inspection and Investigations

The site was inspected on 1 May 2014 with Warren Brown (Council), Gary Blumberg (RHDHV) and Ben Morgan (RHDHV). Following the site inspection, site investigations (sediment samples, shallow test pits and dynamic cone penetrometer (DCP) investigations) were carried out by Gary and Ben.

The site inspection involved observation of matters that included: effectiveness of existing foreshore stabilisation methods, influence of trees on stability/instability, riparian vegetation as an indicator of possible recent instability/slumping, proximity and influence of stormwater outlets, contribution of traffic to bank condition, wave exposure, and typical tidal level fluctuations. The implementation of various conceptual options were discussed at the site inspection.

Five DCPs were carried out along the foreshore to provide input into foundation conditions for various foreshore treatments. The DCPs were carried out to depths between 1.5m to 3.5m below the surface and generally indicated softer material for the upper 1 to 1.5m with stronger material below with the exception of DCP 1 that consisted of softer material at depth. The DCPs results are provided in **Appendix A**.

Four sediment samples were also be taken and analysed for particle size distribution (PSD) to input into the design of natural sloping foreshore areas. The sediment sample results indicated generally a medium grained sand with less than 10% fines (silt and clay sized) across the site. The PSD results are provided in **Appendix A**.

The grass reserve also appears to be reclaimed land that was once likely to have been an extension of the existing intertidal foreshore. Shallow test pitting along the reserve (around 4 to 8 metres from the foreshore) confirmed that the material was fill that varied in nature from clayey to sandy with an organic content. **Photograph 1** shows the test pit behind the existing timber wall near the dilapidated jetty.



Photograph 1 – Test Pit behind the existing timber wall near the dilapidated jetty

It is understood investigation of acid sulphate soils (ASS) would be carried out by Council at a later date as part of the environmental assessment.

2.2 Site Description

Captain Cook Reserve is situated on the eastern foreshore of Brisbane Water at Green Point. The reserve is utilised for passive recreation and boat launching. The Study Area extends around 250m along the alignment of the foreshore from Orana Street Boat Ramp in the south to the dinghy storage racks in the north (refer **Figure 1**). The reserve is between 25 to 30m wide, grassed and relatively flat with levels ranging from 0.8 to 1.4m AHD. The reserve also exhibits varying levels of active shoreline erosion and there are a number of ad-hoc sea walls present with varying degrees of structural integrity. The Study Area has been divided into Areas A, B and C, and are described below.

Area A is presented in **Figure 2** and comprises of the following:

- gabion structure – around 10m long, apparently two courses (bottom 1H x 1W x 2mL, top 0.5H x 1W x 2mL), showing signs of repairs and further deterioration;
- public Boat Ramp – cast in situ concrete, weathered but appears in reasonable condition (excluded from the Study Area);
- public Jetty – concrete piles with timber superstructure, weathered but appears in reasonable condition with signs of maintenance (excluded from the Study Area);
- mangroves with scattered rock, most of which is dimensioned; and

- open eroded foreshore, around a 0.5m scarp, with several local drainage lines exposed.

Inventory of shoreline blocks and rock suggests some 12T of material in this area may be suitable for reuse in the foreshore stabilisation works.

Area B is presented in **Figure 3** and comprises of the following:

- mangroves with ad-hoc timber and rock seawalls in poor condition and failing;
- concrete block wall 3 courses high in reasonable condition with northern end subject to undermining;
- timber wall in reasonable condition with the exception of the southernmost end that has been outflanked; and
- four concrete ramps, three of poor construction/condition and one (second most northern) in reasonable condition.

Inventory of shoreline blocks and rock suggests <1T of material in this area may be suitable for reuse in the foreshore stabilisation works.

Area C is presented in **Figure 4** and comprises of the following:

- timber jetty with a concrete approach, concrete deteriorating but still serving its purpose, timber jetty is damaged and in very poor/unsafe condition (excluded from the Study Area);
- sandy beach to the east of the jetty;
- small stand of mangroves ;
- scattered concrete blocks (demolished slabs) and rock;
- deteriorated timber wall; and
- informal dingy skid.

Inventory of shoreline blocks and rock suggests some 9T of material in this area may be suitable for reuse in the foreshore stabilisation works.



MANGROVES AND PLACED ROCK



ERODED FORESHORE



PUBLIC JETTY AND RAMP



GABIONS



NOT TO SCALE



BLOCKWALL AND RAMP



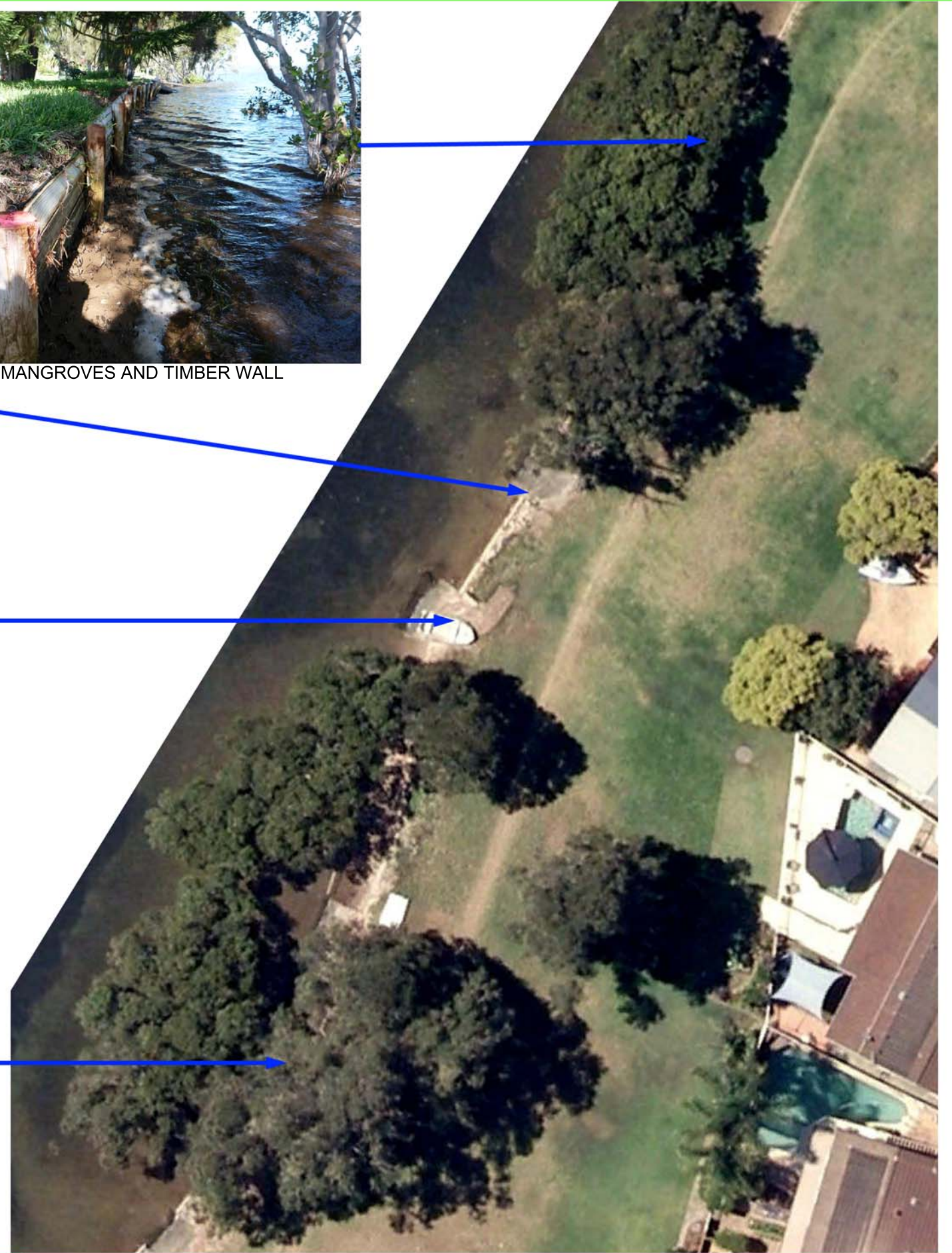
MANGROVES AND TIMBER WALL



RAMP



MANGROVES AND DETERIORATED
ROCK AND TIMBER WALL



NOT TO SCALE



MANGROVES AND PLACED ROCK



DINGHY SKID



BEACH AND DETERIORATED TIMBER WALL



CONCRETE AND TIMBER JETTY



NOT TO SCALE

2.3 Survey and Services

A detailed survey of the site was undertaken by Stephen Thorne and Associates on 29 April 2014. The survey included site levels and the locations of visible services, trees and structures. The survey plan detailing these features is provided in **Appendix B**. Note that AHD refers to Australian Height Datum. Zero metres AHD approximates Mean Sea Level at present.

2.4 Coastal Processes

2.4.1 Water Level

Tidal information for the site has been obtained from the *Brisbane Water Estuary Processes Study* (Cardno 2008). A summary of the tidal planes relative to AHD is presented in **Table 1**.

Table 1 - Tidal Planes for Erina Creek (Cardno 2008)

Tidal Planes	Water Level (m)
High High Water Springs (HHWS)	0.628
Mean High Water Springs (MHWS)	0.391
Mean High Water	0.338
Mean Tide Level (MTL)	0.081
Mean Low Water	-0.176
Mean Low Water Springs (MLWS)	-0.229
Indian Springs Low Water (ISLW)	-0.398

Coastal water levels can be elevated above predicted tide levels during storms. Elevated water levels can be of concern because they may intensify damage to the coastline and to coastal developments. Extreme water level simulations were undertaken for Koolewong and Gosford as part of the *Brisbane Water Estuary Processes Study* (Cardno 2008). Simulations were undertaken for approximate 10 and 20-year Average Reoccurrence Interval (ARI) events, and a hindcast investigation of the severe May 1974 storm event. A summary of the peak water levels determined at Koolewong and Gosford for each of these simulations is provided in **Table 2**.

Table 2 - Predicted peak water levels for Koolewong and Gosford (Cardno Lawson Treloar 2008)

Simulated Event	Koolewong Water Level (m AHD)	Gosford Water Level (m AHD)
10-year ARI	1.43	1.47
20-year ARI	1.51	1.55
May 1974 ¹	1.75	1.80

¹ The May 1974 event is normally associated with a 50 to 100 year ARI event condition for the NSW Central Coast.

2.4.2 Waves

The wave climate at Green Point is limited to locally generated wind waves and boat wake. This section describes the wave climate at Green Point and the design wave height adopted for the proposed works at Captain Cook Reserve.

Wind waves at Green Point are limited by the available fetch (distance of water over that the wind blows). The longest fetch length is close to 4 km to the west and south west. Wave modelling was undertaken for the Brisbane Water estuary, including Green Point, as reported in Cardno (2008). Predicted wave heights at Green Point for a range of ARI events are summarised in **Table 3**. It can be seen that there is little difference between the results for the various ARI events, which is due to wave generation at Green Point being fetch limited (relatively short fetches).

Table 3 - Predicted significant wave heights for Green Point (Cardno 2008)

ARI (Years)	Significant Wave Height (m)
5	~0.40
100	~0.50

Wind-wave hindcasting calculations carried out by RHDHV based on procedures in Coastal Engineering Manual (USACE, 2006) and using long term wind data for the Sydney region, indicate that a significant wave height and period for a 20 year average return period (ARI) would equate to 0.9m and 3.1 respectively. The variability in the Cardno and RHDHV hindcast predictions would likely be attributed to different assessment methodologies and design values within the range of results are reasonable for application in this investigation.

Boat wake at the site is generated on a regular basis by the small craft that use the area. Other larger craft also generate wake on an infrequent basis. Boat wake at the site is estimated to have a maximum wave height of around 0.5 m.

Based on a peak water level of 1.80 m AHD and existing bed levels of around 0.4 m AHD immediately seaward of the foreshore, the maximum water depth at the site would be 1.40 m. The breaking wave height for this water depth is around 0.90 m, assuming a breaker index of 0.6 which is appropriate for shallow waters (USACE, 2006). Based on the RHDHV hindcasting calculations, it is reasonable to expect that wave heights up to 0.90 m (based on the limiting depth) could propagate to the site. A design wave height of 0.90 m has therefore been adopted for the Green Point stabilisation works.

2.4.3 Climate Change

The possibility of global climate change accelerated by increasing concentrations of greenhouse gases, the so-called Greenhouse Effect, is now widely accepted by the scientific and engineering communities. This is predicted to cause globally averaged surface air temperatures and sea levels to rise.

The *NSW Sea Level Rise Policy Statement* (DECCW 2009) was released in October 2009. It includes sea level rise (SLR) planning benchmarks of 0.4 m at 2050 and 0.9 m at 2100 (both relative to 1990), with the two benchmarks allowing for consideration of SLR over

different timeframes. Although formally retracted by the State Government, the benchmarks remain the default position for SLR prediction in NSW including Gosford LGA.

An analysis of water level data collected at Koolewong between since July 1985 was undertaken by Cardno (2007), which determined an average water level increase for the site of around 2.2 mm/year during this period. At this rate, mean sea level (and other tidal planes) would have risen by 0.05 m since 1990.

Another potential outcome of climate change is an increase in the frequency and intensity of storm events, which can be assessed in the future as predictions become more definitive. Suitable conservatism can be incorporated in the design process to account for potential increases in design waves and water levels (say in the order of 10%), in addition to any sea level rise.

2.5 Acid Sulfate Soils

Acid Sulfate Soils (ASS) is the common name given to sediment and soil containing iron sulfide. The exposure of iron sulfides to air will result in oxidation and the generation of sulphuric acid. Acid leachate can strip metals such as aluminium and iron from the soil matrix and release them into water bodies. Elevated concentrations of these metals may potentially affect water quality and adversely affect aquatic organisms (disease or death) that inhabit the water body.

In 1995, the then Department of Land and Water Conservation (DLWC) published Acid Sulfate Soils Risk Maps for NSW coastal areas. The risk maps identify three risk classes (high, low and zero) based on the probability of ASS being present. Within each risk class, the depth to acid sulfate material, landform and environmental risk are documented.

The Gosford Acid Sulphate Soils Risk Map (1:25,000 scale, 1995 edition) indicates the site lies within an area of high probability of occurrence of ASS materials located within 1 m of natural ground surface levels. The proposed construction methodology involves minor excavation in some areas to a level of around -0.3 m AHD. This level approximates MLWS level (-0.229 m AHD) which means that the material to be excavated is frequently exposed to oxygen and it is unlikely that acid sulphate conditions would be generated. The material that forms the reserve appears to be imported fill material and is not expected to be acid generating. Nevertheless, ASS investigations are recommended as part of the future environmental assessment.

3 BASIS OF DESIGN

3.1 Purpose

The foreshore stabilisation is required to address foreshore erosion along Captain Cook Memorial Reserve. The design should aim to accommodate the following where possible:

- be of a soft treatment design;
- reinstate a natural, sloping foreshore with the aim of improving reserve amenity;
- provide access to the water and inter-tidal habitat;
- increase recreational amenity and safety;
- improve habitat value through the use of environmentally friendly seawall design; and
- be applied elsewhere in the estuary where prevailing estuarine processes and bathymetry allow.

3.2 Guidelines, Standards and Project Documents

The following Guidelines, Standards and Project Documents were considered for the design of the foreshore stabilisation.

Guidelines and Standards

Australian Standard AS 2758.6 -2008, Aggregated and rock engineering purposes, Part 6: Guidelines for the specification of armourstone

Coastal Engineering Manual (CEM) prepared by US Army Corps of Engineers in 2002

Coastline Management Manual (CMM) prepared by the New South Wales Government in 1990

Shore Protection Manual (SPM) prepared by US Army Corps of Engineers in 1984

Environmentally Friendly Seawalls Guide prepared by DECC

Foreshore Stabilisation and Rehabilitation Guideline prepared by Lake Macquarie City Council

The Rock Manual prepared by CIRIA

Australian Standard AS 4997-2005, Guidelines for the Design of Maritime Structures

Environmental Engineering for Coastal Shore Protection prepared by USACE.

Technical Design Guide for Cantilever Retaining Walls by Koppers

Project Documents

Brisbane Water Estuary Processes Study prepared by Cardno 2008.

3.3 Design life

A design life of nominally 20 years has been selected for the foreshore treatments.

3.4 Survey

The design of the foreshore is based on survey undertaken by Stephen Thorn & Associates in April 2014, covering around 10m both sides of the waterline along the foreshore within the Study Area. All levels are reduced to the Australian Height Datum.

3.5 Geometry

The investigation has regards to the following geometric constraints:

- Existing shoreline profiles;
- Existing seawalls and ramps;
- Existing trees and other vegetation; and
- Minimise excavation to limit ASS risk.

3.6 Site Investigations

DCPs have been carried out to assess the suitability of founding various foreshore treatments. Sediment samples have been collected and analysed for particle size grading to provide input into the design of natural sloping foreshore areas, filter design and constructability.

3.7 Rock Hydrodynamic Stability (Sizing and Grading)

The hydrodynamic stability of the rock used was assessed in accordance with the Hudson equation in CEM (USACE, 2006). An igneous and sandstone rock with densities of 2.65t/m^3 and 2.3t/m^3 respectively, and a natural angle of repose of 42 degrees has been assumed.

3.8 Geotechnical Stability

Conventional low height design profiles have been used that would not be subject to a geotechnical stability analysis.

3.9 Saltmarsh

The selection and planting level of saltmarsh species would be in conjunction with Council and consider existing saltmarsh species and levels in the area.

4 CONCEPT DESIGN

4.1 Failure Modes of Revetment Designs

Failure modes of revetments for the foreshore stabilisation works were considered for the design. A structure is deemed to have failed if damage has occurred that results in structure performance and functionality below the minimum anticipated by design (USACE 2006).

Failure may occur for one or more of the following reasons (USACE 2006):

- Design failure: when the structure as a whole, or individual structure components, cannot withstand load conditions within the design criteria;
- Load exceedance failure: when anticipated design load conditions are exceeded;
- Construction failure: due to incorrect or poor construction or materials; and
- Deterioration failure: from structure deterioration and/or poor maintenance.

Possible failure modes for revetment designs are summarised in **Figures 5 to 8** to These failure modes have been considered as part of the design process for this project, as described in **Table 4**.

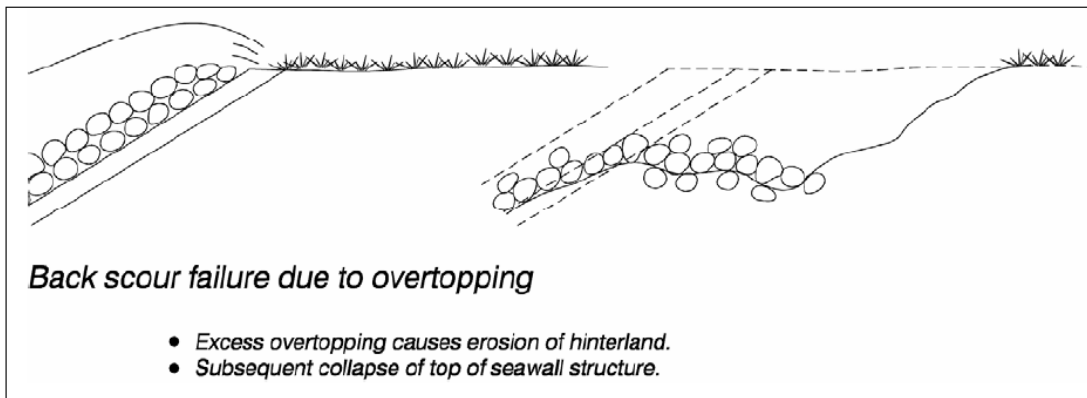


Figure 5: Scour due to overtopping (USACE 2006)

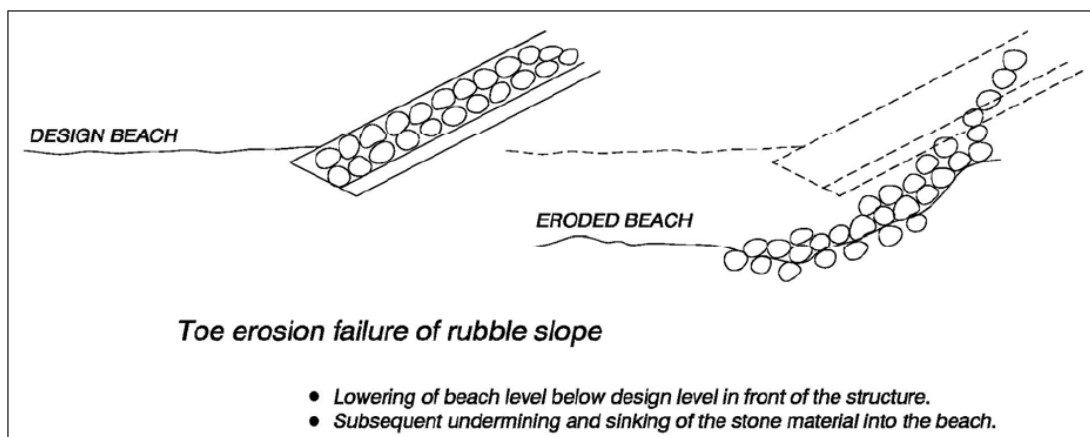


Figure 6: Toe erosion failure of rubble slope (USACE 2006)

