City Pacific Limited

Townsville Ocean Terminal Construction Methodology Report

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Contents

Executive Summary

The preferred construction methodology proposed for formation of engineered fill land platforms and waterways within the TOT Project will be by initial construction of new permanent breakwaters and temporary bunding to encapsulate the site, de-watering and progressive reclamation of land by excavation of canal areas utilising materials within the site. Existing external licensed rock and sand material sources. The construction methodology stages and sequencing to be employed for the overall Project is detailed and described in Section 2.1. Standard equipment suitable for the methodology is expected to be used.

The preferred method for import of rock, sand and engineered fill is for material to be delivered to the project site by road registered trucks from Roseneath, Pinnacle and Marathon Quarries via Boundary Street to a temporary bridge crossing of Ross Creek.

Three other options have been considered for delivery of material to the project site. Two include haulage of material through town (either via The Strand or via Bundock/Warburton Street) directly to the project site during the first stage of construction. During latter construction stages, transport will be via Boundary Street to a temporary stockpile location at the Barge Point site and delivery to the project site by barge.

The proposed material import and export arrangements including details of the proposed transport options, proposed haul routes and haulage schedule are described in Section 5 of this report along with the alternative options considered. The materials to be stockpiled and stockpile methods are described throughout the report and are discussed in Section 5.2.3

Construction traffic will include construction contractors and staff private vehicles and heavy vehicles used in delivery of construction materials. Vehicle types and frequency are described in Section 5.2.2. Construction haulage routes are the same as those proposed for transport of rock and sand material.

Any hazardous materials required to be transported to or from the project site during construction will be appropriately handled to prevent release to receiving environments. Vehicles required to transport hazardous materials will be appropriately licensed to carry such materials. Hazardous materials that may be transported to or from the Project are identified and management measures for handling these materials are provided for..

It is anticipated the TOT project will be constructed over a 39 month period beginning in March 2008. The proposed phases of development, corresponding construction periods and construction working areas are outlined in detail in Section 2.4

Construction of the TOT project is expected to provide employment for between 50 and 300 persons in any one year for a period of three years (approximately 440 positions over three years). It is likely that a further 175 to 200 persons would be employed in construction of private residential dwellings in any one year over a period of four years following completion of the project (approximately 760 positions over four years).

The construction workforce will predominantly be sourced from the local construction industry. Construction employees are expected to be transported to the site by normal public or private transport means given the site accessibility.

Pollution control methods for control of noise, air and water emissions as well as preventing dispersal of waste and spilled material will be achieved by implementation of the project EMP.

Temporary works associated with construction will include a site construction compound, temporary fencing and bunding and the temporary bridge.

Safe Navigation of the Port of Townsville and surrounding waterways will be maintained during construction activities. Once construction vessels and equipment are in place within the site, all works will be conducted outside the main Port channel and navigational markers.

In the event of a cyclone occurring during construction works, all works on the site will cease and standard damage mitigation measures will be undertaken to secure vehicles property and material.

Sustainable engineering solutions will be implemented to reduce the resource consumption during construction of the TOT project. These solutions will focus on resource efficiency including efficient use of energy, water and materials during construction. These solutions have been incorporated into the project EMP.

Capital dredging is required for creation of the TOT berth pocket and swing basin together with the outer access channel. Material to be dredged consists of soft organic clay and stiff/clay material. Dredging and material disposal will be timed to avoid impacts on marine fauna species as recommended by the Nature Conservation Report. Dredging and dredge material disposal is addressed in detail in Section 2.10.

The Townsville Ocean Terminal Project involves works in tidal waters; these works are described as tidal works in the Coastal Protection and Management Act and Coastal Protection and Management Regulations.

The TOT Precinct and Breakwater Cove Precinct are described in detail in Section 3 and Section 4 respectively including all buildings and structures, site access arrangements, traffic management and service provision.

Extraction of material to be used for fill of the TOT project site during site reclamation is no longer proposed to be undertaken from within nearby riverine sediments. Material required for fill will now be sourced from existing licensed extraction operations. Material delivery options and alternatives are discussed in Section 5.

It is considered that the construction of the TOT Project can be undertaken without significant impacts on environmental values in accordance with the recommendations of specialist studies and investigations.

1 Introduction

Hyder Consulting Pty Ltd (Hyder) was commissioned to develop a construction methodology for works internal to the project site for the development of the Townsville Ocean Terminal (TOT) Project.

1.1 Project Description

The site proposed for development of the TOT Project is located adjacent to the Townsville Hotel and Casino Complex and the Townsville Entertainment Centre as identified in the Breakwater Island Casino Agreement Act (BICA) as the "Future Development Area". This area is identified in the context of the surrounding area on Drawing K200–QL00704-01 and is bounded by the Port Western Breakwater, the existing Offshore Breakwater and the Townsville Hotel and Casino Complex and the Townsville Entertainment Centre Peninsula. The TOT project is the reclamation of land to the north of Sir Leslie Thiess Drive for development of two precincts –

(1) The TOT Precinct: will be developed for construction of a dedicated ocean terminal and ancillary facilities for use by cruise ships and naval vessels; and

(2) The Breakwater Cove Precinct: a residential area providing for a range of uses including apartments, attached dwellings, detached dwellings, commercial and retail facilities services, landscaping and public utilities.

The project site is located within the State waters of Cleveland Bay, which supports species, communities and habitats of conservation significance under State and Commonwealth legislation. The site is within the Great Barrier Reef World Heritage Area but is excluded from the Great Barrier Reef Marine Park as it is located within Port of Townsville limits.

The construction methodology has been developed to ensure environmental values are protected during site reclamation works and construction of the terminal building and wharf structure.

2 PART A: CONSTRUCTION METHODOLOGY AND SEQUENCING

2.1 Construction Methodology

The construction methodology has been based on the following primary objectives for the TOT Project.

- To deliver a dedicated berthing facility in Townsville for the growth of the Cruise Shipping Industry and to encourage additional visits to Townsville by USA and Australian Military vessels through the provision of this dedicated berthing facility.
- To provide a high quality residential/marina development within the Project to provide an alternative urban residential mix, encourage investment within the city centre, as restaurant/entertainment facilities and support services will be required for the residential community.
- To generate employment within the service industries as well as capital investment in the city centre.
- To implement ESD principles into all aspects of the development.
- To set up appropriate management structures to minimise any future impact on the State or local community with respect to the management and maintenance of the TOT Project.
- To implement best practice environmental management procedures during design construction and operational phases of the project.
- To provide improved carparking for the Townsville Entertainment Centre and Townsville Hotel and Casino complex.
- To deliver high quality residential investment and living opportunities for waterfront residences with attached Marina berths on the Townsville mainland.
- To comply with all Commonwealth, State and Local Government environmental standards in the approval, construction and operation of the TOT Project.
- To work with Local Government and other relevant authorities to ensure minimisation of social and economic impacts and for the respective Management of any such impacts as the Project develops.
- To maintain open community involvement and communication with all Stakeholders throughout the life of the Project.
- To ensure protection of environmental values identified during site investigations.

Hyder has also reviewed the extensive environmental assessments that have been undertaken to satisfy the terms of reference for the TOT Project to ensure the development of the methodology is cognisant of the environmental values of the area.

In simple terms, the preferred construction methodology proposed for formation of engineered fill land platforms and waterways within the TOT Project will be by progressive reclamation of land utilising materials within the site, contained by breakwaters of rock material exported from existing external licensed rock and sand material sources.

2.1.1 Alternative Construction Methods

Alternative construction methods were considered prior to selection of the preferred methodology. Two alternatives were considered and are described below.

Alternative 1: Dredged sand for site reclamation

Typical methods for reclamation of wet sites were considered by dredging of adjacent marine bed sediments for sourcing of suitable fill materials. This method was discounted due to unavailability of suitable volumes of sand in close proximity of the site and potential impacts on environmentally sensitive areas.

Alternative 2: Imported sand and landfill materials

A hybrid method was considered to retain materials within the site by preloading landfill areas using stable inert materials. This option was discounted due to unavailability of suitable volumes of sand in close proximity of the project site. This alternative also required removal of preload material off site at the completion of works and significant impacts from haulage of materials.

2.2 Preferred Construction Method

The fundamental construction elements to be created during construction of the TOT Project are illustrated on Methodology Drawing K202-QL00703-01 Key Construction Elements. Construction will proceed generally as described in the following 25 Step methodology and sequencing, which where relevant, will be further illustrated by the explanatory Methodology Drawings attached in Appendix A. More detailed Design Drawings are contained in Appendix B.

Construction of the TOT terminal building and detailed civil engineering and other infrastructure services to the Breakwater Cove Precinct will follow the land reclamation formation.

Step 1 – Access Haul Road and Hardstand Area

AS the undeveloped site is wholly below water (see Undeveloped Site Plan K201-QL00704-01), creating construction vehicle access and a workable area is a primary concern.

An internal access haul road and hardstand area will be constructed within the site, (refer to Methodology Drawing K203-QL00704-01 Step 1 Hardstand and Haul Road Bund), by creation of a trafficable rock bund wall running adjacent to the existing Port Western Breakwater, Northern Breakwater and the hardstand area will be generally located in the position of the future carpark adjacent to the Townsville Entertainment Centre. The access haul road will be created as a bund to serve as waterproof barriers between the project site and surrounding waterways through incorporation of a water barrier membrane such as, High Density Polyethylene (HDPE) / NAVE membrane. A typical haul road construction bund is illustrated in Design Drawing K218-QL00704-01.

Quarry rock material will be used in construction of this access haul road. The volume of rock material will include 54,774 m^3 of 1-tonne rocks and 226,114 m^3 of crushed rock. One-tonne rocks will be used to form the base layer of the bund walls to penetrate the soft upper layer of the waterway bed, containing dark grey silty/clay, clayey silt with some sandy zones (“soft clay layer”) and will found on the underlying stiff clay.

Once rock material is delivered to the site it will be tipped into place either directly from the truck or stored in stockpiles. It is proposed stockpiles will be provided generally within the designated stockpile area as shown on Methodology Drawing K203-QL00704-01 Step 1 Hardstand and Haul Road Bund. The stored material will be removed from the stockpile area and then transported into place by excavator, truck or barge within the TOT project site.

Step 2 – Perimeter Breakwater Construction

Construction of the Strand Breakwater, a Northern Breakwater extension and Northern Breakwater remediation will be undertaken during Step 2. The locations of breakwaters are shown on Methodology Drawing K204-QL00704-01 Step 2 Perimeter Breakwater Construction.

The size and quantity of rock material used for breakwater construction is detailed in Table 1.

Table 1: Rock materials used in breakwater profiles

Rock Size	Quantity	Breakwater Profile
0.25-1 tonne rock	156,473 m^3	corefill
2 tonne rock	33,789 m^3	rear slope armour
4 tonne rock	6,279 m^3	seaward buttress
1 tonne rock	12,928 m^3	seaward slope armour
250 kg rock	36,151 m^3	filter rock
1-6 tonne rocks	12,772 m^3	seaward primary armour
2 tonne rock	1,314 m^3	toe beam
2 tonne rock	12,438 m^3	primary armour

In general, corefill material will be placed to form the inner layer of the breakwaters. A layer of High Density Polyethylene (HDPE) water proofing membrane will be placed against the corefill material where required. Armour rock is placed to form the outer layers of the breakwaters. The profiles of these breakwaters are illustrated on Design Drawing K219-QL00704-01 Breakwater Sections.

Placement of rock material onto the breakwaters will be undertaken by an excavator or loader located on the breakwaters. Incorporation of a HDPE / NAVE membrane will enable these breakwaters to act as waterproof barriers between the project site and surrounding waterways.

Step 3 – Temporary Construction Bunds

In order to encapsulate the site for dewatering, a temporary bund will be constructed between the Strand Breakwater and the termination of the access road in the northwest corner of the site (Refer to Methodology Drawing K205-QL00704-01 Step 3 to 5 Construction Bunds). This temporary bund will assist in isolating the construction site from the adjacent waterways. This bund will be constructed using 2,400m^3 of 1-tonne rocks and 9,600 m^3 of crushed rock.

Additional temporary bunds will be positioned between the Strand Breakwater and the Northern Breakwater (Refer to Methodology Drawing K205-QL00704-01 Step 3 to 5 Construction Bunds) to complete the site encapsulation or isolation. These bunds will be constructed of 6,030 m3 of 1-tonne rocks and 24,117 m3 of crushed rock. This will consist of 1-tonne

rocks to be used to form the base layer of the bund to penetrate the soft clay material and found on the stiff clay.

Construction of the Step 2 breakwaters with the temporary construction bunds will provide bunding of the entire site to retain the soft material layer of the existing waterway bed or soft clay material and prevent uncontrolled discharges to Cleveland Bay during construction.

Step 4 – Construct Terminal Haul Road Bund

A second trafficable rock haul road bund wall will be constructed between the access haul road bund constructed during Step 1 and the Port Western Breakwater to separately identify the final wall alignment of the terminal berth (Refer to Methodology Drawing K205-QL00704-01 Step 3 to 5 Construction Bunds Key Element 4). This terminal haul road bund will require 13,650 m^3 of 1-tonne rock and 64,474 m^3 of crushed rock for construction. Once this bund wall is created, the TOT precinct can then be constructed in concurrently with the rest of the site.

Step 5 - Sheet Pile Future Land Area

Remaining perimeter areas in the northwest corner of the site will be sheet piled to close off the parkland area using some 205 lm – 15 m lengths of sheet pile material. Sheet piles will be protected with 12,371m^3 of crushed rock and 3,907m^3 of 2-tonne primary armour rock. A construction rock bund will be placed between the main haul road bund and the northern breakwater for creation of a water treatment area. This is shown as the temporary flocculent bund on Methodology Drawing K205-QL00704-01, Step 3 to 5 Construction Bunds.

Step 6 – Site Dewatering

The site will be dewatered following construction of breakwaters, temporary bund walls and sheet piling by installation of spear pumps within the perimeter of the encapsulated area. Dewatering will be undertaken progressively and water will be treated via a series of settlement ponds prior to discharge of water to surrounding waterways. Dewatering will proceed in accordance with the recommendations contained in the Geotechnical Report and the Water Quality Report contained in the EIS.

Full dewatering will not occur within the berth pocket and the Terminal Haul Bund due to the removal of part of the existing Port Western Breakwater in Step 11. In the event that an artesian water lense is encountered, this will be managed by installation of localised sumps within the work cell areas, (Refer to Methodology Drawing K206-QL00704-01 Step 6 Site Dewatering).

Step 7 – Excavation Treatment from Soft Layers to Storage Areas

Once the site is dewatered, the soft clay from Canal C and the intended temporary flocculent area will be removed down to the stiff clay layer by excavator and trucked by Rigid Dump Trucks. Part of this material will be placed within the temporary storage area in the northern corner of the site.

Geotextile fabric will be laid over the existing soft clay within the future parkland area. Then a 500mm layer of sand (8,440 m^3) will be introduced for wick drain dewatering. Further soft clay material will be excavated from the TOT terminal precinct and will be laid over the sand layer in the Future Parkland Area.

Soft clay from inside the berth pocket area will be removed down to the stiff clay layer by excavator and trucked by Rigid Dump Trucks for continuing fill of the remaining parkland areas to complete filling to RL2.6m. Refer to Methodology Drawing K207-QL00704-01 Step 7 Excavation Treatment from Soft Layers to Storage Areas.

Step 8 - Commencement of Clay Recovery and Revetment Wall Construction

The Breakwater Cove precinct will be progressively excavated, filled and backfilled until completion of land reclamation areas to the required design levels. Temporary bunds will be used within the Breakwater Cove precinct and progressively relocated across the site to create working cells for excavation of soft clay and stiff clay.

Each “working cell” is generally a future land platform area and a canal area. Within each cell, soft clay will be either pushed by dozer or loaded by excavators into Rigid Dump Trucks for either storage or permanent placement in an excavated canal trench. The excavation of the clay material will be undertaken progressively within each working cell identified on the construction sequence drawings.

Land reclamation will be created by the excavated stiff clay being relocated to the landform site in controlled stiff clay compaction in maximum layers of 300mm to 95% compaction with a maximum soil moisture content of 20 to 25% and to a maximum height of RL 2.6m.

A pre-cast revetment wall system will then be placed at the perimeter of the land platform fingers. The revetment wall system will be complete with drainage membrane, engineered backfill and soil retention anchor system. Rock armour protection will be placed at the toe of revetment walls using 29,619.m^3 of 50 to 250kg rocks. Land areas will then receive 900mm of engineered fill (292,548 m^3) to achieve final levels of RL 3.5m. Fill material will be offloaded onsite for storage within the designated stockpile area and

will be trucked by Rigid Dump Trucks to the final placement areas when required.

The construction sequencing for the TOT project site will follow this general progression of the landforms from north to south across the project site. At the same time as the later construction are progressing for one cell, there will be other construction sequence steps occurring in other cells or on the TOT Precinct. To identify concurrent activities, refer to Methodology Drawing K208-QL00704-01 Step 8 and Step 9. To "step out" the methodology however, each will be explained individually.

In Step 8, a temporary flocculent area is created, stiff clay layers (exposed after Step 7) in Canal Area C are placed in the Landform 4 Area. Imported engineered fill material will be placed in the Future Parkland Area.

Step 9 – Commence Berth Pocket Clay Recovery

Stiff clay from within the terminal berth pocket (120,023 m^3) will be excavated and material transferred to terminal building precinct. Refer to Methodology Drawing K208-QL00704-01 Step 8 and Step 9.

Step 10 – Continue Clay Recovery and Revetment Wall Construction

Soft clay material will be excavated from Canal B and Landform 3 and placed in Canal C.

Engineered fill will be imported and placed in Landform 4 and the TOT Precinct.

The northern parkland area will be finished to a final profile of RL3.5m AHD. Refer to Methodology Drawing K209-QL00704-01 Step 10 and Step 11.

Step 11 – TOT Berth Pocket Works

The wharf piling will then be constructed from a barge mounted piling rig. Rock armour protection will be placed at the toe of the wharf embankment by clamshell excavator. Wharf pre-cast headstocks and decking will be placed via land based 40t crane to complete the wharf structure. Refer to Methodology Drawing K209-QL00704-01 Step 10 and Step 11.

The portion of the existing Port Western Breakwater directly in front of the berth pocket will then be removed by clam shell and conventional excavators. The excavated rocks will be available for re-use and subject to TPA consent can be barged for final placement at Mariners Peninsula and on the northern side of the

Northern Breakwater. Alternatively, their relocation will be discussed with the TPA See Plate 3.4.8 - Methodology Drawing K209-QL00704-01.

Step 12 – Continue Clay Recovery and Revetment Wall Construction

Stiff clay will be excavated from Canal B and placed in engineered fill to form Landform 3. Landform 4 will be finished to a final profile of RL 3.5m AHD. The TOT Precinct will then be finished to a final profile of RL 3.5m AHD. Refer to Methodology Drawing K210-QL00704-01 Step 12 to Step 14.

Step 13 – Final Clay Removal from the Berth Pocket and Swing Basin

Stiff clays from below the removed rocks of the Port Western Breakwater (109,610 m^3) and within the berth pocket will be excavated for creation of the swing basin (145,942 m^3) by cutter suction dredge. These materials are considered unsuitable for reuse on site and will be removed to a suitable disposal site. Refer to Methodology Drawing K210-QL00704-01 Step 12 to Step 14.

Step 14 – Dredge Future Marina Outer Access Channel

Approximately 15,433 m^3 of material will be dredged from within the outer entry access channel to be deposited in Canal B within the project site. This material will be removed by cutter suction dredge and deposited within the excavation pit. Refer to Methodology Drawing K210-QL00704-01 Step 12 to Step 14.

Step 15 – Continue clay recovery from Canal A and Import Engineered fill to Landform 3

Soft clay material will be excavated from Canal A and Landform 2 and removed to the excavation pit in Canal B. Imported engineering fill will be placed within Landform 3 to achieve a final profile of RL 3.5m AHD. Refer to Methodology Drawing K211-QL00704-01 Step 15 and Step 16.

Step 16 – Bridge 3 Construction

Bridges within the Breakwater Cove Precinct will be constructed in dry site conditions with piles being driven by conventional means. Rock scour protection consisting of 24m^3 of 2-tonne rock will be placed by excavator at the base of the piling. Headstocks and decking will be placed on bridges via 40t crane and handrail installed at completion of the rock protection works.

For the proposed bridge construction sequence, refer to Methodology Drawing K211-QL00704-01 Step 15 and Step 16.

The indicative bridge elevations and cross sections are shown on Design Drawings S001-QL00704-01 to S003-QL00704-01.

Step 17 – Clay Recovery from Canal A

Stiff clay from Canal A will be excavated and placed on Landform 2 to fill to RL 2.6m AHD. Landform 3 will then be filled to achieve a final profile of RL 3.5m AHD. Refer to Methodology Drawing K212-QL00704-01 Step 17 Clay Recovery, Revetment Wall Construction.

Step 18 – Soft Clay Recovery From Marina

The soft clay layer from within the Marina basin and Landform 1 will be excavated and relocated to the excavation pit in Canal A. Imported engineering fill will be placed on Landform 2 to fill to a final profile of RL 3.5m AHD. Refer to Methodology Drawing K213-QL00704-01 Step 18 and Step 19.

Step 19 – Bridge 2 Construction

Bridge 2 which links to Landform 2 within the Breakwater Cove Precinct will be constructed in dry site conditions with piles being driven by conventional means. Rock scour protection consisting of 24m^3 of 2-tonne rock will be placed by excavator at the base of the piling. Headstocks and decking will be placed on bridges via 40t crane and handrail installed at completion of the rock protection works. Refer to Methodology Drawing K213-QL00704-01 Step 18 and Step 19.

Step 20 – Continue Clay Recovery and Revetment Wall Construction

Stiff clay material will be excavated from the Marina basin and placed on Landform 1. Excavation of stiff clay from the Marina will also be placed on the temporary flocculent area to fill to a level of RL 2.6m AHD. Landform 2 will then be finished to a final profile of RL 3.5m AHD. Refer to Methodology Drawing K214-QL00704-01 Continue Clay Recovery and Revetment Wall Construction.

Step 21 – Complete Soft Clay Material Recovery and Importation of fill to Landform 1

Imported engineering fill will be placed on Landform 1 to achieve a final profile of RL 3.5m AHD. Approximately 175,000 m^3 of soft clay material that

was temporarily stored within the on-site storage areas will be returned to the final disposal areas within the Marina by use of a cutter suction dredge. Refer to Methodology Drawing K215-QL00704-01.

Step 22 – Commence the Strand Breakwater Bridge Construction

The bridge connection from Mariners Peninsula to the Strand Breakwater will be constructed by driving piles from the water via a piling rig barge. Headstocks will be lifted from a barge based 40t crane. Decking will be placed in the same manner. The location of the Strand Breakwater Bridge is shown on Methodology Drawing K202-QL00704-01 and Key Construction Drawing K215-QL00704-01. Refer to Design Drawings S001-QL00704-01 to S003-QL00704-01 for indicative bridge elevations and cross sections.

Step 23 – Complete Landform Construction

Landform 1 will be filled to achieve a finished profile of RL 3.5m AHD. The temporary flocculent area will be then filled to achieve a final profile of 3.5m AHD. Refer to Methodology Drawing K216-QL00704-01.

Step 24 – Staged Removal of Temporary Construction Bunds

Temporary construction bunds installed during Steps 1, 3 and 4 will be removed by barge mounted clam shell excavators and deposited adjacent to the Strand and Northern breakwaters. This will allow water to flow into the project site. Refer to Methodology Drawing K216-QL00704-01

This step will be undertaken progressively by staged removal of temporary bunds. Bunds at the end of working cells will be removed one by one allowing settlement of water and turbidity within canals on a staged basis prior to removal of successive bunds.

Step 25 – Complete the Strand Breakwater Bridge Construction

In the final step, the Strand Breakwater Bridge connection to Mariners Peninsula will be completed. Refer to Methodology Drawing K216-QL00704-01.

Indicative Master Plan

Methodology Drawing K217-QL00704-01 indicates the finally constructed landforms with an indicative future development overlay.

2.3 Construction Plant and Equipment

The equipment expected to be used within the Townsville Ocean Terminal project site during construction is listed in Tables 2 to 5.

Table 2: Common Equipment used in All Areas

Equipment	1st Year	2nd Year	3rd Year
Sheet Piling Rig	√	0	0
Driven Piles Rig	√	√	√
Barge SLV 500	√	√	√
Dewatering Pump(s)	√	√	√
Pile Breakers	√	√	√

Table 3: Bulk Earthworks Equipment

Equipment	1st Year	2nd Year	3rd Year
100 t Digger	0	√	√
12G Grader	√	√	√
16G Grader	0	√	√
30t Excavator	0	√	√
40t Excavator	√	√	√
65t Excavator	√	√	√
Cutter suction dredge	√	0	0
825C 4 Wheel Compactor	0	√	√
988 Wheel Loader	√	√	√
Cat 740 40t Articulated Truck	√	√	√
D6 Dozer	√	√	√
D6 LGP Swamp dozer	0	√	√
HD 465 Rigid Dump Truck	0	√	√
Self Propelled Roller	0	√	√
Tandem Water Truck	√	√	√
40 t Crane	0	0	√
Franna Crane	0	√	√

Table 4: Civil Works Equipment

Equipment	1st Year	2nd Year	3rd Year
Excavators	0	0	√
Backhoe	0	0	√
Ditch Witch Trencher	0	0	√
Dozers / Drotts	0	0	√
Grader	0	0	√
Kerb Machine	0	0	√
Water Truck	0	0	√
Sheep foot Roller	0	0	√
Steel Drum Roller	0	0	√
Rigid Dump Trucks	0	0	√

A.C Placing Plant	0	0	√
Moxy Truck	0	0	√
Franna Crane	0	0	√

Table 5: Terminal Construction Works

Equipment	1st Year	2nd Year	3rd Year
Excavators	0	√	0
Backhoe	0	√	0
BobCat	0	0	√
Clamshell Digger / Dragline	0	√	0
Cranes Franna	0	√	√
Cranes 40 t	0	√	√
Scissor Lift	0	√	√

2.4 Preliminary Programme

It is anticipated the TOT project will be constructed over a 39 month period beginning in March 2008. The proposed phases of development and corresponding construction periods are outlined below.

Development Phase	Timeframe	Commencement
Construction of sea walls and bunds	12 months	May 2008
Excavation and compaction	14 months	March 2009
Precast / Engineering fill and rip rap	13 months	September 2009
Roads and services	12 months	March 2010
Landscaping works	6 months	April 2010
First settlements	--	June 2010
Construction of terminal building and wharf	16 months	Jan 2009
Handover and commissioning of TOT precinct	--	May 2010

The TOT precinct is anticipated to be completed and commissioned in May 2010. This is prior to completion of the Breakwater Cove precinct which is due to be completed in stages with the final stages being completed by May 2011.

A description of the construction areas including construction parking areas are illustrated on Methodology Drawing K203-QL00704-01 as ‘hardstand areas’.

2.5 Construction Employees

It is anticipated that construction of the TOT project will provide employment for between 50 and 300 persons in any one year for a period of three years (approximately 440 positions over three years). It is likely that a further 175 to 200 persons would be employed in construction of private residential dwellings in any one year over a period of four years following completion of the project (approximately 760 positions over four years). The number of construction personnel employed during construction of the TOT project is detailed in Table 6. Table 7 provides details of construction personnel during future residential development.

Table 6: Construction employees for the TOT Project

	Number of Construction Personnel											
	Year 1				Year 2				Year 3			
Construction Activity	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
Construction of Bunds and Breakwaters	50	50	50	50								
Excavation of Site to Gain Fill Materials					75	75	75	75	75			
Construction of Revetment Walls and Filling							75	75	75	75	75	
Installation of Roads and Infrastructure									75	75	75	75
Site Landscaping Works												50
Terminal Building and Wharf					75	75	75	75	75	75		
Total Personnel on Site	50	50	50	50	150	150	225	225	300	225	150	125
Average				50				188				200

Table 7: Construction employees for future residential development

	Number of Persons on Site															
	Year 4				Year 5				Year 6				Year 7			
Residential Construction	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
Site Landscaping	50															
Year 1	200	200	200	200												
Year 2					200	200	200	200								
Year 3									175	175	175	175				

Year 4													175	175	175	175
Total Persons	250	200	200	200	200	200	200	200	175	175	175	175	175	175	175	175
Average				213				200				175				175

Employee numbers during the first year of construction will be approximately 50 persons on site at any one time. During the second year, construction employee numbers are likely to vary between 150 and 225 persons on site. The maximum number of employees on site at any one time will be approximately 300 during the third year. This is likely to occur when the wharf and building construction works on the TOT Precinct will coincide with installation of roads and services and site landscaping works on the Breakwater Cove Precinct.

The construction workforce will predominantly be sourced from the local construction industry. It is expected any specialist construction personnel required to be sourced from other areas will be able to be housed temporarily within existing accommodation in Townsville given their small numbers. It is therefore not proposed to construct temporary accommodation for the construction workforce.

Construction employees are expected to be transported to the site by normal public or private transport means given the site accessibility. Staff carparking will be provided within a hardstand area in the construction compound. This area will be located within secure fencing and access will be controlled.

2.6 Pollution Control Measures

Control of emissions and pollutants during construction will be achieved by implementation of the project EMP. The construction contractor will be required to prepare and implement a refined Construction Management Plan (CMP) to be in accordance with the project EMP. The refined CMP will be developed to cater for the specific construction method to be utilised on site and to ensure the Contractors Occupational Health and Safety Plan is compatible with the CMP.