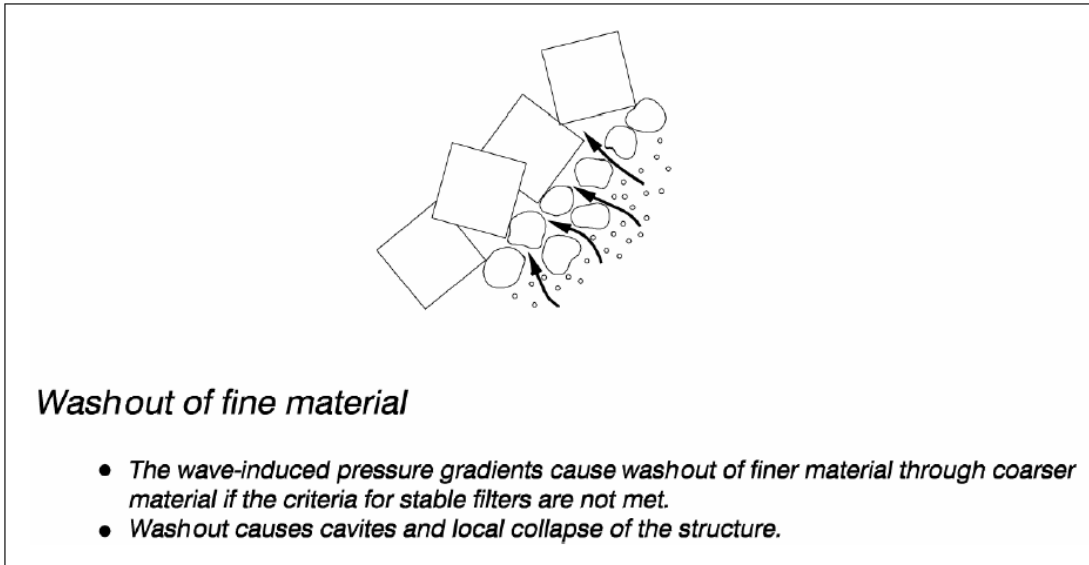


Figure 7: Washout of underlayer material (USACE 2006)

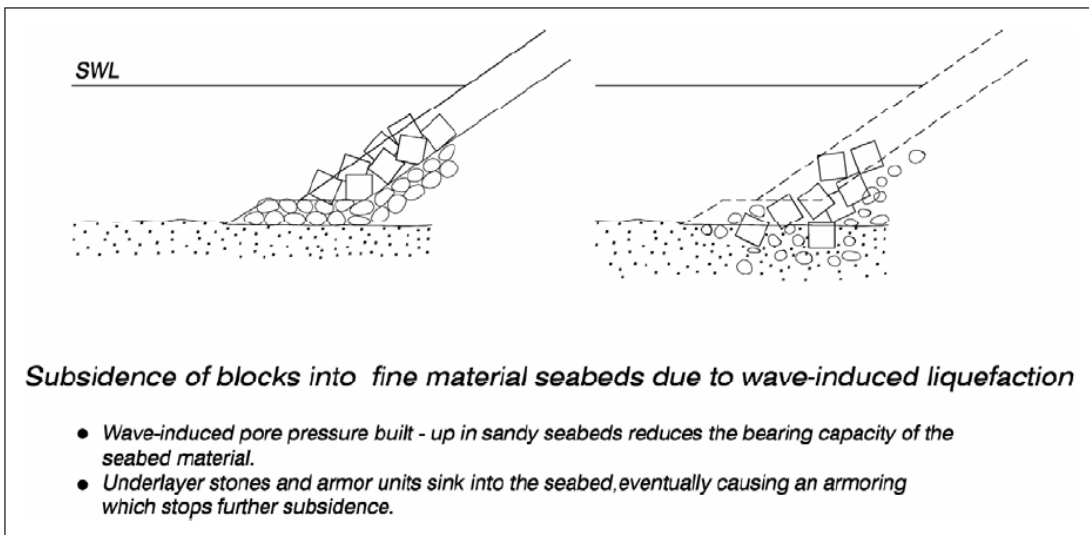


Figure 8: Block subsidence due to liquefaction (USACE 2006)

Table 4 - Design features addressing possible failure modes of revetments

Possible Failure Mode	Design features addressing failure mode
Scour due to overtopping	High crest level relative to prevailing wave climate and water levels such that overtopping would be limited to rare water level or wave events
Toe erosion failure of rubble slope	Construct toe to design scour level. Alternatively Layer of large rock placed at toe of seawall to provide additional protection against scour; if toe erosion were to occur, this rock layer could settle to a level below the MLWS level of -0.229 m AHD without compromising the structural integrity of the seawall

Possible Failure Mode	Design features addressing failure mode
Washout of underlayer material	Incorporation of a gravel layer or suitable geotextile filter between the bed and revetment to minimise washout of fine material
Block subsidence due to liquefaction	Gravel between the bed and revetment and / or possibly a geotextile filter would minimise wave-induced pore pressures in the seabed, which in any case would be low because of the mild wave climate at the site

4.2 Concept Design Options

The concept designs have been developed in accordance with the Basis of Design, and informed by the walkover assessment in collaboration with Council and the site investigations. The concept designs are presented on a series of design sketches provided in **Appendix C**. Four general concept designs for foreshore stabilisation have been developed, namely:

- Rock Treatment (refer **Sketch SK4**);
- Beach Treatment (refer **Sketch SK5**);
- Saltmarsh Berm Treatment (refer **Sketch SK7**); and
- Saltmarsh Walkthrough Treatment (refer **Sketch SK6**).

Concept designs for remediation of the gabion wall at the southern extent of the site adjacent to the public boat ramp (refer **Sketch SK3**), and the dinghy skid at the northern extent of the site adjacent to the dinghy storage racks (refer **Sketch SK8**) have also been developed.

The concept designs are discussed in more detail below.

Rock Treatment

- Minimum two layers of sandstone rock around 350 to 400mm diameter at a slope of 1 in 2.0 to 1.5 respectively
- Founded by rock bedding layer underlain by geotextile to prevent migration of fines
- No-mow area behind wall optional
- Grasses expected to partially grow over crest of treatment
- Treatment positioned relative to alignment of existing foreshore to balance cut/fill
- Used intertidal area with existing mangrove colonisation
- Partially leave (but conceal) existing timber wall where appears to successfully retain bank
- Comparative cost estimate \$470/ linear metre

Beach Treatment

- Creation of beach areas indented from existing foreshore to enhance amenity including informal seating
- Beach slope would match existing foreshore slope of 1:17 to 1:20 with the existing 500mm step at the shoreline grading to 250mm inside the beach recess
- Require at least 200mm thick of medium to coarse grained sand, graded to match existing slightly seaward of existing shoreline

- Excavation of existing fill material not expected to be ASS but should be confirmed prior to construction
- Recessed edge of beach to be supported, either by reused timber from existing wall, rock fillet, or timber logs backed by geotextile
- Comparative cost estimate \$60/ square metre

Saltmarsh Berm

- Similar design to rock treatment with incorporation of 2 to 3m wide saltmarsh berm built out from existing foreshore alignment, to a planting level of around 0.7m AHD (to be confirmed)
- *Suaeda australis* observed onsite, *Sarcocornia quinqueflora* thought to be native to area, advice from Council to be sort
- Comparative cost estimate \$570/ linear metre

Saltmarsh Walkthrough

- Similar to Saltmarsh berm but built landward from existing foreshore alignment with a 3 to 5m wide saltmarsh area
- Walkway (potentially using dimensioned stone from site) along existing foreshore alignment
- Comparative cost estimate \$770/ linear metre

Gabion Wall Remediation

- Removal of top 0.5m high gabion and reuse rock material for rock bedding
- Retain bottom 1m high gabion and consider removing wire basket to release rock material
- Reuse rock material scattered around side including both loose rock and dimensioned stone for the wall facing (place flat or tilted back, and consider pattern grouting to achieve steep stable face)
- Found wall on rock bedding (reuse fill from top gabion) underlain by geotextile and geogrid (if required) to spread bearing load
- Retain no-mow area behind wall

Dinghy Skid

- Retain natural approach to ramp at existing grade
- Incorporate chained walkway slats similar what is used for beach access, either using sawn hardwood or a durable recycled plastic product
- Apply no-slip/grit surface to slats and fill in-between with coarse sand/crushed rock <5mm
- Anchor slats near existing foreshore

Suggested locations for implementation of these concept designs are presented on two plans **Sketches SK1** and **SK2**. The rock treatment locations are seen to be somewhat fixed due to the proximity of existing mangroves and terrestrial trees. The locations of the beach treatments have been determined based on available reserve area and are also interchangeable with the saltmarsh walkthrough treatment. One area has been allowed for the saltmarsh berm treatment, however this treatment could potentially be incorporated into the foreshore areas nominated for the beach treatment.

5 DETAILED DESIGN

5.1 General

Detailed design for the foreshore stabilisation works is documented in this section. As part of the detailed design, a drawing set including specification notes has been prepared suitable for development and construction approvals (refer **Appendix D**).

5.2 Design Scour Depth

Accurate estimation of variation in foreshore levels at the site would be best derived from photogrammetry data, however this data is not available. The *Shore Protection Manual* suggests for scour under wave action alone the maximum depth of scour below the natural bed is about equal to the height of the maximum unbroken wave that can be supported by the original depth of water at the toe of the structure (CERC, 1984). In the case of the proposed foreshore treatments, this equates to a depth of around 0.7m below the existing foreshore level of R.L. 0.4m to give a scour level of R.L. -0.5. This value could be considered conservative for foreshore stabilisation within an enclosed waterway protecting a low level reserve. In order to minimise excavation, and reduce the risk of encountering acid sulfate soils, that rock is to be placed to R.L. -0.3m with an extended toe to provide some protection against potential undermining.

5.3 Rock

The stabilisation works must be designed to sufficiently withstand hydrodynamic forces from wind and boat waves, in this case governed by wind waves from the large fetch to the south west. The rock sizing has been checked using the formulae from the *Shore Protection Manual*, 1977 and the *CIRIA Rock Manual*. Inputs into the design equations were as follows:

- significant wave height $H_s = 0.9\text{m}$ (not less than 20 year ARI wind wave)
- batter slope = 1 in 1.5 (V:H)
- damage Coefficient $KD = 3.5$
- angle of repose of armour rock = 42° (generally assumed for armour rock)
- sandstone rock density of 2300kg/m^3

The rock armour sizes calculated a median mass for rock armour of $W_{50} = 120\text{kg}$ which is equivalent to a D_{50} sieve size of approximately 400mm. In terms of grading, the armour rock is to meet the following criteria:

- have a minimum mass of 90kg;
- have a maximum mass of 150kg; and
- at least 50% of the rock is to exceed a mass of 120kg.

Rock sizes much smaller than specified are not recommended due to being potentially moved, or removed by people. All rock bedding (underlayer) is to meet filter requirements and be between 160 and 200mm in diameter with a $D_{50} = 180\text{mm}$. Geotextile is to be used along any interface of the existing surface and the rock material to manage the mitigation of fines.

5.4 Vegetation

Based on existing salt marsh vegetation and discussions with Council, *Suaeda australis* (Seablite) and *Sarcocornia quinqueflora* (Samphire) is to be planted to form saltmarsh berms. Existing saltmarsh near the dingy racks appears to be flushing at a level of around 0.7m AHD.

5.5 Importing Sand

To promote the development of stable beach areas, imported sand is to be:

- medium to coarse grained ($D_{50} \sim 0.45\text{mm}$)
- angular in shape,
- well sorted; and
- thoroughly compacted when placed.

5.6 Timber Retaining Wall

The timber retaining wall has been designed in accordance with relevant standards and guidelines. Double treated hardwood timber is specified to achieve the design life of the structure. The wall is designed for light pedestrian traffic only and should not be surcharged with vehicles or plant and equipment during construction. It is also assumed existing ground levels immediately behind the wall would not be raised.

5.7 Gabion Wall Remediation

The partial demolition and modification of the gabion wall is important for the short-term stability of the wall. The following is recommended

- Remove top row of gabions to remove surcharge pressure;
- Remove seaweed and debris from in front of the bottom row of gabions
- Push sandstone cobbles into the bed in even layers, and track over with excavator with caution; and
- Place geotextile material and sandstone blocks.

Additional surcharging behind the wall beyond light pedestrian traffic must not occur, especially during construction.

6 SUMMARY OF QUANTITIES AND COST ESTIMATE

A summary of quantities and construction cost estimate has been prepared and is provided in **Appendix E**.

7 REFERENCES

CIRIA (2007), *The Rock Manual*, The use of rock in hydraulic engineering

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APPENDIX A

Site Investigations (DCPs and PSDs)



CAPTAIN COOK RESERVE FORESHORE STABILISATION SITE INVESTIGATION



LEGEND		
Symbol	Sample Type	ID
	DCP	DCP1, DCP2, DCP3, DCP4, DCP5
	Surface Sample	S1, S2, S4, S6

Project: Captain Cook Foreshore Bank Stabilisation
 Job Number: 8A0400
 Persons Undertaking Test: Ben Morgan, Gary Blumberg
 Test Date: 1/05/2014

DCP Number: 1
 Time: 12:40
 Approximate RL: 0.4m

Weather: Fine
 Location: Beach in front of reserve
 Lat/Long: -33.4501 151.358
 Test Method: DCP
 Other Notes: 1m from WL to 4cm above WL

Depth	No. Blows
0-100	2
100-200	
200-300	1
300-400	1
400-500	
500-600	
600-700	
700-800	
800-900	2
900-1000	
1000-1100	3
1100-1200	2
1200-1300	2
1300-1400	4
1400-1500	4
1500-1600	4
1600-1700	3
1700-1800	4

Depth	No. Blows
1800-1900	2
1900-2000	3
2000-2100	3
2100-2200	4
2200-2300	5
2300-2400	5
2400-2500	3
2500-2600	5
2600-2700	4
2700-2800	4
2800-2900	4
2900-3000	4
3000-3100	5
3100-3200	4
3200-3300	6
3300-3400	8
3400-3500	9
3500-3600	

Depth	No. Blows
3600-3700	
3700-3800	
3800-3900	
3900-4000	
4000-4100	
4100-4200	
4200-4300	
4300-4400	
4400-4500	
4500-4600	
4600-4700	
4700-4800	
4800-4900	
4900-5000	

Reason for stopping test:
 Ran out of rods

Project: Captain Cook Foreshore Bank Stabilisation
 Job Number: 8A0400
 Persons Undertaking Test: Ben Morgan, Gary Blumberg
 Test Date: 1/05/2014

DCP Number: 2
 Time: 13:31
 Approximate RL: 0.3m

Weather: Fine
 Location: Middle DCP
 Lat/Long -33.4508 151.358
 Test Method: DCP
 Other Notes: 1.5m off WL

Depth	No. Blows
0-100	2
100-200	
200-300	2
300-400	2
400-500	
500-600	
600-700	2
700-800	3
800-900	6
900-1000	8
1000-1100	9
1100-1200	11
1200-1300	14
1300-1400	17
1400-1500	18
1500-1600	
1600-1700	
1700-1800	

Depth	No. Blows
1800-1900	
1900-2000	
2000-2100	
2100-2200	
2200-2300	
2300-2400	
2400-2500	
2500-2600	
2600-2700	
2700-2800	
2800-2900	
2900-3000	
3000-3100	
3100-3200	
3200-3300	
3300-3400	
3400-3500	
3500-3600	

Depth	No. Blows
3600-3700	
3700-3800	
3800-3900	
3900-4000	
4000-4100	
4100-4200	
4200-4300	
4300-4400	
4400-4500	
4500-4600	
4600-4700	
4700-4800	
4800-4900	
4900-5000	

Reason for stopping test:
 Stopped at firm material

Project: Captain Cook Foreshore Bank Stabilisation
 Job Number: 8A0400
 Persons Undertaking Test: Ben Morgan, Gary Blumberg
 Test Date: 1/05/2014

DCP Number: 3
 Time: 14:15
 Approximate RL: 0.3m

Weather: Fine
 Location: Infront of reserve
 Lat/Long -33.4502 151.358
 Test Method: DCP
 Other Notes: 2m from WL

Depth	No. Blows
0-100	2
100-200	
200-300	
300-400	
400-500	
500-600	
600-700	4
700-800	6
800-900	
900-1000	3
1000-1100	3
1100-1200	
1200-1300	3
1300-1400	
1400-1500	4
1500-1600	
1600-1700	4
1700-1800	8

Depth	No. Blows
1800-1900	10
1900-2000	11
2000-2100	12
2100-2200	15
2200-2300	16
2300-2400	22
2400-2500	
2500-2600	
2600-2700	
2700-2800	
2800-2900	
2900-3000	
3000-3100	
3100-3200	
3200-3300	
3300-3400	
3400-3500	
3500-3600	

Depth	No. Blows
3600-3700	
3700-3800	
3800-3900	
3900-4000	
4000-4100	
4100-4200	
4200-4300	
4300-4400	
4400-4500	
4500-4600	
4600-4700	
4700-4800	
4800-4900	
4900-5000	

Reason for stopping test:
 Stopped at firm material

Project: Captain Cook Foreshore Bank Stabilisation
 Job Number: 8A0400
 Persons Undertaking Test: Ben Morgan, Gary Blumberg
 Test Date: 1/05/2014

DCP Number: 4
 Time: 14:50
 Approximate RL: 0.2m

Weather: Fine
 Location: Foreshore in front of gabion
 Lat/Long -33.4515 151.357
 Test Method: DCP
 Other Notes: 2m off wall, 4m off ramp

Depth	No. Blows
0-100	1
100-200	1
200-300	2
300-400	1
400-500	2
500-600	3
600-700	2
700-800	3
800-900	4
900-1000	4
1000-1100	13
1100-1200	11
1200-1300	18
1300-1400	18
1400-1500	15
1500-1600	20
1600-1700	
1700-1800	

Depth	No. Blows
1800-1900	
1900-2000	
2000-2100	
2100-2200	
2200-2300	
2300-2400	
2400-2500	
2500-2600	
2600-2700	
2700-2800	
2800-2900	
2900-3000	
3000-3100	
3100-3200	
3200-3300	
3300-3400	
3400-3500	
3500-3600	

Depth	No. Blows
3600-3700	
3700-3800	
3800-3900	
3900-4000	
4000-4100	
4100-4200	
4200-4300	
4300-4400	
4400-4500	
4500-4600	
4600-4700	
4700-4800	
4800-4900	
4900-5000	

Reason for stopping test:
 Possibly hit rock

Project: Captain Cook Foreshore Bank Stabilisation
 Job Number: 8A0400
 Persons Undertaking Test: Ben Morgan, Gary Blumberg
 Test Date: 1/05/2014

DCP Number: 5
 Time: 14:58
 Approximate RL: 0.2m

Weather: Fine
 Location: Foreshore in front of gabion
 Lat/Long -33.4516 151.357
 Test Method: DCP
 Other Notes: 2m off wall, 8m off ramp

Depth	No. Blows
0-100	2
100-200	
200-300	1.5
300-400	0.7
400-500	1
500-600	1
600-700	1
700-800	4
800-900	4
900-1000	7
1000-1100	5
1100-1200	9
1200-1300	
1300-1400	5
1400-1500	4
1500-1600	4
1600-1700	18
1700-1800	

Depth	No. Blows
1800-1900	
1900-2000	
2000-2100	
2100-2200	
2200-2300	
2300-2400	
2400-2500	
2500-2600	
2600-2700	
2700-2800	
2800-2900	
2900-3000	
3000-3100	
3100-3200	
3200-3300	
3300-3400	
3400-3500	
3500-3600	

Depth	No. Blows
3600-3700	
3700-3800	
3800-3900	
3900-4000	
4000-4100	
4100-4200	
4200-4300	
4300-4400	
4400-4500	
4500-4600	
4600-4700	
4700-4800	
4800-4900	
4900-5000	

Reason for stopping test:
 Hit top of rip rap/rubble
 Could go down another 0.1m

Certificate of Analysis

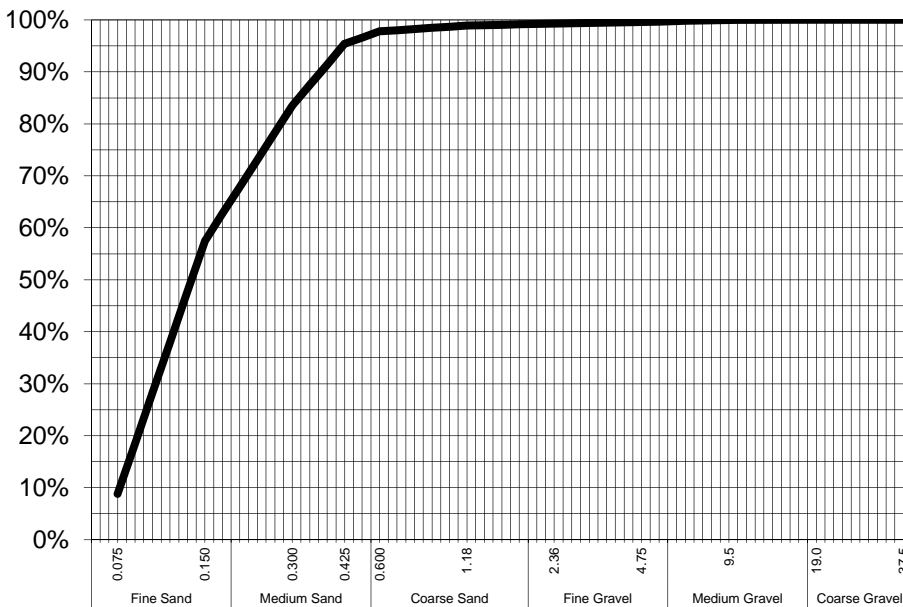
ALS Laboratory Group Pty Ltd
 5/585 Maitland Road
 Mayfield West, NSW 2304
 pH 02 4014 2500
 fax 02 4968 0349
 samples.newcastle@alsenviro.com

ALS Environmental
Newcastle, NSW



CLIENT:	Ben Morgan	DATE REPORTED:	29-May-2014
COMPANY:	Haskoning Australia- Royal Haskoning	DATE RECEIVED:	20-May-2014
ADDRESS:	Suite 505 100 Walker Street North Sydney, NSW 2060	REPORT NO:	ES1411225-001 / PSD
PROJECT:	Captain Cook Reserve	SAMPLE ID:	S1

Particle Size Distribution



Particle Size (mm)	Percent Passing
19.0	100%
9.5	100%
4.75	100%
2.36	99%
1.18	99%
0.600	98%
0.425	95%
0.300	84%
0.150	58%
0.075	9%

Samples analysed as received.

Median Particle Size (mm)*	0.138
----------------------------	-------

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

Sample Comments:

Analysed: 28-May-14

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description: Sand

Test Method: AS1289.3.6.1

Hydrometer Type ASTM E100

NATA Accreditation: 825 Site: Newcastle
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Hamish Murray
 Laboratory Supervisor, Newcastle
Authorised Signatory

Certificate of Analysis

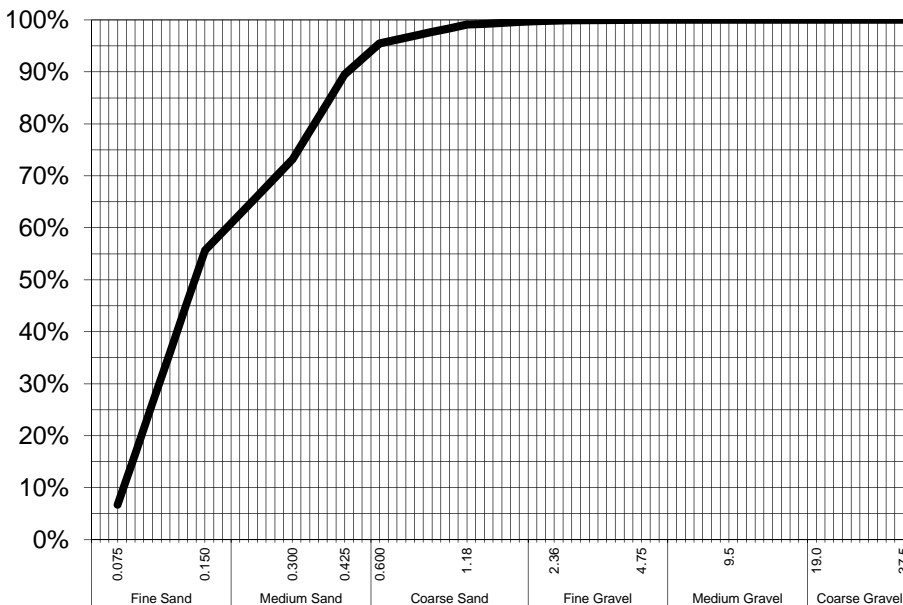
ALS Laboratory Group Pty Ltd
 5/585 Maitland Road
 Mayfield West, NSW 2304
 pH 02 4014 2500
 fax 02 4968 0349
 samples.newcastle@alsenviro.com

ALS Environmental
Newcastle, NSW



CLIENT:	Ben Morgan	DATE REPORTED:	29-May-2014
COMPANY:	Haskoning Australia- Royal Haskoning	DATE RECEIVED:	20-May-2014
ADDRESS:	Suite 505 100 Walker Street North Sydney, NSW 2060	REPORT NO:	ES1411225-003 / PSD
PROJECT:	Captain Cook Reserve	SAMPLE ID:	S4

Particle Size Distribution



Particle Size (mm)	Percent Passing
19.0	100%
9.5	100%
4.75	100%
2.36	100%
1.18	99%
0.600	96%
0.425	90%
0.300	73%
0.150	56%
0.075	7%

Samples analysed as received.

Median Particle Size (mm)*	0.141
----------------------------	-------

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

Sample Comments:

Analysed: 28-May-14

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description: Sand

Test Method: AS1289.3.6.1

Hydrometer Type ASTM E100

NATA Accreditation: 825 Site: Newcastle
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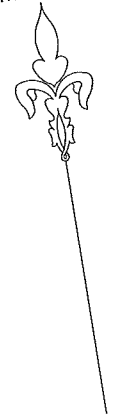


Hamish Murray
 Laboratory Supervisor, Newcastle
Authorised Signatory

APPENDIX B

Survey

M.G.A.



SEE SHEET 2

SEE SHEET 2

SEE SHEET 2

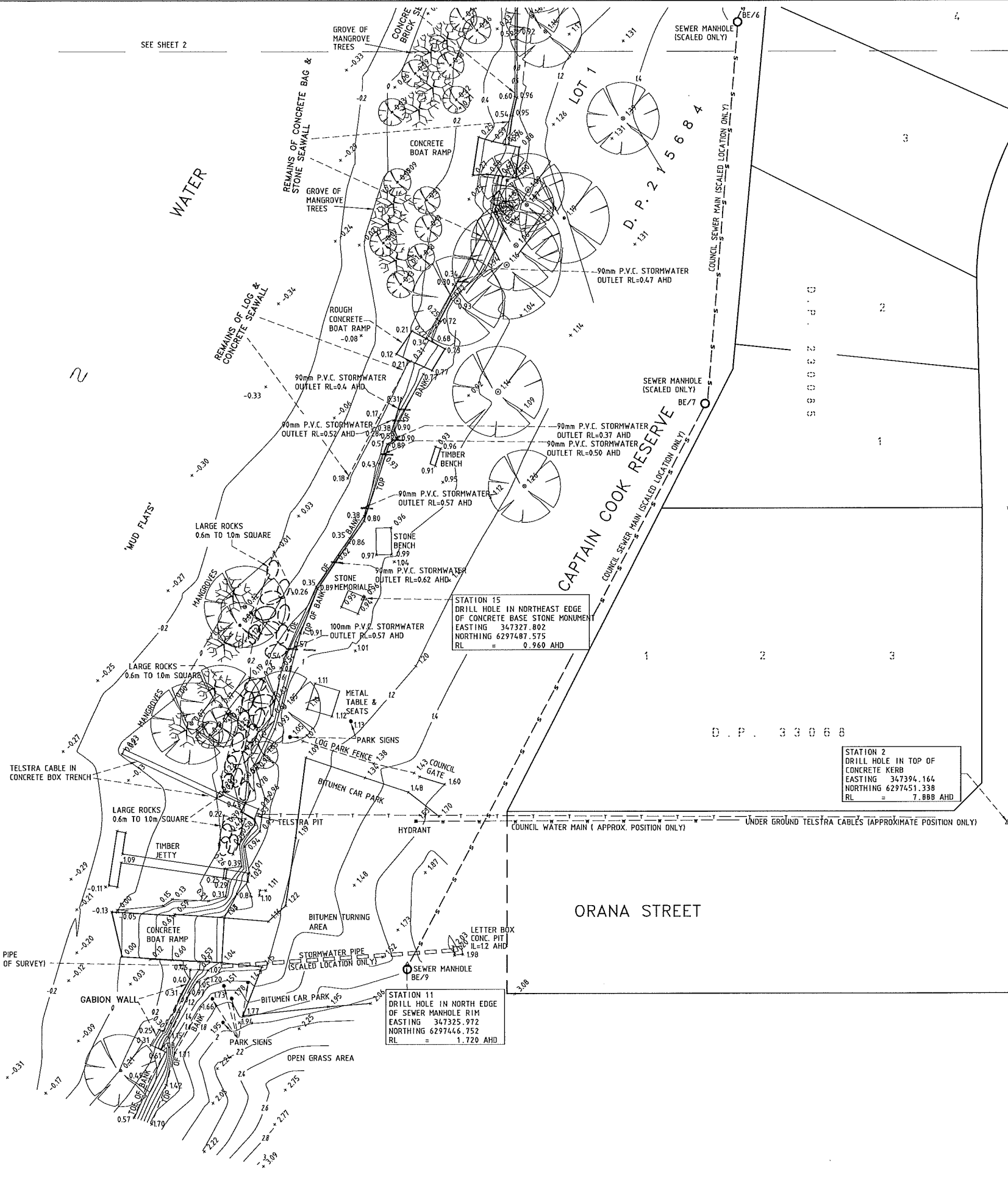
BRISBANE

WATER

CAPTAIN COOK RESERVE

BAYSIDE DRIVE

ORANA STREET



STATION 15
DRILL HOLE IN NORTHEAST EDGE
OF CONCRETE BASE STONE MONUMENT
EASTING 347327.802
NORTHING 6297487.575
RL = 0.960 AHD

STATION 2
DRILL HOLE IN TOP OF
CONCRETE KERB
EASTING 347394.164
NORTHING 6297451.338
RL = 7.888 AHD

STATION 11
DRILL HOLE IN NORTH EDGE
OF SEWER MANHOLE RIM
EASTING 347325.972
NORTHING 6297446.752
RL = 1.720 AHD

STATION P.M. 21291
STAINLESS STEEL PIN IN BOX
EASTING 347406.357
NORTHING 6297431.582
RL = 10.297 AHD

CAUTIONS :

- 1) THIS SURVEY HAS BEEN PREPARED FOR THE PURPOSE OF DETAIL & CONTOUR ONLY. THE LOCATION OF ANY FENCING OR STRUCTURE IN RELATION TO THE BOUNDARIES HAS NOT NECESSARILY BEEN EXACTLY DETERMINED.
- 2) UTILITY SERVICES SHOWN HAVE BEEN LOCATED BY SURVEY WHERE THEY ARE VISIBLE AND APPARENT. HOWEVER, THE APPROXIMATE POSITION OF UNDERGROUND SERVICES MAY HAVE ALSO BEEN PLOTTED FROM UTILITY AUTHORITY PLANS, AND THIS PLAN MUST BE READ IN CONJUNCTION WITH THE RELEVANT UTILITY AUTHORITY PLANS.
- 3) THE LOCATION OF SERVICES ARE TO BE VERIFIED BY OBTAINING CURRENT INFORMATION FROM "DIAL BEFORE YOU DIG" (PHONE 1100) PRIOR TO DESIGN/CONSTRUCTION WORKS. ALTERNATIVELY, THE EXACT LOCATION OF SERVICES SHOULD BE DETERMINED BY FIELD SURVEY IN CONSULTATION WITH THE SERVICE AUTHORITIES WHERE DEEMED NECESSARY.

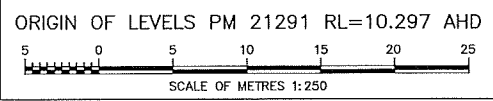


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REFERENCE: 6907/000

SCALE: 1:250 @ A1 SHEET

STEPHEN THORNE AND ASSOCIATES PTY LTD
CONSULTING SURVEYORS
48 MANN STREET, GOSFORD, 2250
Phone (02)4323-1255 Facsimile (02)4324-2226
P.O. BOX 1315 GOSFORD NSW 2250
A.C.N. 057 514 860 A.B.N. 51 057 514 860

DETAIL AND CONTOUR SURVEY OVER
PART LOT 1 D.P. 215684
CAPTAIN COOK RESERVE, GREEN POINT



amendments

PLAN NUMBER
6907

ISSUE
A

DATUM: Australian Height Datum

DATE
29/04/2014

SHEET 1 OF 2 SHEETS

M.G.A.



WATER

BRISBANE

2

'MUD FLATS'

CONCRETE RUBBLE
(1m & 2m SQUARE SLABS)

TIMBER JETTY
IN DISREPAIR

STONE & CONCRETE
JETTY

MANGROVE

DINGHY STORAGE
RACKS

CONC. BASE

DINGHY STORAGE
RACKS

CONC. LIDED PIT

RECENT TIMBER LOG
SEAWALL

RECENT TIMBER LOG
SEAWALL

RECENT TIMBER LOG
SEAWALL

RECENT TIMBER LOG
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CAPTAIN COOK RESERVE

LOT 1

D.P. 215684

D.P. 230085

D.P. 230085

D.P. 230085

D.P. 230085

D.P. 230085

SEWER MANHOLE
BE/5

COUNCIL SEWER MAIN

SEWER MANHOLE
BE/4

STATION 243
DRILL HOLE IN SOUTHEAST EDGE
OF SEWER MANHOLE RIM
EASTING 347421.263
NORTHING 6297603.003
RL = 1.324 AHD

CONC. LIDED PIT

CAUTIONS:

- 1) THIS SURVEY HAS BEEN PREPARED FOR THE PURPOSE OF DETAIL & CONTOUR ONLY. THE LOCATION OF ANY FENCING OR STRUCTURE IN RELATION TO THE BOUNDARIES HAS NOT NECESSARILY BEEN EXACTLY DETERMINED.
- 2) UTILITY SERVICES SHOWN HAVE BEEN LOCATED BY SURVEY WHERE THEY ARE VISIBLE AND APPARENT. HOWEVER, THE APPROXIMATE POSITION OF UNDERGROUND SERVICES MAY HAVE ALSO BEEN PLOTTED FROM UTILITY AUTHORITY PLANS, AND THIS PLAN MUST BE READ IN CONJUNCTION WITH THE RELEVANT UTILITY AUTHORITY PLANS.
- 3) THE LOCATION OF SERVICES ARE TO BE VERIFIED BY OBTAINING CURRENT INFORMATION FROM "DIAL BEFORE YOU DIG" (PHONE 1100) PRIOR TO DESIGN/CONSTRUCTION WORKS. ALTERNATIVELY, THE EXACT LOCATION OF SERVICES SHOULD BE DETERMINED BY FIELD SURVEY IN CONSULTATION WITH THE SERVICE AUTHORITIES WHERE DEEMED NECESSARY.

www.dialbeforeyoudig.com.au



STATION 16
DRILL HOLE IN CENTRE OF
CONCRETE PAD AT RAMP
EASTING 347355.816
NORTHING 6297551.641
RL = 0.910 AHD

STATION P.M. 21290
STAINLESS STEEL PIN IN BOX
UNDER GRASS
EASTING 347425.423
NORTHING 6297548.151
RL = 1.587 AHD

GROVE OF
MANGROVE
TREES

CONCRETE
BOAT RAMP

CONCRETE
BOAT RAMP

CONCRETE
BOAT RAMP

CONCRETE
BOAT RAMP

CONCRETE
BOAT RAMP

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BOAT RAMP

CONCRETE
BOAT RAMP

CONCRETE
BOAT RAMP

SEE SHEET 1

SEE SHEET 1

CAD FILE: 6907_DET.dwg
THIS PLOT: 28-04-2014 10:54
REFERENCE: 6907.000

SCALE: 1:250 @ A1 SHEET	STEPHEN THORNE AND ASSOCIATES PTY LTD CONSULTING SURVEYORS 48 MANN STREET, GOSFORD, 2250 Phone (02)4323-1255 Facsimile (02)4324-2226 P.O. BOX 1315 GOSFORD NSW 2250 A.C.N. 057 514 860 A.B.N. 51 057 514 860	DETAIL AND CONTOUR SURVEY OVER PART LOT 1 D.P. 215684 CAPTAIN COOK RESERVE, GREEN POINT	ORIGIN OF LEVELS PM 21291 RL=10.297 AHD 5 0 5 10 15 20 25 SCALE OF METRES 1:250	amendments	PLAN NUMBER 6907	ISSUE A
DATUM: Australian Height Datum	DATE 29/04/2014				SHEET 2 OF 2 SHEETS	

APPENDIX C

Concept Design Sketches



FOR PLAN CONTINUATION REF: DRG No. 0006

LEAVE EXISTING BLOCK WALL

Rock TREATMENT

REMOVE RAMPS

BEACH TREATMENT
(CONSIDER SALT MARSH BERM OR SALT MARSH WALKTHROUGH)

REMOVE/ABANDON TIMBER BENCH

Rock TREATMENT
(CONSIDER SALT MARSH BERM)

EXISTING BOAT RAMP

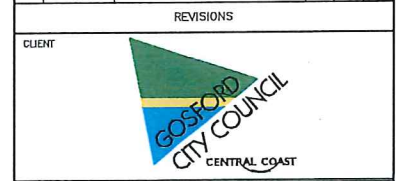
GABION WALL REMEDIATION

ORANA STREET

BAYSIDE DRIVE

NOT FOR CONSTRUCTION

REV	DATE	DESCRIPTION	BY	CHK	APPRO
A	-05.14	ISSUED FOR --	ADS	EM	GB



PROJECT:
FORESHORE STABILISATION
CAPTAIN COOK RESERVE
GREEN POINT

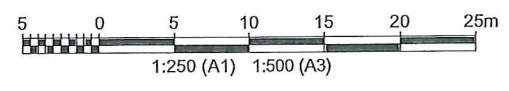
DRAWING TITLE:
GENERAL ARRANGMENT
PLAN
SHEET 1

HASKONING AUSTRALIA PTY LTD
SYDNEY

Royal HaskoningDHV
Enhancing Society Together

Sub 5, Level 5
100 Wattle Street
North Sydney NSW 2060
+61 2 8554 6000 Telephone
+61 2 8550 0000 Fax
www.royalhaskoning.com Internet

DRAWN ADS	DATE 06/05/2014	JOB No. 8A0400
AUTOCAD REF: 8A0400-MA-0005		
SCALE AT A1 1:250		
DRAWING No. 8A0400/MA/0005	REVISION A	





BRISBANE WATER

CONSIDER REINSTATE/REPAIR JETTY (NOT PART OF SCOPE)

SALT MARSH BERM TREATMENT

DINGHY SKID

ROCK TREATMENT

EXTENT OF WORKS

'MUD FLATS'

BEACH TREATMENT

LEAVE BEACH AS IS

ROCK TREATMENT

RETAIN OR PARTIALLY RETAIN TIMBER LALL

BEACH TREATMENT

REMOVE RAMP

LEAVE EXISTING BLOCKWALL

RETAIN RAMP

NOT FOR CONSTRUCTION

REV	DATE	DESCRIPTION	BY	CHK	APPD
A	-05.14	ISSUED FOR --	ADS	BH	GB



PROJECT: FORESHORE STABILISATION CAPTAIN COOK RESERVE GREEN POINT

DRAWING TITLE: GENERAL ARRANGEMENT PLAN SHEET 2

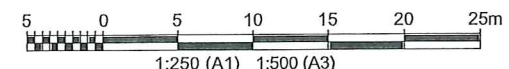
HASKONING AUSTRALIA PTY LTD SYDNEY
Royal HaskoningDHV
Enhancing Society Together

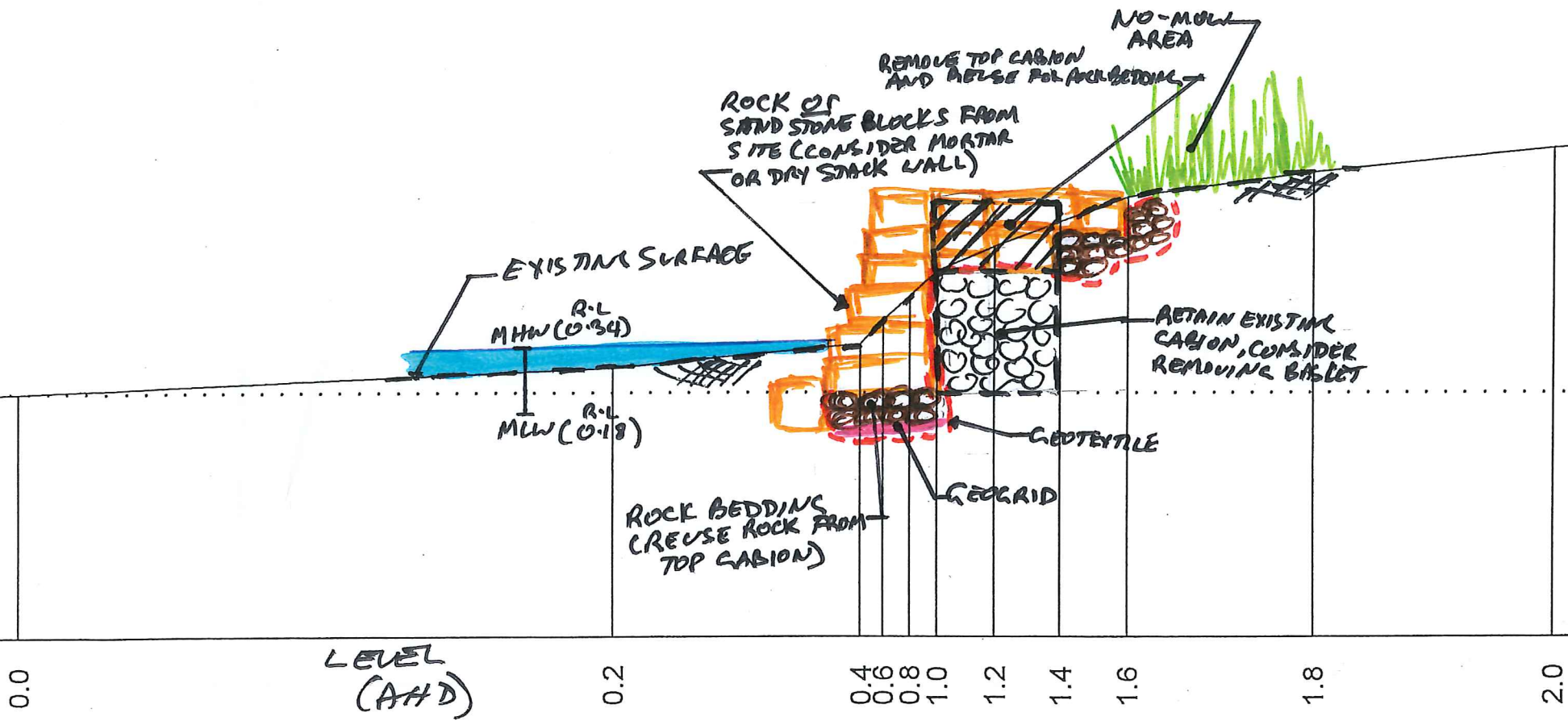
DRAWN ADS DATE 06/05/2014 JOB No. 8A0400