2.6.1 Noise

Construction site operating hours will be, in accordance with normal Townsville City Council approval conditions imposed on the Operational and Building Works Approvals obtained to prevent amenity impacts on the immediate area. Activities generating excessive noise will be timed to minimise the amount of disturbance to sensitive receptors. Noise and other nuisance complaints will be managed by provision of a contact name and

number which will be displayed in a location accessible to members of the public. Noise control measures are specified in the project EMP.

2.6.2 Air

In order to maintain acceptable air quality in and around the construction site, dust suppression techniques will be implemented to minimise airborne dust from vehicle and material movements within the site. Dust generation will be minimised by watering of working areas with consideration for water efficiency. All equipment and plant in use within the site will be properly maintained and regularly serviced to minimise discharge of airborne emissions. Air emissions will be controlled by mitigation measures proposed in the project EMP and are discussed in the Air Quality Report.

2.6.3 Water

Stormwater runoff over the construction site will be controlled by use of filtration and detention devices prior to discharge to prevent mobilisation of sediment and prevent contaminants leaving the site. Silt curtains will be used during rock placement for construction of bunds to minimise turbidity plumes due to migration of suspended sediments.

Sediment filters such as geo-textile screens, straw bales or sandbags will be installed around stockpiles and exposed working areas and clean rainwater will be diverted to prevent it flowing across the site. Sediment ponds will be used for filtration and settlement of suspended solids prior to discharge from the site. An erosion and sediment control plan will be prepared prior to construction in accordance with the measures proposed in the project EMP.

2.6.4 Site Dewatering

Dewatering of the site will be undertaken progressively and water will be treated via a series of settlement ponds for removal of suspended solids prior to discharge of water to surrounding waterways. All dewatering activities will be undertaken in accordance with the recommendations of the Geotechnical Report and the Water Quality Report.

2.6.5 Spills

In the event of a spill within the site or during transport, immediate actions will be taken to contain spilled material and effective clean-up procedures implemented. In the case of dangerous or hazardous substances, a spill response plan will be implemented in accordance with the project EMP.

This will include application of absorbent and/or neutralising substances. Spills will not be hosed or washed away. Any significant spills will be reported to the Environmental Protection Agency.

2.6.6 Waste

The contractor is to adopt a policy of waste management that ensures protection of natural resources through minimisation of construction materials and reduction of environmental impacts by ensuring appropriate recycling, reuse and disposal methods. The contractor will be encouraged to adopt the waste hierarchy for waste avoidance, reuse and recycling ensuring that disposal of wastes to landfill is the last option after all other options have been considered. A waste management plan will be prepared by the construction contractor to implement the waste minimisation measures proposed in the project EMP.

2.7 Temporary Works

Site Construction Compound

A temporary construction compound will be established within the project site to provide office, lunch room, first aid area and toilet facilities and to provide a location for stockpiles and storage of construction materials and equipment. Temporary offices will be provided by use of mobile demountable buildings which will be connected to water, sewer, electricity and telecommunications services. At the completion of site construction works, these building will be demobilised off site.

Fencing

Temporary fencing will be required to secure the construction site and prevent unauthorised access. This fencing will be located across the site land access points and will be constructed of chain wire fencing panels. At the completion of site construction works and once the site is secure for safe public access, fencing material will be demobilised off site.

Site Bunding

The site will be bunded to facilitate and provide a dry site for undertaking excavation and formation of land reclamation platforms and to prevent dispersion of pollutants to surrounding waterways. The majority of the site will be contained by construction of breakwaters. Additional, temporary bunding will be required to isolate the site from adjacent waterways. These bunds will be constructed of rock material and will be removed at the completion of site reclamation works to allow water to flow into canal and

marina areas. Rock material removed from temporary bunds will be reused within the site.

Removal of the bunds will be undertaken in stages or controlled in piped water fill to allow stabilisation of the enclosed waterway prior to total removal of the bund.

Barge Point Site

One of the material delivery options involves barging of material to the project site from a Barge Point site located at the junction of Boundary Street and Benwell Road. This option is described in Section 5.2.2. Temporary stockpiling of rock and sand fill material will be provided within this site prior to transport to the project site. Agreement has been reached with the owner of the site for temporary stockpiling of materials for the period of construction and temporary fencing.

Temporary Bridge

One of the material delivery options involves construction of a temporary openable bridge across Ross Creek. This is likely to be constructed by means of a barge mounted piling rig driving steel tube piles. A barge mounted crane will be used to lift pre-cast concrete or steel section headstocks onto pile caps and to lift pre-cast concrete or steel section bridge beams to bear on headstocks. Pre-cast decking will also be lifted onto bridge beams by a barge mounted crane.

The openable section of the bridge decking will provide a minimum 25m clear navigation width for marine traffic. Sealed haul roads will be completed with commercial crossovers to link with adjoining roads. Traffic control devices and navigational markers will be installed as necessary.

2.8 Maintenance of Safe Navigation

Safe Navigation of the Port of Townsville and surrounding waterways will be maintained during construction activities. The barging haul route option will see two (2) barges operated on 90 minute cycles which will result in a vessel transiting across the Port entrance every 22 minutes.

The proposed barge operations have been reviewed and formulated in co-operation with the Port of Townsville Harbour Master. No foreseeable problems are expected from such a low frequency operation involving relatively slow barge vessels. Nevertheless all movements of construction vessels within the Port of Townsville will be reported to the Port Control office on the VHF working frequencies 12 and 16. Construction vessels will also observe the red Port Busy Signal located on the Port Control Tower

prior to entering the Port. There is no proposal for modifications to Port infrastructure or navigation markers. If it becomes necessary to change any facilities the relevant approvals will be obtained through the administering agency.

Construction vessels required to cross the entrance to Ross Creek will observe established harbour operations protocols including giving way to all shipping traffic and normal application of collision regulations for all other small craft. It is anticipated appropriate notification to mariners and emergency response agencies will be provided where necessary by the Harbour Master.

Once construction vessels and equipment are in place within the site, all works will be conducted outside the main Port channel and navigational markers. It is not anticipated that construction works will impact on Port operations or stability of Port facilities.

In the event of a cyclone occurring during construction works, all works on the site will cease and standard damage mitigation measures will be undertaken to secure vehicles property and material in accordance with an emergency response plan. It is expected that a level of protection will be provided by proposed breakwaters which are to be constructed during the first phase of construction.

2.9 Sustainable Engineering Solutions

Sustainable engineering solutions will be implemented to reduce the resource consumption during construction of the TOT project. These solutions will focus on resource efficiency including efficient use of energy, water and materials during construction.

Consumption of fill materials has been reduced during site reclamation works through re-evaluation of required volumes of material. Re-use of materials excavated from within the site has reduced the requirement for sand as fill and has eliminated the need for extraction of sand material from nearby riverine sediments. The reduced volume of sand required for reclamation will now be sourced from existing licenced sand mining operations.

The construction contractor will be required to implement control measures outlined in the project EMP. These measures include:

- reduction of greenhouse gas emissions and energy use through appropriate maintenance and servicing of plant and equipment used during construction activities;

- reduction of dispersion of pollutants to receiving environments through adoption of pollution control measures outlined in Section 2.8; and
- reuse or recycling of construction materials and minimisation of waste generated during construction as specified in Section 2.8.5.

The design of the ocean terminal building has also considered options for sustainability. The internal building layout is adaptable to allow for reconfiguration of spaces should user requirements change over time and allows easy replacement of equipment and incorporation of developing technologies into the new structure without the need for significant redesign and further refurbishment construction.

2.10 Capital Dredging

Capital dredging is required for creation of the TOT berth pocket and swing basin together with the outer access channel. Material to be dredged consists of soft organic clay and stiff/clay material. Proposed dredge areas are presented on Design Drawing K223-QL00704-02.

It is proposed that the approximately 15,430m^3 of material to be dredged from the outer access channel will be disposed of on site.

The approximately 109,610m^3 of stiff clay material will be dredged from the Port Western breakwater for construction of the TOT berth pocket and approximately 145,940m^3 of sediment material will be dredged within the Port area for creation of the TOT swing basin, will be unsuitable for engineered fill and is likely to be disposed of at the Port of Townsville approved spoil disposal site at sea.

Dredging and material disposal will be timed to avoid impacts on marine fauna species as recommended by the Nature Conservation Report.

2.11 Tidal Works

The Townsville Ocean Terminal Project involves works in tidal waters; these works are described as tidal works in the Coastal Protection and Management Act and Coastal Protection and Management Regulations.

Tidal works are undertaken on land that is in, on or above tidal water, or designed to be exposed to tidal water or on land that will or may be under tidal water because of development on or near the land. Tidal works in the Townsville Ocean Terminal Project include structures such as listed below:

- Constructed in tidal water.

- Basin (marina)
- Breakwaters (temporary and permanent)
- Bridges (temporary and permanent)
- Dredging (outer access channel, internal waterway, berth pocket and swing basin)
- Rehabilitation of breakwalls
- Waterways (canal)
- Marina facilities
- Embankment
- Barge ramp (temporary)
- Access channels
- Stormwater drainage
- Revetment walls
- Reclamation of land forms
- Jetty
- Pipeline (electrical conduit to Magnetic Island)
- Pontoon
- Power line
- Sea wall
- Small-craft and facility
- Training wall
- Wharf-terminal berth

Other works in tidal waters will include:

- Erecting a sign such as for maritime navigation
- Removing material from land under tidal water for the purpose of selling the material of using it to reclaim land
- Work within strategic part land tidal area that is assessable by a port authority
- Tidal works that is not completely or partly within a local government tidal area.
- Tidal works for new or existing structures that will be used for the operation of a port authority
- Tidal works for new or existing structures that will be used for a public marine facility being constructed by or for Queensland Transport or a port authority (e.g. public boat ramps, public marinas, private marinas within a State boat harbour)

- Tidal works that involves creating or changing the configuration or characteristics of a navigational channel (e.g. dredging a channel)

There will be demolition of existing structures in tidal waters. These include:

- Partial demolition of the Port western breakwater
- Demolition will need to be undertaken in a manner that minimises environmental impacts consistent with the Environmental Protects Acts (1994) General Environmental Duty. Applicants should refer to the Australian Standard 2601 “Demolition of structures” for guidance on demolition.
- Complete demolition of temporary construction bunds within the project site.

The nature and extent of these tidal works and works in tidal waters are described in this report and the potential impacts and associated management strategies are described in the EIS.

2.12 Works during Periods of Rainfall

In the event of excessive rainfall, it is proposed that construction works will cease and disturbed areas within the site will be stabilised. All temporary erosion and sediment control measures will be inspected daily to ensure that contaminants are not discharged from the site in stormwater runoff.

3 Construction of the TOT Precinct

3.1 Precinct Description and Location

The TOT Precinct will be located within the Port Western Breakwater as illustrated in Design Drawing K019-QL00704-01. Design Drawings detailing the specifications of the terminal building and wharf structure are contained in Appendix C.

The TOT Precinct will comprise the following primary elements:

- dedicated berth for cruise ships and naval vessels;
- wharf structure and terminal building; and
- associated road works, security car parking and infrastructure services.

Dedicated Berth

A berth pocket of 350m in length and 45m width will be located on the eastern side of the Port Western Breakwater with access for cruise ships and naval vessels provided from Platypus Channel within the Port of Townsville. The berth pocket will be dredged to a depth of 11.7m below HAT.

A clearance zone of 46m will be provided from the centreline of Platypus Channel to the berth pocket. The berth pocket will accommodate vessels up to the “Wasp” class (length = 258m, beam = 32.3m) and the State’s 'Benchmark Cruise Ship' identified in the *Queensland Shipping Plan* (length = 238m, beam = 33m). Hyder Drawing QL00017-SK-02C illustrates the general arrangement of structures within the TOT Precinct.

Wharf Structure

The TOT wharf structure will be 200m in length and will be of 30m width from the terminal building to edge of the berth pocket. The wharf structure will be a suspended reinforced concrete slab deck on steel piles. The wharf will be designed for B-double tanker and semi-trailer trucks and will have the capacity to receive military tanks up to 65 tonnes and tank/truck trailer combinations up to 95 tonnes. The wharf deck details are provided on CGR Drawing HWH-001-003 Rev 6.

Fenders will be provided for berthing of cruise ships and naval vessels at the deck face. Fenders for cruise ships will be a typical cone fender and facing panel. Naval vessels will berth to pneumatic “Fentek” or equivalent fenders placed on the quay line. Details of proposed fender systems are provided on CGR Drawing HWH-001-004 Rev 5.

Service Provision

Water supply, sewerage and electrical and telecommunication services will be located in a services duct suspended beneath the wharf deck. Connections to existing Townsville City Council and Ergon Energy services will be provided to vessels at the deck face. The wharf services plan is provided in CGR Drawing HWH-003 Rev 6 and 007 Rev 2.

Water will be provided by the Townsville municipal potable water supply. Connection will be provided to marine vessels at four (4) discharge

locations within the wharf face. Details of potable water reticulation within the project site are provided in Section 4.4.2.2 of the EIS.

Two sewage/greywater connection pits are provided at the wharf face for collection of ship-board wastewater. This will then be delivered to a sewage storage facility and pump station for connection to the Townsville municipal sewerage network and treatment plant. There will be no treatment or disposal of sewerage within the TOT precinct. Details of sewerage networks within the project site are provided in Section 4.4.2.4 of the EIS.

Wharf lighting will be provided in accordance with Australian Standards AS1158.3.1, AS3827 and AS4282 as described in Section 4.9.2.3 of the EIS. Flood lights will be appropriately shielded to prevent interference with navigation beacons and to prevent light spill onto residential areas.

Terminal Building

The terminal building will be a single storey rectangular structure of 20m by 50m and approximately 3.5m height at the eaves as shown on CGR Drawings HWH-001-003 Rev 6 and Buchan Drawings Ska3-10-D and Ska3-11-D. The Terminal Building will have a gross floor area of approximately 1000 m^2. The building design will be a contemporary light form with a nautical theme.

It is proposed that the building will be an open, flexible structure providing the following facilities as detailed on Buchan Drawing Ska3-12-A.

- A general hall area to cater for vessel arrivals and departures comprising a quarantine/customs area, transit hall, dining area/observation lounge, document check-in station and baggage pick up.
- Offices for accommodation of terminal operational staff and management, Customs and Australian Quarantine Inspection Service.
- General office space, staff rooms, meeting room, store room, security and interview rooms.
- A café and service provider kiosks and toilet facilities.

Site Access and Traffic Management

The TOT Precinct will be linked to Entertainment Drive by means of a two lane divided road. This new road will cater for public, private and service vehicles and will be designed to meet the relevant Australian road design standards and Townsville City Council standards.

Separate demarcated set down areas will be provided for buses and taxis. Two spaces for taxis and two spaces for buses will be provided in the set down area immediately adjacent to the TOT Terminal. A holding area will be provided in the TOT Precinct for an additional 8 taxis and 10 buses. Emergency vehicles will access the TOT Precinct via the internal road system.

The following parking facilities will be provided.

- The TOT Precinct will provide for ten (10) onsite parking spaces for tour and shuttle buses;
- The bus parking area will also serve as a parking area for up to 8 heavy trucks (prime movers) in the event of visitation by Navy vessels;
- The TOT Precinct will provide onsite parking for 100 visitors cars in a designated parking area;
- Reserved uncovered parking will be provided for twelve (12) official vehicles adjacent to the terminal building; and
- The TOT Precinct will have twenty (20) uncovered spaces for VIP and hire vehicles in close proximity to the TOT terminal.

3.2 Preliminary Programme for the TOT Precinct

The construction of the TOT precinct will occur over a 28 month period as described in Section 2.4. Construction of the terminal building and wharf structure will commence at the completion of construction of seawalls and site bunding in March 2009 and will continue for a period of 16 months. The TOT is expected to be commissioned in June 2010.

4 Construction of the Breakwater Cove Precinct

4.1 Precinct Description and Location

Landforms will be constructed by reclamation of land within the Breakwater Cove Precinct to provide sites for a range of uses including multiple dwellings, detached dwellings, and a range of commercial and retail services. Typical landform sections and canal sections are illustrated on Design Drawings K220-QL00704-01 to K222-QL00704-01.

Future construction of buildings within the Breakwater Cove precinct will be controlled by the Future Development Area (FDA) Scheme and residential development will be governed by a Community Management Scheme.

The existing Northern Breakwater will be upgraded to provide protection of the Breakwater Cove Precinct. In addition, the new Strand Breakwater will be construction to provide protection of land fingers and navigational access. This breakwater also provides public access to the site.

Site Access and Traffic

The Breakwater Cove Precinct will be connected to Entertainment Drive by means of a public two way road. This main access road will be designed to cater adequately for pedestrians and on road cyclists. Internal roads will cater for public, private, emergency and service vehicles. These roadways will be designed to meet the relevant Australian road design standards.

Vehicular access to the traditional residential waterway peninsulas will be provided by private roadways with limitations on on-street parking. The multiple dwelling peninsula is accessed by a public road and on-street parking will be provided for visitors to the sites and private parking will be provided within the future residential properties.

Pedestrian footpaths and walkways will be provided on footpath areas and within open space zones. Bicycles routes will be accommodated by a combination of ongrade pathways within verge areas and within road corridors.

Access to the new Strand Breakwater will be provided via the Mariners Drive precinct. Access onto the Strand Breakwater will be restricted to pedestrians, cyclists and maintenance/emergency vehicles only.

Service Provision

Water supply, sewerage and electrical and telecommunication services will be located in underground services trenches within the roadway corridor and within easements as described in the Infrastructure Report. Connections will be provided to existing Townsville City Council and Ergon Energy services to each residential lot and apartment lot.

Water will be provided by the Townsville citiwater municipal potable water supply. Connection will be provided to each residential lot and apartment lots. Sewerage infrastructure will be connected to the Townsville City Council infrastructure. Details of potable water and sewerage reticulation

within the Breakwater Cove precinct are provided in the Infrastructure Report.

Protected Areas

The project site is within the Great Barrier Reef World Heritage Area and a Dugong Protection Zone. The location of the site in relation to protected areas is described and illustrated on maps in the Nature Conservation Report.

4.2 Preliminary Program for the Breakwater Cove Precinct

The Breakwater Cove precinct will be constructed in stages over a 39 month period as outlined in Section 2.4. Construction of seawalls and site bunding will commence in March 2008. First settlements to transfer title to third party residents on future developers are expected to be completed by February 2011.

5 PART B: MATERIAL EXTRACTION AND DELIVERY

5.1 Material Extraction

The initial sources of fill material were identified in the Initial Advice Statement for the TOT Project as being taken from waterways adjacent to the site and possibly remote from the TOT project site. Extraction of material to be used for fill of the TOT project site during site reclamation is no longer proposed to be undertaken from within nearby riverine sediments.

Material required for fill will now be sourced from existing licensed extraction operations. Sand and rock material will be sourced from the following locations.

- Roseneath Quarry
- Pinnacles Quarry
- Marathon Quarry

5.1.1 Material Quantities

The delivery of rock, sand and engineered fill material from quarries to the project site will occur during three construction stages of twelve months each. The quantity of material to be delivered to the project site during each construction stage is detailed in Table 8.

Table 8: Quantity of material to be delivered to the project site during construction

Material	Stage 1	Stage 2	Stage 3
Quarry rock (>150mm)	67,641m^3	162,486m^3	20,128m^3
Crushed rock (<150mm)	286,678m^3	161,667m^3	
Sand		8,440m^3	
Engineered fill		35,827m^3	256,721m^3
Total Materials	354,319 m^3	368,420 m^3	276,849 m^3
	580,439 tonnes	621,125 tonnes	446,984 tonnes

In addition to quarry sourced fill material, existing material within the site will be utilised in land reclamation and formation of building platforms. These quantities are detailed in Table 9.

Table 9: Existing material within the project site to be used in reclamation of land

Material	Quantity
Soft clay material	65,634 m^3
Stiff clay material	1,579,057 m^3
Existing breakwater materials	54,950 m^3

The re-use of existing materials within the site in land reclamation works has reduced the quantity of fill material required to be delivered to the site during construction. A number of alternative transport options were considered for delivery of material from quarries these are detailed in Section 5.2.

5.2 Material Delivery

The preferred method for import of rock, sand and engineered fill material to be used in construction of the Breakwater Cove and TOT Precincts is for material to be delivered to the project site by road registered trucks from Roseneath, Pinnacle and Marathon Quarries via Boundary Street to a temporary bridge crossing of Ross Creek.

Three other options have been considered for delivery of material to the project site. Two include haulage of material through town (either via The Strand or via Bundock/Warburton Street) directly to the project site during the first stage of construction. During latter construction stages, transport will be via Boundary Street to a temporary stockpile location at the Barge Point site and delivery to the project site by barge. All haul route maps are contained in Appendix D.

5.2.1 Options and Alternatives

Option 1 – Temporary Bridge and Haul Road (Preferred)

It is proposed that material will be delivered from Roseneath, Pinnacle and Marathon Quarries via Boundary Street to a temporary bridge across Ross Creek and then to the project site during Construction Stages 1, 2 and 3 as described below.

Delivery from Pinnacle Quarry to City Limits

Trucks delivering material from Pinnacle Quarry will use the haul route along Gumlow Road turning east on Hervey Range Road then continuing along Ross River Road. Trucks will then turn left onto Nathan Street (Bruce Highway) and then right onto Woolcock Street. (Refer to Haul Route Maps – Drawing K424-QL00704-01 Pinnacle Quarry).

Delivery from Roseneath and Marathon Quarries to City Limits

Trucks will use the northern haul route from Roseneath and Marathon Quarry along Flinders Highway then turn right onto the Bruce Highway. Trucks will then turn left onto Abbot Street and continue north onto Railway Avenue. (Refer to Haul Route Maps – Drawing K417-QL00704-01 Marathon Quarry and Drawing K426-QL00704-01 Roseneath Quarry).

Delivery from City Limits to Temporary Bridge at Ross Creek

Trucks from Roseneath and Marathon Quarries will turn right at Boundary Street then left onto Archer Street and continue on to Ross Street. Trucks from Pinnacle Quarry will continue west from Woolcock Street onto Boundary Street then left onto Archer Street and continue on to Ross Street.

Trucks from all quarries will then turn left from Ross Street into the present Curtin Brothers Marine site continuing over temporary haulage roads and bridge (openable for marine traffic). Once over the temporary bridge, trucks will turn right onto Sir Leslie Thiess Drive to the project site. Trucks will return to the quarries via the same route. The proposed frequency of material deliveries for Option 1 is provided in Table 10.

Table 10: Option 1 haul route material delivery frequencies

Option 1 Stage	Material Volumes	Delivery Times	Vehicle Frequency / Delivery	Total Movements
Stage 1	580,439 tonne of rock	Ten hours/day six days/week	5.79 vehicle movements per hour	17,475 over 12 months
Stage 2	621,125 tonne of rock, sand and engineered fill	Ten hours/day six days/week	6.94 vehicle movements per hour	20,960 over 12 months
Stage 3	446,984 tonne of rock and engineered fill	Ten hours/day six days/week	4.19 vehicle movements per hour	12,653 over 12 months

Advantages and Disadvantages of Option 1

Option 1 utilises existing major truck routes and does not require haulage of materials through built-up areas of Townsville or The Strand. The proposed route is less visible to members of the public and will result in fewer noise and air quality impacts associated with heavy vehicle use in built-up areas.

In addition, there is no requirement for barging of material via Ross River and across Port of Townsville navigational channels. This option reduces the potential impacts of adverse weather and tidal movements associated with barge transport to the project site.

Further advantages may include potential post-construction use of temporary facilities for private development or Council uses.

Option 2 – Strand Haul Road and Barge Transport

It is proposed that material will be delivered from Roseneath Quarry via The Strand directly to the project site during Construction Stage 1 and from Roseneath, Pinnacle and Marathon Quarries via Boundary Street to the Barge Point site then by barge to the project site during Construction Stages 2 and 3.

Stage 1 - Delivery from Roseneath Quarry to the Project Site via The Strand

Trucks will use the northern haul route from the Roseneath Quarry along Flinders Highway then right onto the Bruce Highway. Trucks will then turn left onto Abbot Street and continue north onto Railway Avenue/ Saunders Street/ Dean Street. Trucks will follow Dean Street to Oxley Street then turn right onto The Strand then left onto Sir Leslie Thiess Drive onto Entertainment Drive and continue to the project site *(*Refer to Haul Route Maps – Drawing K401-QL00704-01 Roseneath Quarry).

Stages 2 and 3 - Delivery from Roseneath, Pinnacle and Marathon Quarries to Barge Point Site

Trucks from Pinnacle Quarry will utilise the haul route to the city limits as described for Option 1 and will then continue west onto Boundary Street Trucks from Roseneath and Marathon Quarries will utilise haul routes to the city limits as described for Option 1 and will then turn right at Boundary Road.

Trucks from all quarries will continue along Boundary Street to the Barge Point barge landing site at the junction of Boundary Street and Benwell Road. (Refer to Haul Route Maps – Drawing K414-QL00704-01 Roseneath Quarry, Drawing K412-QL00704-01 Pinnacle Quarry and Drawing K405-QL00704-01 Marathon Quarry,).

Material may be stockpiled within the Barge Point site then transported by two SLV 500-tonne barges via Ross River to the project site. Transport by barge may occur 24 hours per day. However, material would be delivered in two 8-hour shifts. Rock material would be loaded onto the barges by excavator or front end loader from stockpiles, as rocks greater than 1 tonne cannot be loaded directly from trucks to the barge. The proposed frequency of material deliveries for Option 2 is provided in Table 11.

Table 11: Option 2 haul route material delivery frequencies

Option 1 Stage	Material Volumes	Delivery Times	Vehicle Frequency / Delivery	Total Movements
Stage 1	580,439 tonne of rock	Six hours/day six days/week	10.27 vehicle movements per hour	18,615 over 12 months
Stage 2	621,125 tonne of rock, sand and engineered fill	Ten hours/day six days/week	6.94 vehicle movements per hour	20,960 over 12 months
Stage 3	446,984 tonne of rock and engineered fill	Ten hours/day six days/week	4.19 vehicle movements per hour	12,653 over 12 months

Advantages and Disadvantages of Option 2

This option requires heavy vehicle haulage through the Townsville CBD and will have associated noise and air quality impacts on sensitive receptors including businesses, schools and residential areas. Programme delays may occur as a result of requirements to avoid peak traffic. In addition, this option will result in deterioration of existing road infrastructure which will require significant upgrade.

This option also requires delivery of materials by barge to the project site. Barges will be required to utilise navigation channels within Ross River and across the Port of Townsville and will be subject to programme delays due to adverse weather and tidal movements.

Option 3 – Warburton/Bundock Street Haul Road and Barge Transport

It is proposed that material will be delivered from Roseneath Quarry via Warburton/Bundock Street directly to the project site during Construction Stage 1 and from Roseneath, Pinnacle and Marathon Quarries via Boundary Street to the Barge Point site then by barge to the project site during Construction Stages 2 and 3.

Stage 1 - Delivery from Roseneath Quarry to the Project Site via Warburton / Bundock Street

Trucks will use the northern haul route from the Roseneath Quarry along Flinders Highway then turn right onto the Bruce Highway. Trucks will then turn left onto Abbot Street and continue north onto Railway Avenue. Trucks will turn left onto Boundary Street/Woolcock Street then right onto Hugh Street/Percy Street. Trucks will follow Bundock/Warburton/Eyre Street then turn left onto Oxley Street then right onto The Strand. Trucks will follow The Strand and turn left onto Sir Leslie Thiess Drive then take Entertainment Drive to the project site.

Stages 2 and 3 - Delivery from Roseneath, Pinnacle and Marathon Quarries to the Barge Point Site

Trucks from Roseneath, Pinnacle and Marathon Quarries will utilise haul routes to the Barge Point site as described for Option 2. The proposed frequency of material deliveries for Option 3 is provided in Table 12.

Table 12: Option 2 haul route material delivery frequencies

Option 1 Stage	Material Volumes	Delivery Times	Vehicle Frequency / Delivery	Total Movements
Stage 1	580,439 tonne of rock	Six hours/day six days/week	10.27 vehicle movements per hour	18,615 over 12 months
Stage 2	621,125 tonne of rock, sand and engineered fill	Ten hours/day six days/week	6.94 vehicle movements per hour	20,960 over 12 months
Stage 3	446,984 tonne of rock and engineered fill	Ten hours/day six days/week	4.19 vehicle movements per hour	12,653 over 12 months

Advantages and Disadvantages of Option 3

This option requires heavy vehicle haulage through built-up areas in Townsville and will have associated noise and air quality impacts on sensitive receptors. This option will result in deterioration of road infrastructure which will require significant upgrade and major temporary traffic control works due to haulage along busy arterial roads to Townsville CBD. Programme delays may occur as a result of requirements to avoid peak traffic along these roads.

This option also requires delivery of materials by barges, which will be required to utilise navigation channels within Ross River and across the Port of Townsville and will be subject to programme delays due to adverse weather and tidal movements.

Presentation of the details of this proposed haul route during community consultation resulted in negative public reactions. Given the social constraints associated with the use of this haulage option, it has been discounted.

Option 4 – Southern Haul Road

This option would involve haulage of quarry materials along an existing unsealed road located within the Townsville State Development Area to the south of the Ross River.

Haulage during Stage 1 would be as described in Options 2 and 3 as material would need to be delivered directly to the project site via The Strand or via Warburton/Bundock Street. Haulage during Stages 2 and 3 would be via the unsealed road to a new barge landing point to be constructed within the Ross River, then delivery by barge to the project site.

Advantages and Disadvantages of Option 4

This option requires heavy vehicle haulage through built-up areas in Townsville and will have associated noise and air quality impacts on sensitive receptors. This option will result in deterioration of road infrastructure which will require significant upgrade and major temporary traffic control works due to haulage along busy arterial roads to Townsville CBD. Programme delays may occur as a result of requirements to avoid peak traffic along these roads.

Barges will be required to utilise navigation channels within Ross River and to traverse across the Port of Townsville and will be subject to programme delays due to adverse weather and tidal movements.

There will also be construction programme delays given the extensive works required for construction of the unsealed road to a standard required for conveying heavy vehicles during Stages 2 and 3 of construction.

There are also ecological and hydraulic constraints associated with this option given the location of the road within extensive flood-prone coastal vegetation areas. This route would also require construction of a barge landing site and dredging of Ross River.

Selection of Preferred Haul Route Option

Analysis of all four options has resulted in selection of Option 1 as the preferred haul route. This option will result in fewer impacts on residential and business areas and fewer environmental impacts. It also involves fewer programme delays associated with the use of barges and the need to avoid peak traffic periods in built-up areas.

It may be that for specific construction steps, the remaining options (or a mix of options) will also be appropriate, particularly if it results in overall lessening of the construction impacts of the TOT Project.

5.2.2 Material Haulage Schedule

Option 1 – Temporary Bridge Haul Route (Preferred)

Stage 1

It is proposed that approximately 580,439 tonne of rock will be delivered to the project site by B-Double and Semi-Trailer for rock materials larger than 1 tonne to the project site via the temporary bridge and haul roads during the first twelve months of construction. It is expected that trucks will operate for ten hours a day for six days a week at a frequency of 5.79 vehicle delivery movements each hour. This will give a total of 17,475 deliveries to the project site via the temporary bridge haul route during Stage 1.

Stage 2

A total of 621,125 tonne of rock, sand and engineered fill will be transported by B Double and Semi-Trailer for rock materials larger than 1 tonne to the project site via the temporary bridge and haul roads for a period of twelve months. Trucks will deliver material at a rate of 6.94 vehicles per hour operating for 10 hours a day for 6 days a week. This gives a total of 20,960 deliveries of material to the project site via the temporary bridge haul route during Stage 2.

Stage 3

During Stage 3, approximately 446,984 tonne of rock and engineered fill will be delivered by B Double and Semi-Trailer for rock materials larger than 1 tonne to the project site via the temporary bridge and haul roads for a further period of twelve months. A total of 12,653 deliveries will be made during this period with trucks operating for 10 hours a day for 6 days a week giving a delivery rate of 4.19 vehicles per hour during Stage 3.

Option 2 Strand Haul Route and Barge Transport

Stage 1

It is proposed that approximately 580,439 tonne of rock will be delivered by truck and dog directly to the project site via the Strand during the first twelve months of construction. It is expected that trucks will operate for six hours a day for six days a week at a frequency of 10.27 vehicle delivery movements each hour. This will give a total of 18,615 deliveries to the site via the town haul route.

Stage 2

A total of 621,125 tonne of rock, sand and engineered fill will be transported by B Double and Semi-Trailer for rock materials larger than 1 tonne to the Barge Point site for a period of twelve months. Trucks will deliver material at a rate of 6.94 vehicles per hour operating for 10 hours a day for 6 days a week. This gives a total of 20,960 deliveries of material to the Barge Point site during Stage 2.

Stage 3

During Stage 3, approximately 446,984 tonne of rock and engineered fill will be delivered by B Double and Semi-Trailer for rock materials larger than 1 tonne to the Barge Point site for a further period of twelve months. A total of 12,653 deliveries will be made during this period with trucks operating for 10 hours a day for 6 days a week giving a delivery rate of 4.19 vehicles per hour.

Option 3 – Warburton/Bundock Street Haul Road and Barge Transport (Discounted Option)

Stage 1 – Bundock Street/Warburton Street Haul Route

It is proposed that approximately 580,439 tonne of rock will be delivered by truck and dog directly to the project site via Bundock Street/Warburton Street during the first twelve months of construction. It is expected that trucks will operate for six hours a day for six days a week at a frequency of 10.27 vehicle delivery movements each hour. This will give a total of 18,615 deliveries to the site via the town haul route.

Stage 2 – Barge Point Site Haul Route

A total of 621,125 tonne of rock, sand and engineered fill will be transported by B Double and Semi-Trailer for rock materials larger than 1 tonne to the Barge Point site for a period of twelve months. Trucks will deliver material at a rate of 6.94 vehicles per hour operating for 10 hours a day for 6 days a week. This gives a total of 20,960 deliveries of material to the Barge Point site during Stage 2.

Stage 3 – Barge Point Site Haul Route

During Stage 3, approximately 446,984 tonne of rock and engineered fill will be delivered by B Double and Semi-Trailer for rock materials larger than 1 tonne to the Barge Point site for a further period of twelve months. A total of 12,653 deliveries will be made during this period with trucks operating for 10 hours a day for 6 days a week giving a delivery rate of 4.19 vehicles per hour.

5.2.3 Material Stockpiles

Rock and sand material will be stockpiled within the project site for distribution to working cells. The locations of designated stockpile areas within the site are indicated on Methodology Drawing K203-QL00704-01

5.3 Construction Traffic

Construction traffic will include construction contractors and staff private vehicles and heavy vehicles used in delivery of construction materials. Vehicle types and frequency are described in Section 5.2.2. Construction haulage routes are the same as those proposed for transport of rock and sand material described in Section 5.2.1.

The construction contractor engaged to undertake these works will be required to develop a detailed localised Traffic Management Plan to control construction traffic in accordance with the project Environmental Management Plan (EMP).

The Traffic Management Plan will be developed to mange specific intersections within the city when required by the Department of Main Roads and/or the Townsville City Council.

5.4 Hazardous Materials Transport

The following hazardous materials are likely to be used during construction.

- Concrete (cement powder)
- Diesel
- Oils, grease and lubricants
- Paint
- Solvents
- Silicons/Mastic
- Grouts
- Contact cement

Any hazardous materials required to be transported to or from the project site during construction will be appropriately handled to prevent release to receiving environments. Vehicles required to transport hazardous materials will be appropriately licensed to carry such materials and will display appropriate warning signs, in accordance with the relevant Australian Standards.

All hazardous materials will be transported with a copy of the Material Safety Data Sheet (MSDS) provided by the product manufacturer and will be appropriately labelled and accompanied by instructions for correct handling. Any accidental spill or loss of hazardous materials during transport will be immediately reported to the Environmental Protection Agency and emergency agencies.

Persons handling and transporting hazardous materials will be appropriately trained in handling the products and be aware of the procedures required for clean-up of spills. All persons required to be in contact with hazardous materials will be provided with appropriate protective clothing, and will be trained in handling such substances.

All hazardous materials will be transported in the original containers where possible. Where alternative containers are required for transport, these will

be compatible with the producers requirements, the product being transported and will be appropriately labelled.

Measures for management of hazardous substances within the project site are provided in the project EMP. Action to be taken in the event of accidental spillage of material during delivery is outlined in Section 2.6.5 and in the project EMP.

6 Conclusion

It is considered that the construction of the TOT Project can be undertaken without significant impacts on environmental values in accordance with the recommendations of specialist studies and investigations. These recommendations have been incorporated into the project EMP and will be implemented during construction.

City Pacific Limited

Townsville Ocean Terminal Construction Methodology Report

Tuesday, 11 September 2007

F0001-QL00704-QLR-05

City Pacific Limited

Townsville Ocean Terminal Construction Methodology Report

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Report no: F0001-QL00704-QLR-05 Date: Tuesday, 11 September 2007

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Contents

Executive Summary

The preferred construction methodology proposed for formation of engineered fill land platforms and waterways within the TOT Project will be by initial construction of new permanent breakwaters and temporary bunding to encapsulate the site, de-watering and progressive reclamation of land by excavation of canal areas utilising materials within the site. Existing external licensed rock and sand material sources. The construction methodology stages and sequencing to be employed for the overall Project is detailed and described in Section 2.1. Standard equipment suitable for the methodology is expected to be used.

The preferred method for import of rock, sand and engineered fill is for material to be delivered to the project site by road registered trucks from Roseneath, Pinnacle and Marathon Quarries via Boundary Street to a temporary bridge crossing of Ross Creek.

Three other options have been considered for delivery of material to the project site. Two include haulage of material through town (either via The Strand or via Bundock/Warburton Street) directly to the project site during the first stage of construction. During latter construction stages, transport will be via Boundary Street to a temporary stockpile location at the Barge Point site and delivery to the project site by barge.

The proposed material import and export arrangements including details of the proposed transport options, proposed haul routes and haulage schedule are described in Section 5 of this report along with the alternative options considered. The materials to be stockpiled and stockpile methods are described throughout the report and are discussed in Section 5.2.3

Construction traffic will include construction contractors and staff private vehicles and heavy vehicles used in delivery of construction materials. Vehicle types and frequency are described in Section 5.2.2. Construction haulage routes are the same as those proposed for transport of rock and sand material.

Any hazardous materials required to be transported to or from the project site during construction will be appropriately handled to prevent release to receiving environments. Vehicles required to transport hazardous materials will be appropriately licensed to carry such materials. Hazardous materials that may be transported to or from the Project are identified and management measures for handling these materials are provided for..

It is anticipated the TOT project will be constructed over a 39 month period beginning in March 2008. The proposed phases of development, corresponding construction periods and construction working areas are outlined in detail in Section 2.4

Construction of the TOT project is expected to provide employment for between 50 and 300 persons in any one year for a period of three years (approximately 440 positions over three years). It is likely that a further 175 to 200 persons would be employed in construction of private residential dwellings in any one year over a period of four years following completion of the project (approximately 760 positions over four years).

The construction workforce will predominantly be sourced from the local construction industry. Construction employees are expected to be transported to the site by normal public or private transport means given the site accessibility.

Pollution control methods for control of noise, air and water emissions as well as preventing dispersal of waste and spilled material will be achieved by implementation of the project EMP.

Temporary works associated with construction will include a site construction compound, temporary fencing and bunding and the temporary bridge.

Safe Navigation of the Port of Townsville and surrounding waterways will be maintained during construction activities. Once construction vessels and equipment are in place within the site, all works will be conducted outside the main Port channel and navigational markers.

In the event of a cyclone occurring during construction works, all works on the site will cease and standard damage mitigation measures will be undertaken to secure vehicles property and material.

Sustainable engineering solutions will be implemented to reduce the resource consumption during construction of the TOT project. These solutions will focus on resource efficiency including efficient use of energy, water and materials during construction. These solutions have been incorporated into the project EMP.

Capital dredging is required for creation of the TOT berth pocket and swing basin together with the outer access channel. Material to be dredged consists of soft organic clay and stiff/clay material. Dredging and material disposal will be timed to avoid impacts on marine fauna species as recommended by the Nature Conservation Report. Dredging and dredge material disposal is addressed in detail in Section 2.10.

The Townsville Ocean Terminal Project involves works in tidal waters; these works are described as tidal works in the Coastal Protection and Management Act and Coastal Protection and Management Regulations.

The TOT Precinct and Breakwater Cove Precinct are described in detail in Section 3 and Section 4 respectively including all buildings and structures, site access arrangements, traffic management and service provision.

Extraction of material to be used for fill of the TOT project site during site reclamation is no longer proposed to be undertaken from within nearby riverine sediments. Material required for fill will now be sourced from existing licensed extraction operations. Material delivery options and alternatives are discussed in Section 5.

It is considered that the construction of the TOT Project can be undertaken without significant impacts on environmental values in accordance with the recommendations of specialist studies and investigations.

1 Introduction

Hyder Consulting Pty Ltd (Hyder) was commissioned to develop a construction methodology for works internal to the project site for the development of the Townsville Ocean Terminal (TOT) Project.

1.1 Project Description

The site proposed for development of the TOT Project is located adjacent to the Townsville Hotel and Casino Complex and the Townsville Entertainment Centre as identified in the Breakwater Island Casino Agreement Act (BICA) as the "Future Development Area". This area is identified in the context of the surrounding area on Drawing K200–QL00704-01 and is bounded by the Port Western Breakwater, the existing Offshore Breakwater and the Townsville Hotel and Casino Complex and the Townsville Entertainment Centre Peninsula. The TOT project is the reclamation of land to the north of Sir Leslie Thiess Drive for development of two precincts –

(1) The TOT Precinct: will be developed for construction of a dedicated ocean terminal and ancillary facilities for use by cruise ships and naval vessels; and

(2) The Breakwater Cove Precinct: a residential area providing for a range of uses including apartments, attached dwellings, detached dwellings, commercial and retail facilities services, landscaping and public utilities.

The project site is located within the State waters of Cleveland Bay, which supports species, communities and habitats of conservation significance under State and Commonwealth legislation. The site is within the Great Barrier Reef World Heritage Area but is excluded from the Great Barrier Reef Marine Park as it is located within Port of Townsville limits.

The construction methodology has been developed to ensure environmental values are protected during site reclamation works and construction of the terminal building and wharf structure.

2 PART A: CONSTRUCTION METHODOLOGY AND SEQUENCING

2.1 Construction Methodology

The construction methodology has been based on the following primary objectives for the TOT Project.

- To deliver a dedicated berthing facility in Townsville for the growth of the Cruise Shipping Industry and to encourage additional visits to Townsville by USA and Australian Military vessels through the provision of this dedicated berthing facility.
- To provide a high quality residential/marina development within the Project to provide an alternative urban residential mix, encourage investment within the city centre, as restaurant/entertainment facilities and support services will be required for the residential community.
- To generate employment within the service industries as well as capital investment in the city centre.
- To implement ESD principles into all aspects of the development.
- To set up appropriate management structures to minimise any future impact on the State or local community with respect to the management and maintenance of the TOT Project.
- To implement best practice environmental management procedures during design construction and operational phases of the project.
- To provide improved carparking for the Townsville Entertainment Centre and Townsville Hotel and Casino complex.
- To deliver high quality residential investment and living opportunities for waterfront residences with attached Marina berths on the Townsville mainland.
- To comply with all Commonwealth, State and Local Government environmental standards in the approval, construction and operation of the TOT Project.
- To work with Local Government and other relevant authorities to ensure minimisation of social and economic impacts and for the respective Management of any such impacts as the Project develops.
- To maintain open community involvement and communication with all Stakeholders throughout the life of the Project.
- To ensure protection of environmental values identified during site investigations.

Hyder has also reviewed the extensive environmental assessments that have been undertaken to satisfy the terms of reference for the TOT Project to ensure the development of the methodology is cognisant of the environmental values of the area.

In simple terms, the preferred construction methodology proposed for formation of engineered fill land platforms and waterways within the TOT Project will be by progressive reclamation of land utilising materials within the site, contained by breakwaters of rock material exported from existing external licensed rock and sand material sources.

2.1.1 Alternative Construction Methods

Alternative construction methods were considered prior to selection of the preferred methodology. Two alternatives were considered and are described below.

Alternative 1: Dredged sand for site reclamation

Typical methods for reclamation of wet sites were considered by dredging of adjacent marine bed sediments for sourcing of suitable fill materials. This method was discounted due to unavailability of suitable volumes of sand in close proximity of the site and potential impacts on environmentally sensitive areas.

Alternative 2: Imported sand and landfill materials

A hybrid method was considered to retain materials within the site by preloading landfill areas using stable inert materials. This option was discounted due to unavailability of suitable volumes of sand in close proximity of the project site. This alternative also required removal of preload material off site at the completion of works and significant impacts from haulage of materials.

2.2 Preferred Construction Method

The fundamental construction elements to be created during construction of the TOT Project are illustrated on Methodology Drawing K202-QL00703-01 Key Construction Elements. Construction will proceed generally as described in the following 25 Step methodology and sequencing, which where relevant, will be further illustrated by the explanatory Methodology Drawings attached in Appendix A. More detailed Design Drawings are contained in Appendix B.

Construction of the TOT terminal building and detailed civil engineering and other infrastructure services to the Breakwater Cove Precinct will follow the land reclamation formation.

Step 1 – Access Haul Road and Hardstand Area

AS the undeveloped site is wholly below water (see Undeveloped Site Plan K201-QL00704-01), creating construction vehicle access and a workable area is a primary concern.

An internal access haul road and hardstand area will be constructed within the site, (refer to Methodology Drawing K203-QL00704-01 Step 1 Hardstand and Haul Road Bund), by creation of a trafficable rock bund wall running adjacent to the existing Port Western Breakwater, Northern Breakwater and the hardstand area will be generally located in the position of the future carpark adjacent to the Townsville Entertainment Centre. The access haul road will be created as a bund to serve as waterproof barriers between the project site and surrounding waterways through incorporation of a water barrier membrane such as, High Density Polyethylene (HDPE) / NAVE membrane. A typical haul road construction bund is illustrated in Design Drawing K218-QL00704-01.

Quarry rock material will be used in construction of this access haul road. The volume of rock material will include 54,774 m^3 of 1-tonne rocks and 226,114 m^3 of crushed rock. One-tonne rocks will be used to form the base layer of the bund walls to penetrate the soft upper layer of the waterway bed, containing dark grey silty/clay, clayey silt with some sandy zones (“soft clay layer”) and will found on the underlying stiff clay.

Once rock material is delivered to the site it will be tipped into place either directly from the truck or stored in stockpiles. It is proposed stockpiles will be provided generally within the designated stockpile area as shown on Methodology Drawing K203-QL00704-01 Step 1 Hardstand and Haul Road Bund. The stored material will be removed from the stockpile area and then transported into place by excavator, truck or barge within the TOT project site.

Step 2 – Perimeter Breakwater Construction

Construction of the Strand Breakwater, a Northern Breakwater extension and Northern Breakwater remediation will be undertaken during Step 2. The locations of breakwaters are shown on Methodology Drawing K204-QL00704-01 Step 2 Perimeter Breakwater Construction.

The size and quantity of rock material used for breakwater construction is detailed in Table 1.

Table 1: Rock materials used in breakwater profiles

Rock Size	Quantity	Breakwater Profile
0.25-1 tonne rock	156,473 m^3	corefill
2 tonne rock	33,789 m^3	rear slope armour
4 tonne rock	6,279 m^3	seaward buttress
1 tonne rock	12,928 m^3	seaward slope armour
250 kg rock	36,151 m^3	filter rock
1-6 tonne rocks	12,772 m^3	seaward primary armour
2 tonne rock	1,314 m^3	toe beam
2 tonne rock	12,438 m^3	primary armour

In general, corefill material will be placed to form the inner layer of the breakwaters. A layer of High Density Polyethylene (HDPE) water proofing membrane will be placed against the corefill material where required. Armour rock is placed to form the outer layers of the breakwaters. The profiles of these breakwaters are illustrated on Design Drawing K219-QL00704-01 Breakwater Sections.

Placement of rock material onto the breakwaters will be undertaken by an excavator or loader located on the breakwaters. Incorporation of a HDPE / NAVE membrane will enable these breakwaters to act as waterproof barriers between the project site and surrounding waterways.

Step 3 – Temporary Construction Bunds

In order to encapsulate the site for dewatering, a temporary bund will be constructed between the Strand Breakwater and the termination of the access road in the northwest corner of the site (Refer to Methodology Drawing K205-QL00704-01 Step 3 to 5 Construction Bunds). This temporary bund will assist in isolating the construction site from the adjacent waterways. This bund will be constructed using 2,400m^3 of 1-tonne rocks and 9,600 m^3 of crushed rock.

Additional temporary bunds will be positioned between the Strand Breakwater and the Northern Breakwater (Refer to Methodology Drawing K205-QL00704-01 Step 3 to 5 Construction Bunds) to complete the site encapsulation or isolation. These bunds will be constructed of 6,030 m3 of 1-tonne rocks and 24,117 m3 of crushed rock. This will consist of 1-tonne

rocks to be used to form the base layer of the bund to penetrate the soft clay material and found on the stiff clay.

Construction of the Step 2 breakwaters with the temporary construction bunds will provide bunding of the entire site to retain the soft material layer of the existing waterway bed or soft clay material and prevent uncontrolled discharges to Cleveland Bay during construction.

Step 4 – Construct Terminal Haul Road Bund

A second trafficable rock haul road bund wall will be constructed between the access haul road bund constructed during Step 1 and the Port Western Breakwater to separately identify the final wall alignment of the terminal berth (Refer to Methodology Drawing K205-QL00704-01 Step 3 to 5 Construction Bunds Key Element 4). This terminal haul road bund will require 13,650 m^3 of 1-tonne rock and 64,474 m^3 of crushed rock for construction. Once this bund wall is created, the TOT precinct can then be constructed in concurrently with the rest of the site.

Step 5 - Sheet Pile Future Land Area

Remaining perimeter areas in the northwest corner of the site will be sheet piled to close off the parkland area using some 205 lm – 15 m lengths of sheet pile material. Sheet piles will be protected with 12,371m^3 of crushed rock and 3,907m^3 of 2-tonne primary armour rock. A construction rock bund will be placed between the main haul road bund and the northern breakwater for creation of a water treatment area. This is shown as the temporary flocculent bund on Methodology Drawing K205-QL00704-01, Step 3 to 5 Construction Bunds.

Step 6 – Site Dewatering

The site will be dewatered following construction of breakwaters, temporary bund walls and sheet piling by installation of spear pumps within the perimeter of the encapsulated area. Dewatering will be undertaken progressively and water will be treated via a series of settlement ponds prior to discharge of water to surrounding waterways. Dewatering will proceed in accordance with the recommendations contained in the Geotechnical Report and the Water Quality Report contained in the EIS.

Full dewatering will not occur within the berth pocket and the Terminal Haul Bund due to the removal of part of the existing Port Western Breakwater in Step 11. In the event that an artesian water lense is encountered, this will be managed by installation of localised sumps within the work cell areas, (Refer to Methodology Drawing K206-QL00704-01 Step 6 Site Dewatering).

Step 7 – Excavation Treatment from Soft Layers to Storage Areas

Once the site is dewatered, the soft clay from Canal C and the intended temporary flocculent area will be removed down to the stiff clay layer by excavator and trucked by Rigid Dump Trucks. Part of this material will be placed within the temporary storage area in the northern corner of the site.

Geotextile fabric will be laid over the existing soft clay within the future parkland area. Then a 500mm layer of sand (8,440 m^3) will be introduced for wick drain dewatering. Further soft clay material will be excavated from the TOT terminal precinct and will be laid over the sand layer in the Future Parkland Area.

Soft clay from inside the berth pocket area will be removed down to the stiff clay layer by excavator and trucked by Rigid Dump Trucks for continuing fill of the remaining parkland areas to complete filling to RL2.6m. Refer to Methodology Drawing K207-QL00704-01 Step 7 Excavation Treatment from Soft Layers to Storage Areas.

Step 8 - Commencement of Clay Recovery and Revetment Wall Construction

The Breakwater Cove precinct will be progressively excavated, filled and backfilled until completion of land reclamation areas to the required design levels. Temporary bunds will be used within the Breakwater Cove precinct and progressively relocated across the site to create working cells for excavation of soft clay and stiff clay.

Each “working cell” is generally a future land platform area and a canal area. Within each cell, soft clay will be either pushed by dozer or loaded by excavators into Rigid Dump Trucks for either storage or permanent placement in an excavated canal trench. The excavation of the clay material will be undertaken progressively within each working cell identified on the construction sequence drawings.

Land reclamation will be created by the excavated stiff clay being relocated to the landform site in controlled stiff clay compaction in maximum layers of 300mm to 95% compaction with a maximum soil moisture content of 20 to 25% and to a maximum height of RL 2.6m.

A pre-cast revetment wall system will then be placed at the perimeter of the land platform fingers. The revetment wall system will be complete with drainage membrane, engineered backfill and soil retention anchor system. Rock armour protection will be placed at the toe of revetment walls using 29,619.m^3 of 50 to 250kg rocks. Land areas will then receive 900mm of engineered fill (292,548 m^3) to achieve final levels of RL 3.5m. Fill material will be offloaded onsite for storage within the designated stockpile area and

will be trucked by Rigid Dump Trucks to the final placement areas when required.

The construction sequencing for the TOT project site will follow this general progression of the landforms from north to south across the project site. At the same time as the later construction are progressing for one cell, there will be other construction sequence steps occurring in other cells or on the TOT Precinct. To identify concurrent activities, refer to Methodology Drawing K208-QL00704-01 Step 8 and Step 9. To "step out" the methodology however, each will be explained individually.

In Step 8, a temporary flocculent area is created, stiff clay layers (exposed after Step 7) in Canal Area C are placed in the Landform 4 Area. Imported engineered fill material will be placed in the Future Parkland Area.

Step 9 – Commence Berth Pocket Clay Recovery

Stiff clay from within the terminal berth pocket (120,023 m^3) will be excavated and material transferred to terminal building precinct. Refer to Methodology Drawing K208-QL00704-01 Step 8 and Step 9.

Step 10 – Continue Clay Recovery and Revetment Wall Construction

Soft clay material will be excavated from Canal B and Landform 3 and placed in Canal C.

Engineered fill will be imported and placed in Landform 4 and the TOT Precinct.

The northern parkland area will be finished to a final profile of RL3.5m AHD. Refer to Methodology Drawing K209-QL00704-01 Step 10 and Step 11.

Step 11 – TOT Berth Pocket Works

The wharf piling will then be constructed from a barge mounted piling rig. Rock armour protection will be placed at the toe of the wharf embankment by clamshell excavator. Wharf pre-cast headstocks and decking will be placed via land based 40t crane to complete the wharf structure. Refer to Methodology Drawing K209-QL00704-01 Step 10 and Step 11.

The portion of the existing Port Western Breakwater directly in front of the berth pocket will be removed by clam shell and conventional excavators with rocks barged to Mariners Peninsular and the northern side of the

northern breakwater for final placement. (Refer to Methodology Drawing K209-QL00704-01).

Step 12 – Continue Clay Recovery and Revetment Wall Construction

Stiff clay will be excavated from Canal B and placed in engineered fill to form Landform 3. Landform 4 will be finished to a final profile of RL 3.5m AHD. The TOT Precinct will then be finished to a final profile of RL 3.5m AHD. Refer to Methodology Drawing K210-QL00704-01 Step 12 to Step 14.

Step 13 – Final Clay Removal from the Berth Pocket and Swing Basin

Stiff clays from below the removed rocks of the Port Western Breakwater (109,610 m^3) and within the berth pocket will be excavated for creation of the swing basin (145,942 m^3) by cutter suction dredge. These materials are considered unsuitable for reuse on site and will be removed to a suitable disposal site. Refer to Methodology Drawing K210-QL00704-01 Step 12 to Step 14.

Step 14 – Dredge Future Marina Outer Access Channel

Approximately 15,433 m^3 of material will be dredged from within the outer entry access channel to be deposited in Canal B within the project site. This material will be removed by cutter suction dredge and deposited within the excavation pit. Refer to Methodology Drawing K210-QL00704-01 Step 12 to Step 14.

Step 15 – Continue clay recovery from Canal A and Import Engineered fill to Landform 3

Soft clay material will be excavated from Canal A and Landform 2 and removed to the excavation pit in Canal B. Imported engineering fill will be placed within Landform 3 to achieve a final profile of RL 3.5m AHD. Refer to Methodology Drawing K211-QL00704-01 Step 15 and Step 16.

Step 16 – Bridge 3 Construction

Bridges within the Breakwater Cove Precinct will be constructed in dry site conditions with piles being driven by conventional means. Rock scour protection consisting of 24m^3 of 2-tonne rock will be placed by excavator at the base of the piling. Headstocks and decking will be placed on bridges via 40t crane and handrail installed at completion of the rock protection works. For the proposed bridge construction sequence, refer to Methodology Drawing K211-QL00704-01 Step 15 and Step 16.

The indicative bridge elevations and cross sections are shown on Design Drawings S001-QL00704-01 to S003-QL00704-01.

Step 17 – Clay Recovery from Canal A

Stiff clay from Canal A will be excavated and placed on Landform 2 to fill to RL 2.6m AHD. Landform 3 will then be filled to achieve a final profile of RL 3.5m AHD. Refer to Methodology Drawing K212-QL00704-01 Step 17 Clay Recovery, Revetment Wall Construction.

Step 18 – Soft Clay Recovery From Marina

The soft clay layer from within the Marina basin and Landform 1 will be excavated and relocated to the excavation pit in Canal A. Imported engineering fill will be placed on Landform 2 to fill to a final profile of RL 3.5m AHD. Refer to Methodology Drawing K213-QL00704-01 Step 18 and Step 19.

Step 19 – Bridge 2 Construction

Bridge 2 which links to Landform 2 within the Breakwater Cove Precinct will be constructed in dry site conditions with piles being driven by conventional means. Rock scour protection consisting of 24m^3 of 2-tonne rock will be placed by excavator at the base of the piling. Headstocks and decking will be placed on bridges via 40t crane and handrail installed at completion of the rock protection works. Refer to Methodology Drawing K213-QL00704-01 Step 18 and Step 19.

Step 20 – Continue Clay Recovery and Revetment Wall Construction

Stiff clay material will be excavated from the Marina basin and placed on Landform 1. Excavation of stiff clay from the Marina will also be placed on the temporary flocculent area to fill to a level of RL 2.6m AHD. Landform 2 will then be finished to a final profile of RL 3.5m AHD. Refer to Methodology Drawing K214-QL00704-01 Continue Clay Recovery and Revetment Wall Construction.