AUTOCAD REF. 8A0400-NA-0005

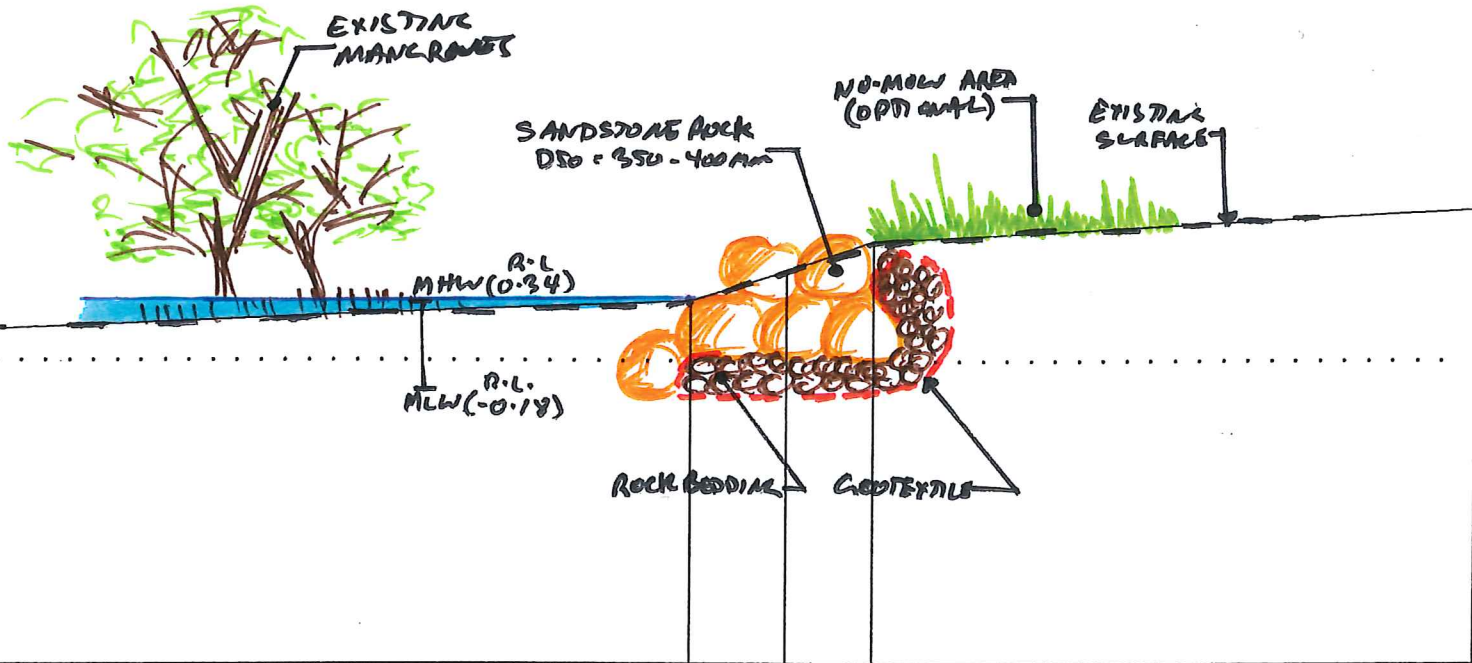
SCALE AT A1 1:250

DRAWING No. 8A0400/MA/0006 SK2 REVISION A





SECTION 1 SKETCH SK 3
 GABION WALL REMEDIATION



LEVEL (AHD) 0.2

0.4

0.6

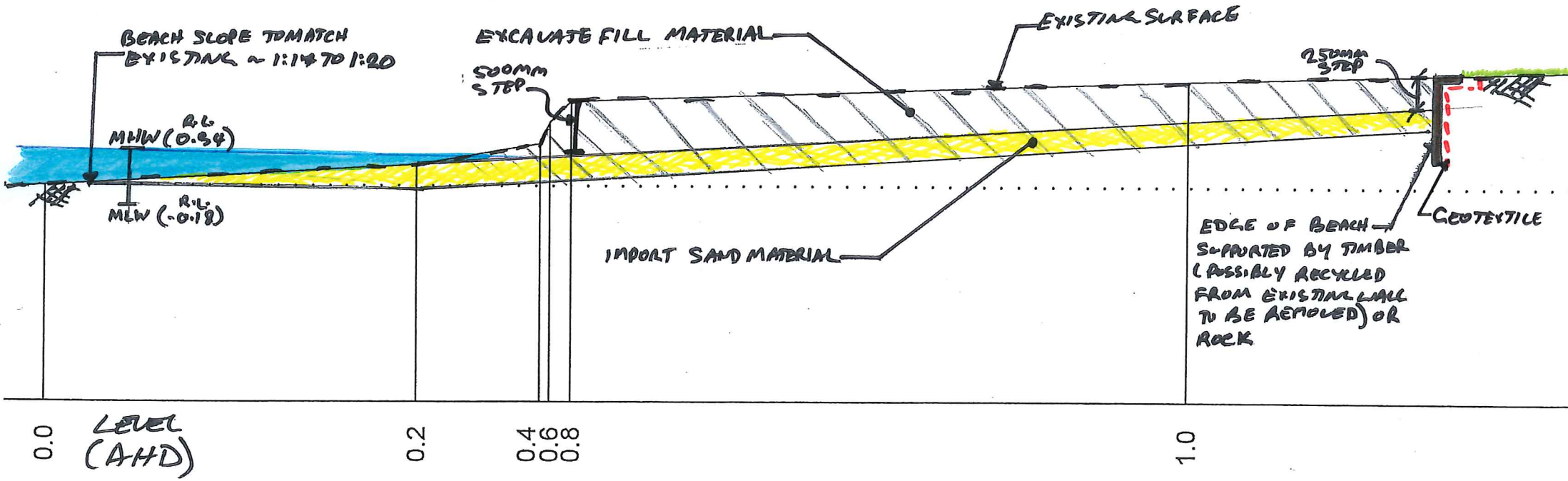
0.8

1.0

SECTION 4 ROCK TREATMENT

SCALE 1:50

SKETCH SK4



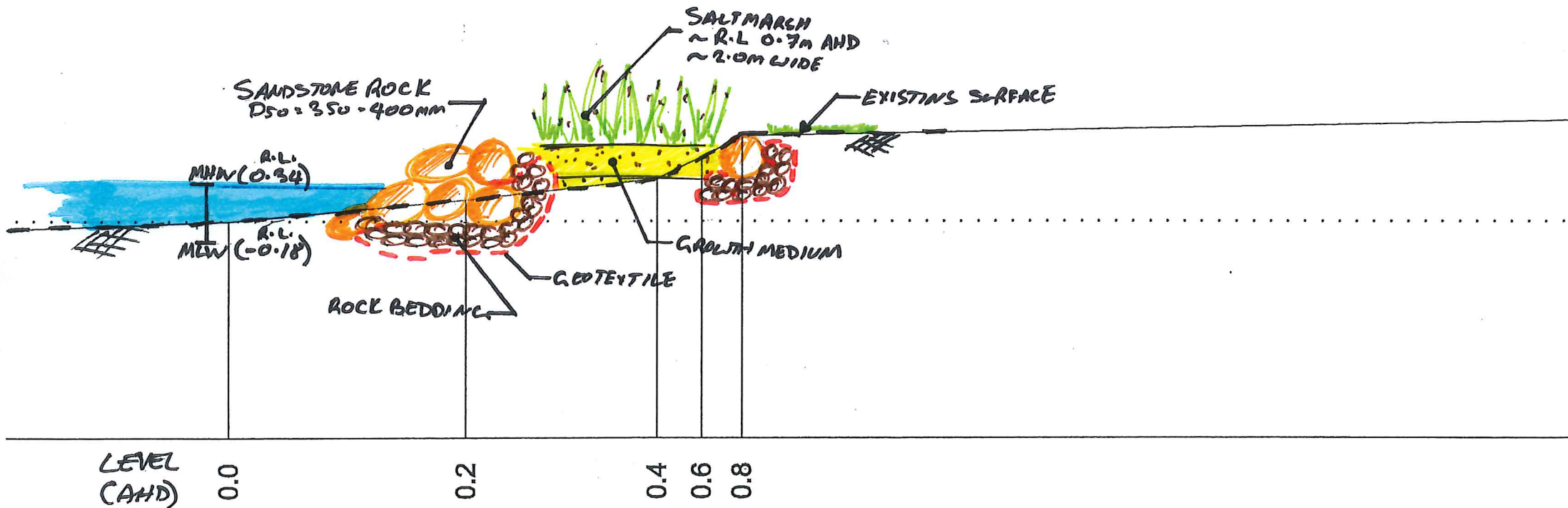
SECTION 5

BEACH TREATMENT

SCALE 1:50

SKETCH

SK 5



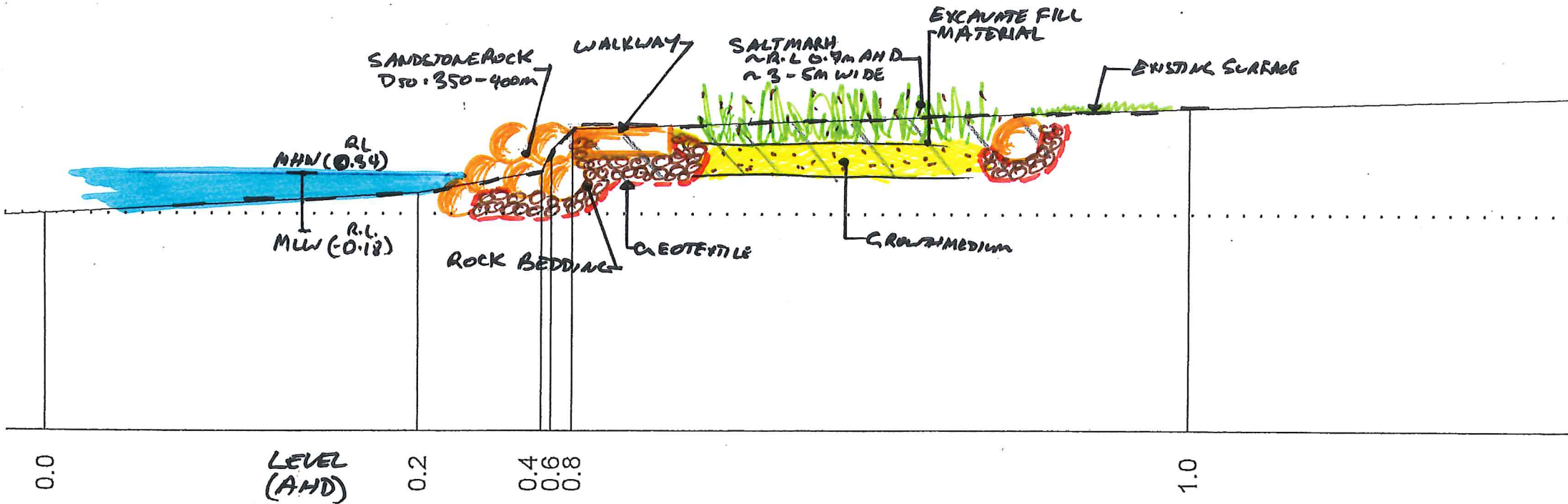
SECTION 8

SCALE 1:50

SALT MARSH BERM
TREATMENT

SKETCH

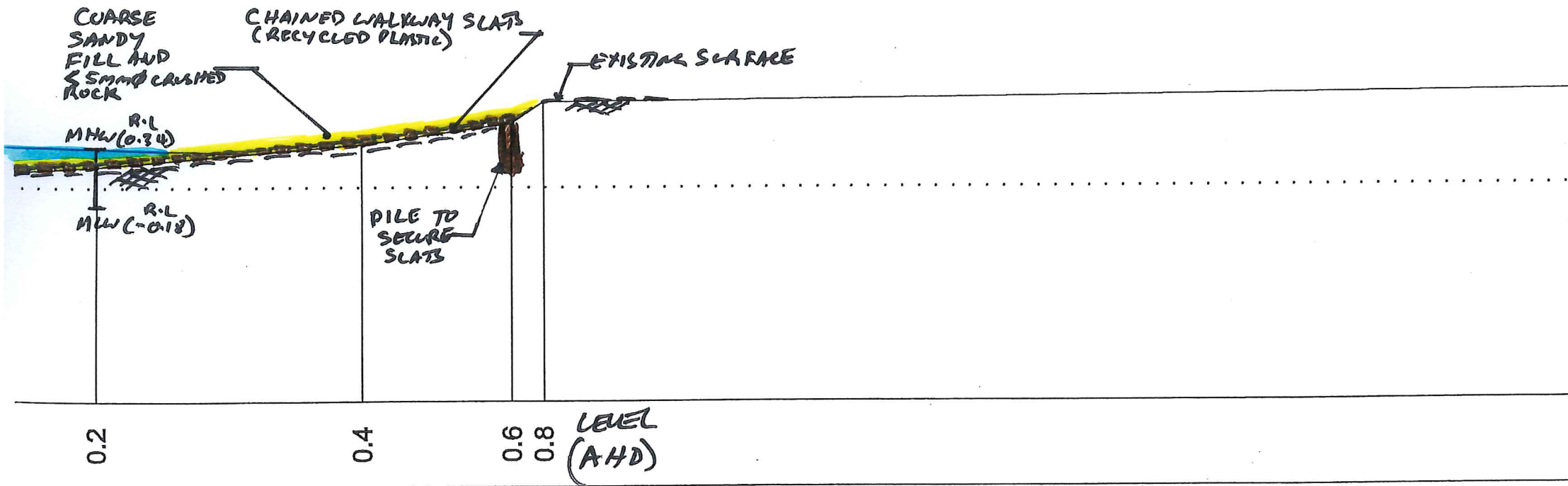
SK7



SECTION 5
SCALE 1:50

SALT MARSH
WALKTHROUGH TREATMENT

SKETCH SK6



SECTION 9 DINGHY SKIP
 SCALE 1:50

SKETCH SK8

APPENDIX D

Detailed Design Drawings and Specification Notes

FORESHORE STABILISATION CAPTAIN COOK RESERVE, GREEN POINT



LOCALITY PLAN
N.T.S

DRAWING SCHEDULE

DRG No.	TITLE
8A0400/MA/0001	TITLE SHEET, LOCALITY PLAN AND DRAWING LIST
8A0400/MA/0002	NOTES - SHEET 1
8A0400/MA/0003	NOTES - SHEET 2
8A0400/MA/0005	SITE PLAN
8A0400/MA/0006	GENERAL ARRANGEMENT PLAN - SHEET 1
8A0400/MA/0007	GENERAL ARRANGEMENT PLAN - SHEET 2
8A0400/MA/0010	DESIGN SECTIONS - SHEET 1
8A0400/MA/0011	DESIGN SECTIONS - SHEET 2
8A0400/MA/0012	DESIGN SECTIONS - SHEET 3
8A0400/MA/0013	DESIGN SECTIONS - SHEET 4
8A0400/MA/0014	DESIGN SECTIONS - SHEET 5
8A0400/MA/0015	DESIGN SECTIONS DETAILS

SURVEY (STEPHEN THORNE AND ASSOCIATES)

DRG No.	TITLE
6907 - SHEET 1	DETAIL AND CONTOUR SURVEY, CAPTAIN COOK RESERVE, GREEN POINT - SHEET 1
6907 - SHEET 2	DETAIL AND CONTOUR SURVEY, CAPTAIN COOK RESERVE, GREEN POINT - SHEET 2

GENERAL NOTES:

1. THESE DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ALL OTHER REFERENCE DRAWINGS WHICH SHOW OTHER ASPECTS OF WORK TO BE INCORPORATED.
2. ALL DIMENSIONS ARE IN MILLIMETRES AND ALL LEVELS ARE IN METRES (UNLESS NOTED OTHERWISE).
3. ALL LEVELS REDUCED TO AUSTRALIAN HEIGHT DATUM (AHD).
4. ALL LEVELS ARE FROM SURVEY PROVIDED BY STEPHEN THORNE AND ASSOCIATES PTY LTD, DATED 29/04/2014. ROYAL HASKONINGDHV TAKE NO RESPONSIBILITY FOR THE ACCURACY OF THE SURVEY AND SERVICES SHOWN.
5. CONTRACTOR TO CONFIRM SURVEY PRIOR TO COMMENCEMENT OF WORKS.
6. SERVICES SHOWN ARE INDICATIVE ONLY. LOCATIONS TO BE CONFIRMED ON SITE PRIOR TO CONSTRUCTION.
7. FOR OTHER NOTES REFER TO DRAWINGS 0002 AND 0003.

REV	DATE	DESCRIPTION	BY	CHK	APPD
B	27.06.14	ISSUED FOR FINAL REVIEW	ADS	BM	GB
A	18.06.14	ISSUED FOR COUNCIL REVIEW	ADS	BM	GB

REVISIONS



CLIENT: GOSFORD CITY COUNCIL
PROJECT: FORESHORE STABILISATION
CAPTAIN COOK RESERVE
GREEN POINT

DRAWING TITLE:
TITLE SHEET,
LOCALITY PLAN AND
DRAWING LIST

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DRAWN ADS	DATE 27/06/2014	JOB No. 8A0400
AUTOCAD REF. 8A0400-MA-0001		
SCALE AT A1 N.T.S		
DRAWING No. 8A0400/MA/0001	REVISION B	

NOT FOR CONSTRUCTION

GENERAL

THESE DRAWINGS SHALL BE READ IN CONJUNCTION WITH ALL OTHER DRAWINGS AND SPECIFICATIONS AND WITH SUCH OTHER WRITTEN INSTRUCTIONS AS MAY BE ISSUED DURING THE COURSE OF THE CONTRACT. ANY DISCREPANCY SHALL BE REFERRED TO THE SUPERINTENDENT BEFORE PROCEEDING WITH THE WORK.

ALL MATERIALS AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE RELEVANT AND CURRENT SAA CODES AND WITH THE BY-LAWS AND ORDINANCES OF THE RELEVANT BUILDING AUTHORITIES EXCEPT WHERE VARIED BY THESE DRAWINGS AND SPECIFICATIONS.

ALL CRITICAL ARRANGEMENTS AND DIMENSIONS SHOWN SHALL BE VERIFIED BY THE CONTRACTOR ON SITE BEFORE WORK COMMENCES. DRAWINGS SHALL NOT BE SCALED FOR DIMENSIONS.

BEFORE UNDERTAKING ANY WORK, ESTABLISH THE LOCATIONS OF ALL EXISTING SERVICES AFFECTED BY THE WORKS. IF NECESSARY, CARRY OUT A DIAL-BEFORE-YOU-DIG SEARCH. ADVISE THE SUPERINTENDENT IF THERE ARE ANY UNKNOWN SERVICES THAT CAN POTENTIALLY BE AFFECTED BY THE WORKS.

RETURN DETAILS SHOWN ON THE DRAWINGS FOR DIFFERENT TREATMENT AREAS ARE TO BE CONFIRMED BY THE CONTRACTOR DURING CONSTRUCTION.

DURING CONSTRUCTION THE STRUCTURE SHALL BE MAINTAINED IN A STABLE CONDITION AND NO PART SHALL BE OVERSTRESSED. TEMPORARY BRACING AND BATTERS SHALL BE PROVIDED BY THE CONTRACTOR TO KEEP THE WORKS AND EXCAVATIONS STABLE AT ALL TIMES.

THE CONTRACTOR SHALL PROVIDE TEST CERTIFICATES FROM A N.A.T.A. APPROVED TESTING LABORATORY CERTIFYING THAT THE MATERIALS USED COMPLY WITH THE RELEVANT SPECIFICATIONS.

UNLESS NOTED OTHERWISE ALL LEVELS ARE IN METRES RELATIVE TO AUSTRALIAN HEIGHT DATUM (AHD).

UNLESS NOTED OTHERWISE ALL DIMENSIONS ARE IN MILLIMETRES AND ALL LEVELS ARE IN METRES.

QUALITY ASSURANCE AND OCCUPATIONAL HEALTH & SAFETY

THE CONTRACTOR SHALL IMPLEMENT AND MAINTAIN A QUALITY ASSURANCE SYSTEM SUCH THAT RECORDS ARE KEPT OF ALL ASPECTS AND STAGES OF THE WORK.

THE RECORDS FOR EACH CONSTRUCTION TASK SHALL BE STAGED AND ITEMISED TO THE SATISFACTION OF THE SUPERINTENDENT. THE PROFORMAS SHALL BE SUBMITTED TO THE SUPERINTENDENT FOR APPROVAL AND WORK SHALL NOT COMMENCE UNTIL SUCH APPROVAL HAS BEEN GIVEN.

DURING THE COURSE OF CONSTRUCTION, THE CONTRACTOR SHALL MAINTAIN ACCURATE AND UP TO DATE RECORDS AND SHALL MAKE SUCH RECORDS AVAILABLE TO THE SUPERINTENDENT IF REQUESTED. FAILURE TO MAINTAIN RECORDS AS SPECIFIED WILL RESULT IN THE CONTRACTOR RE-INSPECTING COMPLETED WORKS IF INSTRUCTED TO DO SO BY THE SUPERINTENDENT.

AT THE COMPLETION OF EACH STAGE OF THE WORKS THE CONTRACTOR SHALL CERTIFY THAT THOSE WORKS HAVE BEEN UNDERTAKEN AND COMPLETED IN ACCORDANCE WITH THE DRAWINGS, SPECIFICATION AND INSTRUCTIONS ISSUED DURING THE COURSE OF THE CONTRACT.

ALL WORKSMANSHIP AND CONSTRUCTION METHODS SHALL BE UNDERTAKEN IN ACCORDANCE WITH CURRENT NSW AND AUSTRALIAN WHS LEGISLATION. TOOL BOX TALKS A SHALL BE HELD EACH DAY PRIOR TO COMMENCING WORKS AND SAFE WORK METHOD STATEMENTS (SWMS) SHALL BE PREPARED FOR ALL WORK ITEMS AND REVIEWED PRIOR TO UNDERTAKING EACH WORK ITEM.

THE CONTRACTOR SHALL OBTAIN AND KEEP ON SITE ALL RELEVANT MATERIAL SAFETY DATA SHEETS (MSDS) FOR ANY MATERIALS THAT ARE USED IN THE WORKS. ALL TRANSPORTATION, STORAGE AND USE OF THESE MATERIALS SHALL BE IN ACCORDANCE WITH MSDS.

NOT FOR CONSTRUCTION

SURVEY

ALL LEVELS ARE FROM SURVEY PROVIDED BY STEPHEN THORNE AND ASSOCIATES PTY LTD, DATED 29/04/14. ROYAL HASKONINGDHV TAKE NO RESPONSIBILITY FOR THE ACCURACY OF THE SURVEY AND SERVICES SHOWN. THE CONTRACTOR SHALL CONFIRM THE SURVEY PRIOR TO COMMENCEMENT OF WORKS.

ON COMPLETION OF THE WORKS A COMPLIANCE SURVEY SHALL BE UNDERTAKEN BY THE CONTRACTOR. THIS SHALL COMPRISE SURVEYED CROSS-SECTIONS OF THE SITE TO BE UNDERTAKEN AT 10M INTERVALS ALONG THE FORESHORE WORKS. THIS INFORMATION SHALL BE USED TO PREPARE WORK AS EXECUTED DRAWINGS OF THE WORKS.

SURVEY SHALL BE CARRIED OUT BY A SUITABLY EXPERIENCED AND QUALIFIED REGISTERED SURVEYOR. THE SUPERINTENDANT SHALL BE PROVIDED WITH TWO COPIES OF A1 SIZE DRAWINGS OF THE SURVEY AND WORK AS EXECUTED DRAWINGS. THE CONTRACTOR WILL BE RESPONSIBLE FOR ANY FURTHER SURVEY REQUIRED DUE TO WORK BEING INCOMPLETE OR NOT COMPLYING WITH THE DRAWINGS AND SPECIFICATIONS.

FORESHORE TREATMENT EXTENTS

THE EXTENTS WOULD BE CONFIRMED ONSITE BY THE SUPTERINTENDENT AND GENERALLY BE AS FOLLOWS:

FORESHORE TREATMENT	CHAINAGE (m)	
	START	FINISH
GABION WALL REMEDIATION	0	11
ROCK TREATMENT	19	66
	92	116
	151	171
	199	217
	243	252
BEACH TREATMENT	66	92
	132	151
	171	185
SALTMARSH BERM	217	235
DINGY SKID	235	243

EXCAVATION

EXCAVATION SHALL BE CARRIED OUT AT THE LOCATIONS SHOWN AND THE LEVELS, WIDTHS AND SIDESLOPES INDICATED ON THE DRAWINGS.

SLOPES OF EXCAVATION BATTERS ARE TO BE DETERMINED BY THE CONTRACTOR.

EXISTING SERVICES AND STRUCTURES SHALL BE PRESERVED BY THE CONTRACTOR DURING EXCAVATION ACTIVITIES.

AN INDICATION OF THE MATERIAL TO BE REMOVED DURING EXCAVATION IS PROVIDED IN THE GEOTECHNICAL INVESTIGATIONS THAT HAVE BEEN COMPLETED AT THE SITE. TYPICALLY, THE MATERIAL COMPRISES FINE TO MEDIUM GRAINED SAND WITH A FINES CONTENT OF LESS THAN 10% OVERLAIN BY GENERAL FILL MATERIAL PLACED TO ESTABLISH THE FORESHORE RESERVE.

AT ALL TIMES DURING EXCAVATION THE CONTRACTOR SHALL PROVIDE AND MAINTAIN, TO THE SATISFACTION OF THE SUPERINTENDANT AND RELEVANT AUTHORITIES, A FLOATING BOOM WITH A SUSPENDED SILT CURTAIN TO CONTAIN ANY TURBIDITY GENERATED BY THE WORKS.

ALL EXCAVATED MATERIAL SHALL BE REUSED ONSITE AS DIRECTED BY THE SUPERINTENDANT.

FILLING

FILL USED FOR CREATION OF NEW BEACH AREAS AND AS BEDDING MATERIAL FOR THE DINGY SKID SHALL BE IMPORTED WELL-GRADED, MEDIUM TO COARSE GRAINED SAND WITH LESS THAN 10% FINES. THIS MATERIAL SHALL BE CLASSIFIED AS VIRGIN EXCAVATED NATURAL MATERIAL (VENM).

BACKFILL PLACED BEHIND TIMBER WALL STRUCTURES SHALL BE FREE DRAINING, FREE FROM ORGANIC MATERIALS, OTHER CONTAMINANTS AND DELETERIOUS SUBSTANCES AND HAVE A MAXIMUM PARTICLE SIZE NOT EXCEEDING 40mm.

FILLING CONT:

PRIOR TO DELIVERY OF FILL MATERIAL TO SITE, THE CONTRACTOR SHALL PROVIDE WRITTEN EVIDENCE TO THE SUPERINTENDANT DEMONSTRATING THE COMPLIANCE OF PROPOSED FILL MATERIALS WITH THE SPECIFICATION.

FILL MATERIAL SHALL BE PLACED IN LAYERS OF LOOSE THICKNESS NOT EXCEEDING 100mm.

WHERE FILL IS PLACED FOR LANDSCAPING PURPOSES, EACH LAYER SHALL BE COMPACTED TO 90% STANDARD MAXIMUM DRY DENSITY WITHIN 2% OF THE STANDARD OPTIMUM MOISTURE CONTENT.

WHERE BACKFILL IS PLACED ADJACENT TO STRUCTURES, EACH LAYER SHALL BE COMPACTED TO AN AVERAGE DENSITY EQUIVALENT TO 98% (AND NO TEST RESULT BELOW 95%) STANDARD MAXIMUM DRY DENSITY WITHIN 2% OF THE STANDARD OPTIMUM MOISTURE CONTENT.

THE CONTRACTOR SHALL ARRANGE FOR TESTING TO BE CONDUCTED BY A N.A.T.A. APPROVED TESTING LABORATORY TO DETERMINE THE STANDARD OPTIMUM MOISTURE CONTENT AND STANDARD MAXIMUM DRY DENSITY OF FILL MATERIALS.

INSITU DENSITY TESTING ON BACKFILL MATERIAL SHALL BE CARRIED OUT BY THE CONTRACTOR AT A FREQUENCY OF ONE TEST PER LAYER PER 500sqm OR THREE TESTS PER VISIT BY THE SUPERINTENDANT, WHICHEVER REQUIRES THE MOST TESTS, TO CONFIRM COMPLIANCE WITH THE COMPACTION SPECIFICATION.

THE CONSTRUCTION TOLERANCES FOR EARTHWORKS SHALL BE AS FOLLOWS:

- +/-100mm OF THE HORIZONTAL POSITION SHOWN ON THE DRAWINGS.
- +/-50mm OF THE LEVEL/LAYER THICKNESS SHOWN ON THE DRAWINGS.

ROCK SUPPLY

ROCK USED IN ROCK TREATMENT AREAS SHALL CONSIST OF SANDSTONE SOURCED FROM A QUARRY THAT HAS PREVIOUSLY SUPPLIED ROCK FOR APPLICATION IN MARINE ENVIRONMENTS, AND THAT HAS DEMONSTRATED DURABILITY IN THIS ENVIRONMENT.

FISSILE SEDIMENTARY AND METAMORPHIC ROCK SUCH AS SHALE, MUDSTONES, CLAYSTONES, BEDDED SANDSTONE OR SLATES ARE NOT SUITABLE FOR USE IN ROCK TREATMENT AREAS.

ROCK SHALL HAVE NO MORE THAN 10% (BY VOLUME) OLIVINE MATERIAL AND SHALL EXHIBIT NO ZONES OF SECONDARY ALTERATION SUCH AS CHLORITISATION.

ROCKS SHALL BE UNWEATHERED WITHOUT SIGNIFICANT QUANTITIES OF DELETERIOUS MATERIALS SUCH AS ANALCIME AND EXPANSIVE CLAY MATERIALS, OR UNFAVOURABLE DELINEATIONS WITHIN THE MICROFABRIC.

INDIVIDUAL ROCKS SHALL BE HARD, DURABLE AND CLEAN AND FREE FROM CRACKS, CLEAVAGE PLANES, SEAMS, CHEMICAL ALTERATION OR WEATHERING AND OTHER DEFECTS WHICH WOULD RESULT IN THE BREAKDOWN OF THE ROCK IN A MARINE ENVIRONMENT.

ROCK SHALL BE ROUGH AND ANGULAR.

ROCKS SHALL EXHIBIT NO SIGNS OF STRESS RELIEF.

ROCK SHALL AS A MINIMUM SATISFY THE FOLLOWING CRITERIA:

PROPERTY	TEST METHOD	UNIT	CRITERIA
STRENGTH	IS(50) POINT LOAD (WET) (RMS NSW METHOD T223)	MPa	>1.5
	WET/DRY STRENGTH RATIO (RMS NSW METHOD T215)	%	<30%
DENSITY	DRY UNIT WEIGHT	t/m ³	>2.3
	WATER ABSORPTION	%	<1.5%
DURABILITY	SODIUM SULFATE SOUNDNESS	%	<9%
MAX/MIN DIMENSION	-	-	<2.5

SANDSTONE BLOCKS USED FOR DRY STACKING AS PART OF GABION WALL REMEDIATION SHALL BE SOURCED FROM THOSE EXISTING ON THE SITE.

ROCK PLACEMENT

THE THICKNESS OF ARMOUR ROCK AND ROCK BEDDING SHOWN ON THE DRAWINGS SHALL BE ACHIEVED BY PLACEMENT OF AT LEAST TWO LAYERS OF ROCK.

THE ARMOUR ROCK AND ROCK BEDDING SHALL BE PLACED SUCH THAT THE SPECIFIED REQUIREMENTS FOR MASS (50% OR MEDIAN), DIAMETER (MINIMUM AND MAXIMUM), FINISHED SIDE SLOPES, CREST AND TOE LEVELS, LAYER THICKNESSES AND DENSITY REQUIREMENTS ARE SATISFIED.

ROCK SHALL NOT BE ROLLED OR DROPPED INTO POSITION, IT SHALL BE PLACED IN A MANNER THAT SATISFIES THE FOLLOWING:

- MINIMISES ITS BREAKDOWN ON HANDLING AND PRODUCTION OF FINES.
- MINIMISES THE SEGRATION OF VARIOUS GRADES OF ROCK
- ROCKS ARE WEDGED AND LOCKED TOGETHER SUCH THAT THEY ARE NOT FREE TO MOVE. THIS SHALL BE DONE WITHOUT DISTURBING ADJACENT ROCKS.
- THERE SHALL BE NO FREE ROCK ON THE FINISHED SURFACE OF THE ROCK TREATMENT.

THE CONSTRUCTION TOLERANCES FOR PLACEMENT OF ROCK SHALL BE AS FOLLOWS:

- +/-200mm OF THE HORIZONTAL POSITION SHOWN ON THE DRAWINGS.
- +100mm/-0mm OF THE LAYER THICKNESS SHOWN ON THE DRAWINGS.

GEOTEXTILE

GEOTEXTILE FILTER FABRIC USED SHALL BE ELCOMAX 600R OR AN APPROVED EQUIVALENT.

GEOTEXTILE SHALL BE LAID ON A CONTINUOUS BED FREE OF VOIDS AND FREE OF SHARP OBJECTS TO PREVENT TEARING.

GEOTEXTILE ELEMENTS MAY BE JOINED BY EITHER OVERLAPPING OR SEWING. OVERLAP WIDTHS SHALL BE NO LESS THAN 0.5m. FOR SEWING ASSEMBLY, 0.1m OVERLAP IS SUFFICIENT USING A NON-BIODEGRADABLE THREAD.

GEOTEXTILE PLACED IN WATER WILL REQUIRE BALLAST TO SECURE IT IN POSITION.

THE GEOTEXTILE SHALL MEET THE INSPECTION AND ACCEPTANCE CRITERIA SET OUT BY THE MANUFACTURER.

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B	27.06.14	ISSUED FOR FINAL REVIEW	ADS	BM	GB
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REVISIONS

CLIENT



PROJECT:

FORESHORE STABILISATION
CAPTAIN COOK RESERVE
GREEN POINT

DRAWING TITLE:

NOTES
SHEET 1

HASKONING AUSTRALIA PTY LTD SYDNEY



DRAWN ADS DATE 27/06/2014 JOB No. 8A0400

AUTOCAD REF. 8A0400-MA-NOTES

SCALE AT A1 N.T.S

DRAWING No. 8A0400/MA/0002 REVISION

B

TIMBER SUPPLY

WHERE POSSIBLE, THE NEW TIMBER RETAINING WALL (LOGS AND WALING) BEHIND BEACH TREATMENT AREAS SHALL BE CONSTRUCTED FROM TIMBER RECYCLED FROM EXISTING TIMBER WALLS AT THE SITE.

NEW SAWN TIMBER SHALL BE TREATED, HARDWOOD IN-GROUND DURABILITY CLASS I OR II GRADE F17 UNLESS NOTED OTHERWISE.

PRESERVATIVE TREATMENT FOR TIMBER SHALL IN ACCORDANCE WITH AS1604 FOR HAZARD CLASS H6. THE PRESERVATIVES USED SHALL BE COPPER CHROME ARSENIC (CCA) AND PIGMENT EMULSIFIED CREOSOTE (PEC). THE CONTRACTOR SHALL PROVIDE DETAILS OF THE PRESERVATION COMPANY TO THE SUPERINTENDANT AND A CERTIFICATE OF COMPLIANCE WITH THE RETENTION RATES AND PENETRATION RATES IN AS1604. THE CERTIFICATE SHALL ALSO STATE THE SPECIES OF TIMBER AND PRESERVATIVES USED.

MAXIMUM TIMBER DIMENSIONAL TOLERANCE ON THE FINISHED WIDTH AND THICKNESS TO BE:

WIDTH: +6mm -3mm
THICKNESS: +1.5mm -1.5mm

TIMBER CONSTRUCTION

ALL TIMBER CONSTRUCTION SHALL BE IN ACCORDANCE WITH AS1720.

150mm DIAMETER POSTS USED TO SUPPORT THE TIMBER RETAINING WALL ARE TO BE INSTALLED BY EXCAVATION OF A 300mm DIAMETER HOLE TO A DEPTH OF AT LEAST 1m BELOW THE NEW BEACH SURFACE LEVEL AND GROUTING OF POSTS WITHIN EACH HOLE. IF SOFT MATERIAL IS ENCOUNTERED DURING EXCAVATION, THE SUPERINTENDENT SHALL BE NOTIFIED AND ENGINEER ADVICE SOUGHT BEFORE PROCEEDING.

ALL BOLTS IN TIMBER CONSTRUCTION TO BE GALVANISED GRADE 4.6/S, WITH MINIMUM 20mm DIAMETER UNLESS NOTED OTHERWISE. BOLT HOLES TO BE DRILLED EXACT SIZE. WASHERS UNDER HEADS AND NUTS TO BE AT LEAST 2.5 TIMES BOLT DIAMETER UNLESS OTHERWISE SPECIFIED.

RECESSES TO THE TOPS OF HORIZONTAL MEMBERS EXPOSED TO THE ENVIRONMENT (SUCH AS FROM BOLTS, SPIKES ETC.) SHALL HAVE DEPRESSIONS FILLED WITH GREY PORION EXTERIOR FILLER OR APPROVED EQUIVALENT AFTER COMPLETION OF THE AFFECTED PART OF THE WORKS.

CUTS, RECESSES, LAPS AND END GRAIN SHALL BE COATED LIBERALLY WITH TWA IN-GROUND PASTE IN ACCORDANCE WITH THE DIRECTIONS FOR USE.

ALL TIMBER JOINTS AND CONNECTORS ARE TO BE 100mm MINIMUM AWAY FROM LOOSE KNOTS, SEVERE SLOPING GRAIN, GUM VEINS OR OTHER MINOR DEFECTS.

THE FACE OF ROUNDED TIMBER MEMBERS SHALL BE SAW CUT TO PROVIDE A FLAT SURFACE FOR TIMBER CONNECTIONS.

METAL WORK

ALL BOLTS, WASHERS, NUTS, NAILS, BRACKETS AND CHAIN SHALL BE HOT DIP GALVANISED IN ACCORDANCE WITH AS4680.

EXPOSED BOLTS AND NUTS SHALL BE PROTECTED AFTER THE BOLT HAS BEEN FINALLY TIGHTENED AS FOLLOWS. THE NUTS AND BOLT-ENDS PROTRUDING BEYONDS THE NUTS, SHALL BE PAINTED WITH TWO COATS OF AN ALUMINISED PROTECTIVE MASTIC COATING.

DEMOLITION

THE CONTRACTOR SHALL CARRY OUT DEMOLITION WORK IN ACCORDANCE WITH AS2601 MAKING DUE ALLOWANCE FOR THE DETERIORATED CONDITION OF THE STRUCTURES.

THE CONTRACTOR SHALL PROTECT PROPERTY AND SERVICES WHICH ARE TO REMAIN ON OR ADJACENT TO THE SITE DURING DEMOLITION ACTIVITIES.

ALL DEMOLITION MATERIALS SHALL BE LAWFULLY DISPOSED OF OR REUSED IN ACCORDANCE WITH THE DRAWINGS AND SPECIFICATIONS.

SALTMARSH VEGETATION

THE CONTRACTOR SHALL ENSURE THAT THE SEEDLINGS FOR THE VEGETATION SPECIES ARE SOURCED FROM A NURSERY THAT HAS EXPERIENCE IN SALTMARSH SUPPLY. SALTMARSH SPECIES THAT ARE APPROVED FOR USE COMPRISE SARCOCORNIA QUINQUEFLORA (SAMPHIRE) AND SUAEDA AUSTRALIS (SEABLITE).

PLANT AND GROWTH MEDIUM SAMPLES SHALL BE PROVIDED TO THE SUPERINTENDANT PRIOR TO ACCEPTANCE OF STOCK FROM THE SOURCE NURSERY FOR USE IN THE WORKS. ONE SAMPLE FOR EACH PLANT SPECIES SHALL BE PROVIDED IN THE CONDITION IN WHICH IS PROPOSED TO BE SUPPLIED TO SITE. A 5kg SAMPLE OF GROWTH MEDIUM SHALL ALSO BE PROVIDED.

ONCE THE SALTMARSH PLANT STOCK IS INSPECTED FOR ANY DEFECTIVE STOCK (AND REFUSED IF REQUIRED), THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE DELIVERY, STORAGE AND MAINTENANCE OF THE SALTMARSH PLANT STOCK PRIOR TO PLANTING. PLANTS SHALL BE DELIVERED ON A DAY-TO-DAY BASIS AND NOT BE STORED AT THE SITE FOR LONGER THAN 24 HOURS.

THE SALTMARSH GROWTH MEDIUM SHALL CONSIST OF A MINIMUM 250mm LAYER OF SOIL MATERIAL CAPABLE OF SUPPORTING HEALTHY MARINE VEGETATION. THIS SHALL COMPRISE SOIL THAT CONTAINS AN ADEQUATE PROPORTION OF SILT AND ORGANIC MATERIAL WITH GOOD MOISTURE RETENTION AND IS FREE FROM THE FOLLOWING:

- STONES OVER 25mm DIAMETER.
- CLAY LUMPS.
- TREE ROOTS.
- WEEDS, PARTICULARLY HYDROCOTYLE BONARIENSIS AND JUNCTUS ACUTUS (SPINY RUSH).
- STICKS AND RUBBISH.
- MATERIAL TOXIC TO PLANTS.

THE GROWTH MEDIUM SHALL BE EVALUATED FOR SUITABILITY BY A QUALIFIED SOIL SCIENTIST AND ACCEPTED BY A PRACTICIONER EXPERIENCED IN SALTMARSH CONSTRUCTION. GROWTH MEDIUM MAY BE SOURCED FROM EXCAVATED NON ACID SULFATE SOIL MATERIAL FROM THE SITE SUBJECT TO ITS EVALUATION, AND AMELIORATION OR ADDITIVES APPLIED AS NECESSARY. ALL IMPORTED GROWTH MEDIUM SHALL COMPLY WITH THE NEPC INTERIM URBAN ECOLOGICAL INVESTIGATION LEVELS.

THE BASE SOIL SHALL BE RIPPED PRIOR TO PLACEMENT OF THE GROWTH MEDIUM.