Step 21 – Complete Soft Clay Material Recovery and Importation of fill to Landform 1

Imported engineering fill will be placed on Landform 1 to achieve a final profile of RL 3.5m AHD. Approximately 175,000 m^3 of soft clay material that was temporarily stored within the on-site storage areas will be returned to the final disposal areas within the Marina by use of a cutter suction dredge. Refer to Methodology Drawing K215-QL00704-01.

Step 22 – Commence the Strand Breakwater Bridge Construction

The bridge connection from Mariners Peninsula to the Strand Breakwater will be constructed by driving piles from the water via a piling rig barge. Headstocks will be lifted from a barge based 40t crane. Decking will be placed in the same manner. The location of the Strand Breakwater Bridge is shown on Methodology Drawing K202-QL00704-01 and Key Construction Drawing K215-QL00704-01. Refer to Design Drawings S001-QL00704-01 to S003-QL00704-01 for indicative bridge elevations and cross sections.

Step 23 – Complete Landform Construction

Landform 1 will be filled to achieve a finished profile of RL 3.5m AHD. The temporary flocculent area will be then filled to achieve a final profile of 3.5m AHD. Refer to Methodology Drawing K216-QL00704-01.

Step 24 – Staged Removal of Temporary Construction Bunds

Temporary construction bunds installed during Steps 1, 3 and 4 will be removed by barge mounted clam shell excavators and deposited adjacent to the Strand and Northern breakwaters. This will allow water to flow into the project site. Refer to Methodology Drawing K216-QL00704-01

This step will be undertaken progressively by staged removal of temporary bunds. Bunds at the end of working cells will be removed one by one allowing settlement of water and turbidity within canals on a staged basis prior to removal of successive bunds.

Step 25 – Complete the Strand Breakwater Bridge Construction

In the final step, the Strand Breakwater Bridge connection to Mariners Peninsula will be completed. Refer to Methodology Drawing K216-QL00704-01.

Indicative Master Plan

Methodology Drawing K217-QL00704-01 indicates the finally constructed landforms with an indicative future development overlay.

2.3 Construction Plant and Equipment

The equipment expected to be used within the Townsville Ocean Terminal project site during construction is listed in Tables 2 to 5.

Table 2: Common Equipment used in All Areas

Equipment	1st Year	2nd Year	3rd Year
Sheet Piling Rig	√	0	0
Driven Piles Rig	√	√	√
Barge SLV 500	√	√	√
Dewatering Pump(s)	√	√	√
Pile Breakers	√	√	√

Table 3: Bulk Earthworks Equipment

Equipment	1st Year	2nd Year	3rd Year
100 t Digger	0	√	√
12G Grader	√	√	√
16G Grader	0	√	√
30t Excavator	0	√	√
40t Excavator	√	√	√
65t Excavator	√	√	√
Cutter suction dredge	√	0	0
825C 4 Wheel Compactor	0	√	√
988 Wheel Loader	√	√	√
Cat 740 40t Articulated Truck	√	√	√
D6 Dozer	√	√	√
D6 LGP Swamp dozer	0	√	√
HD 465 Rigid Dump Truck	0	√	√
Self Propelled Roller	0	√	√
Tandem Water Truck	√	√	√
40 t Crane	0	0	√
Franna Crane	0	√	√

Table 4: Civil Works Equipment

Equipment	1st Year	2nd Year	3rd Year
Excavators	0	0	√
Backhoe	0	0	√
Ditch Witch Trencher	0	0	√
Dozers / Drotts	0	0	√
Grader	0	0	√
Kerb Machine	0	0	√
Water Truck	0	0	√
Sheep foot Roller	0	0	√
Steel Drum Roller	0	0	√
Rigid Dump Trucks	0	0	√
A.C Placing Plant	0	0	√
Moxy Truck	0	0	√
Franna Crane	0	0	√

Table 5: Terminal Construction Works

Equipment	1st Year	2nd Year	3rd Year
Excavators	0	√	0
Backhoe	0	√	0
BobCat	0	0	√
Clamshell Digger / Dragline	0	√	0
Cranes Franna	0	√	√
Cranes 40 t	0	√	√
Scissor Lift	0	√	√

2.4 Preliminary Programme

It is anticipated the TOT project will be constructed over a 39 month period beginning in March 2008. The proposed phases of development and corresponding construction periods are outlined below.

Development Phase	Timeframe	Commencement
Construction of sea walls and bunds	12 months	May 2008
Excavation and compaction	14 months	March 2009
Precast / Engineering fill and rip rap	13 months	September 2009
Roads and services	12 months	March 2010
Landscaping works	6 months	April 2010
First settlements	--	June 2010
Construction of terminal building and wharf	16 months	Jan 2009
Handover and commissioning of TOT precinct	--	May 2010

The TOT precinct is anticipated to be completed and commissioned in May 2010. This is prior to completion of the Breakwater Cove precinct which is due to be completed in stages with the final stages being completed by May 2011.

A description of the construction areas including construction parking areas are illustrated on Methodology Drawing K203-QL00704-01 as 'hardstand areas'.

2.5 Construction Employees

It is anticipated that construction of the TOT project will provide employment for between 50 and 300 persons in any one year for a period of three years (approximately 440 positions over three years). It is likely

that a further 175 to 200 persons would be employed in construction of private residential dwellings in any one year over a period of four years following completion of the project (approximately 760 positions over four years). The number of construction personnel employed during construction of the TOT project is detailed in Table 6. Table 7 provides details of construction personnel during future residential development.

Table 6: Construction employees for the TOT Project

	Number of Construction Personnel											
	Year 1				Year 2				Year 3			
Construction Activity	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
Construction of Bunds and Breakwaters	50	50	50	50								
Excavation of Site to Gain Fill Materials					75	75	75	75	75			
Construction of Revetment Walls and Filling							75	75	75	75	75	
Installation of Roads and Infrastructure									75	75	75	75
Site Landscaping Works												50
Terminal Building and Wharf					75	75	75	75	75	75		
Total Personnel on Site	50	50	50	50	150	150	225	225	300	225	150	125
Average				50				188				200

Table 7: Construction employees for future residential development

	Number of Persons on Site															
	Year 4				Year 5				Year 6				Year 7			
Residential Construction	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
Site Landscaping	50															
Year 1	200	200	200	200												
Year 2					200	200	200	200								
Year 3									175	175	175	175				
Year 4													175	175	175	175
Total Persons	250	200	200	200	200	200	200	200	175	175	175	175	175	175	175	175
Average				213				200				175				175

Employee numbers during the first year of construction will be approximately 50 persons on site at any one time. During the second year, construction employee numbers are likely to vary between 150 and 225 persons on site. The maximum number of employees on site at any one time will be approximately 300 during the third year. This is likely to occur when the wharf and building construction works on the TOT Precinct will coincide with installation of roads and services and site landscaping works on the Breakwater Cove Precinct.

The construction workforce will predominantly be sourced from the local construction industry. It is expected any specialist construction personnel required to be sourced from other areas will be able to be housed temporarily within existing accommodation in Townsville given their small numbers. It is therefore not proposed to construct temporary accommodation for the construction workforce.

Construction employees are expected to be transported to the site by normal public or private transport means given the site accessibility. Staff carparking will be provided within a hardstand area in the construction compound. This area will be located within secure fencing and access will be controlled.

2.6 Pollution Control Measures

Control of emissions and pollutants during construction will be achieved by implementation of the project EMP. The construction contractor will be required to prepare and implement a refined Construction Management Plan (CMP) to be in accordance with the project EMP. The refined CMP will be developed to cater for the specific construction method to be utilised on site and to ensure the Contractors Occupational Health and Safety Plan is compatible with the CMP.

2.6.1 Noise

Construction site operating hours will be, in accordance with normal Townsville City Council approval conditions imposed on the Operational and Building Works Approvals obtained to prevent amenity impacts on the immediate area. Activities generating excessive noise will be timed to minimise the amount of disturbance to sensitive receptors. Noise and other nuisance complaints will be managed by provision of a contact name and number which will be displayed in a location accessible to members of the public. Noise control measures are specified in the project EMP.

2.6.2 Air

In order to maintain acceptable air quality in and around the construction site, dust suppression techniques will be implemented to minimise airborne dust from vehicle and material movements within the site. Dust generation will be minimised by watering of working areas with consideration for water efficiency. All equipment and plant in use within the site will be properly maintained and regularly serviced to minimise discharge of airborne emissions. Air emissions will be controlled by mitigation measures proposed in the project EMP and are discussed in the Air Quality Report.

2.6.3 Water

Stormwater runoff over the construction site will be controlled by use of filtration and detention devices prior to discharge to prevent mobilisation of sediment and prevent contaminants leaving the site. Sediment filters such as geo-textile screens, straw bales or sandbags will be installed around stockpiles and exposed working areas and clean rainwater will be diverted to prevent it flowing across the site. Sediment ponds will be used for filtration and settlement of suspended solids prior to discharge from the site. An erosion and sediment control plan will be prepared prior to construction in accordance with the measures proposed in the project EMP.

2.6.4 Site Dewatering

Dewatering of the site will be undertaken progressively and water will be treated via a series of settlement ponds for removal of suspended solids prior to discharge of water to surrounding waterways. All dewatering activities will be undertaken in accordance with the recommendations of the Geotechnical Report and the Water Quality Report.

2.6.5 Spills

In the event of a spill within the site or during transport, immediate actions will be taken to contain spilled material and effective clean-up procedures implemented. In the case of dangerous or hazardous substances, a spill response plan will be implemented in accordance with the project EMP. This will include application of absorbent and/or neutralising substances. Spills will not be hosed or washed away. Any significant spills will be reported to the Environmental Protection Agency.

2.6.6 Waste

The contractor is to adopt a policy of waste management that ensures protection of natural resources through minimisation of construction materials and reduction of environmental impacts by ensuring appropriate recycling, reuse and disposal methods. The contractor will be encouraged to adopt the waste hierarchy for waste avoidance, reuse and recycling ensuring that disposal of wastes to landfill is the last option after all other options have been considered. A waste management plan will be prepared by the construction contractor to implement the waste minimisation measures proposed in the project EMP.

2.7 Temporary Works

Site Construction Compound

A temporary construction compound will be established within the project site to provide office, lunch room, first aid area and toilet facilities and to provide a location for stockpiles and storage of construction materials and equipment. Temporary offices will be provided by use of mobile demountable buildings which will be connected to water, sewer, electricity and telecommunications services. At the completion of site construction works, these building will be demobilised off site.

Fencing

Temporary fencing will be required to secure the construction site and prevent unauthorised access. This fencing will be located across the site land access points and will be constructed of chain wire fencing panels. At the completion of site construction works and once the site is secure for safe public access, fencing material will be demobilised off site.

Site Bunding

The site will be bunded to facilitate and provide a dry site for undertaking excavation and formation of land reclamation platforms and to prevent dispersion of pollutants to surrounding waterways. The majority of the site will be contained by construction of breakwaters. Additional, temporary bunding will be required to isolate the site from adjacent waterways. These bunds will be constructed of rock material and will be removed at the completion of site reclamation works to allow water to flow into canal and marina areas. Rock material removed from temporary bunds will be reused within the site.

Removal of the bunds will be undertaken in stages or controlled in piped water fill to allow stabilisation of the enclosed waterway prior to total removal of the bund.

Barge Point Site

One of the material delivery options involves barging of material to the project site from a Barge Point site located at the junction of Boundary Street and Benwell Road. This option is described in Section 5.2.2. Temporary stockpiling of rock and sand fill material will be provided within this site prior to transport to the project site. Agreement has been reached with the owner of the site for temporary stockpiling of materials for the period of construction and temporary fencing.

Temporary Bridge

One of the material delivery options involves construction of a temporary openable bridge across Ross Creek. This is likely to be constructed by means of a barge mounted piling rig driving steel tube piles. A barge mounted crane will be used to lift pre-cast concrete or steel section headstocks onto pile caps and to lift pre-cast concrete or steel section bridge beams to bear on headstocks. Pre-cast decking will also be lifted onto bridge beams by a barge mounted crane.

The openable section of the bridge decking will provide a minimum 25m clear navigation width for marine traffic. Sealed haul roads will be completed with commercial crossovers to link with adjoining roads. Traffic control devices and navigational markers will be installed as necessary.

2.8 Maintenance of Safe Navigation

Safe Navigation of the Port of Townsville and surrounding waterways will be maintained during construction activities. The barging haul route option will see two (2) barges operated on 90 minute cycles which will result in a vessel transiting across the Port entrance every 22 minutes.

The proposed barge operations have been reviewed and formulated in co-operation with the Port of Townsville Harbour Master. No foreseeable problems are expected from such a low frequency operation involving relatively slow barge vessels. Nevertheless all movements of construction vessels within the Port of Townsville will be reported to the Port Control office on the VHF working frequencies 12 and 16. Construction vessels will also observe the red Port Busy Signal located on the Port Control Tower prior to entering the Port. There is no proposal for modifications to Port infrastructure or navigation markers. If it becomes necessary to change any

facilities the relevant approvals will be obtained through the administering agency.

Construction vessels required to cross the entrance to Ross Creek will observe established harbour operations protocols including giving way to all shipping traffic and normal application of collision regulations for all other small craft. It is anticipated appropriate notification to mariners and emergency response agencies will be provided where necessary by the Harbour Master.

Once construction vessels and equipment are in place within the site, all works will be conducted outside the main Port channel and navigational markers. It is not anticipated that construction works will impact on Port operations or stability of Port facilities.

In the event of a cyclone occurring during construction works, all works on the site will cease and standard damage mitigation measures will be undertaken to secure vehicles property and material in accordance with an emergency response plan. It is expected that a level of protection will be provided by proposed breakwaters which are to be constructed during the first phase of construction.

2.9 Sustainable Engineering Solutions

Sustainable engineering solutions will be implemented to reduce the resource consumption during construction of the TOT project. These solutions will focus on resource efficiency including efficient use of energy, water and materials during construction.

Consumption of fill materials has been reduced during site reclamation works through re-evaluation of required volumes of material. Re-use of materials excavated from within the site has reduced the requirement for sand as fill and has eliminated the need for extraction of sand material from nearby riverine sediments. The reduced volume of sand required for reclamation will now be sourced from existing licenced sand mining operations.

The construction contractor will be required to implement control measures outlined in the project EMP. These measures include:

- reduction of greenhouse gas emissions and energy use through appropriate maintenance and servicing of plant and equipment used during construction activities;
- reduction of dispersion of pollutants to receiving environments through adoption of pollution control measures outlined in Section 2.8; and

- reuse or recycling of construction materials and minimisation of waste generated during construction as specified in Section 2.8.5.

The design of the ocean terminal building has also considered options for sustainability. The internal building layout is adaptable to allow for reconfiguration of spaces should user requirements change over time and allows easy replacement of equipment and incorporation of developing technologies into the new structure without the need for significant redesign and further refurbishment construction.

2.10 Capital Dredging

Capital dredging is required for creation of the TOT berth pocket and swing basin together with the outer access channel. Material to be dredged consists of soft organic clay and stiff/clay material. Proposed dredge areas are presented on Design Drawing K223-QL00704-02.

It is proposed that the approximately 15,430m^3 of material to be dredged from the outer access channel will be disposed of on site.

The approximately 109,610m^3 of stiff clay material will be dredged from the Port Western breakwater for construction of the TOT berth pocket and approximately 145,940m^3 of sediment material will be dredged within the Port area for creation of the TOT swing basin, will be unsuitable for engineered fill and is likely to be disposed of at the Port of Townsville approved spoil disposal site at sea.

Dredging and material disposal will be timed to avoid impacts on marine fauna species as recommended by the Nature Conservation Report.

2.11 Tidal Works

The Townsville Ocean Terminal Project involves works in tidal waters; these works are described as tidal works in the Coastal Protection and Management Act and Coastal Protection and Management Regulations.

Tidal works are undertaken on land that is in, on or above tidal water, or designed to be exposed to tidal water or on land that will or may be under tidal water because of development on or near the land. Tidal works in the Townsville Ocean Terminal Project include structures such as listed below:

- Constructed in tidal water.
- Basin (marina)
- Breakwaters (temporary and permanent)

- Bridges (temporary and permanent)
- Dredging (outer access channel, internal waterway, berth pocket and swing basin)
- Rehabilitation of breakwalls
- Waterways (canal)
- Marina facilities
- Embankment
- Barge ramp (temporary)
- Access channels
- Stormwater drainage
- Revetment walls
- Reclamation of land forms
- Jetty
- Pipeline (electrical conduit to Magnetic Island)
- Pontoon
- Power line
- Sea wall
- Small-craft and facility
- Training wall
- Wharf-terminal berth

Other works in tidal waters will include:

- Erecting a sign such as for maritime navigation
- Removing material from land under tidal water for the purpose of selling the material of using it to reclaim land
- Work within strategic part land tidal area that is assessable by a port authority
- Tidal works that is not completely or partly within a local government tidal area.
- Tidal works for new or existing structures that will be used for the operation of a port authority
- Tidal works for new or existing structures that will be used for a public marine facility being constructed by or for Queensland Transport or a port authority (e.g. public boat ramps, public marinas, private marinas within a State boat harbour)
- Tidal works that involves creating or changing the configuration or characteristics of a navigational channel (e.g. dredging a channel)

There will be demolition of existing structures in tidal waters. These include:

- Partial demolition of the Port western breakwater
- Demolition will need to be undertaken in a manner that minimises environmental impacts consistent with the Environmental Protects Acts (1994) General Environmental Duty. Applicants should refer to the Australian Standard 2601 “Demolition of structures” for guidance on demolition.
- Complete demolition of temporary construction bunds within the project site.

The nature and extent of these tidal works and works in tidal waters are described in this report and the potential impacts and associated management strategies are described in the EIS.

2.12 Works during Periods of Rainfall

In the event of excessive rainfall, it is proposed that construction works will cease and disturbed areas within the site will be stabilised. All temporary erosion and sediment control measures will be inspected daily to ensure that contaminants are not discharged from the site in stormwater runoff.

3 Construction of the TOT Precinct

3.1 Precinct Description and Location

The TOT Precinct will be located within the Port Western Breakwater as illustrated in Design Drawing K019-QL00704-01. Design Drawings detailing the specifications of the terminal building and wharf structure are contained in Appendix C.

The TOT Precinct will comprise the following primary elements:

- dedicated berth for cruise ships and naval vessels;
- wharf structure and terminal building; and
- associated road works, security car parking and infrastructure services.

Dedicated Berth

A berth pocket of 350m in length and 45m width will be located on the eastern side of the Port Western Breakwater with access for cruise ships and naval vessels provided from Platypus Channel within the Port of Townsville. The berth pocket will be dredged to a depth of 11.7m below HAT.

A clearance zone of 46m will be provided from the centreline of Platypus Channel to the berth pocket. The berth pocket will accommodate vessels up to the “Wasp” class (length = 258m, beam = 32.3m) and the State’s 'Benchmark Cruise Ship' identified in the *Queensland Shipping Plan* (length = 238m, beam = 33m). Hyder Drawing QL00017-SK-02C illustrates the general arrangement of structures within the TOT Precinct.

Wharf Structure

The TOT wharf structure will be 200m in length and will be of 30m width from the terminal building to edge of the berth pocket. The wharf structure will be a suspended reinforced concrete slab deck on steel piles. The wharf will be designed for B-double tanker and semi-trailer trucks and will have the capacity to receive military tanks up to 65 tonnes and tank/truck trailer combinations up to 95 tonnes. The wharf deck details are provided on CGR Drawing HWH-001-003 Rev 6.

Fenders will be provided for berthing of cruise ships and naval vessels at the deck face. Fenders for cruise ships will be a typical cone fender and facing panel. Naval vessels will berth to pneumatic “Fentek” or equivalent fenders placed on the quay line. Details of proposed fender systems are provided on CGR Drawing HWH-001-004 Rev 5.

Service Provision

Water supply, sewerage and electrical and telecommunication services will be located in a services duct suspended beneath the wharf deck. Connections to existing Townsville City Council and Ergon Energy services will be provided to vessels at the deck face. The wharf services plan is provided in CGR Drawing HWH-003 Rev 6 and 007 Rev 2.

Water will be provided by the Townsville municipal potable water supply. Connection will be provided to marine vessels at four (4) discharge locations within the wharf face. Details of potable water reticulation within the project site are provided in Section 4.4.2.2 of the EIS.

Two sewage/greywater connection pits are provided at the wharf face for collection of ship-board wastewater. This will then be delivered to a sewage storage facility and pump station for connection to the Townsville municipal sewerage network and treatment plant. There will be no treatment or disposal of sewerage within the TOT precinct. Details of sewerage networks within the project site are provided in Section 4.4.2.4 of the EIS.

Wharf lighting will be provided in accordance with Australian Standards AS1158.3.1, AS3827 and AS4282 as described in Section 4.9.2.3 of the EIS. Flood lights will be appropriately shielded to prevent interference with navigation beacons and to prevent light spill onto residential areas.

Terminal Building

The terminal building will be a single storey rectangular structure of 20m by 50m and approximately 3.5m height at the eaves as shown on CGR Drawings HWH-001-003 Rev 6 and Buchan Drawings Ska3-10-D and Ska3-11-D. The Terminal Building will have a gross floor area of approximately 1000 m^2. The building design will be a contemporary light form with a nautical theme.

It is proposed that the building will be an open, flexible structure providing the following facilities as detailed on Buchan Drawing Ska3-12-A.

- A general hall area to cater for vessel arrivals and departures comprising a quarantine/customs area, transit hall, dining area/observation lounge, document check-in station and baggage pick up.
- Offices for accommodation of terminal operational staff and management, Customs and Australian Quarantine Inspection Service.
- General office space, staff rooms, meeting room, store room, security and interview rooms.
- A café and service provider kiosks and toilet facilities.

Site Access and Traffic Management

The TOT Precinct will be linked to Entertainment Drive by means of a two lane divided road. This new road will cater for public, private and service vehicles and will be designed to meet the relevant Australian road design standards and Townsville City Council standards.

Separate demarcated set down areas will be provided for buses and taxis. Two spaces for taxis and two spaces for buses will be provided in the set down area immediately adjacent to the TOT Terminal. A holding area will

be provided in the TOT Precinct for an additional 8 taxis and 10 buses. Emergency vehicles will access the TOT Precinct via the internal road system.

The following parking facilities will be provided.

- The TOT Precinct will provide for ten (10) onsite parking spaces for tour and shuttle buses;
- The bus parking area will also serve as a parking area for up to 8 heavy trucks (prime movers) in the event of visitation by Navy vessels;
- The TOT Precinct will provide onsite parking for 100 visitors cars in a designated parking area;
- Reserved uncovered parking will be provided for twelve (12) official vehicles adjacent to the terminal building; and
- The TOT Precinct will have twenty (20) uncovered spaces for VIP and hire vehicles in close proximity to the TOT terminal.

3.2 Preliminary Programme for the TOT Precinct

The construction of the TOT precinct will occur over a 28 month period as described in Section 2.4. Construction of the terminal building and wharf structure will commence at the completion of construction of seawalls and site bunding in March 2009 and will continue for a period of 16 months. The TOT is expected to be commissioned in June 2010.

4 Construction of the Breakwater Cove Precinct

4.1 Precinct Description and Location

Landforms will be constructed by reclamation of land within the Breakwater Cove Precinct to provide sites for a range of uses including multiple dwellings, detached dwellings, and a range of commercial and retail services. Typical landform sections and canal sections are illustrated on Design Drawings K220-QL00704-01 to K222-QL00704-01.

Future construction of buildings within the Breakwater Cove precinct will be controlled by the Future Development Area (FDA) Scheme and residential development will be governed by a Community Management Scheme.

The existing Northern Breakwater will be upgraded to provide protection of the Breakwater Cove Precinct. In addition, the new Strand Breakwater will be construction to provide protection of land fingers and navigational access. This breakwater also provides public access to the site.

Site Access and Traffic

The Breakwater Cove Precinct will be connected to Entertainment Drive by means of a public two way road. This main access road will be designed to cater adequately for pedestrians and on road cyclists. Internal roads will cater for public, private, emergency and service vehicles. These roadways will be designed to meet the relevant Australian road design standards.

Vehicular access to the traditional residential waterway peninsulas will be provided by private roadways with limitations on on-street parking. The multiple dwelling peninsula is accessed by a public road and on-street parking will be provided for visitors to the sites and private parking will be provided within the future residential properties.

Pedestrian footpaths and walkways will be provided on footpath areas and within open space zones. Bicycles routes will be accommodated by a combination of ongrade pathways within verge areas and within road corridors.

Access to the new Strand Breakwater will be provided via the Mariners Drive precinct. Access onto the Strand Breakwater will be restricted to pedestrians, cyclists and maintenance/emergency vehicles only.

Service Provision

Water supply, sewerage and electrical and telecommunication services will be located in underground services trenches within the roadway corridor and within easements as described in the Infrastructure Report. Connections will be provided to existing Townsville City Council and Ergon Energy services to each residential lot and apartment lot.

Water will be provided by the Townsville citiwater municipal potable water supply. Connection will be provided to each residential lot and apartment lots. Sewerage infrastructure will be connected to the Townsville City Council infrastructure. Details of potable water and sewerage reticulation within the Breakwater Cove precinct are provided in the Infrastructure Report.

Protected Areas

The project site is within the Great Barrier Reef World Heritage Area and a Dugong Protection Zone. The location of the site in relation to protected areas is described and illustrated on maps in the Nature Conservation Report.

4.2 Preliminary Program for the Breakwater Cove Precinct

The Breakwater Cove precinct will be constructed in stages over a 39 month period as outlined in Section 2.4. Construction of seawalls and site bunding will commence in March 2008. First settlements to transfer title to third party residents on future developers are expected to be completed by February 2011.

5 PART B: MATERIAL EXTRACTION AND DELIVERY

5.1 Material Extraction

The initial sources of fill material were identified in the Initial Advice Statement for the TOT Project as being taken from waterways adjacent to the site and possibly remote from the TOT project site. Extraction of material to be used for fill of the TOT project site during site reclamation is no longer proposed to be undertaken from within nearby riverine sediments.

Material required for fill will now be sourced from existing licensed extraction operations. Sand and rock material will be sourced from the following locations.

- Roseneath Quarry
- Pinnacles Quarry
- Marathon Quarry

5.1.1 Material Quantities

The delivery of rock, sand and engineered fill material from quarries to the project site will occur during three construction stages of twelve months each. The quantity of material to be delivered to the project site during each construction stage is detailed in Table 8.

Table 8: Quantity of material to be delivered to the project site during construction

Material	Stage 1	Stage 2	Stage 3
Quarry rock (>150mm)	67,641m^3	162,486m^3	20,128m^3
Crushed rock (<150mm)	286,678m^3	161,667m^3	
Sand		8,440m^3	
Engineered fill		35,827m^3	256,721m^3
Total Materials	354,319 m^3	368,420 m^3	276,849 m^3
	580,439 tonnes	621,125 tonnes	446,984 tonnes

In addition to quarry sourced fill material, existing material within the site will be utilised in land reclamation and formation of building platforms. These quantities are detailed in Table 9.

Table 9: Existing material within the project site to be used in reclamation of land

Material	Quantity
Soft clay material	65,634 m^3
Stiff clay material	1,579,057 m^3
Existing breakwater materials	54,950 m^3

The re-use of existing materials within the site in land reclamation works has reduced the quantity of fill material required to be delivered to the site during construction. A number of alternative transport options were considered for delivery of material from quarries these are detailed in Section 5.2.

5.2 Material Delivery

The preferred method for import of rock, sand and engineered fill material to be used in construction of the Breakwater Cove and TOT Precincts is for material to be delivered to the project site by road registered trucks from Roseneath, Pinnacle and Marathon Quarries via Boundary Street to a temporary bridge crossing of Ross Creek.

Three other options have been considered for delivery of material to the project site. Two include haulage of material through town (either via The Strand or via Bundock/Warburton Street) directly to the project site during the first stage of construction. During latter construction stages, transport will be via Boundary Street to a temporary stockpile location at the Barge Point site and delivery to the project site by barge. All haul route maps are contained in Appendix D.

5.2.1 Options and Alternatives

Option 1 – Temporary Bridge and Haul Road (Preferred)

It is proposed that material will be delivered from Roseneath, Pinnacle and Marathon Quarries via Boundary Street to a temporary bridge across Ross Creek and then to the project site during Construction Stages 1, 2 and 3 as described below.

Delivery from Pinnacle Quarry to City Limits

Trucks delivering material from Pinnacle Quarry will use the haul route along Gumlow Road turning east on Hervey Range Road then continuing along Ross River Road. Trucks will then turn left onto Nathan Street (Bruce Highway) and then right onto Woolcock Street. (Refer to Haul Route Maps – Drawing K424-QL00704-01 Pinnacle Quarry).

Delivery from Roseneath and Marathon Quarries to City Limits

Trucks will use the northern haul route from Roseneath and Marathon Quarry along Flinders Highway then turn right onto the Bruce Highway. Trucks will then turn left onto Abbot Street and continue north onto Railway Avenue. (Refer to Haul Route Maps – Drawing K417-QL00704-01 Marathon Quarry and Drawing K426-QL00704-01 Roseneath Quarry).

Delivery from City Limits to Temporary Bridge at Ross Creek

Trucks from Roseneath and Marathon Quarries will turn right at Boundary Street then left onto Archer Street and continue on to Ross Street. Trucks from Pinnacle Quarry will continue west from Woolcock Street onto Boundary Street then left onto Archer Street and continue on to Ross Street.

Trucks from all quarries will then turn left from Ross Street into the present Curtin Brothers Marine site continuing over temporary haulage roads and bridge (openable for marine traffic). Once over the temporary bridge, trucks will turn right onto Sir Leslie Thiess Drive to the project site. Trucks will return to the quarries via the same route. The proposed frequency of material deliveries for Option 1 is provided in Table 10.

Table 10: Option 1 haul route material delivery frequencies

Option 1 Stage	Material Volumes	Delivery Times	Vehicle Frequency / Delivery	Total Movements
Stage 1	580,439 tonne of rock	Ten hours/day six days/week	5.79 vehicle movements per hour	17,475 over 12 months
Stage 2	621,125 tonne of rock, sand and engineered fill	Ten hours/day six days/week	6.94 vehicle movements per hour	20,960 over 12 months
Stage 3	446,984 tonne of rock and engineered fill	Ten hours/day six days/week	4.19 vehicle movements per hour	12,653 over 12 months

Advantages and Disadvantages of Option 1

Option 1 utilises existing major truck routes and does not require haulage of materials through built-up areas of Townsville or The Strand. The proposed route is less visible to members of the public and will result in fewer noise and air quality impacts associated with heavy vehicle use in built-up areas.

In addition, there is no requirement for barging of material via Ross River and across Port of Townsville navigational channels. This option reduces the potential impacts of adverse weather and tidal movements associated with barge transport to the project site.

Further advantages may include potential post-construction use of temporary facilities for private development or Council uses.

Option 2 – Strand Haul Road and Barge Transport

It is proposed that material will be delivered from Roseneath Quarry via The Strand directly to the project site during Construction Stage 1 and from Roseneath, Pinnacle and Marathon Quarries via Boundary Street to the Barge Point site then by barge to the project site during Construction Stages 2 and 3.

Stage 1 - Delivery from Roseneath Quarry to the Project Site via The Strand

Trucks will use the northern haul route from the Roseneath Quarry along Flinders Highway then right onto the Bruce Highway. Trucks will then turn left onto Abbot Street and continue north onto Railway Avenue/ Saunders Street/ Dean Street. Trucks will follow Dean Street to Oxley Street then turn right onto The Strand then left onto Sir Leslie Thiess Drive onto Entertainment Drive and continue to the project site *(*Refer to Haul Route Maps – Drawing K401-QL00704-01 Roseneath Quarry).

Stages 2 and 3 - Delivery from Roseneath, Pinnacle and Marathon Quarries to Barge Point Site

Trucks from Pinnacle Quarry will utilise the haul route to the city limits as described for Option 1 and will then continue west onto Boundary Street Trucks from Roseneath and Marathon Quarries will utilise haul routes to the city limits as described for Option 1 and will then turn right at Boundary Road.

Trucks from all quarries will continue along Boundary Street to the Barge Point barge landing site at the junction of Boundary Street and Benwell Road. (Refer to Haul Route Maps – Drawing K414-QL00704-01 Roseneath Quarry, Drawing K412-QL00704-01 Pinnacle Quarry and Drawing K405-QL00704-01 Marathon Quarry,).

Material may be stockpiled within the Barge Point site then transported by two SLV 500-tonne barges via Ross River to the project site. Transport by barge may occur 24 hours per day. However, material would be delivered in two 8-hour shifts. Rock material would be loaded onto the barges by excavator or front end loader from stockpiles, as rocks greater than 1 tonne cannot be loaded directly from trucks to the barge. The proposed frequency of material deliveries for Option 2 is provided in Table 11.

Table 11: Option 2 haul route material delivery frequencies

Option 1 Stage	Material Volumes	Delivery Times	Vehicle Frequency / Delivery	Total Movements
Stage 1	580,439 tonne of rock	Six hours/day six days/week	10.27 vehicle movements per hour	18,615 over 12 months
Stage 2	621,125 tonne of rock, sand and engineered fill	Ten hours/day six days/week	6.94 vehicle movements per hour	20,960 over 12 months
Stage 3	446,984 tonne of rock and engineered fill	Ten hours/day six days/week	4.19 vehicle movements per hour	12,653 over 12 months

Advantages and Disadvantages of Option 2

This option requires heavy vehicle haulage through the Townsville CBD and will have associated noise and air quality impacts on sensitive receptors including businesses, schools and residential areas. Programme delays may occur as a result of requirements to avoid peak traffic. In addition, this option will result in deterioration of existing road infrastructure which will require significant upgrade.

This option also requires delivery of materials by barge to the project site. Barges will be required to utilise navigation channels within Ross River and across the Port of Townsville and will be subject to programme delays due to adverse weather and tidal movements.

Option 3 – Warburton/Bundock Street Haul Road and Barge Transport

It is proposed that material will be delivered from Roseneath Quarry via Warburton/Bundock Street directly to the project site during Construction Stage 1 and from Roseneath, Pinnacle and Marathon Quarries via Boundary Street to the Barge Point site then by barge to the project site during Construction Stages 2 and 3.

Stage 1 - Delivery from Roseneath Quarry to the Project Site via Warburton / Bundock Street

Trucks will use the northern haul route from the Roseneath Quarry along Flinders Highway then turn right onto the Bruce Highway. Trucks will then turn left onto Abbot Street and continue north onto Railway Avenue. Trucks will turn left onto Boundary Street/Woolcock Street then right onto Hugh Street/Percy Street. Trucks will follow Bundock/Warburton/Eyre Street then turn left onto Oxley Street then right onto The Strand. Trucks will follow The Strand and turn left onto Sir Leslie Thiess Drive then take Entertainment Drive to the project site.

Stages 2 and 3 - Delivery from Roseneath, Pinnacle and Marathon Quarries to the Barge Point Site

Trucks from Roseneath, Pinnacle and Marathon Quarries will utilise haul routes to the Barge Point site as described for Option 2. The proposed frequency of material deliveries for Option 3 is provided in Table 12.

Table 12: Option 2 haul route material delivery frequencies

Option 1 Stage	Material Volumes	Delivery Times	Vehicle Frequency / Delivery	Total Movements
Stage 1	580,439 tonne of rock	Six hours/day six days/week	10.27 vehicle movements per hour	18,615 over 12 months
Stage 2	621,125 tonne of rock, sand and engineered fill	Ten hours/day six days/week	6.94 vehicle movements per hour	20,960 over 12 months
Stage 3	446,984 tonne of rock and engineered fill	Ten hours/day six days/week	4.19 vehicle movements per hour	12,653 over 12 months

Advantages and Disadvantages of Option 3

This option requires heavy vehicle haulage through built-up areas in Townsville and will have associated noise and air quality impacts on sensitive receptors. This option will result in deterioration of road infrastructure which will require significant upgrade and major temporary traffic control works due to haulage along busy arterial roads to Townsville CBD. Programme delays may occur as a result of requirements to avoid peak traffic along these roads.

This option also requires delivery of materials by barges, which will be required to utilise navigation channels within Ross River and across the Port of Townsville and will be subject to programme delays due to adverse weather and tidal movements.

Presentation of the details of this proposed haul route during community consultation resulted in negative public reactions. Given the social constraints associated with the use of this haulage option, it has been discounted.

Option 4 – Southern Haul Road

A fourth option was also considered that would involve haulage of quarry materials along an existing unsealed road located within the Townsville State Development Area to the south of the Ross River. However, due to considerable ecological and hydraulic constraints given the location of the road within extensive flood-prone coastal vegetation areas this haul route has also been discounted. This route would also require construction of a barge landing point and possible dredging of Ross River.

Selection of Preferred Haul Route Option

Analysis of all four options has resulted in selection of Option 1 as the preferred haul route. This option will result in fewer impacts on residential and business areas and fewer environmental impacts. It also involves fewer programme delays associated with the use of barges and the need to avoid peak traffic periods in built-up areas.

It may be that for specific construction steps, the remaining options (or a mix of options) will also be appropriate, particularly if it results in overall lessening of the construction impacts of the TOT Project.

5.2.2 Material Haulage Schedule

Option 1 – Temporary Bridge Haul Route (Preferred)

Stage 1

It is proposed that approximately 580,439 tonne of rock will be delivered to the project site by B-Double and Semi-Trailer for rock materials larger than 1 tonne to the project site via the temporary bridge and haul roads during the first twelve months of construction. It is expected that trucks will operate for ten hours a day for six days a week at a frequency of 5.79 vehicle delivery movements each hour. This will give a total of 17,475 deliveries to the project site via the temporary bridge haul route during Stage 1.

Stage 2

A total of 621,125 tonne of rock, sand and engineered fill will be transported by B Double and Semi-Trailer for rock materials larger than 1 tonne to the project site via the temporary bridge and haul roads for a period of twelve months. Trucks will deliver material at a rate of 6.94 vehicles per hour operating for 10 hours a day for 6 days a week. This gives a total of 20,960 deliveries of material to the project site via the temporary bridge haul route during Stage 2.

Stage 3

During Stage 3, approximately 446,984 tonne of rock and engineered fill will be delivered by B Double and Semi-Trailer for rock materials larger than 1 tonne to the project site via the temporary bridge and haul roads for a further period of twelve months. A total of 12,653 deliveries will be made during this period with trucks operating for 10 hours a day for 6 days a week giving a delivery rate of 4.19 vehicles per hour during Stage 3.

Option 2 Strand Haul Route and Barge Transport

Stage 1

It is proposed that approximately 580,439 tonne of rock will be delivered by truck and dog directly to the project site via the Strand during the first twelve months of construction. It is expected that trucks will operate for six hours a day for six days a week at a frequency of 10.27 vehicle delivery movements each hour. This will give a total of 18,615 deliveries to the site via the town haul route.

Stage 2

A total of 621,125 tonne of rock, sand and engineered fill will be transported by B Double and Semi-Trailer for rock materials larger than 1 tonne to the Barge Point site for a period of twelve months. Trucks will deliver material at a rate of 6.94 vehicles per hour operating for 10 hours a day for 6 days a week. This gives a total of 20,960 deliveries of material to the Barge Point site during Stage 2.

Stage 3

During Stage 3, approximately 446,984 tonne of rock and engineered fill will be delivered by B Double and Semi-Trailer for rock materials larger than 1 tonne to the Barge Point site for a further period of twelve months. A total of 12,653 deliveries will be made during this period with trucks operating for 10 hours a day for 6 days a week giving a delivery rate of 4.19 vehicles per hour.

Option 3 – Warburton/Bundock Street Haul Road and Barge Transport (Discounted Option)

Stage 1 – Bundock Street/Warburton Street Haul Route

It is proposed that approximately 580,439 tonne of rock will be delivered by truck and dog directly to the project site via Bundock Street/Warburton Street during the first twelve months of construction. It is expected that trucks will operate for six hours a day for six days a week at a frequency of 10.27 vehicle delivery movements each hour. This will give a total of 18,615 deliveries to the site via the town haul route.

Stage 2 – Barge Point Site Haul Route

A total of 621,125 tonne of rock, sand and engineered fill will be transported by B Double and Semi-Trailer for rock materials larger than 1 tonne to the Barge Point site for a period of twelve months. Trucks will deliver material at a rate of 6.94 vehicles per hour operating for 10 hours a day for 6 days a week. This gives a total of 20,960 deliveries of material to the Barge Point site during Stage 2.

Stage 3 – Barge Point Site Haul Route

During Stage 3, approximately 446,984 tonne of rock and engineered fill will be delivered by B Double and Semi-Trailer for rock materials larger than 1 tonne to the Barge Point site for a further period of twelve months. A total of 12,653 deliveries will be made during this period with trucks operating for 10 hours a day for 6 days a week giving a delivery rate of 4.19 vehicles per hour.

5.2.3 Material Stockpiles

Rock and sand material will be stockpiled within the project site for distribution to working cells. The locations of designated stockpile areas within the site are indicated on Methodology Drawing K203-QL00704-01

5.3 Construction Traffic

Construction traffic will include construction contractors and staff private vehicles and heavy vehicles used in delivery of construction materials. Vehicle types and frequency are described in Section 5.2.2. Construction haulage routes are the same as those proposed for transport of rock and sand material described in Section 5.2.1.

The construction contractor engaged to undertake these works will be required to develop a detailed localised Traffic Management Plan to control construction traffic in accordance with the project Environmental Management Plan (EMP).

The Traffic Management Plan will be developed to mange specific intersections within the city when required by the Department of Main Roads and/or the Townsville City Council.

5.4 Hazardous Materials Transport

The following hazardous materials are likely to be used during construction.

- Concrete (cement powder)
- Diesel
- Oils, grease and lubricants
- Paint
- Solvents
- Silicons/Mastic
- Grouts
- Contact cement

Any hazardous materials required to be transported to or from the project site during construction will be appropriately handled to prevent release to receiving environments. Vehicles required to transport hazardous materials will be appropriately licensed to carry such materials and will display appropriate warning signs, in accordance with the relevant Australian Standards.

All hazardous materials will be transported with a copy of the Material Safety Data Sheet (MSDS) provided by the product manufacturer and will be appropriately labelled and accompanied by instructions for correct handling. Any accidental spill or loss of hazardous materials during transport will be immediately reported to the Environmental Protection Agency and emergency agencies.

Persons handling and transporting hazardous materials will be appropriately trained in handling the products and be aware of the procedures required for clean-up of spills. All persons required to be in contact with hazardous materials will be provided with appropriate protective clothing, and will be trained in handling such substances.

All hazardous materials will be transported in the original containers where possible. Where alternative containers are required for transport, these will be compatible with the producers requirements, the product being transported and will be appropriately labelled.

Measures for management of hazardous substances within the project site are provided in the project EMP. Action to be taken in the event of accidental spillage of material during delivery is outlined in Section 2.6.5 and in the project EMP.

6 Conclusion

It is considered that the construction of the TOT Project can be undertaken without significant impacts on environmental values in accordance with the recommendations of specialist studies and investigations. These recommendations have been incorporated into the project EMP and will be implemented during construction.

Townsville Ocean Terminal
Construction Methodology Report - Appendices

APPENDIX A:

METHODOLOGY DRAWINGS

Issue	Description	Date
01	ORIGINAL ISSUE	03 08 2007

100mm on Original

Scale (Plan)

Scale (Sections)

Surveyor: BRAZIER MOTTI

Architect: BUCHAN GROUP

Filename: K204-QL00704-01-BREAKWATER LAYOUT.DWG

Client: Townsville Ocean Terminal

Status: **PRELIMINARY**
NOT TO BE USED FOR CONSTRUCTION

Approved

R.E.P.Q No :

Scales	NTS	Current Issue Signatures	
		Author P.S.M	
Original Size	A1	Designer R.M	
Height Datum	A.H.D	Reviewer J.S	
Grid	LOCAL	© Copyright reserved	

Project: TOWNSVILLE OCEAN TERMINAL PROJECT

Title: SITE LOCALITY PLAN

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Drawing No.	Project No.	Issue
K200	QL00704	01

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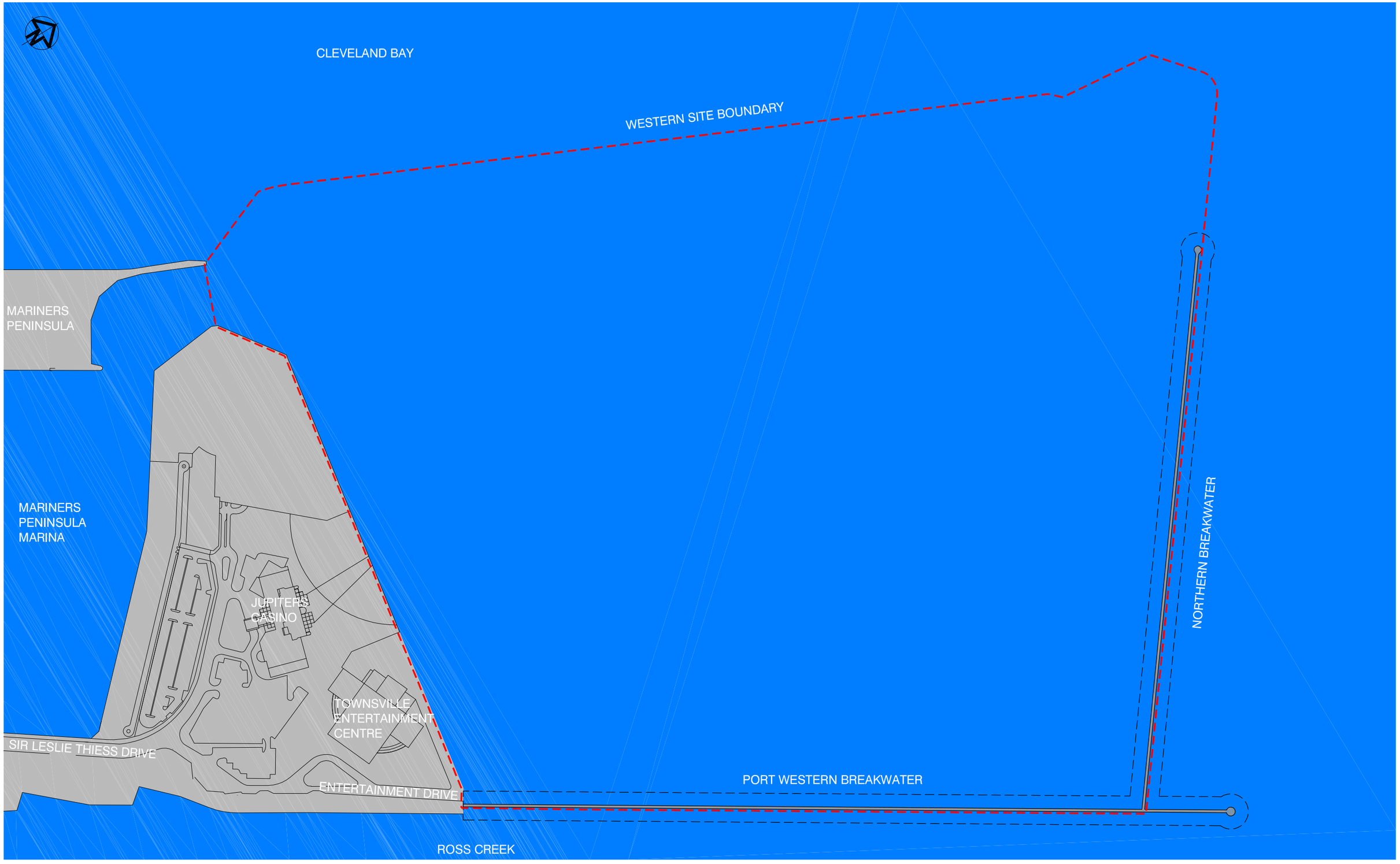

Issue	Description	Date
01	ORIGINAL ISSUE	19.07.2007

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Scale (Sections):

Surveyor: BRAZIER MOTTI

Architect: BUCHAN GROUP

Filename: K204-QL00704-01-BREAKWATER LAYOUT.DWG

Client: Townsville Ocean Terminal

Status: **PRELIMINARY** — NOT TO BE USED FOR CONSTRUCTION

Approved

R.E.P.Q No :

Scales	1:2000 @ A1 1:4000 @ A3	Current Issue Signatures	
		Author P.S.M	
Original Size	A1	Designer R.M	
Height Datum	AHD	Reviewer J.S	
Grid	GRID	© Copyright reserved	

Project: TOWNSVILLE OCEAN TERMINAL PROJECT

Title: UNDEVELOPED SITE PLAN

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Drawing No.	Project No.	Issue
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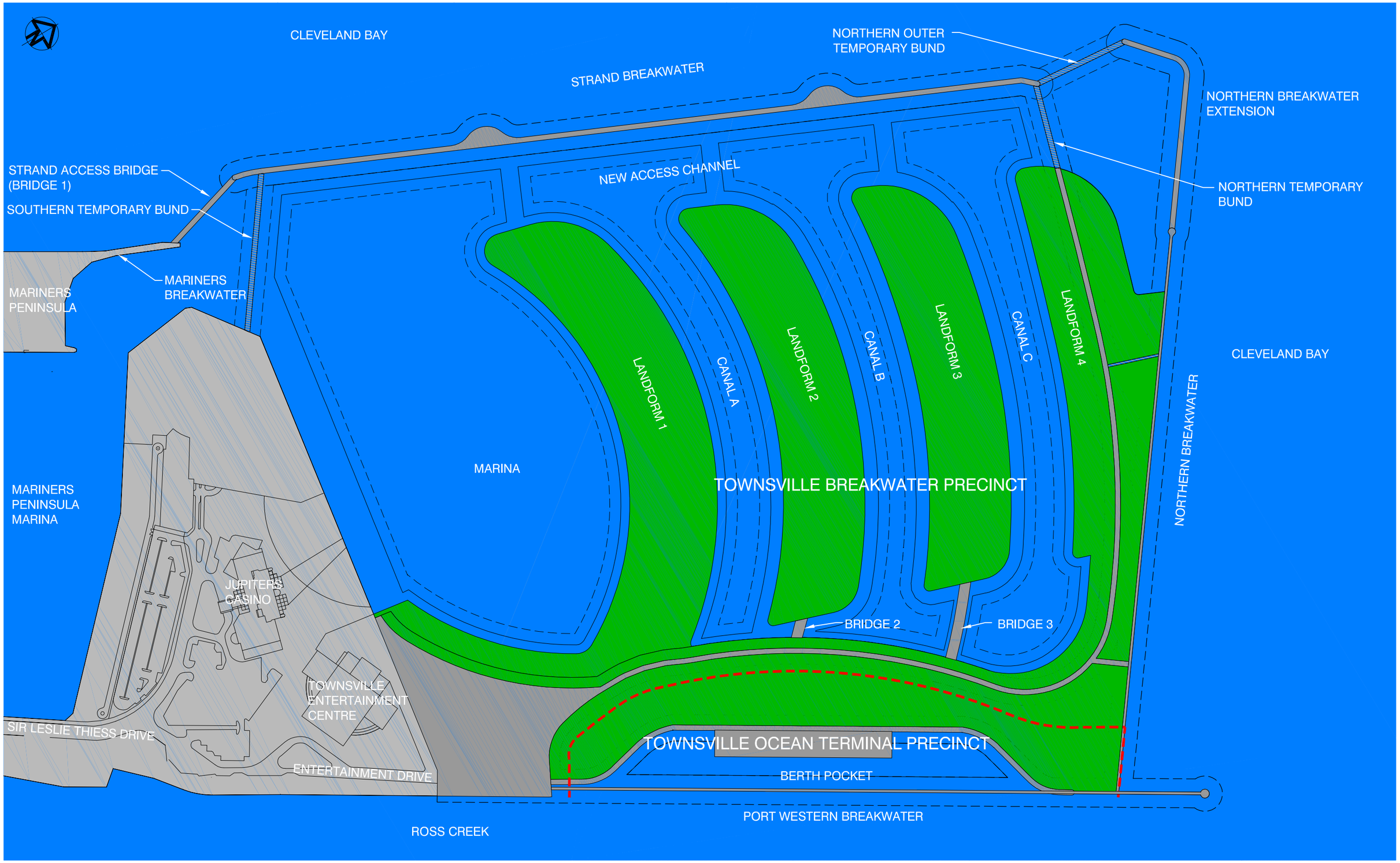

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Scale (Sections)

Surveyor: BRAZIER MOTTI

Architect: BUCHAN GROUP

Filename: K204-QL00704-01-BREAKWATER LAYOUT.DWG

Client: Townsville Ocean Terminal

Status: PRELIMINARY — NOT TO BE USED FOR CONSTRUCTION

Approved

R.E.P.Q No :

Scales: 1:2000 @ A1, 1:4000 @ A3

Current Issue Signatures

Author P.S.M

Original Size: A1

Designer R.M

Height Datum: AHD

Reviewer J.S

Grid: GRID

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Project: TOWNSVILLE OCEAN TERMINAL PROJECT

Title: KEY CONSTRUCTION ELEMENTS

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Drawing No.	Project No.	Issue
K202	QL00704	01

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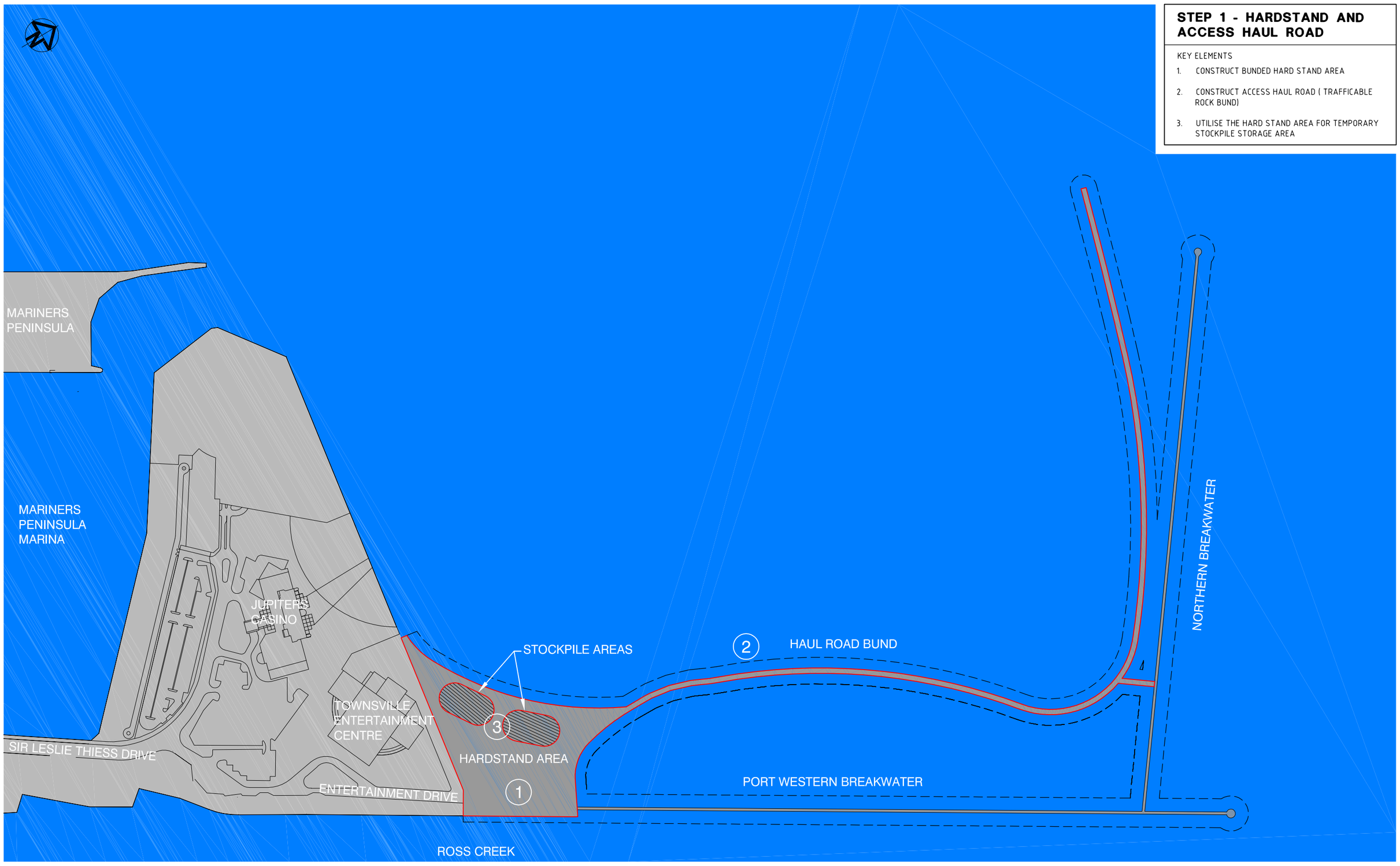
STEP 1 - HARDSTAND AND ACCESS HAUL ROAD

KEY ELEMENTS

1. CONSTRUCT BUNDED HARD STAND AREA
2. CONSTRUCT ACCESS HAUL ROAD (TRAFFICABLE ROCK BUND)
3. UTILISE THE HARD STAND AREA FOR TEMPORARY STOCKPILE STORAGE AREA



Issue	Description	Date
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Scale (Sections):

Surveyor: BRAZIER MOTTI

Architect: BUCHAN GROUP

Filename: K204-QL00704-01-BREAKWATER LAYOUT.DWG

Client: Townsville Ocean Terminal

Status: **PRELIMINARY** NOT TO BE USED FOR CONSTRUCTION

Approved

R.E.P.Q No :

Scales	1:2000 @ A1 1:4000 @ A3	Current Issue Signatures	
		Author P.S.M	
Original Size	A1	Designer R.M	
Height Datum	AHD	Reviewer J.S	
Grid	GRID	© Copyright reserved	

Project: TOWNSVILLE OCEAN TERMINAL PROJECT

Title: CONSTRUCTION SEQUENCING STEP 1 HARDSTAND ACCESS HAUL ROAD BUND

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Drawing No.	Project No.	Issue
K203	— QL00704	— 01

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STEP 2 - PERIMETER BREAKWATER CONSTRUCTION

KEY ELEMENTS

1. CONSTRUCT STRAND BREAKWATER
2. CONSTRUCT NORTHERN BREAKWATER EXTENSION
3. CONSTRUCT NORTHERN BREAKWATER REMEDIATION

CLEVELAND BAY

1 STRAND BREAKWATER

2 NORTHERN BREAKWATER EXTENSION

MARINERS PENINSULA

CLEVELAND BAY

MARINERS PENINSULA MARINA

3 NORTHERN BREAKWATER REMEDIATION

JUPITERS CASINO

STOCKPILE AREAS

HAUL ROAD BUND

TOWNSVILLE ENTERTAINMENT CENTRE

HARDSTAND AREA

PORT WESTERN BREAKWATER

ENTERTAINMENT DRIVE

ROSS CREEK

Issue	Description	Date
01	ORIGINAL ISSUE	19.07.2007

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Scale (Plan): 0 50 100 150 200m — 1 : 2000