THE CONTRACTOR SHALL ENSURE THAT EROSION OF THE GROWTH MEDIUM DOES NOT OCCUR. A SINGLE LAYER OF CRUSHED SANDSTONE BETWEEN 40mm AND 70mm IN DIAMETER SHALL BE USED AS 'MULCH' TO PREVENT EROSION DURING ESTABLISHMENT OF VEGETATION.

PRIOR TO SALTMARSH PLANTING, THE SUPERINTENDANT SHALL VERIFY THAT THE LEVEL OF THE PLACED GROWTH MEDIUM MEETS THE INTENDED TIDAL INUNDATION FREQUENCY. THE SUPERINTENDANT SHALL BE NOTIFIED WHEN THE CONTRACTOR HAS COMPLETED THE PLACEMENT OF THE GROWTH MEDIUM. THE CONTRACTOR SHALL ALLOW FOR A 14 DAY PERIOD FOR THE SUPERINTENDANT TO INSPECT THE TIDAL INUNDATION OF THE PLACED GROWTH MEDIUM. THE SUPERINTENDANT MAY INSTRUCT THE CONTRACTOR TO INFILL OR TRIM THE PLACED GROWTH MEDIUM TO EITHER RAISE OR LOWER THE PLANTING AREA.

PLANTING SHALL BE UNDERTAKEN WITH THE PLANT SPECIES AND AT PLANTING CENTRES AS DIRECTED BY THE SUPERINTENDANT.

THE CONTRACTOR SHALL ENSURE THAT PLANTING ACTIVITIES ARE LIMITED TO COMPANIES OR INDIVIDUALS WITH EXPERIENCE IN PLANTING THE NOMINATED SPECIES.

THE CONTRACTOR SHALL INSTALL PLANTS WITH THE FOLLOWING CHARACTERISTICS:

- LARGE HEALTHY ROOT SYSTEMS.
- VIGOROUS AND WELL ESTABLISHED.
- FREE FROM DISEASE AS PESTS.
- OF GOOD FORM CONSISTENT WITH THE SPECIES OR VARIETY.
- HARDENED OFF, NOT SOFT OR FORCED.

SALTMARSH VEGETATION CONT:

THE PLANT MATERIAL SHALL BE SUFFICIENTLY ROBUST TO STAND UP UNDER ITS OWN WEIGHT. WEAK STEMMED PLANTS SHALL BE REJECTED BY THE SUPERINTENDANT. WHERE STAKING IS REQUIRED, IT SHALL BE TO HOLD THE ROOT BALL STILL WHILE TENDED ROOTS MOVE INTO THE GROWTH MEDIUM, NOT TO SUPPORT WEAK STEMS.

SALTMARSH PLANTING SHALL BE UNDERTAKEN WHEN THE SOIL HAS DRIED OUT, AND TRAMPLING AND FORMATION OF UNEVEN LEVELS OF THE GROWTH MEDIUM SHALL BE PREVENTED.

THE CONTRACTOR SHALL ENSURE THAT PLANTS ARE SUITABLY PROTECTED SO AS TO WITHSTAND BEING BLOWN OVER, WASHED AWAY OR EATEN BY ANIMALS. THIS MAY REQUIRE STAKING AND PLACEMENT OF WIRE MESH SURROUNDS.

PLANTING SHALL NOT BE UNDERTAKEN IN UNSUITABLE WEATHER CONDITIONS, SUCH AS EXTREME HEAT AND/OR WIND, UNDER WHICH INDIVIDUAL SPECIMENS MAY SUFFER, AFFECTING ESTABLISHMENT.

FOLLOWING PLANTING, THE SALTMARSH PLANTING AREA SHALL BE IRRIGATED WITH FRESH WATER SUCH THAT THE GROWTH MEDIUM IS THOROUGHLY SATURATED. FOLLOWING INITIAL WATERING, THE PLANTING AREA SHALL BE WATERED WITH FRESH WATER EVERY 3-4 DAYS OR MORE FREQUENTLY SO AS TO ENSURE THAT THE ROOTS ARE CONTINUALLY MOIST. WATERING SHALL BE UNDERTAKEN FOR A MINIMUM OF 3 MONTHS.

THE CONTRACTOR MUST PLANT THE FULL COMPLEMENT OF SALTMARSH AS SPECIFIED AND DIRECTED BY THE SUPERINTENDANT, AND GUARANTEE AN 80% SUCCESS RATE FOR ALL SPECIES.

FORESHORE PLANTING

THE CONTRACTOR SHALL PLACE A MINIMUM 150mm THICK LAYER OF GROWTH MEDIUM OVER DISTURBED AREAS BEHIND FORESHORE TREATMENT AREAS TO MATCH THE EXISTING SURFACE AND FACILITATE THE ESTABLISHMENT OF GRASS COVER AND PLANTING OF ENDEMIC GRASSES/SEDGES. THE GROWTH MEDIUM SHALL HAVE THE SAME SPECIFICATIONS AS THE GROWTH MEDIUM USED FOR SALTMARSH ESTABLISHMENT.

THE CONTRACTOR SHALL ESTABLISH GRASS COVER AND PLANT SPECIES AT PLANTING CENTRES AS DIRECTED BY THE SUPERINTENDANT. AREAS OF GRASS ESTABLISHMENT AND PLANTINGS SHALL BE MAINTAINED BY THE CONTRACTOR OVER MINIMUM PERIOD OF 3 MONTHS AT A WATERING FREQUENCY SPECIFIED BY THE SUPERINTENDANT.

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REVISIONS

CLIENT



PROJECT:

FORESHORE STABILISATION
CAPTAIN COOK RESERVE
GREEN POINT

DRAWING TITLE:

NOTES
SHEET 2

HASKONING AUSTRALIA PTY LTD SYDNEY	
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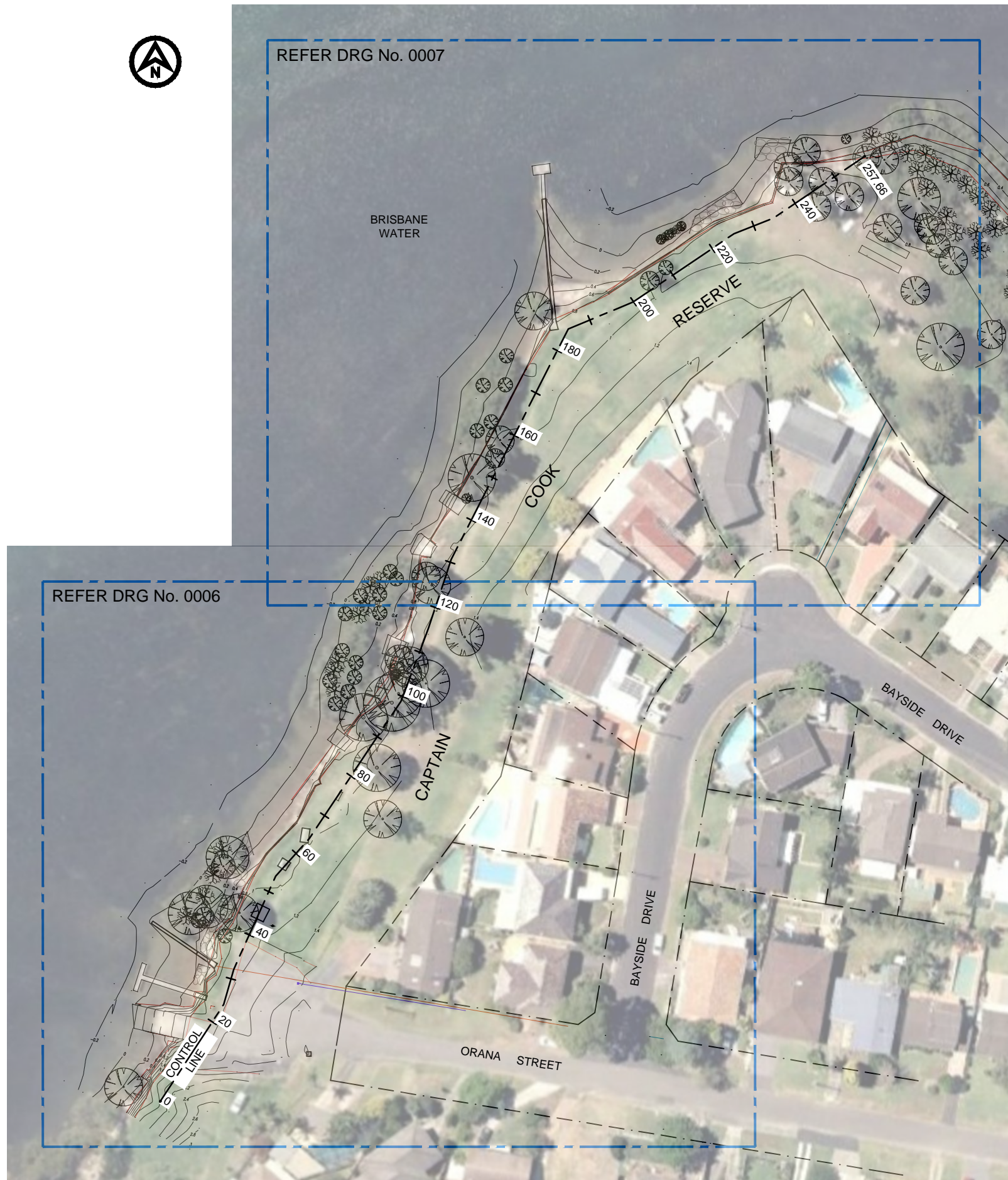
DRAWN ADS	DATE 27/06/2014	JOB No. 8A0400
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AUTOCAD REF. 8A0400-MA-NOTES

SCALE AT A1 N.T.S.

DRAWING No. 8A0400/MA/0003	REVISION B
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NOT FOR CONSTRUCTION



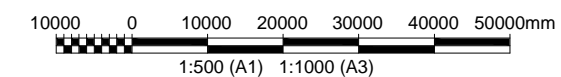
GENERAL NOTES:

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5. CONTRACTOR TO CONFIRM SURVEY PRIOR TO COMMENCEMENT OF WORKS.
6. SERVICES SHOWN ARE INDICATIVE ONLY. LOCATIONS TO BE CONFIRMED ON SITE PRIOR TO CONSTRUCTION.
7. FOR OTHER NOTES REFER TO DRAWINGS 0002 AND 0003.

SETOUT POINTS (ALONG CONTROL LINE)

POINT	CHAINAGE (m)	EASTING	NORTHING
SP1	0.00	347298.377	6297438.297
SP2	24.35	347311.717	6297458.668
SP3	32.01	347313.813	6297466.033
SP4	53.56	347322.671	6297485.686
SP5	64.10	347329.696	6297493.542
SP6	98.92	347349.038	6297522.496
SP7	115.53	347354.905	6297538.027
SP8	130.63	347359.629	6297552.372
SP9	185.09	347384.281	6297600.936
SP10	199.85	347397.911	6297606.596
SP11	225.56	347419.207	6297621.004
SP12	234.54	347427.559	6297624.308
SP13	257.66	347446.709	6297637.265





NOT FOR CONSTRUCTION

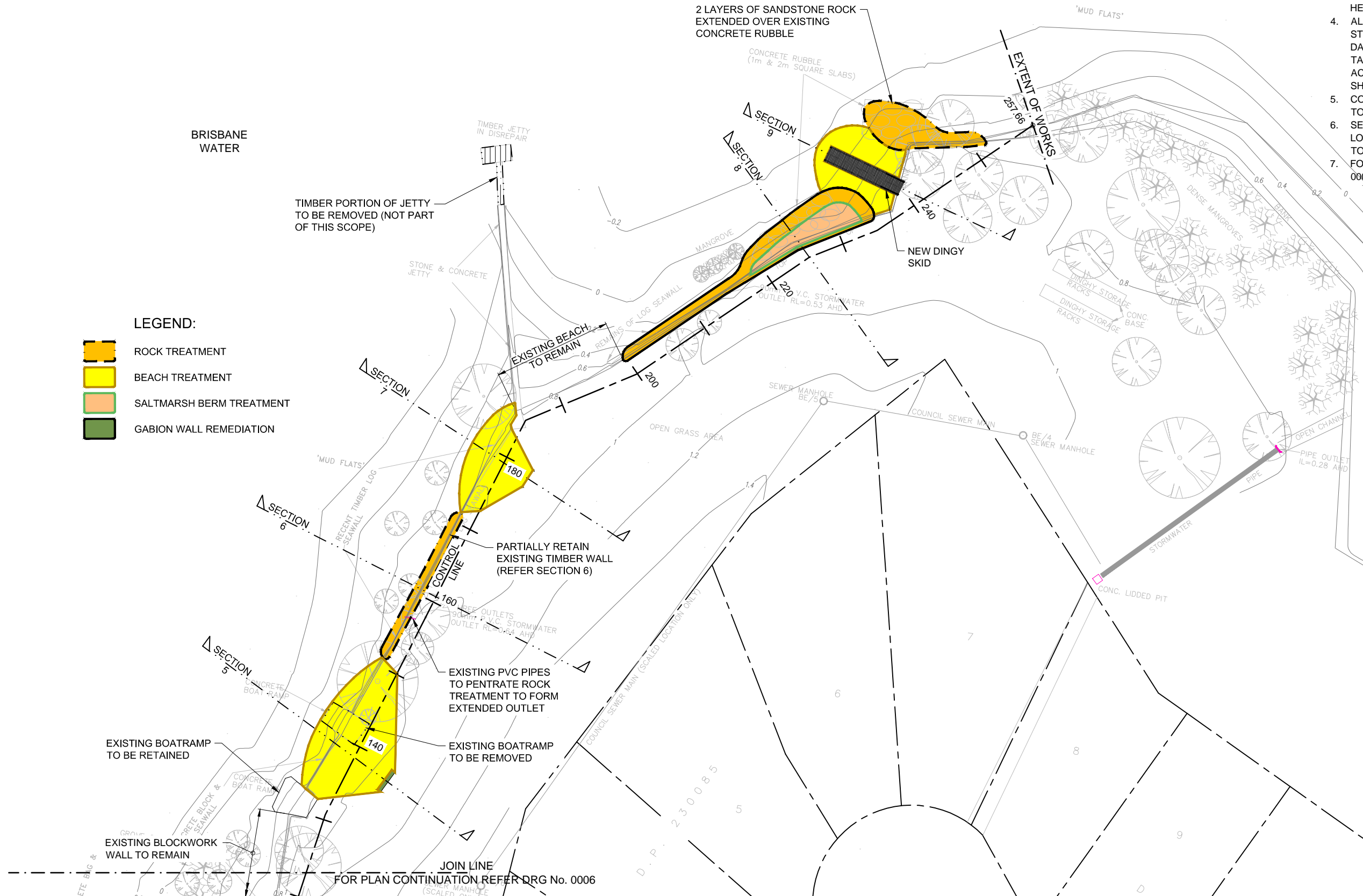


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B	27.06.14	ISSUED FOR FINAL REVIEW	ADS	BM	GB
A	18.06.14	ISSUED FOR COUNCIL REVIEW	ADS	BM	GB
REVISIONS					
CLIENT					
PROJECT:					
FORESHORE STABILISATION CAPTAIN COOK RESERVE GREEN POINT					
DRAWING TITLE:					
SITE PLAN					
<small>HASKONING AUSTRALIA PTY LTD SYDNEY</small>					
<small>Suite 5, Level 5 100 Walker Street North Sydney NSW 2060 +61 2 9554 5000 Telephone +61 2 95207650 Fax www.royalhaskoning.com Internet</small>					
DRAWN ADS		DATE 27/06/2014		JOB No. 8A0400	
AUTOCAD REF. 8A0400-MA-0005					
SCALE AT A1 1:500					
DRAWING No. 8A0400/MA/0005					REVISION B



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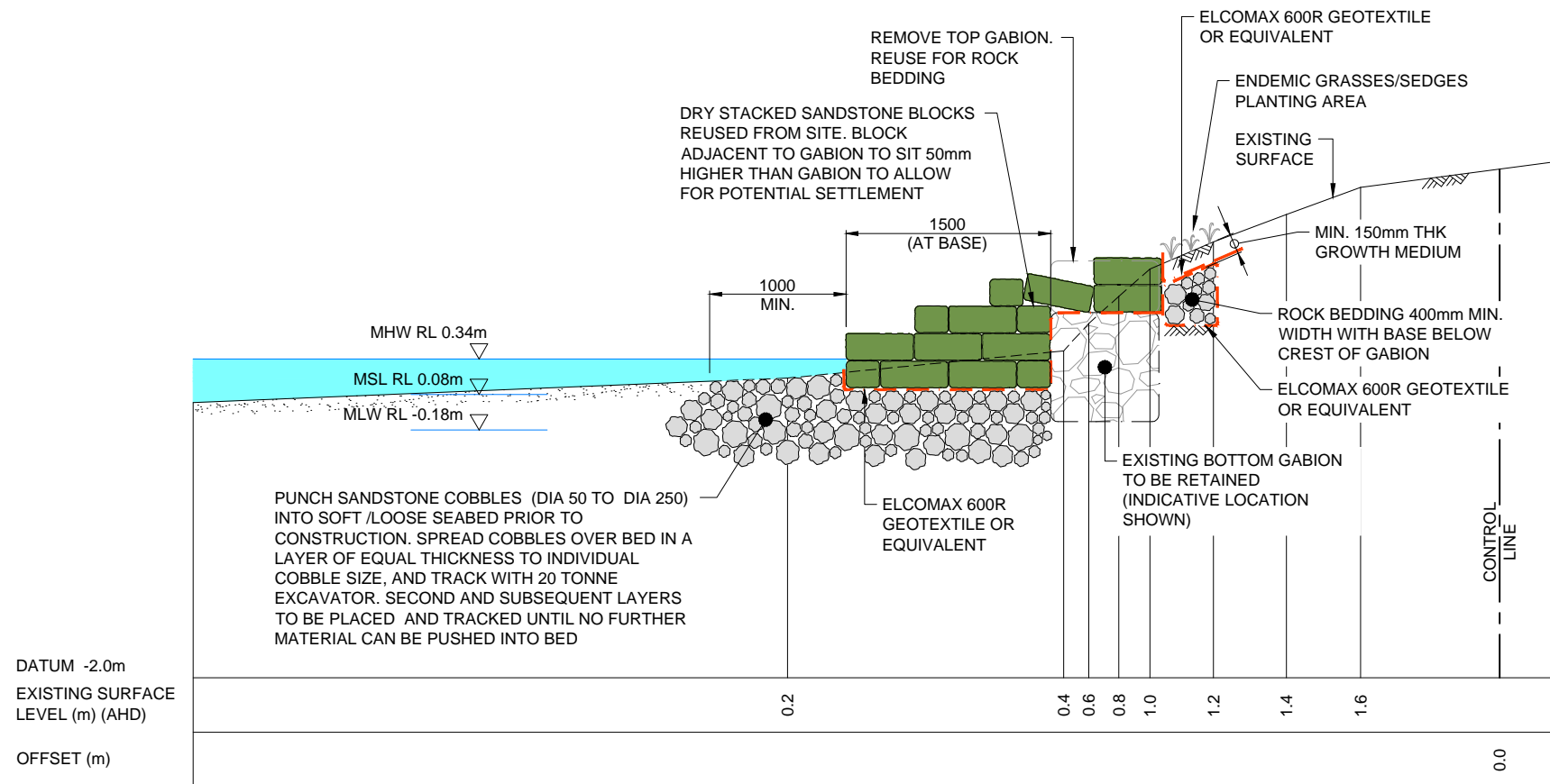
- LEGEND:**
-  ROCK TREATMENT
 -  BEACH TREATMENT
 -  SALTMARSH BERM TREATMENT
 -  GABION WALL REMEDIATION



GENERAL NOTES:

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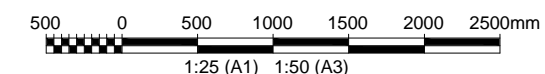
NOT FOR CONSTRUCTION



DATUM -2.0m
EXISTING SURFACE
LEVEL (m) (AHD)

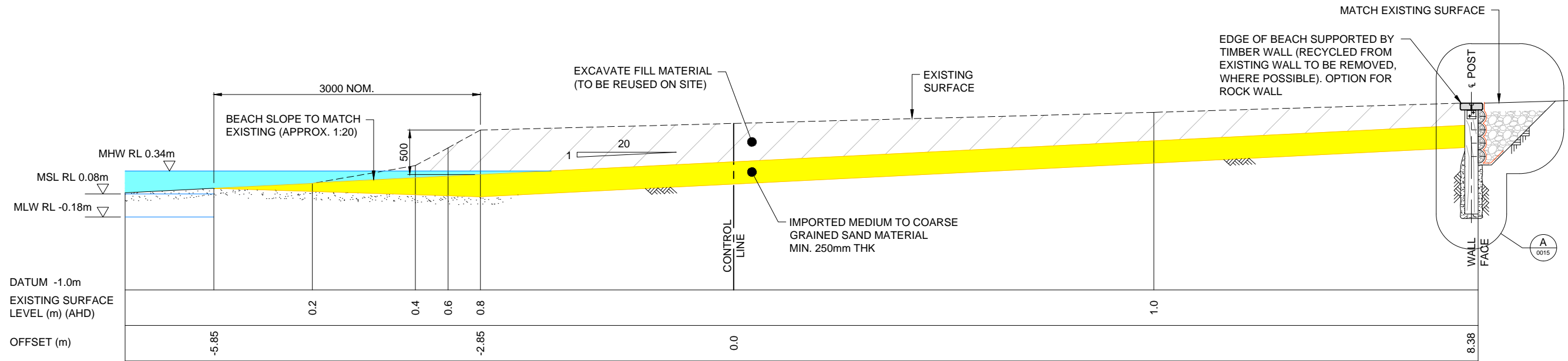
OFFSET (m)

**GABION WALL
SECTION 1**
SCALE 1:25

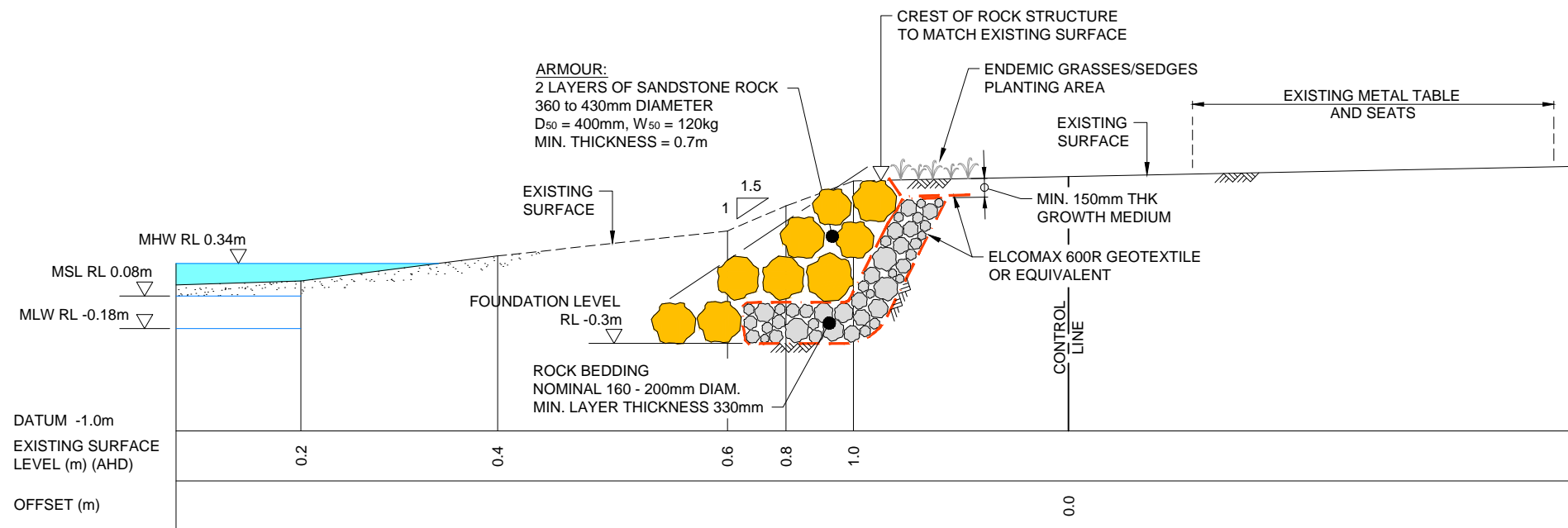


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REVISIONS	
CLIENT	
PROJECT:	FORESHORE STABILISATION CAPTAIN COOK RESERVE GREEN POINT
DRAWING TITLE:	DESIGN SECTIONS SHEET 1
<small>HASKONING AUSTRALIA PTY LTD SYDNEY</small> <small>Suite 5, Level 5 100 Walker Street North Sydney NSW 2060 +61 2 9854 5000 Telephone +61 2 98207960 Fax www.royalhaskoning.com Internet</small>	
DRAWN ADS	DATE 27/06/2014
AUTOCAD REF. 8A0400-MA-SECTIONS	
SCALE AT A1 1:25	
DRAWING No.	REVISION
8A0400/MA/0010	B



BEACH TREATMENT SECTION 3
SCALE 1:25

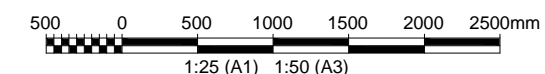


ROCK TREATMENT SECTION 2
SCALE 1:25

GENERAL NOTES:

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NOT FOR CONSTRUCTION



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REVISIONS



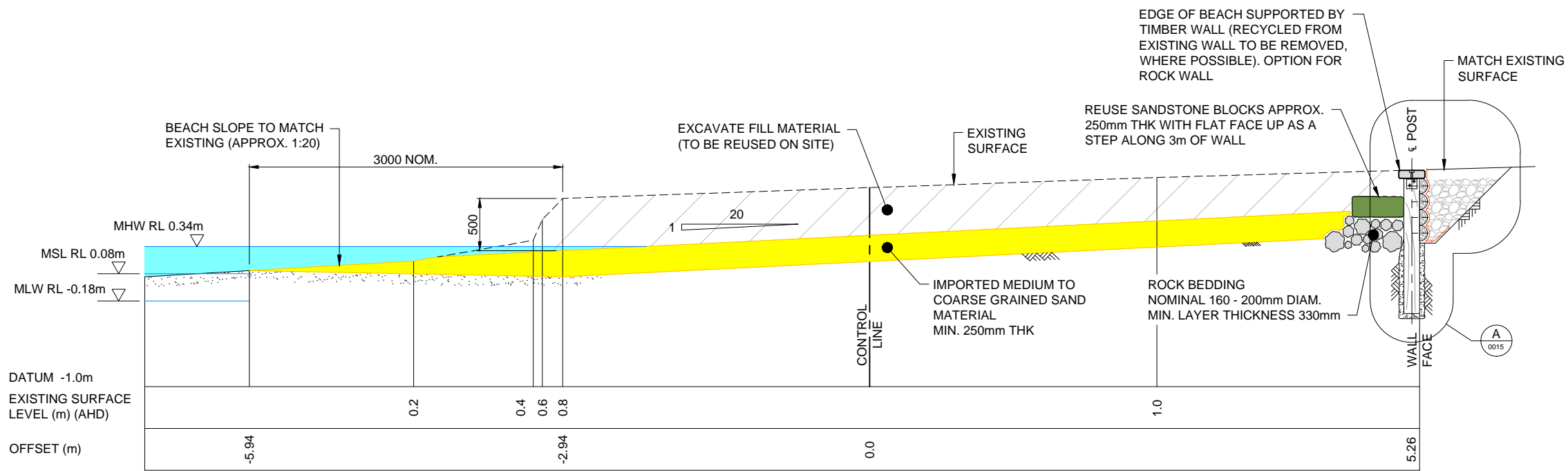
CLIENT: GOSFORD CITY COUNCIL
PROJECT: FORESHORE STABILISATION CAPTAIN COOK RESERVE GREEN POINT

DRAWING TITLE: DESIGN SECTIONS SHEET 2

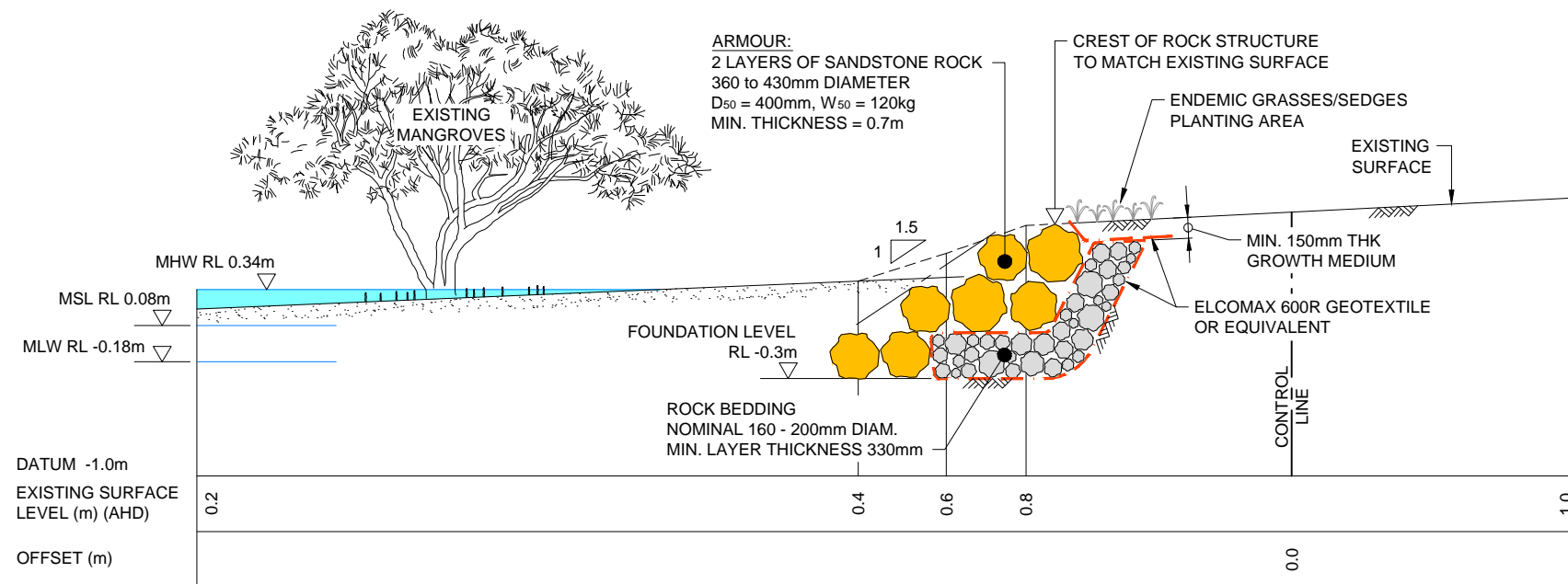
HASKONING AUSTRALIA PTY LTD SYDNEY
Royal HaskoningDHV
Suite 5, Level 5
100 Walker Street
North Sydney NSW 2060
+61 2 9854 5000 Telephone
+61 2 98207960 Fax
www.royalhaskoning.com Internet

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AUTOCAD REF. 8A0400-MA-SECTIONS
SCALE AT A1 1:25

DRAWING No. 8A0400/MA/0011 REVISION B



BEACH TREATMENT SECTION 5
SCALE 1:25

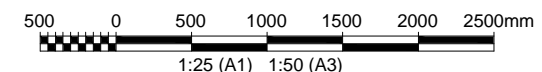


ROCK TREATMENT SECTION 4
SCALE 1:25

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REVISIONS



CLIENT: GOSFORD CITY COUNCIL
PROJECT: FORESHORE STABILISATION CAPTAIN COOK RESERVE GREEN POINT

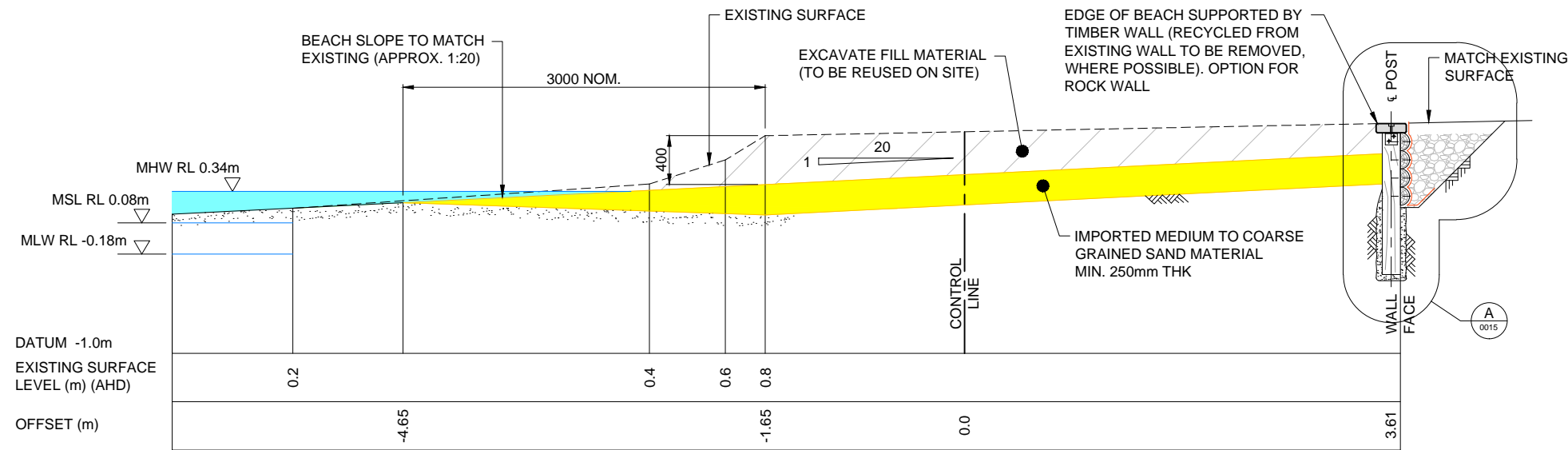
DRAWING TITLE: DESIGN SECTIONS SHEET 3

HASKONING AUSTRALIA PTY LTD SYDNEY
Royal HaskoningDHV
Sutherland NSW 2000
North Sydney NSW 2060
+61 2 9854 5000 Telephone
+61 2 98207660 Fax
www.royalhaskoning.com Internet

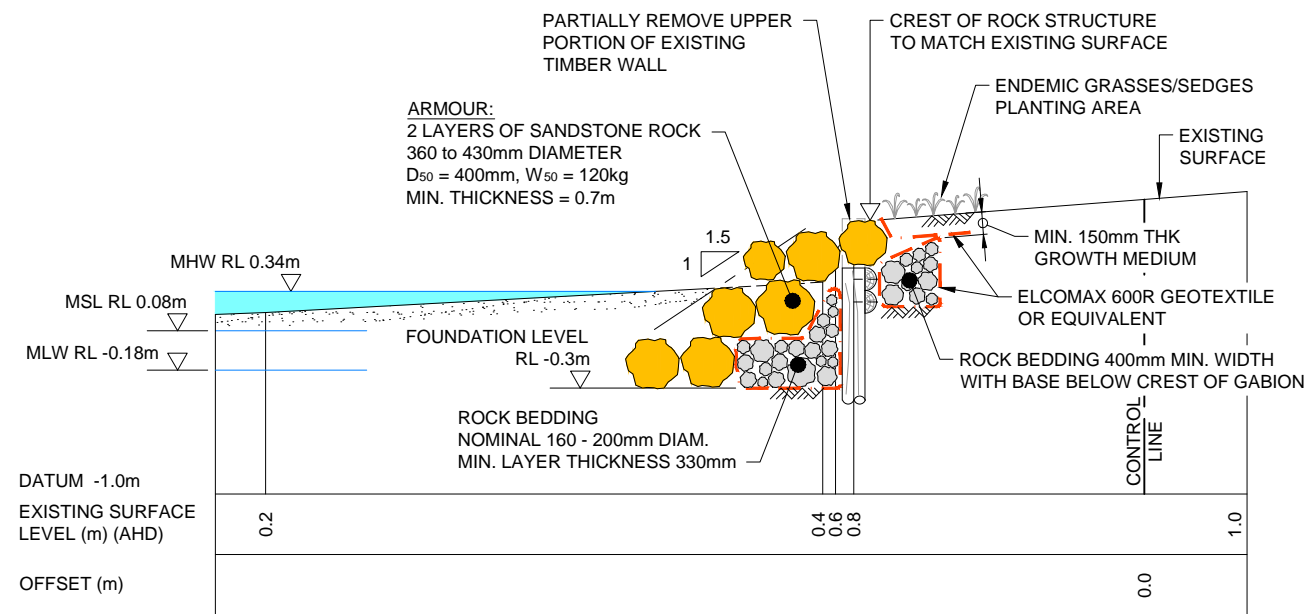
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AUTOCAD REF. 8A0400-MA-SECTIONS		
SCALE AT A1 1:25		
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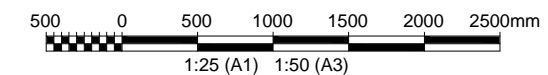


BEACH TREATMENT SECTION 7
SCALE 1:25



ROCK TREATMENT SECTION 6
SCALE 1:25

NOT FOR CONSTRUCTION



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REVISIONS

CLIENT:

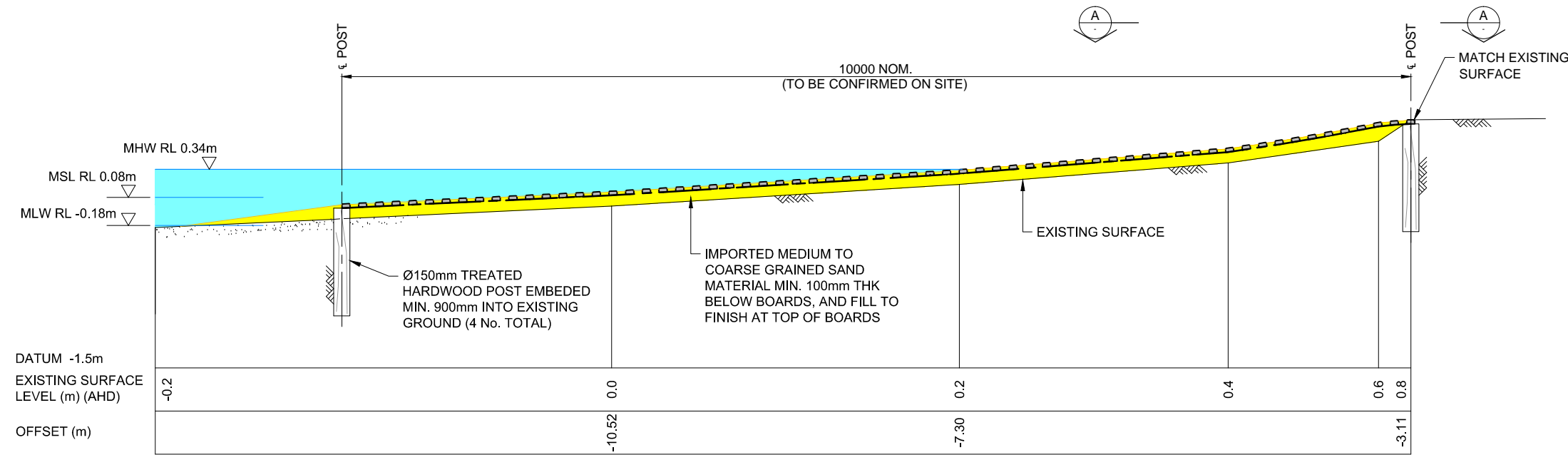
PROJECT: **FORESHORE STABILISATION CAPTAIN COOK RESERVE GREEN POINT**

DRAWING TITLE: **DESIGN SECTIONS SHEET 4**

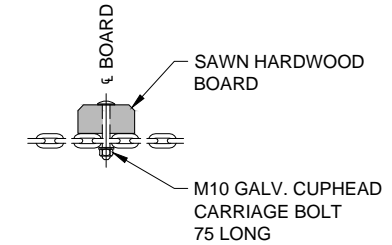
HASKONING AUSTRALIA PTY LTD SYDNEY

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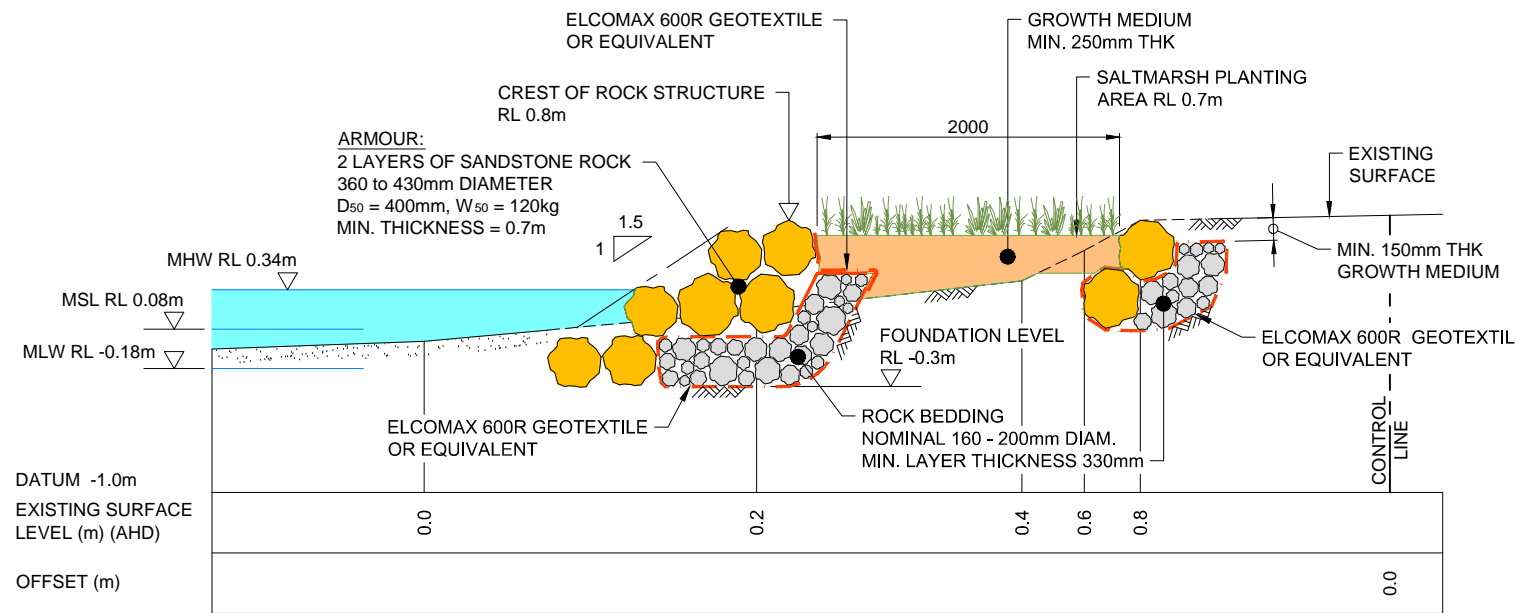
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AUTOCAD REF. 8A0400-MA-SECTIONS		
SCALE AT A1 1:25		
DRAWING No. 8A0400/MA/0013	REVISION B	