Scale (Sections)

Surveyor: BRAZIER MOTTI

Architect: BUCHAN GROUP

Filename: K204-QL00704-01-BREAKWATER LAYOUT.DWG

Client: Townsville Ocean Terminal

Status: **PRELIMINARY** NOT TO BE USED FOR CONSTRUCTION

Approved

R.E.P.Q No :

Scales: 1:2000 @ A1, 1:4000 @ A3

Original Size: A1

Height Datum: AHD

Grid: GRID

Current Issue Signatures

Author P.S.M

Designer R.M

Reviewer J.S

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Project: TOWNSVILLE OCEAN TERMINAL PROJECT

Title: CONSTRUCTION SEQUENCING STEP 2 PERIMETER BREAK WATER CONSTRUCTION

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Drawing No. K204 — Project No. QL00704 — Issue 01

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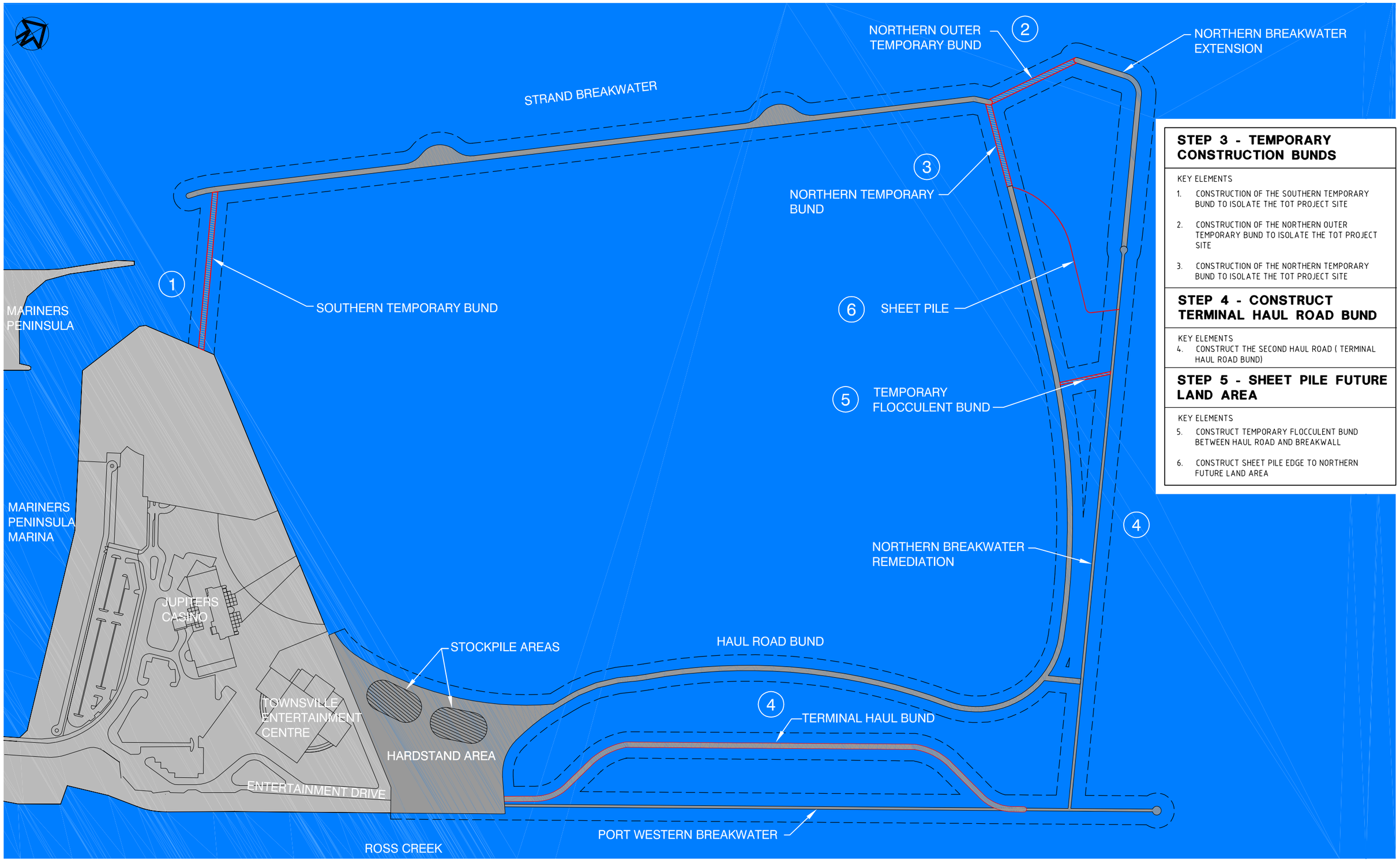

STEP 3 - TEMPORARY CONSTRUCTION BUNDS

KEY ELEMENTS

1. CONSTRUCTION OF THE SOUTHERN TEMPORARY BUND TO ISOLATE THE TOT PROJECT SITE
2. CONSTRUCTION OF THE NORTHERN OUTER TEMPORARY BUND TO ISOLATE THE TOT PROJECT SITE
3. CONSTRUCTION OF THE NORTHERN TEMPORARY BUND TO ISOLATE THE TOT PROJECT SITE

STEP 4 - CONSTRUCT TERMINAL HAUL ROAD BUND

KEY ELEMENTS

4. CONSTRUCT THE SECOND HAUL ROAD (TERMINAL HAUL ROAD BUND)

STEP 5 - SHEET PILE FUTURE LAND AREA

KEY ELEMENTS

5. CONSTRUCT TEMPORARY FLOCCULENT BUND BETWEEN HAUL ROAD AND BREAKWALL
6. CONSTRUCT SHEET PILE EDGE TO NORTHERN FUTURE LAND AREA

Issue	Description	Date
01	ORIGINAL ISSUE	19.07.2007

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Scale (Plan): 0 50 100 150 200m — 1 : 2000

Scale (Sections):

Surveyor: BRAZIER MOTTI

Architect: BUCHAN GROUP

Filename: K204-QL00704-01-BREAKWATER LAYOUT.DWG

Client: Townsville Ocean Terminal

Status: **PRELIMINARY** NOT TO BE USED FOR CONSTRUCTION

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Original Size: A1

Height Datum: AHD

Grid: GRID

Current Issue Signatures: Author P.S.M; Designer R.M; Reviewer J.S

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Project: TOWNSVILLE OCEAN TERMINAL PROJECT

Title: CONSTRUCTION SEQUENCING STEP 3 TO 5 CONSTRUCTION BUNDS

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Drawing No.	Project No.	Issue
K205	QL00704	01

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STEP 6 - SITE DEWATERING PLAN

KEY ELEMENTS

1. COMMENCE SITE DEWATERING
2. CREATE DEWATERING DISCHARGE POINTS TO RECEIVING WATERS

LEGEND

- DEWATERING BUND
- INDICATIVE DEWATERING DISCHARGE POINTS
- SHEET PILE

CLEVELAND BAY
STRAND BREAKWATER
NORTHERN OUTER TEMPORARY BUND
NORTHERN TEMPORARY BUND
SOUTHERN TEMPORARY BUND
NORTHERN BREAKWATER EXTENSION
SHEET PILE
MARINERS PENINSULA
MARINERS PENINSULA MARINA
TEMPORARY FLOCCULENT BUND
NORTHERN BREAKWATER REMEDIATION
JUPITERS CASINO
STOCKPILE AREAS
HAUL ROAD BUND
TOWNSVILLE ENTERTAINMENT CENTRE
TERMINAL BUND
SIR LESLIE THIESS DRIVE
HARDSTAND AREA
ENTERTAINMENT DRIVE
PORT WESTERN BREAKWATER
ROSS CREEK

Issue	Description	Date
01	ORIGINAL ISSUE	19.07.2007

100mm on Original

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Scale (Sections):

Surveyor: BRAZIER MOTTI

Architect: BUCHAN GROUP

Filename: K204-QL00704-01-BREAKWATER LAYOUT.DWG

Client: Townsville Ocean Terminal

Status: **PRELIMINARY** NOT TO BE USED FOR CONSTRUCTION

Approved — R.E.P.Q No :

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Author P.S.M

Original Size: A1 — Designer R.M

Height Datum: AHD — Reviewer J.S

Grid: GRID — © Copyright reserved

Project: TOWNSVILLE OCEAN TERMINAL PROJECT

Title: CONSTRUCTION SEQUENCING STEP 6 SITE DEWATERING

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Drawing No. K206 — Project No. QL00704 — Issue 01

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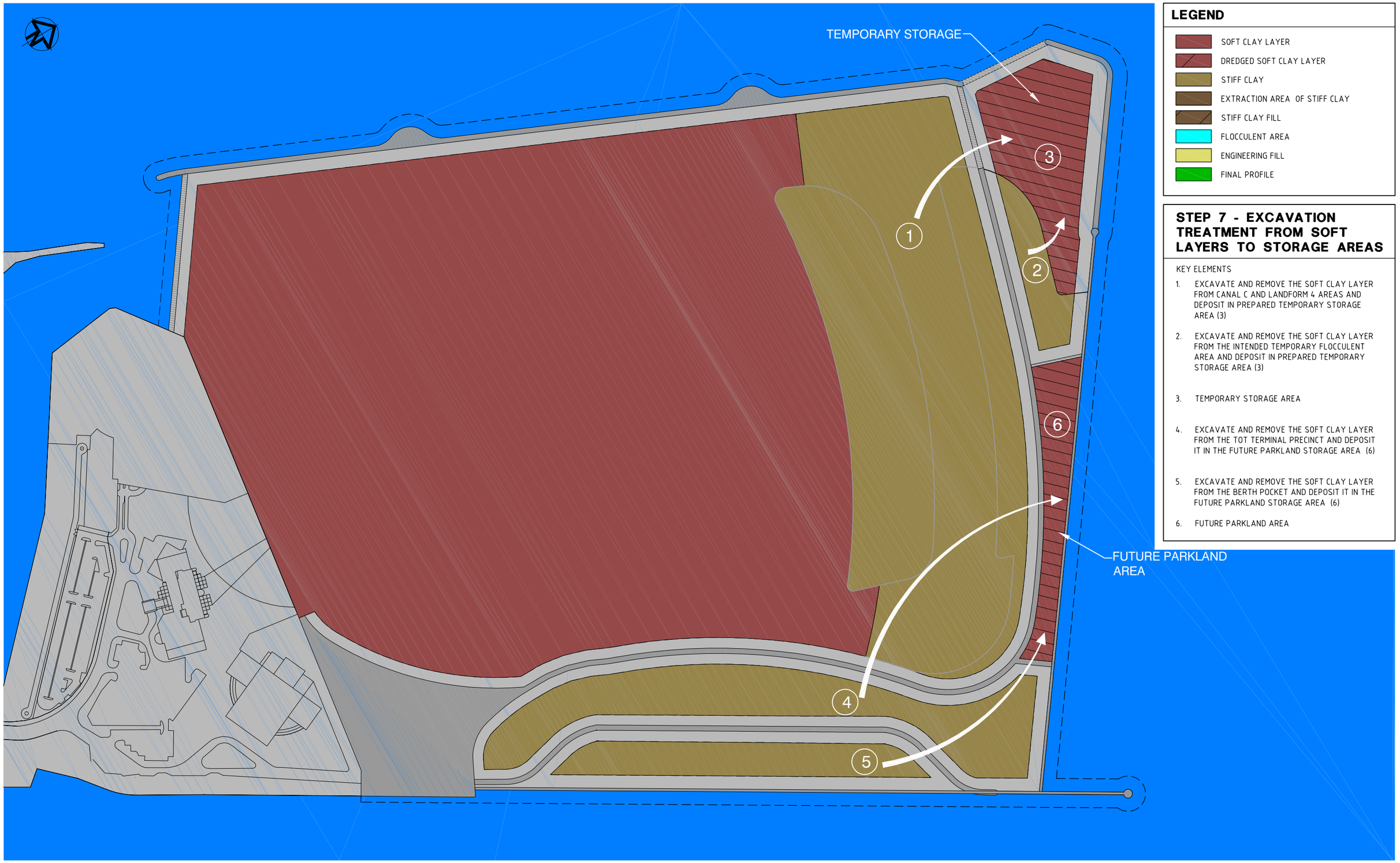

LEGEND

- SOFT CLAY LAYER
- DREDGED SOFT CLAY LAYER
- STIFF CLAY
- EXTRACTION AREA OF STIFF CLAY
- STIFF CLAY FILL
- FLOCCULENT AREA
- ENGINEERING FILL
- FINAL PROFILE

STEP 7 - EXCAVATION TREATMENT FROM SOFT LAYERS TO STORAGE AREAS

KEY ELEMENTS

1. EXCAVATE AND REMOVE THE SOFT CLAY LAYER FROM CANAL C AND LANDFORM 4 AREAS AND DEPOSIT IN PREPARED TEMPORARY STORAGE AREA (3)
2. EXCAVATE AND REMOVE THE SOFT CLAY LAYER FROM THE INTENDED TEMPORARY FLOCCULENT AREA AND DEPOSIT IN PREPARED TEMPORARY STORAGE AREA (3)
3. TEMPORARY STORAGE AREA
4. EXCAVATE AND REMOVE THE SOFT CLAY LAYER FROM THE TOT TERMINAL PRECINCT AND DEPOSIT IT IN THE FUTURE PARKLAND STORAGE AREA (6)
5. EXCAVATE AND REMOVE THE SOFT CLAY LAYER FROM THE BERTH POCKET AND DEPOSIT IT IN THE FUTURE PARKLAND STORAGE AREA (6)
6. FUTURE PARKLAND AREA

Issue	Description	Date
01	ORIGINAL ISSUE	25.07.2007

100mm on Original

Scale (Plan): 0 50 100 150 200m — 1 : 2000

Scale (Sections):

Surveyor: BRAZIER MOTTI

Architect: BUCHAN GROUP

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Client: Townsville Ocean Terminal

Status: **PRELIMINARY** NOT TO BE USED FOR CONSTRUCTION

Approved

R.E.P.Q No :

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Grid: GRID

Current Issue Signatures

Author P.S.M

Designer R.M

Reviewer J.S

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Project: TOWNSVILLE OCEAN TERMINAL PROJECT

Title: CONSTRUCTION SEQUENCING STEP 7 EXCAVATION TREATMENT FROM SOFT LAYERS TO STORAGE AREAS

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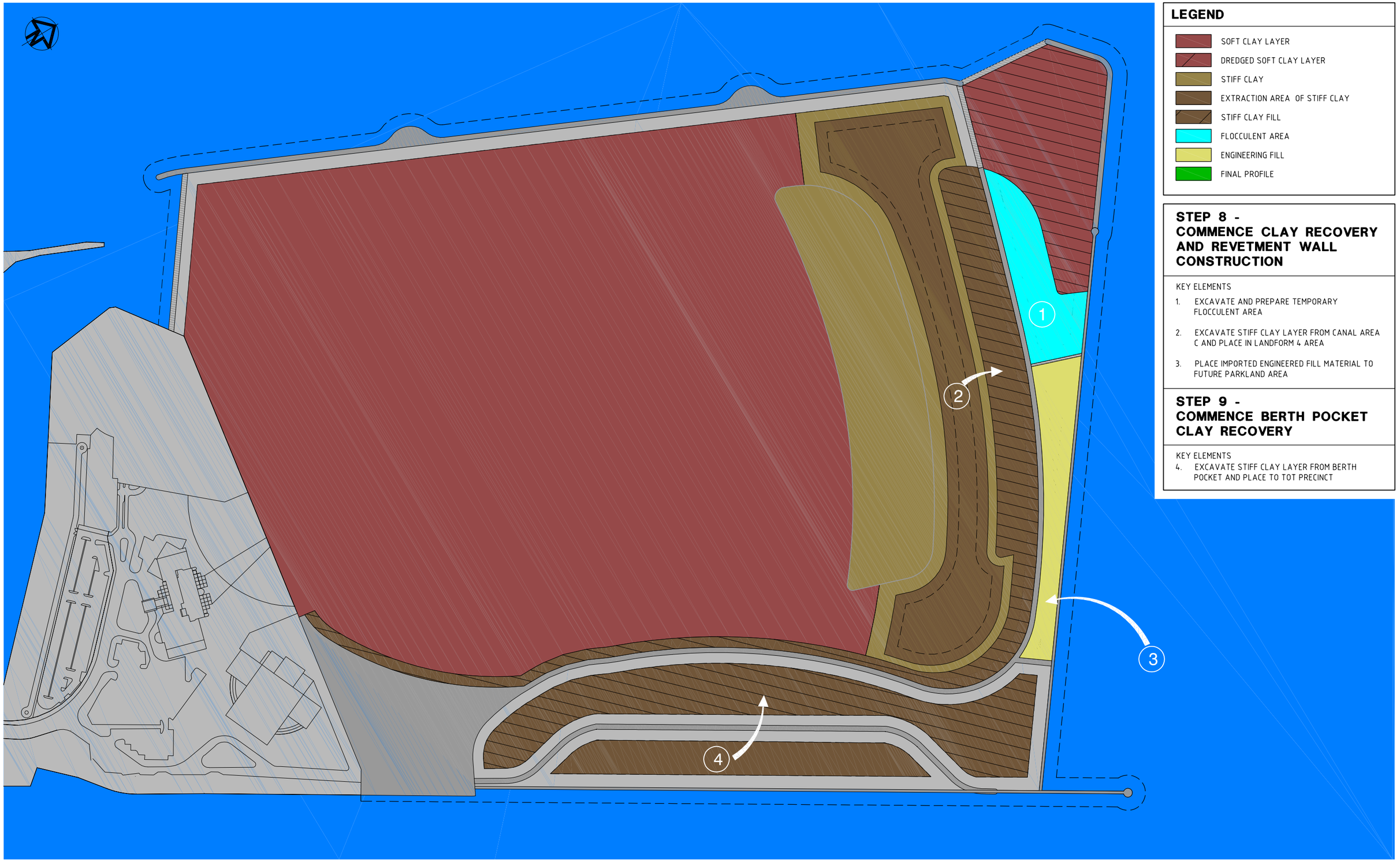

LEGEND

- SOFT CLAY LAYER
- DREDGED SOFT CLAY LAYER
- STIFF CLAY
- EXTRACTION AREA OF STIFF CLAY
- STIFF CLAY FILL
- FLOCCULENT AREA
- ENGINEERING FILL
- FINAL PROFILE

STEP 8 - COMMENCE CLAY RECOVERY AND REVETMENT WALL CONSTRUCTION

KEY ELEMENTS

1. EXCAVATE AND PREPARE TEMPORARY FLOCCULENT AREA
2. EXCAVATE STIFF CLAY LAYER FROM CANAL AREA C AND PLACE IN LANDFORM 4 AREA
3. PLACE IMPORTED ENGINEERED FILL MATERIAL TO FUTURE PARKLAND AREA

STEP 9 - COMMENCE BERTH POCKET CLAY RECOVERY

KEY ELEMENTS

4. EXCAVATE STIFF CLAY LAYER FROM BERTH POCKET AND PLACE TO TOT PRECINCT

Issue	Description	Date
01	ORIGINAL ISSUE	25.07.2007

100mm on Original

Scale (Plan): 0 50 100 150 200m — 1 : 2000

Scale (Sections)

Surveyor: BRAZIER MOTTI

Architect: BUCHAN GROUP

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Client: Townsville Ocean Terminal

Status: **PRELIMINARY** NOT TO BE USED FOR CONSTRUCTION

Approved

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Current Issue Signatures

Author P.S.M

Original Size: A1

Designer R.M

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Reviewer J.S

Grid: GRID

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Project: TOWNSVILLE OCEAN TERMINAL PROJECT

Title: CONSTRUCTION SEQUENCING STEP 8 AND STEP 9

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Drawing No. K208 — Project No. QL00704 — Issue 01

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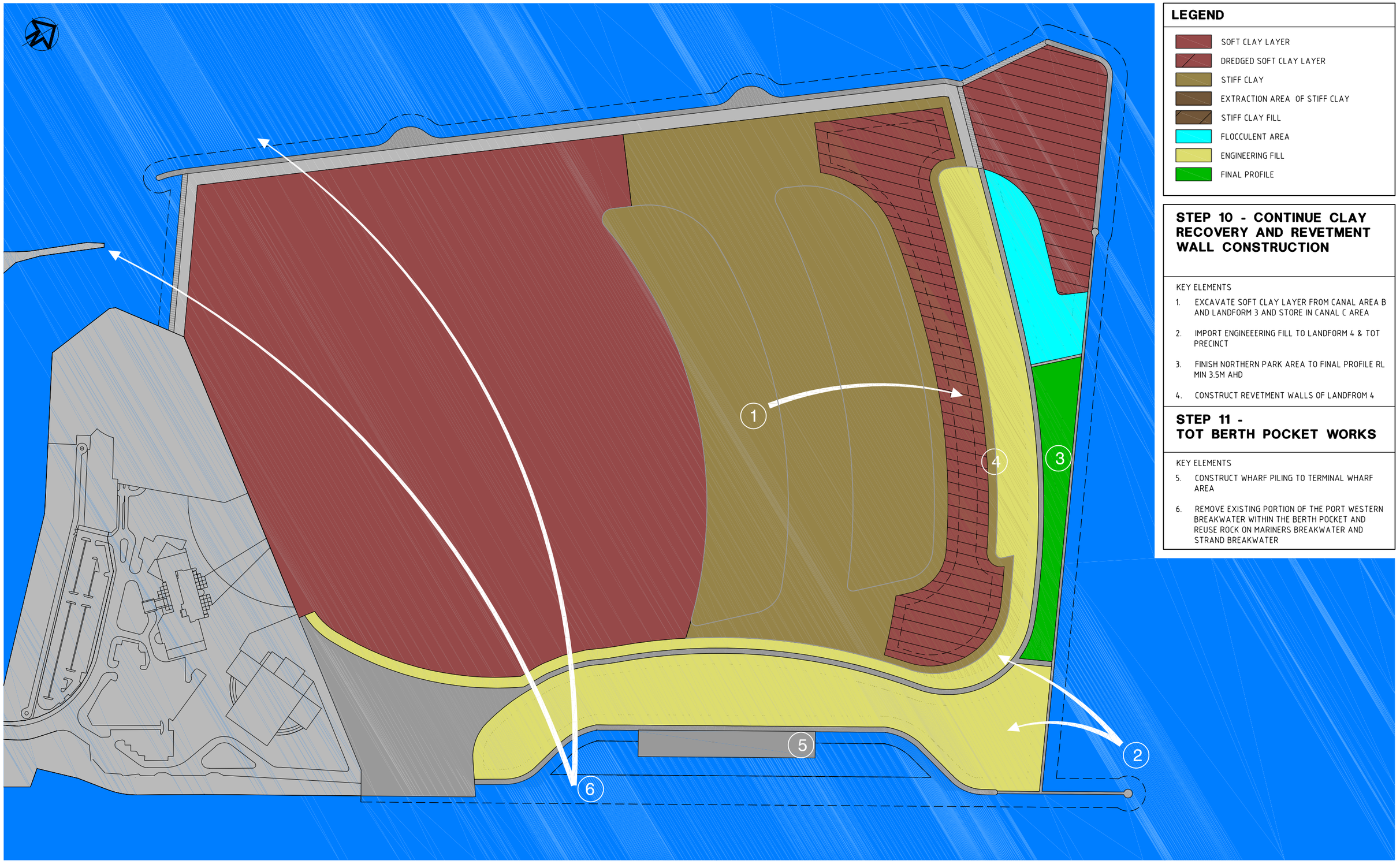

LEGEND

- SOFT CLAY LAYER
- DREDGED SOFT CLAY LAYER
- STIFF CLAY
- EXTRACTION AREA OF STIFF CLAY
- STIFF CLAY FILL
- FLOCCULENT AREA
- ENGINEERING FILL
- FINAL PROFILE

STEP 10 - CONTINUE CLAY RECOVERY AND REVETMENT WALL CONSTRUCTION

KEY ELEMENTS

1. EXCAVATE SOFT CLAY LAYER FROM CANAL AREA B AND LANDFORM 3 AND STORE IN CANAL C AREA
2. IMPORT ENGINEEERING FILL TO LANDFORM 4 & TOT PRECINCT
3. FINISH NORTHERN PARK AREA TO FINAL PROFILE RL MIN 3.5M AHD
4. CONSTRUCT REVETMENT WALLS OF LANDFROM 4

STEP 11 - TOT BERTH POCKET WORKS

KEY ELEMENTS

5. CONSTRUCT WHARF PILING TO TERMINAL WHARF AREA
6. REMOVE EXISTING PORTION OF THE PORT WESTERN BREAKWATER WITHIN THE BERTH POCKET AND REUSE ROCK ON MARINERS BREAKWATER AND STRAND BREAKWATER

Issue	Description	Date
01	ORIGINAL ISSUE	25.07.2007

100mm on Original

Scale (Plan): 0 50 100 150 200m — 1 : 2000

Scale (Sections):

Surveyor: BRAZIER MOTTI

Architect: BUCHAN GROUP

Filename: K204-QL00704-01-BREAKWATER LAYOUT.DWG

Client: Townsville Ocean Terminal

Status: **PRELIMINARY** NOT TO BE USED FOR CONSTRUCTION

Approved

R.E.P.Q No :

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Current Issue Signatures

Author P.S.M

Original Size: A1

Designer R.M

Height Datum: AHD

Reviewer J.S

Grid: GRID

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Project: TOWNSVILLE OCEAN TERMINAL PROJECT

Title: CONSTRUCTION SEQUENCING STEP 10 AND STEP 11

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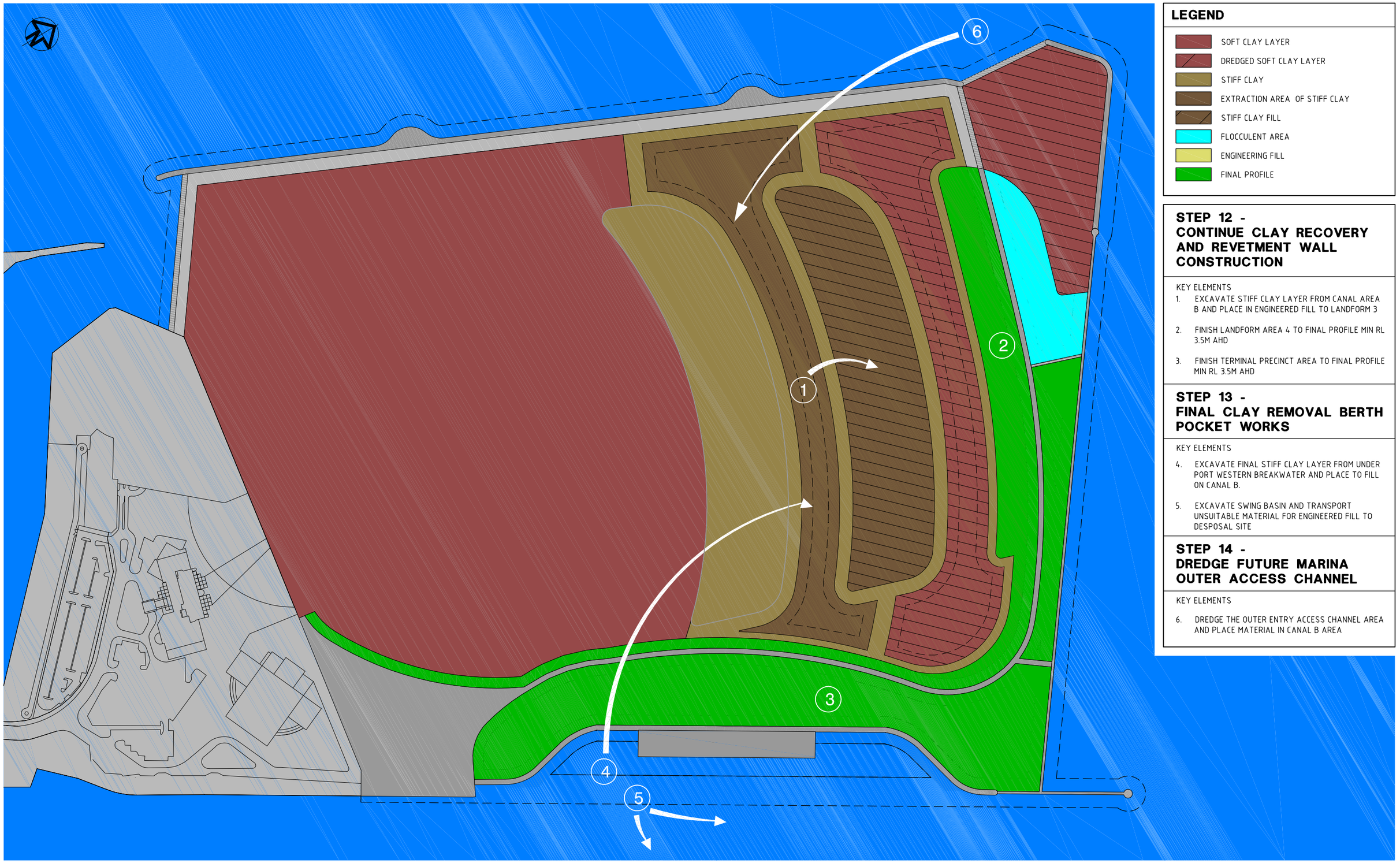

LEGEND

- SOFT CLAY LAYER
- DREDGED SOFT CLAY LAYER
- STIFF CLAY
- EXTRACTION AREA OF STIFF CLAY
- STIFF CLAY FILL
- FLOCCULENT AREA
- ENGINEERING FILL
- FINAL PROFILE

STEP 12 - CONTINUE CLAY RECOVERY AND REVETMENT WALL CONSTRUCTION

KEY ELEMENTS

1. EXCAVATE STIFF CLAY LAYER FROM CANAL AREA B AND PLACE IN ENGINEERED FILL TO LANDFORM 3
2. FINISH LANDFORM AREA 4 TO FINAL PROFILE MIN RL 3.5M AHD
3. FINISH TERMINAL PRECINCT AREA TO FINAL PROFILE MIN RL 3.5M AHD

STEP 13 - FINAL CLAY REMOVAL BERTH POCKET WORKS

KEY ELEMENTS

4. EXCAVATE FINAL STIFF CLAY LAYER FROM UNDER PORT WESTERN BREAKWATER AND PLACE TO FILL ON CANAL B.
5. EXCAVATE SWING BASIN AND TRANSPORT UNSUITABLE MATERIAL FOR ENGINEERED FILL TO DESPOSAL SITE

STEP 14 - DREDGE FUTURE MARINA OUTER ACCESS CHANNEL

KEY ELEMENTS

6. DREDGE THE OUTER ENTRY ACCESS CHANNEL AREA AND PLACE MATERIAL IN CANAL B AREA

Issue	Description	Date
01	ORIGINAL ISSUE	25.07.2007

100mm on Original

Scale (Plan): 0 50 100 150 200m — 1 : 2000

Scale (Sections)

Surveyor: BRAZIER MOTTI

Architect: BUCHAN GROUP

Filename: K204-QL00704-01-BREAKWATER LAYOUT.DWG

Client: Townsville Ocean Terminal

Status: PRELIMINARY — NOT TO BE USED FOR CONSTRUCTION

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Current Issue Signatures

Author P.S.M

Original Size: A1

Designer R.M

Height Datum: AHD

Reviewer J.S

Grid: GRID

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Project: TOWNSVILLE OCEAN TERMINAL PROJECT

Title: CONSTRUCTION SEQUENCING STEP 12 TO STEP 14

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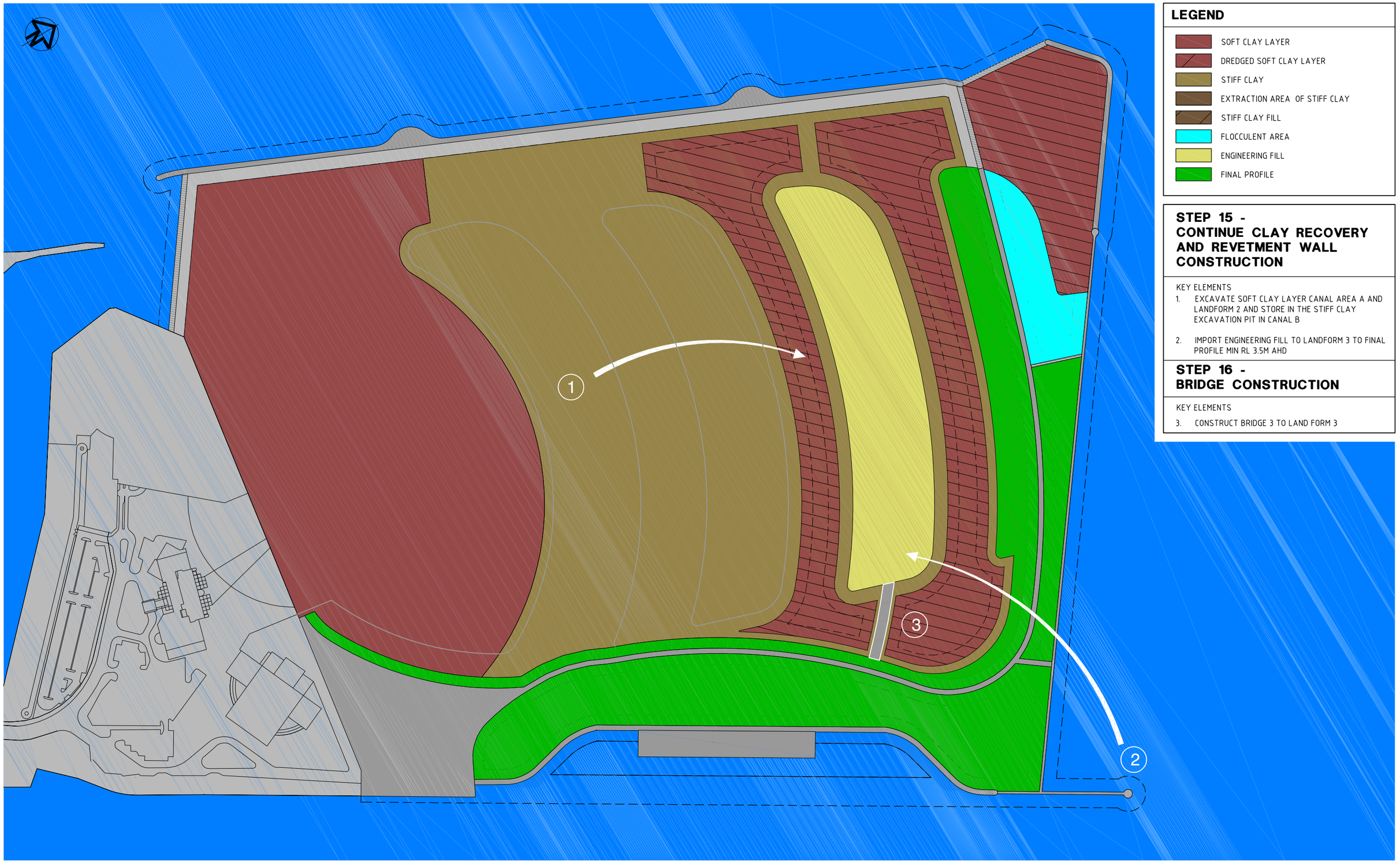

LEGEND

- SOFT CLAY LAYER
- DREDGED SOFT CLAY LAYER
- STIFF CLAY
- EXTRACTION AREA OF STIFF CLAY
- STIFF CLAY FILL
- FLOCCULENT AREA
- ENGINEERING FILL
- FINAL PROFILE

STEP 15 - CONTINUE CLAY RECOVERY AND REVETMENT WALL CONSTRUCTION

KEY ELEMENTS

1. EXCAVATE SOFT CLAY LAYER CANAL AREA A AND LANDFORM 2 AND STORE IN THE STIFF CLAY EXCAVATION PIT IN CANAL B
2. IMPORT ENGINEERING FILL TO LANDFORM 3 TO FINAL PROFILE MIN RL 3.5M AHD

STEP 16 - BRIDGE CONSTRUCTION

KEY ELEMENTS

3. CONSTRUCT BRIDGE 3 TO LAND FORM 3

Issue	Description	Date
01	ORIGINAL ISSUE	25.07.2007

100mm on Original

Scale (Plan): 0 50 100 150 200m — 1 : 2000

Scale (Sections):

Surveyor: BRAZIER MOTTI

Architect: BUCHAN GROUP

Filename: K204-QL00704-01-BREAKWATER LAYOUT.DWG

Client: Townsville Ocean Terminal

Status: **PRELIMINARY** NOT TO BE USED FOR CONSTRUCTION

Approved

R.E.P.Q No :

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Original Size: A1

Height Datum: AHD

Grid: GRID

Current Issue Signatures

Author P.S.M

Designer R.M

Reviewer J.S

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Project: TOWNSVILLE OCEAN TERMINAL PROJECT

Title: CONSTRUCTION SEQUENCING STEP 15 AND 16

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Drawing No. K211 — Project No. QL00704 — Issue 01

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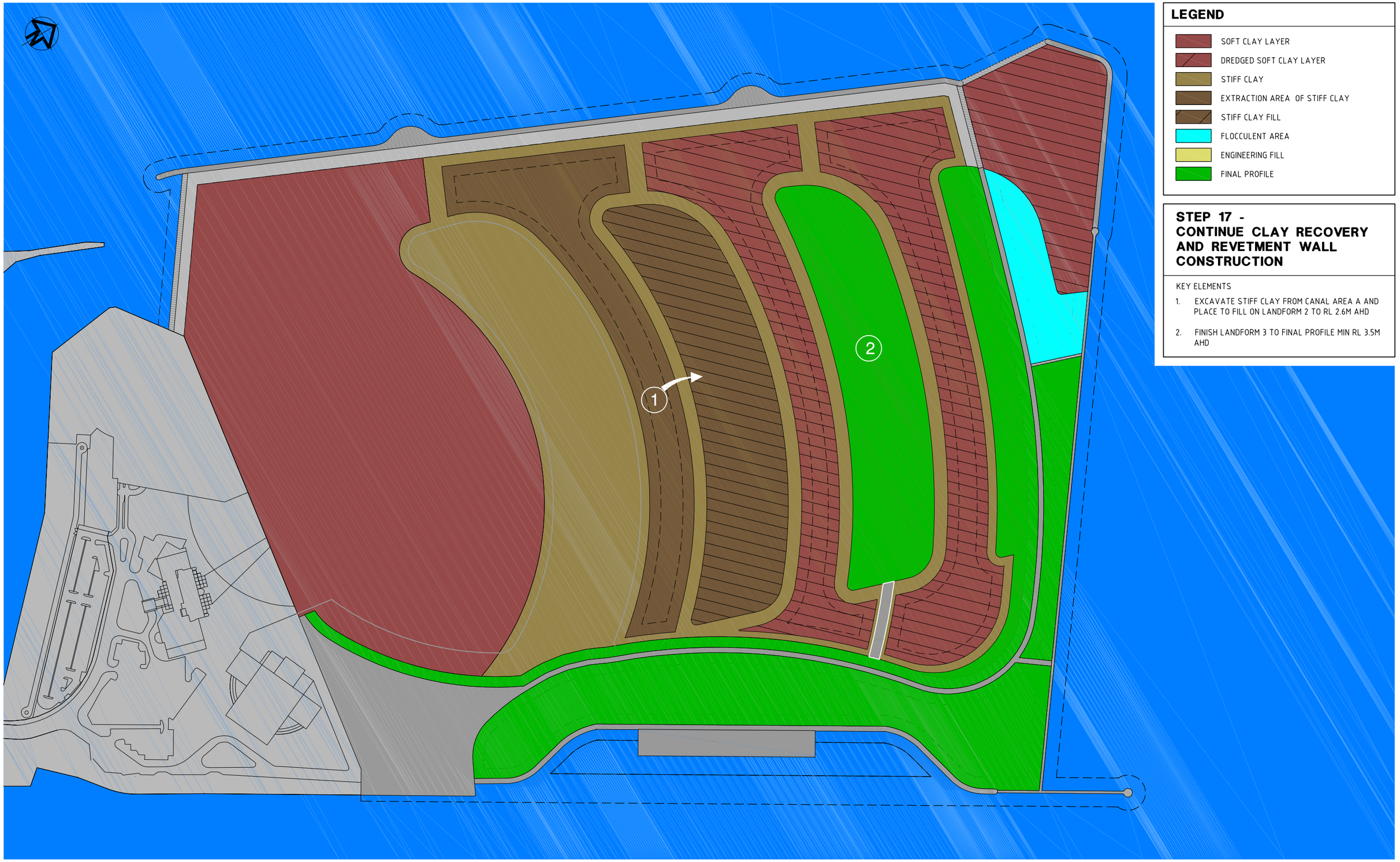

LEGEND

- SOFT CLAY LAYER
- DREDGED SOFT CLAY LAYER
- STIFF CLAY
- EXTRACTION AREA OF STIFF CLAY
- STIFF CLAY FILL
- FLOCCULENT AREA
- ENGINEERING FILL
- FINAL PROFILE

STEP 17 - CONTINUE CLAY RECOVERY AND REVETMENT WALL CONSTRUCTION

KEY ELEMENTS

1. EXCAVATE STIFF CLAY FROM CANAL AREA A AND PLACE TO FILL ON LANDFORM 2 TO RL 2.6M AHD
2. FINISH LANDFORM 3 TO FINAL PROFILE MIN RL 3.5M AHD

Issue	Description	Date
01	ORIGINAL ISSUE	25.07.2007

100mm on Original

Scale (Plan): 0 50 100 150 200m — 1 : 2000

Scale (Sections):

Surveyor: BRAZIER MOTTI

Architect: BUCHAN GROUP

Filename: K204-QL00704-01-BREAKWATER LAYOUT.DWG

Client: Townsville Ocean Terminal

Status: **PRELIMINARY** NOT TO BE USED FOR CONSTRUCTION

Approved: R.E.P.Q No.:

Scales	1:2000 @ A1 1:4000 @ A3	Current Issue Signatures	
		Author P.S.M	
Original Size	A1	Designer R.M	
Height Datum	AHD	Reviewer J.S	
Grid	GRID	© Copyright reserved	

Project: TOWNSVILLE OCEAN TERMINAL PROJECT

Title: CONSTRUCTION SEQUENCING STEP 17 CONTINUED CLAY RECOVERY, REVEMENT WALL CONSTRUCTION

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Drawing No.	Project No.	Issue
K212	QL00704	01

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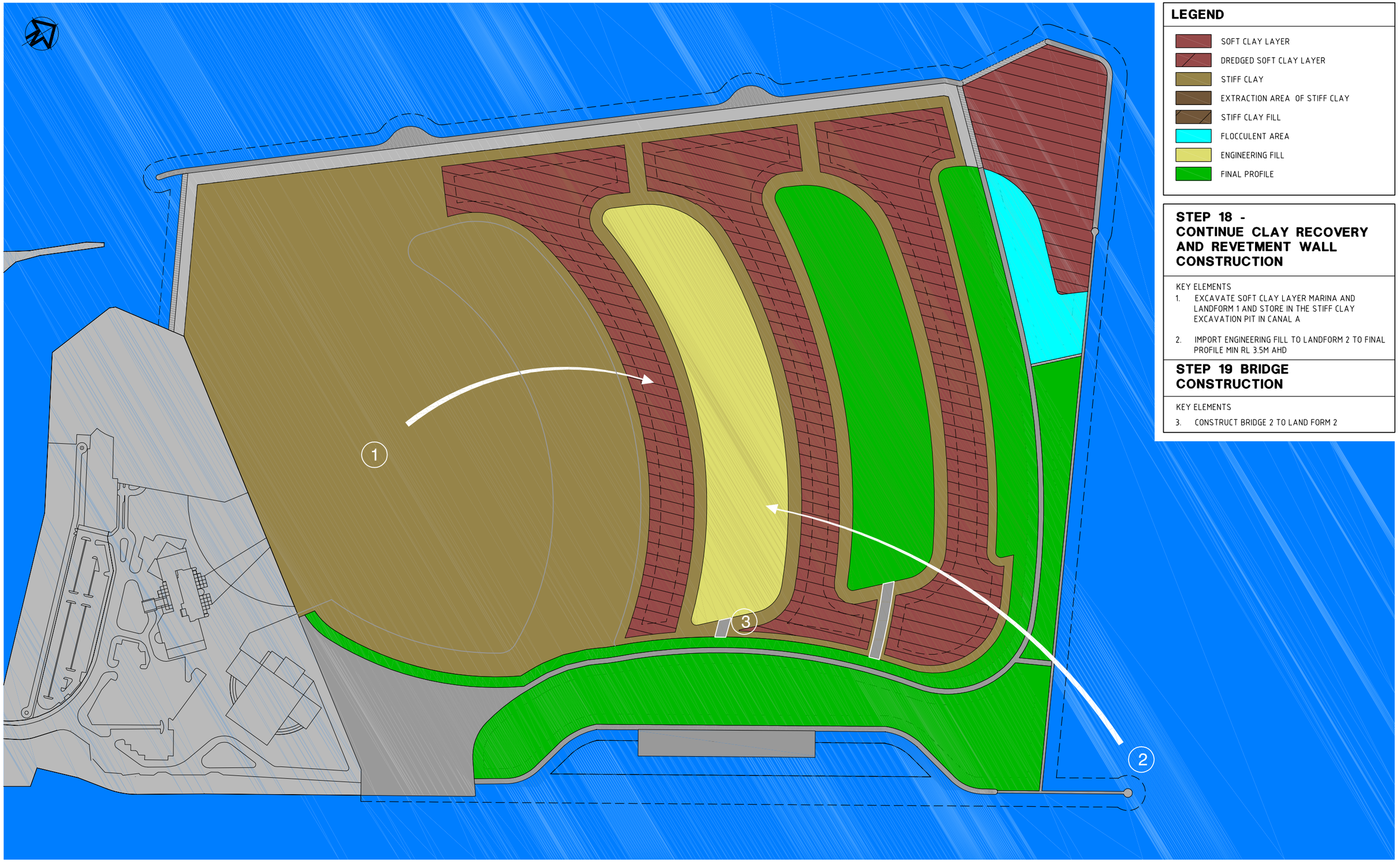

LEGEND

- SOFT CLAY LAYER
- DREDGED SOFT CLAY LAYER
- STIFF CLAY
- EXTRACTION AREA OF STIFF CLAY
- STIFF CLAY FILL
- FLOCCULENT AREA
- ENGINEERING FILL
- FINAL PROFILE

STEP 18 - CONTINUE CLAY RECOVERY AND REVETMENT WALL CONSTRUCTION

KEY ELEMENTS

1. EXCAVATE SOFT CLAY LAYER MARINA AND LANDFORM 1 AND STORE IN THE STIFF CLAY EXCAVATION PIT IN CANAL A
2. IMPORT ENGINEERING FILL TO LANDFORM 2 TO FINAL PROFILE MIN RL 3.5M AHD

STEP 19 BRIDGE CONSTRUCTION

KEY ELEMENTS

3. CONSTRUCT BRIDGE 2 TO LAND FORM 2

Issue	Description	Date
01	ORIGINAL ISSUE	25.07.2007

100mm on Original

Scale (Plan): 0 50 100 150 200m — 1 : 2000

Scale (Sections):

Surveyor: BRAZIER MOTTI

Architect: BUCHAN GROUP

Filename: K204-QL00704-01-BREAKWATER LAYOUT.DWG

Client: Townsville Ocean Terminal

Status: **PRELIMINARY** NOT TO BE USED FOR CONSTRUCTION

Approved

R.E.P.Q No :

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		Author P.S.M	
Original Size	A1	Designer R.M	
Height Datum	AHD	Reviewer J.S	
Grid	GRID	© Copyright reserved	

Project: TOWNSVILLE OCEAN TERMINAL PROJECT

Title: CONSTRUCTION SEQUENCING STEP 18 AND 19

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Drawing No.	Project No.	Issue
K213	— QL00704	— 01

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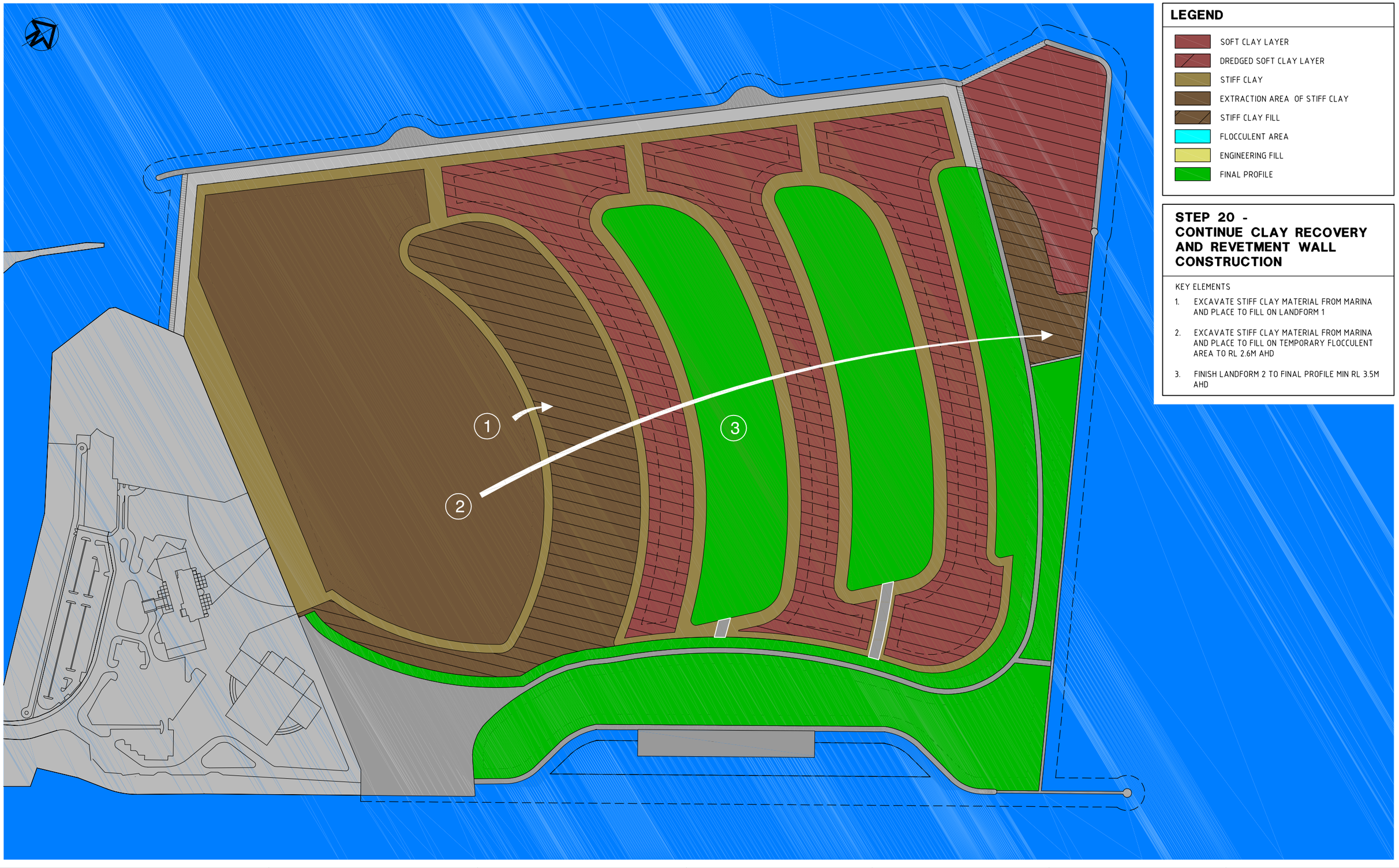

LEGEND

- SOFT CLAY LAYER
- DREDGED SOFT CLAY LAYER
- STIFF CLAY
- EXTRACTION AREA OF STIFF CLAY
- STIFF CLAY FILL
- FLOCCULENT AREA
- ENGINEERING FILL
- FINAL PROFILE

STEP 20 - CONTINUE CLAY RECOVERY AND REVETMENT WALL CONSTRUCTION

KEY ELEMENTS

1. EXCAVATE STIFF CLAY MATERIAL FROM MARINA AND PLACE TO FILL ON LANDFORM 1
2. EXCAVATE STIFF CLAY MATERIAL FROM MARINA AND PLACE TO FILL ON TEMPORARY FLOCCULENT AREA TO RL 2.6M AHD
3. FINISH LANDFORM 2 TO FINAL PROFILE MIN RL 3.5M AHD

Issue	Description	Date
01	ORIGINAL ISSUE	25.07.2007

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Scale (Sections):

Surveyor: BRAZIER MOTTI

Architect: BUCHAN GROUP

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Client: Townsville Ocean Terminal

Status: **PRELIMINARY** — NOT TO BE USED FOR CONSTRUCTION

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Grid: GRID

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Designer R.M

Reviewer J.S

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Project: TOWNSVILLE OCEAN TERMINAL PROJECT

Title: CONSTRUCTION SEQUENCING STEP 20 CONTINUED CLAY RECOVERY, REVEMENT WALL CONSTRUCTION

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Drawing No.	Project No.	Issue
K214	QL00704	01

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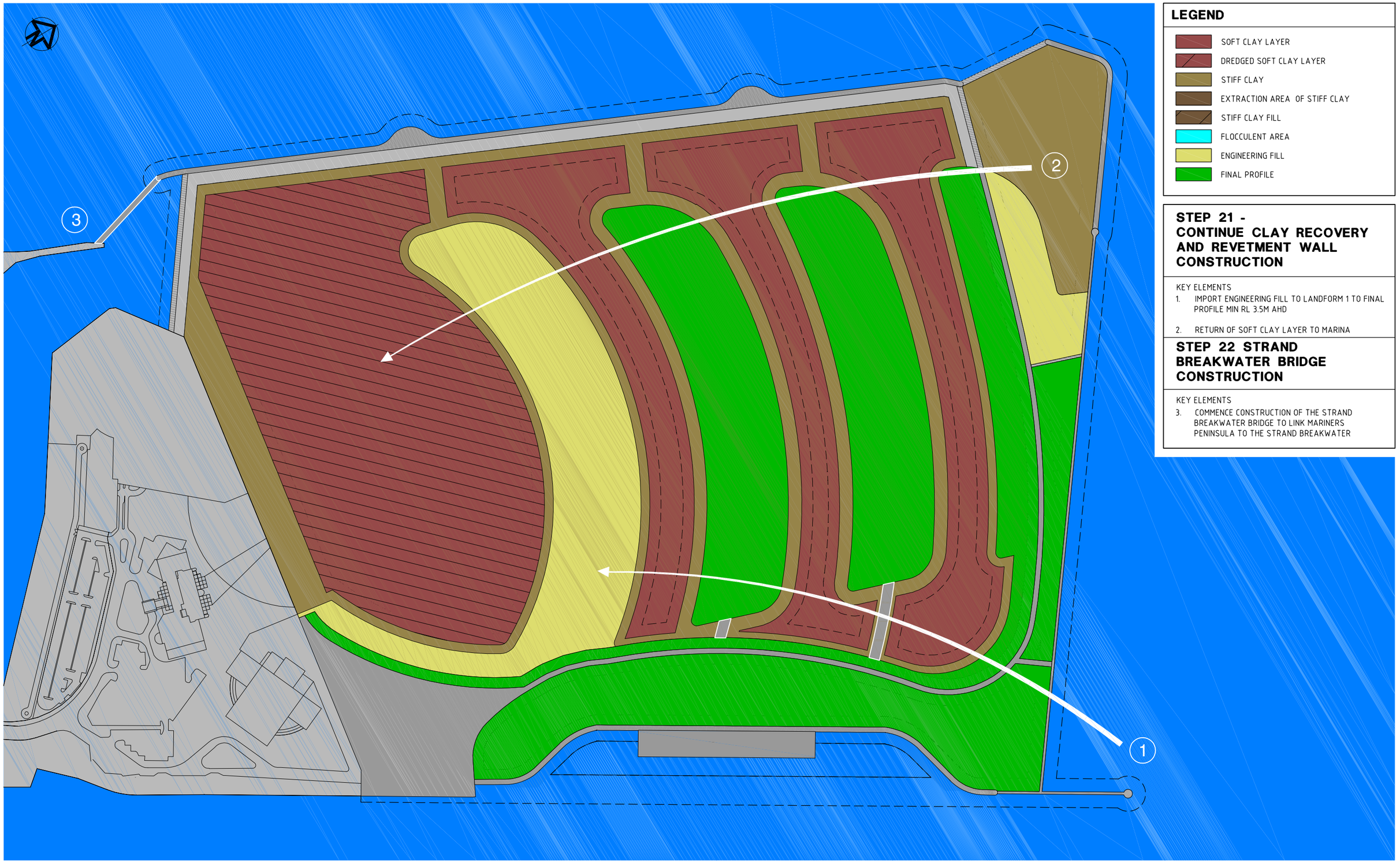

LEGEND

- SOFT CLAY LAYER
- DREDGED SOFT CLAY LAYER
- STIFF CLAY
- EXTRACTION AREA OF STIFF CLAY
- STIFF CLAY FILL
- FLOCCULENT AREA
- ENGINEERING FILL
- FINAL PROFILE

STEP 21 - CONTINUE CLAY RECOVERY AND REVETMENT WALL CONSTRUCTION

KEY ELEMENTS

1. IMPORT ENGINEERING FILL TO LANDFORM 1 TO FINAL PROFILE MIN RL 3.5M AHD
2. RETURN OF SOFT CLAY LAYER TO MARINA

STEP 22 STRAND BREAKWATER BRIDGE CONSTRUCTION

KEY ELEMENTS

3. COMMENCE CONSTRUCTION OF THE STRAND BREAKWATER BRIDGE TO LINK MARINERS PENINSULA TO THE STRAND BREAKWATER

Issue	Description	Date
01	ORIGINAL ISSUE	25.07.2007

100mm on Original

Scale (Plan): 0 50 100 150 200m — 1 : 2000

Scale (Sections):

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Client: Townsville Ocean Terminal

Status: PRELIMINARY — NOT TO BE USED FOR CONSTRUCTION

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R.E.P.Q No :

Scales	1:2000 @ A1 1:4000 @ A3	Current Issue Signatures	
		Author P.S.M	
Original Size	A1	Designer R.M	
Height Datum	AHD	Reviewer J.S	
Grid	GRID	© Copyright reserved	

Project: TOWNSVILLE OCEAN TERMINAL PROJECT

Title: CONSTRUCTION SEQUENCING STEP 21 AND STEP 22

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Drawing No.	Project No.	Issue
K215	QL00704	01