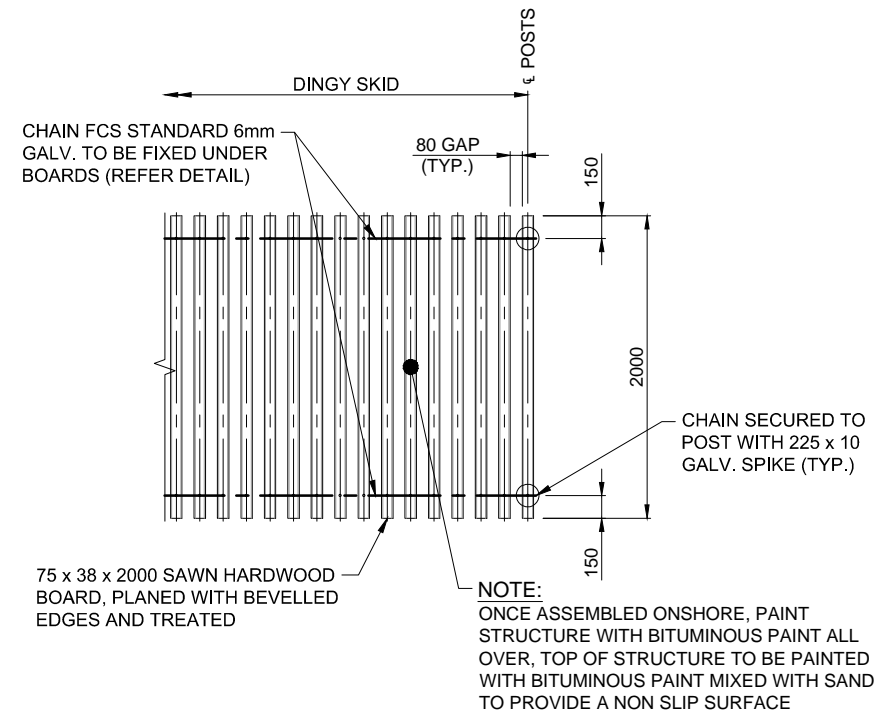
DINGY SKID
SECTION 9
SCALE 1:25



TYPICAL CHAIN FIXING DETAIL
1:5 (A1)



SALTMARSH BERM TREATMENT
SECTION 8
SCALE 1:25



TYPICAL PLAN ON DINGY SKID

SECTION A
1:25 (A1)

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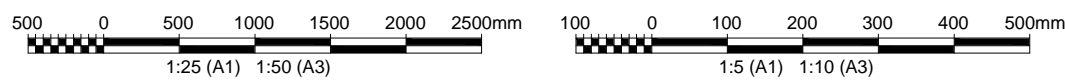
PROJECT:
FORESHORE STABILISATION
CAPTAIN COOK RESERVE
GREEN POINT

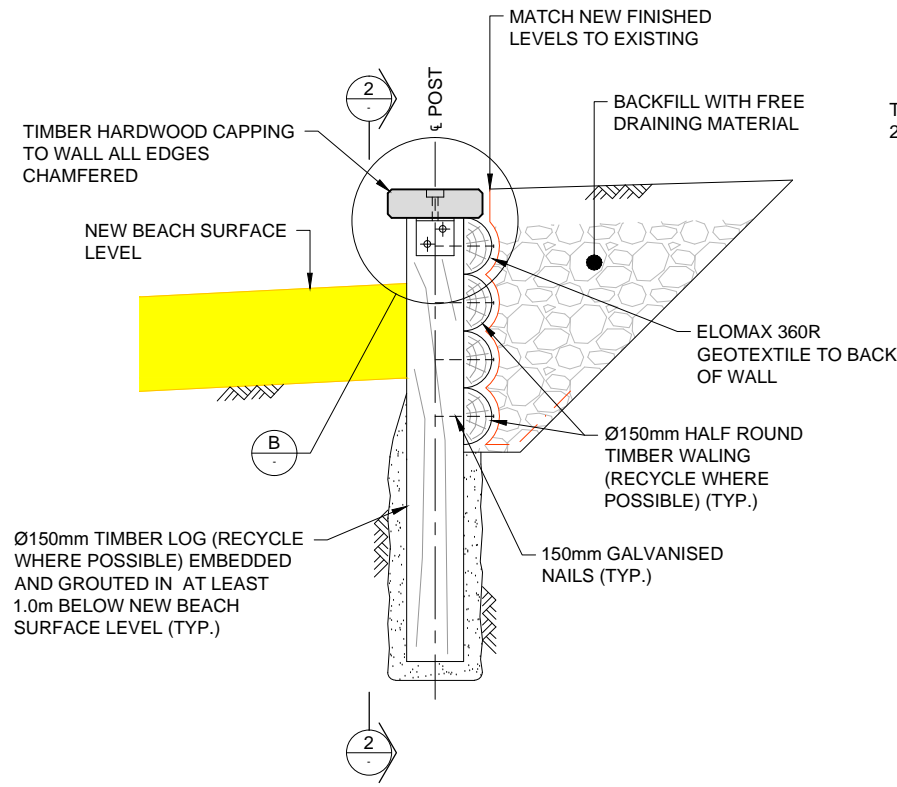
DRAWING TITLE:
DESIGN SECTIONS
SHEET 5

HASKONING AUSTRALIA PTY LTD
SYDNEY
Royal HaskoningDHV
Sustainable Infrastructure
Suite 5, Level 5
100 Walker Street
North Sydney NSW 2060
+61 2 8854 5000 Telephone
+61 2 9620 9950 Fax
www.royalhaskoning.com Internet

DRAWN ADS	DATE 27/06/2014	JOB No. 8A0400
AUTOCAD REF. 8A0400-MA-SECTIONS		
SCALE AT A1 1:25, 1:5		
DRAWING No.	8A0400/MA/0014	REVISION
		B

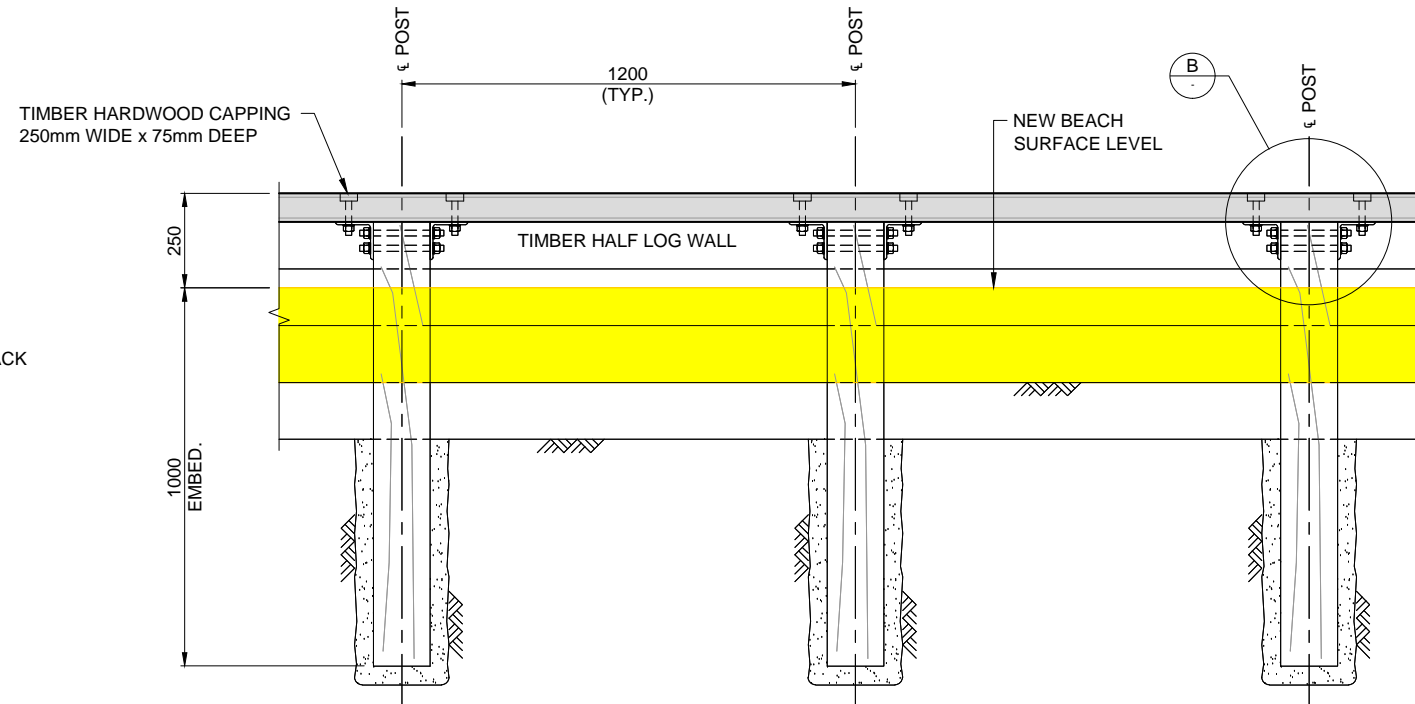
NOT FOR CONSTRUCTION





TYPICAL TIMBER WALL SECTION

DETAIL 1:10 (A1) A 0011 A 0012 A 0013



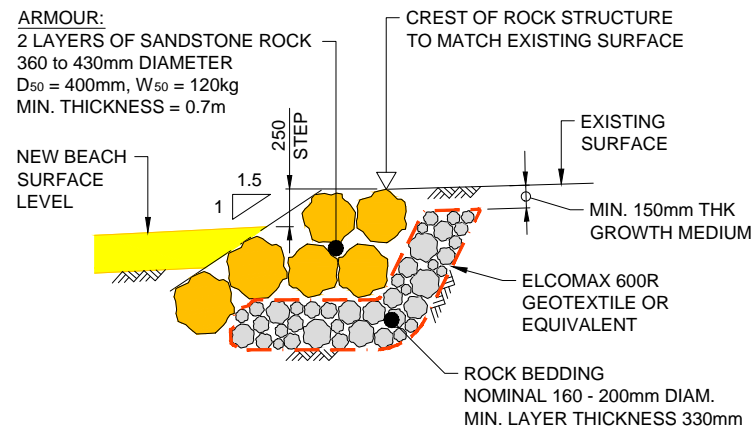
TYPICAL TIMBER WALL ELEVATION

SECTION 2 1:10 (A1)

GENERAL NOTES:

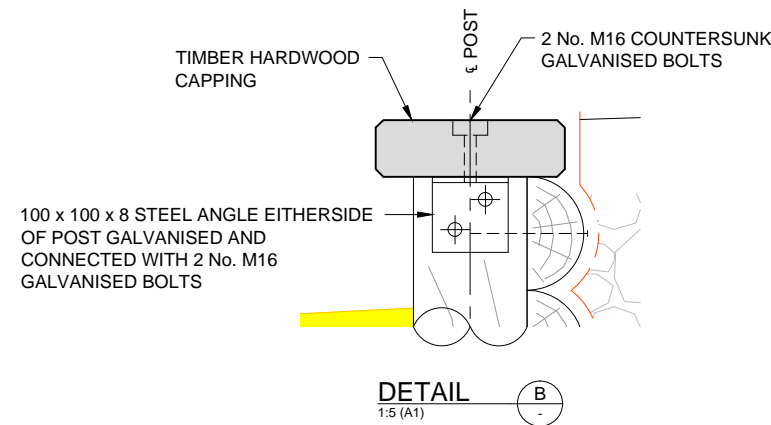
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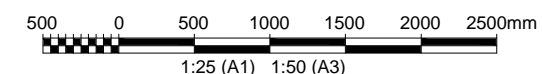
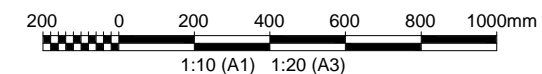
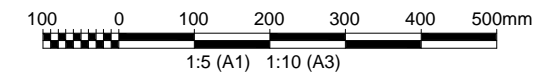


ROCK WALL OPTION AT NEW BEACH

SCALE 1:25



DETAIL B 1:5 (A1)



REV	DATE	DESCRIPTION	BY	CHK	APPD
B	27.06.14	ISSUED FOR FINAL REVIEW	ADS	BM	GB
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REVISIONS



PROJECT:
FORESHORE STABILISATION
CAPTAIN COOK RESERVE
GREEN POINT

DRAWING TITLE:
DESIGN SECTIONS
DETAILS



DRAWN ADS	DATE 27/06/2014	JOB No. 8A0400
AUTOCAD REF. 8A0400-MA-SECTIONS		
SCALE AT A1 1:25, 1:10, 1:5		
DRAWING No. 8A0400/MA/0015	REVISION B	

M.G.A.



WATER

BRISBANE

2

'MUD FLATS'

CONCRETE RUBBLE
(1m & 2m SQUARE SLABS)

TIMBER JETTY
IN DISREPAIR

STONE & CONCRETE
JETTY

MANGROVE

90mm P.V.C. STORMWATER
OUTLET RL=0.53 AHD

DINGHY STORAGE
RACKS

CONC. BASE

DINGHY STORAGE
RACKS

CONC. LIDED PIT

PIPE OUTLET
0.96 I.L.=0.28 AHD

SEWER MANHOLE
BE/5

COUNCIL SEWER MAIN

SEWER MANHOLE
BE/4

STATION 243
DRILL HOLE IN SOUTHEAST EDGE
OF SEWER MANHOLE RIM
EASTING 347421.263
NORTHING 6297603.003
RL = 1.324 AHD

OPEN GRASS AREA

CAPTAIN COOK RESERVE

'MUD FLATS'

RECENT TIMBER LOG

SEA WALL

TIMBER LOG SEA WALL

TIP OF

THREE OUTLETS
90mm P.V.C. STORMWATER
OUTLET RL=0.64 AHD

CONCRETE
BOAT RAMP

CONCRETE
BOAT RAMP

CONCRETE BLOCK
BRICK SEA WALL

GROVE OF
MANGROVE
TREES

STATION 16
DRILL HOLE IN CENTRE OF
CONCRETE PAD AT RAMP
EASTING 347355.816
NORTHING 6297551.641
RL = 0.910 AHD

SEWER MANHOLE
(SCALED ONLY)

STATION P.M. 21290
STAINLESS STEEL PIN IN BOX
UNDER GRASS
EASTING 347425.423
NORTHING 6297548.151
RL = 1.587 AHD

BAYSIDE DRIVE

CAUTIONS:

- 1) THIS SURVEY HAS BEEN PREPARED FOR THE PURPOSE OF DETAIL & CONTOUR ONLY. THE LOCATION OF ANY FENCING OR STRUCTURE IN RELATION TO THE BOUNDARIES HAS NOT NECESSARILY BEEN EXACTLY DETERMINED.
- 2) UTILITY SERVICES SHOWN HAVE BEEN LOCATED BY SURVEY WHERE THEY ARE VISIBLE AND APPARENT. HOWEVER, THE APPROXIMATE POSITION OF UNDERGROUND SERVICES MAY HAVE ALSO BEEN PLOTTED FROM UTILITY AUTHORITY PLANS, AND THIS PLAN MUST BE READ IN CONJUNCTION WITH THE RELEVANT UTILITY AUTHORITY PLANS.
- 3) THE LOCATION OF SERVICES ARE TO BE VERIFIED BY OBTAINING CURRENT INFORMATION FROM "DIAL BEFORE YOU DIG" (PHONE 1100) PRIOR TO DESIGN/CONSTRUCTION WORKS. ALTERNATIVELY, THE EXACT LOCATION OF SERVICES SHOULD BE DETERMINED BY FIELD SURVEY IN CONSULTATION WITH THE SERVICE AUTHORITIES WHERE DEEMED NECESSARY.

www.dialbeforeyoudig.com.au



SEE SHEET 1

SEE SHEET 1

CAD FILE: 6907_DET.dwg
THIS PLOT: 28-04-2014 10:54
REFERENCE: 6907.000

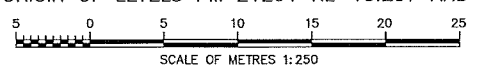
SCALE: 1:250 @ A1 SHEET

STEPHEN THORNE AND ASSOCIATES PTY LTD

CONSULTING SURVEYORS
48 MANN STREET, GOSFORD, 2250
Phone (02)4323-1255 Facsimile (02)4324-2226
P.O. BOX 1315 GOSFORD NSW 2250
A.C.N. 057 514 860 A.B.N. 51 057 514 860

DETAIL AND CONTOUR SURVEY OVER
PART LOT 1 D.P. 215684
CAPTAIN COOK RESERVE, GREEN POINT

ORIGIN OF LEVELS PM 21291 RL=10.297 AHD



amendments

PLAN NUMBER
6907

ISSUE
A

DATUM: Australian Height Datum

DATE
29/04/2014

SHEET 2 OF 2 SHEETS

APPENDIX E

Cost Estimate

Customer **Gosford City Council**

Project title **Foreshore Stabilisation, Captain Cook Reserve, Green Point**

Proj No. **8A0400**



HASKONING AUSTRALIA
MARITIME & WATERWAYS

REVISION	A
DATE	19/06/2014
BY	BSM
CHECKED	GPB 3/7/14

Disclaimer: This cost estimate includes construction cost, and minor allowances for growth in scope. The estimate is based on Royal HaskoningDHV's experience and judgement as a firm of practising professional engineers familiar with the construction industry. The quantities have been estimated from the latest revision of desing drawings, dated August 2013, by Royal HaskoningDHV. The construction cost estimate can NOT be guaranteed as we have no control over Contractor's prices, market forces and competitive bids from tenderers. The construction cost estimate may exclude items which should be considered in a cost plan. Examples of such items are design fees, site investigation fees, project management fees, authority approval fees, contractors risk and all project contingencies (e.g. to account for construction and site conditions, weather conditions, ground conditions and unknown services).

Capatain Cook Reserve Foreshore Stabilisation

Item	Description	Quantity	Unit	Rate (\$)	Cost (\$)
1	Site Establishment	-	Item	LS	\$10,000
2	Survey				
2.1	Preconstruction survey	-	Item	LS	\$3,500
2.2	Setting out construction works	-	Item	LS	\$1,500
2.3	Post-construction survey	-	Item	LS	\$3,500
3	Installation/Maintenance of Environmental Control Provisions	-	Item	LS	\$5,000
4	Demolition	-	Item	LS	\$10,000
5	Gabion Wall Remediation (CH 0-11)				
5.1	Sand stone cobbles D50=50 to 250mm (supply and place)	65	t	\$100	\$6,546
5.2	Reused sand stone blocks	13	m ³	\$150	\$1,950
5.3	Geotextile (supply and place)	50	m ²	\$8	\$400
5.4	Rock bedding D50 = 160 to 200mm (supply and place)	3	t	\$100	\$300
5.5	1m planting behind wall (endemic grassess/sedges)	11	m ²	\$15	\$165
6	Rock Treatment (CH 19-66, 92-116, 151-171, 199-217, 243-252)				
6.1	Earth works (excavation/onsite reuse)	270	m ³	\$20	\$5,400
6.2	Geotextile (supply and place)	490	m ²	\$8	\$3,920
6.3	Rock bedding 160 to 200mm (supply and place)	120	t	\$100	\$12,000
6.4	Sandstone rock D50 = 360 to 430mm (supply and place)	355	t	\$150	\$53,250
6.5	1m planting behind wall (endemic grassess/sedges)	118	m ²	\$15	\$1,770
7	Saltmarsh Berm Treatment (CH 217-235)				
7.1	Earth works (excavation/onsite reuse)	60	m ³	\$20	\$1,200
7.2	Geotextile (supply and place)	100	m ²	\$8	\$800
7.3	Rock bedding (supply and place)	21	t	\$100	\$2,100
7.4	Sandstone rock (supply and place)	57	t	\$150	\$8,550
7.5	Growth medium	20	m ³	\$60	\$1,200
7.6	Salt marsh Plants (4 plants/m2)	45	m ²	\$20	\$900
7.7	1m planting behind wall (endemic grassess.sedges)	20	m ²	\$15	\$300
8	Beach Treatment (CH 66-92, 132-151, 171-185)				
8.1	Earth works (excavation/onsite reuse)	208	m ³	\$20	\$4,160
8.2	Washed Sand medium to coarse grained (supply and place)	125	m ³	\$50	\$6,250
8.3	Vertical logs (150mm diameter)	103	m	\$100	\$10,300
8.4	Horizontal half logs (150mm diameter)	376	m	\$50	\$18,800
8.5	Capping (250 x 75mm)	70	m	\$50	\$3,500
8.6	Geotextile (supply and place)	135	m ²	\$8	\$1,080
8.7	PVC piping (180mm diameter)	19	m	\$60	\$1,140

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Item	Description	Quantity	Unit	Rate (\$)	Cost (\$)
8.8	Backfill (supply and place)	11	m3	\$40	\$455
8.9	Rock bedding	2	t	\$100	\$200
8.10	Reused sand stone blocks	0.5	m ³	\$150	\$75
9	Dingy Skid (CH 235-243)				
9.1	Sand medium to coarse grained (supply and place)	14	m ³	\$40	\$560
9.2	Hardwood posts 150mm diameter	4	m	\$100	\$400
9.3	Chain/timber dingy skid base	23	m ²	\$150	\$3,450
10	Site Disestablishment	-	Item	LS	\$5,000

Subtotal	\$189,621
10% Growth in Construction	\$18,962
10% Contingency	\$18,962
TOTAL	\$227,546