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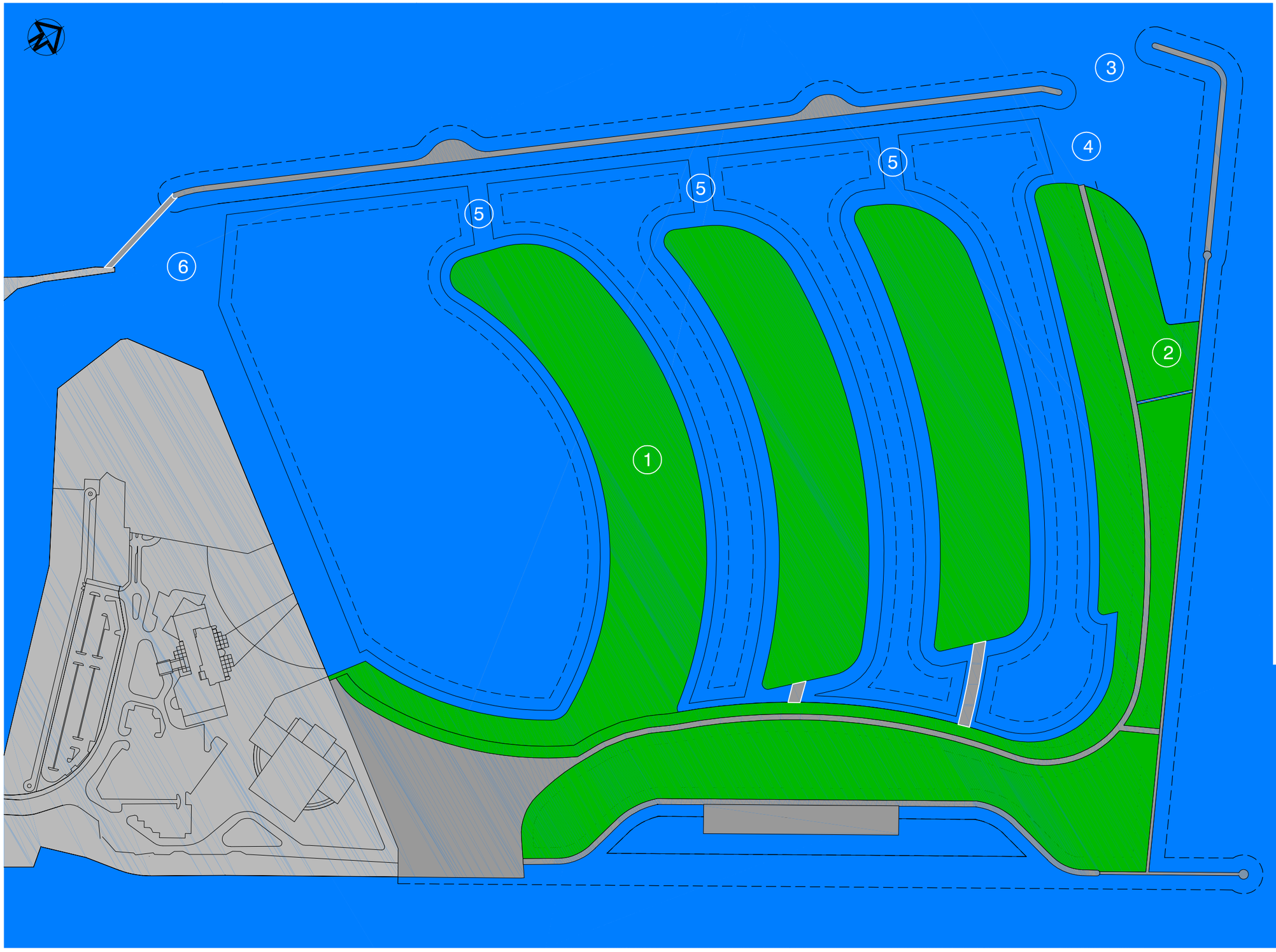

LEGEND

- SOFT CLAY LAYER
- DREDGED SOFT CLAY LAYER
- STIFF CLAY
- EXTRACTION AREA OF STIFF CLAY
- STIFF CLAY FILL
- FLOCCULENT AREA
- ENGINEERING FILL
- FINAL PROFILE

STEP 23 - COMPLETE LANDFORMS

KEY ELEMENTS

1. COMPLETE LANDFORM 1 TO FINISHED LAND PROFILE RL 3.5M AHD
2. COMPLETE TEMPORARY FLOCCULENT AREA TO FINISHED LAND PROFILE RL 3.5M AHD

STEP 24 - STRAND BREAKWATER BRIDGE CONSTRUCTION AND FLUSHING CHANNEL

KEY ELEMENTS

3. REMOVAL OF OUTER NORTHERN TEMPORARY BUND
4. REMOVAL OF NORTHERN TEMPORARY BUND
5. STAGED REMOVAL OF SAND LANDFORM LINK BUND
6. REMOVAL OF SOUTHERN TEMPORARY BUND

STEP 25 - STRAND BREAKWATER BRIDGE CONSTRUCTION

KEY ELEMENTS

7. COMPLETE CONSTRUCTION THE STRAND BREAKWATER BRIDGE TO LINK MARINERS PENINSULAR TO THE STRAND BREAKWATER

Issue	Description	Date
01	ORIGINAL ISSUE	25.07.2007

100mm on Original

Scale (Plan): 0 50 100 150 200m — 1 : 2000

Scale (Sections):

Surveyor: BRAZIER MOTTI

Architect: BUCHAN GROUP

Filename: K204-QL00704-01-BREAKWATER LAYOUT.DWG

Client: Townsville Ocean Terminal

Status: PRELIMINARY — NOT TO BE USED FOR CONSTRUCTION

Approved

R.E.P.Q No :

Scales: 1:2000 @ A1, 1:4000 @ A3

Current Issue Signatures

Author P.S.M

Original Size: A1

Designer R.M

Height Datum: AHD

Reviewer J.S

Grid: GRID

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Project: TOWNSVILLE OCEAN TERMINAL PROJECT

Title: CONSTRUCTION SEQUENCING STEP 23 TO STEP 25

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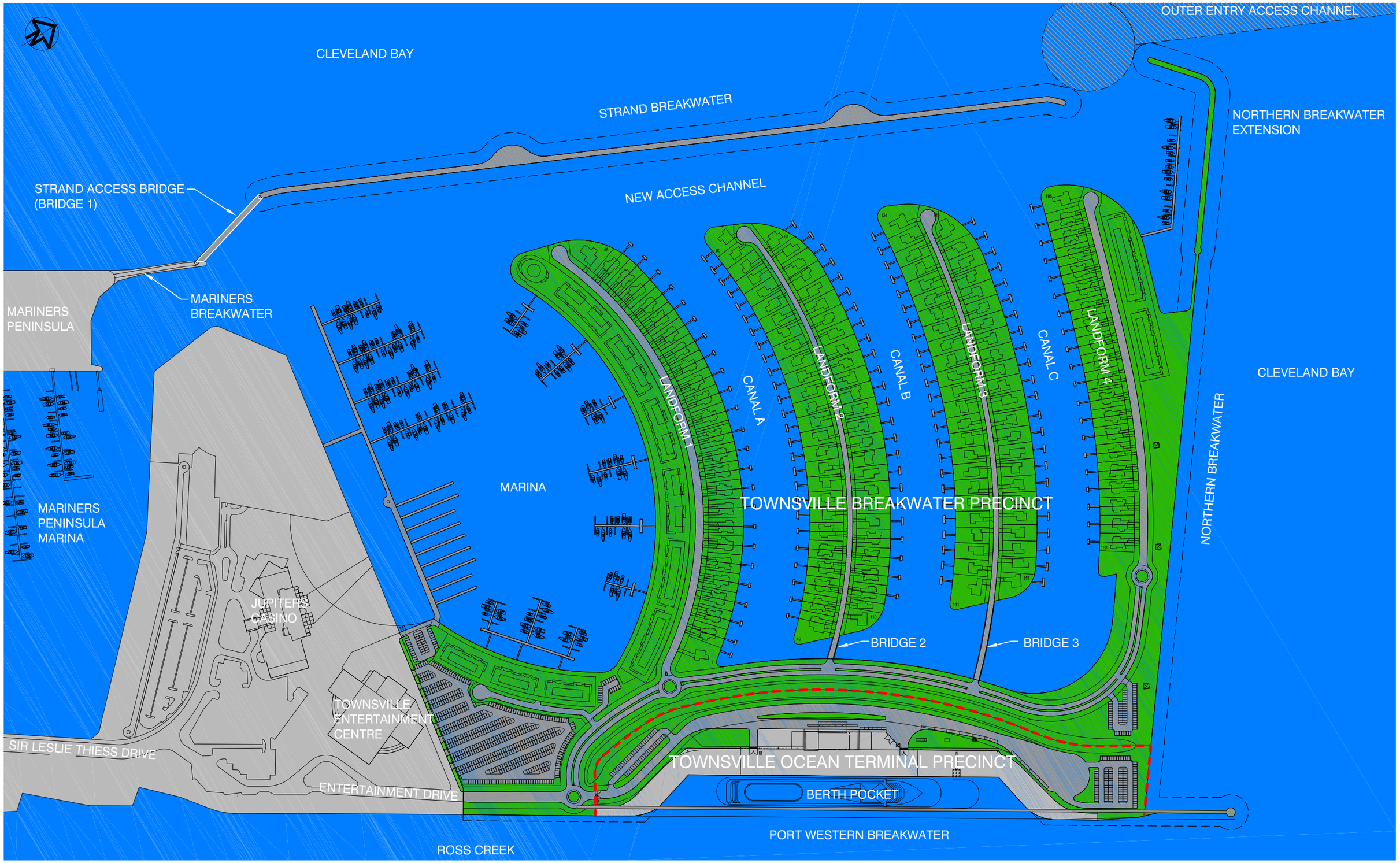
Drawing No. K216 — Project No. QL00704 — Issue 01

13/Sep/2007 3:16 PM F:\QL00704\E-CAD\C-Civil\B-Sketches\K204-QL00704-01-BREAKWATER LAYOUT.dwg V1



Issue	Description	Date
01	ORIGINAL ISSUE	19.07.2007

100mm on Original

Scale (Plan): 0 50 100 150 200m — 1 : 2000

Scale (Sections):

Surveyor: BRAZIER MOTTI

Architect: BUCHAN GROUP

Filename: K217-QL00704-01-KEY CONSTRUCTION ELEMENTS.DWG

Client: Townsville Ocean Terminal

Status: **PRELIMINARY** — NOT TO BE USED FOR CONSTRUCTION

Approved

R.E.P.Q No :

Scales	1:2000 @ A1 1:4000 @ A3	Current Issue Signatures	
		Author P.S.M	
Original Size	A1	Designer R.M	
Height Datum	AHD	Reviewer J.S	
Grid	GRID	© Copyright reserved	

Project: TOWNSVILLE OCEAN TERMINAL PROJECT

Title: INDICATIVE MASTER PLAN

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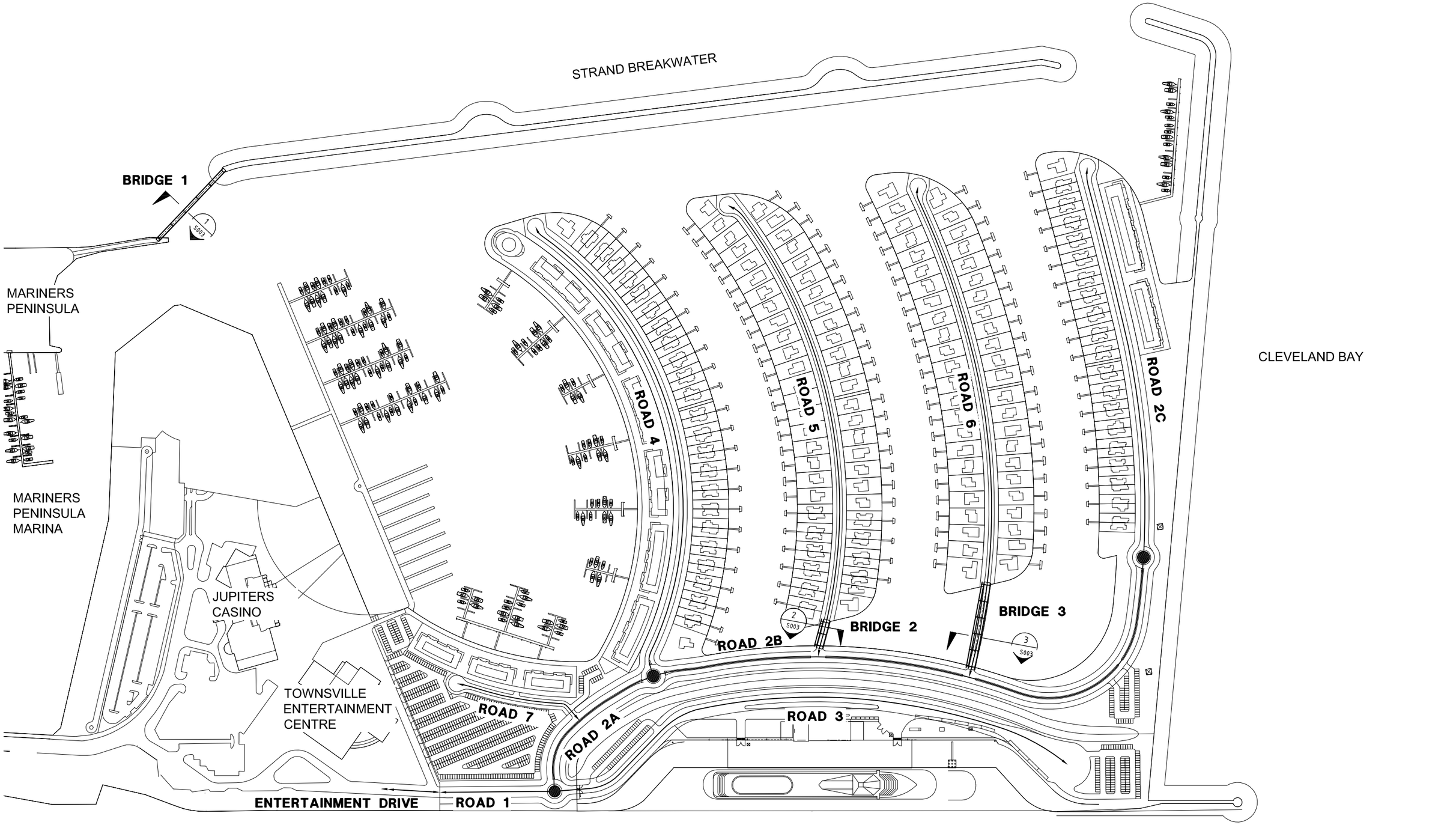
Drawing No.	Project No.	Issue
K217	— QL00704	— 01

13/Sep/2007 5:08 PM F:\QL00704\E-CAD\C-Civil\B-Sketches\K217-QL00704-01-KEY CONSTRUCTION ELEMENTS.DWG V1

APPENDIX B:

DESIGN DRAWINGS



Issue	Description	Date
01	ORIGINAL ISSUE	31.07.2007

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Scale (Sections)

Surveyor: BRAZIER MOTTI

Architect: BUCHAN GROUP

Filename: K204-QL00704-01-BREAKWATER LAYOUT.DWG

Client: Townsville Ocean Terminal

Status: PRELIMINARY — NOT TO BE USED FOR CONSTRUCTION

Approved

R.E.P.Q No :

Scales	AS SHOWN	Current Issue Signatures	
		Author J.H.	
Original Size	A1	Designer S.D.	
Height Datum	A.H.D	Reviewer -	
Grid	LOCAL	© Copyright reserved	

Project: TOWNSVILLE OCEAN TERMINAL PROJECT

Title: PRELIMINARY BRIDGE LAYOUT

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Drawing No.	Project No.	Issue
S001	QL00704	01

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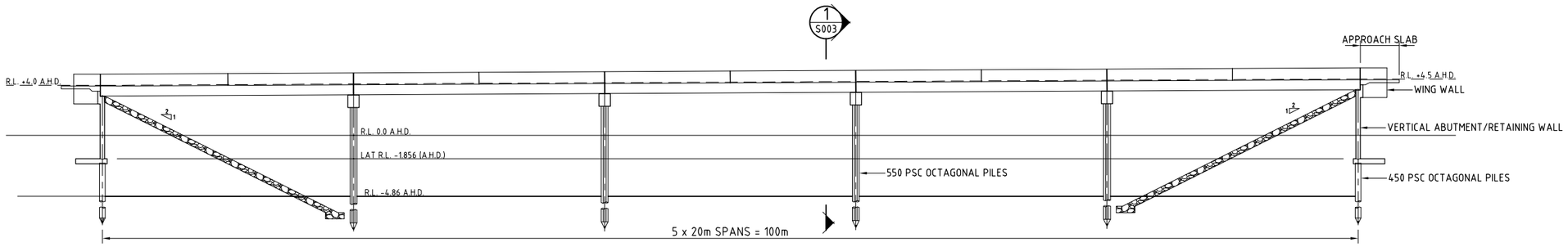
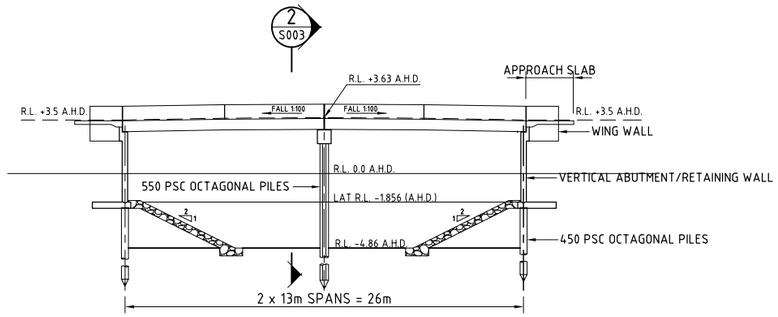


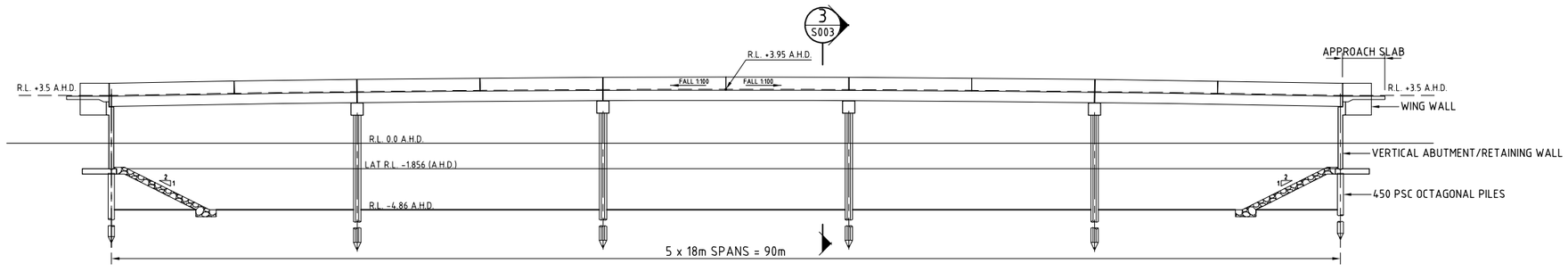
BRIDGE 1 - THE STRAND BREAKWATER

SCALE 1:200



BRIDGE 2 - ROAD 5

SCALE 1:200



BRIDGE 3 - ROAD 6

SCALE 1:200

Issue	Description	Date
01	ORIGINAL ISSUE	31.07.2007

100mm on Original

Scale (Plan)

Scale (Sections)

Surveyor: BRAZIER MOTTI

Architect: BUCHAN GROUP

Filename: K204-QL00704-01-BREAKWATER LAYOUT.DWG

Client: Townsville Ocean Terminal

Status: **PRELIMINARY**
NOT TO BE USED FOR CONSTRUCTION

Approved

R.E.P.Q No :

Scales: 1:200

Original Size: A1

Height Datum: A.H.D

Grid: LOCAL

Current Issue Signatures

Author J.H.

Designer S.D.

Reviewer -

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Project: TOWNSVILLE OCEAN TERMINAL PROJECT

Title: PRELIMINARY BRIDGE ELEVATIONS

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Drawing No. S002 — Project No. QL00704 — Issue 01

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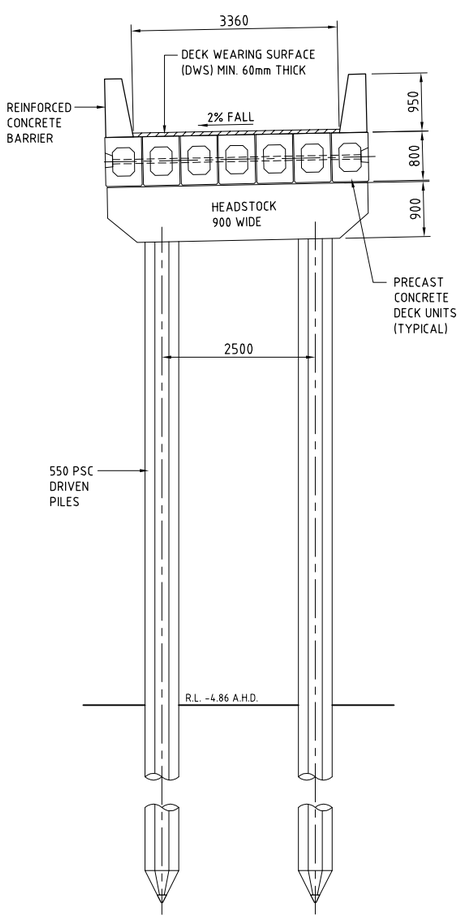
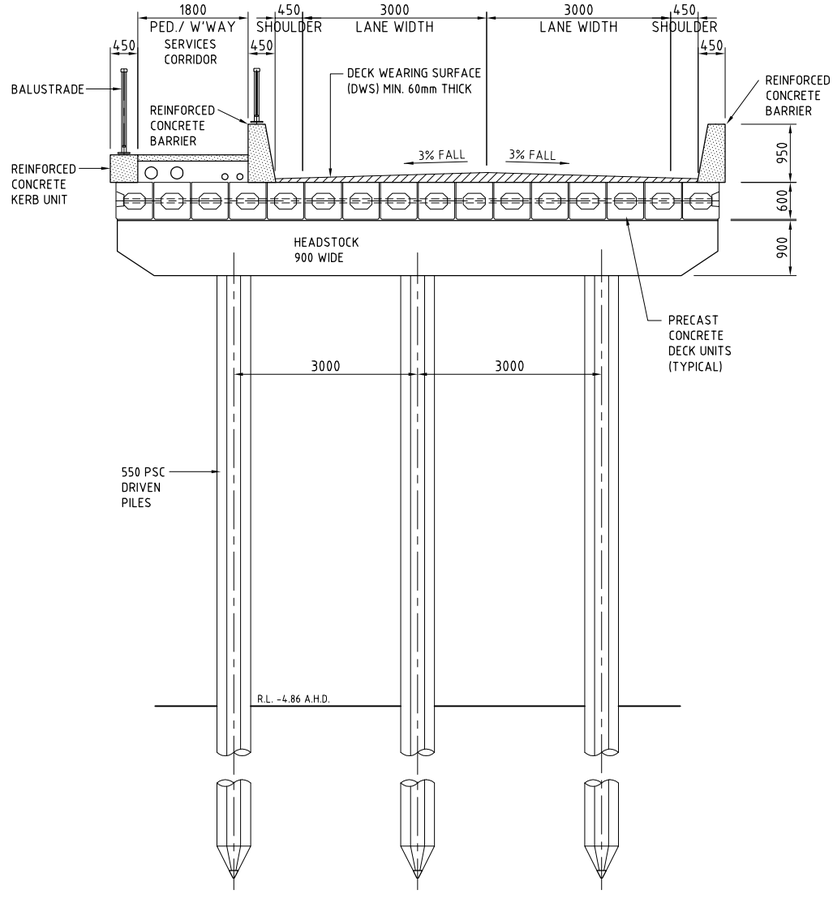
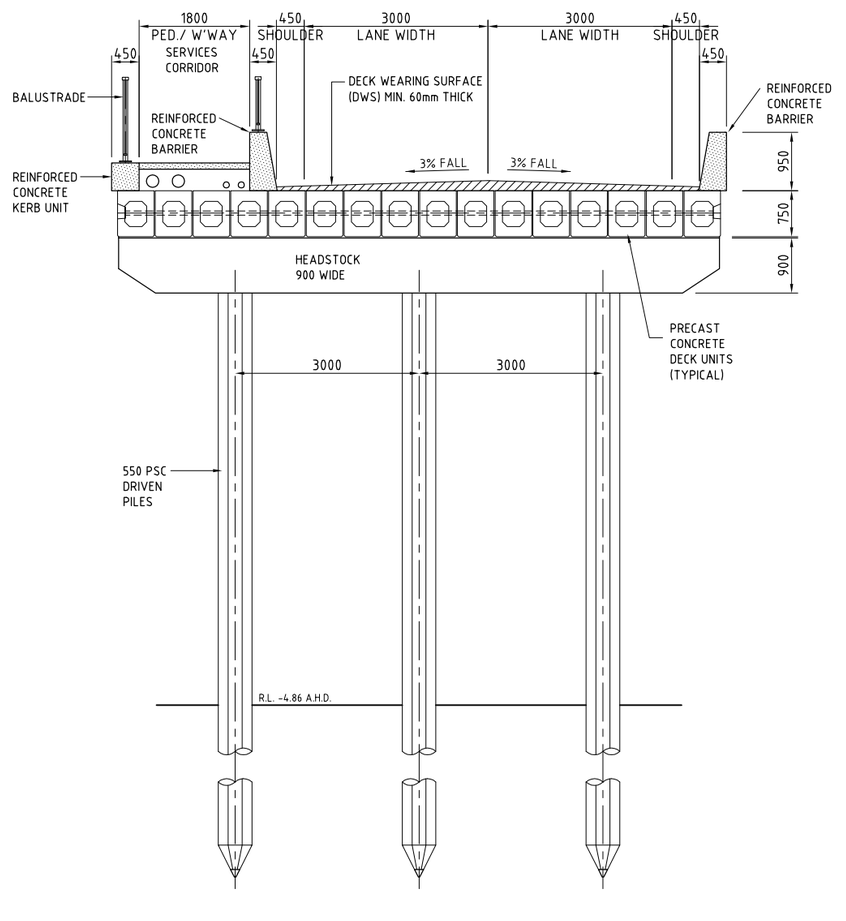


SECTION 1 / SCALE 1:50 / S002



SECTION 2 / SCALE 1:50 / S002



SECTION 3 / SCALE 1:50 / S002

Issue	Description	Date
01	ORIGINAL ISSUE	31.07.2007

100mm on Original

Scale (Plan)

Scale (Sections)

Surveyor: BRAZIER MOTTI

Architect: BUCHAN GROUP

Filename: K204-QL00704-01-BREAKWATER LAYOUT.DWG

Client: Townsville Ocean Terminal

Status: **PRELIMINARY**
NOT TO BE USED FOR CONSTRUCTION

Approved

R.E.P.Q No :

Scales	1:200	Current Issue Signatures	
		Author J.H.	
Original Size	A1	Designer S.D.	
Height Datum	A.H.D	Reviewer -	
Grid	LOCAL	© Copyright reserved	

Project: TOWNSVILLE OCEAN TERMINAL PROJECT

Title: PRELIMINARY BRIDGE CROSS SECTIONS

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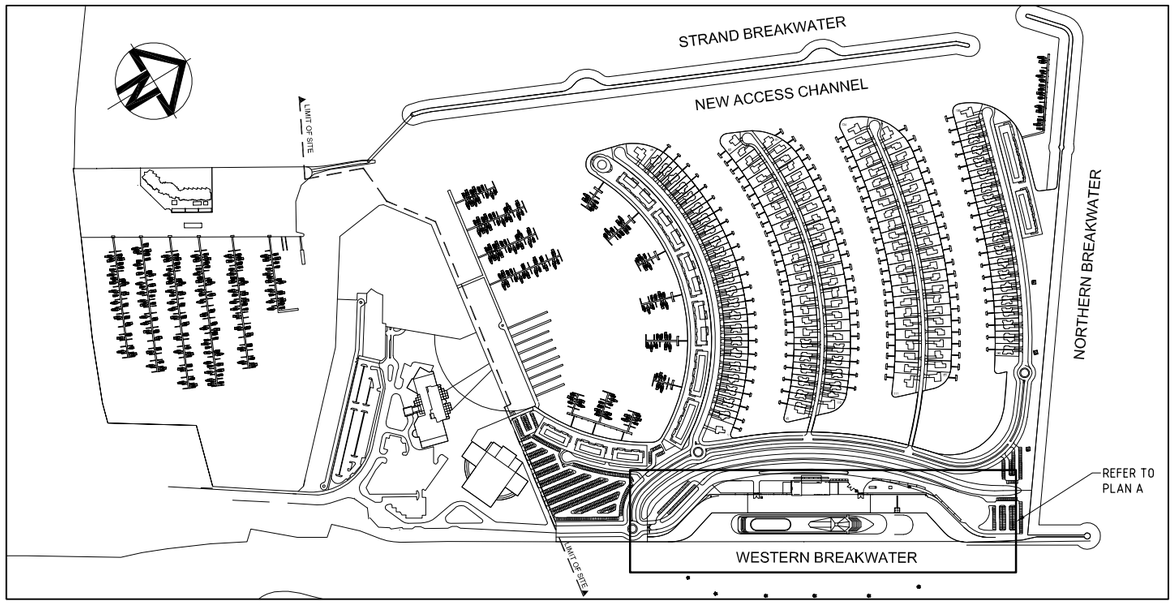
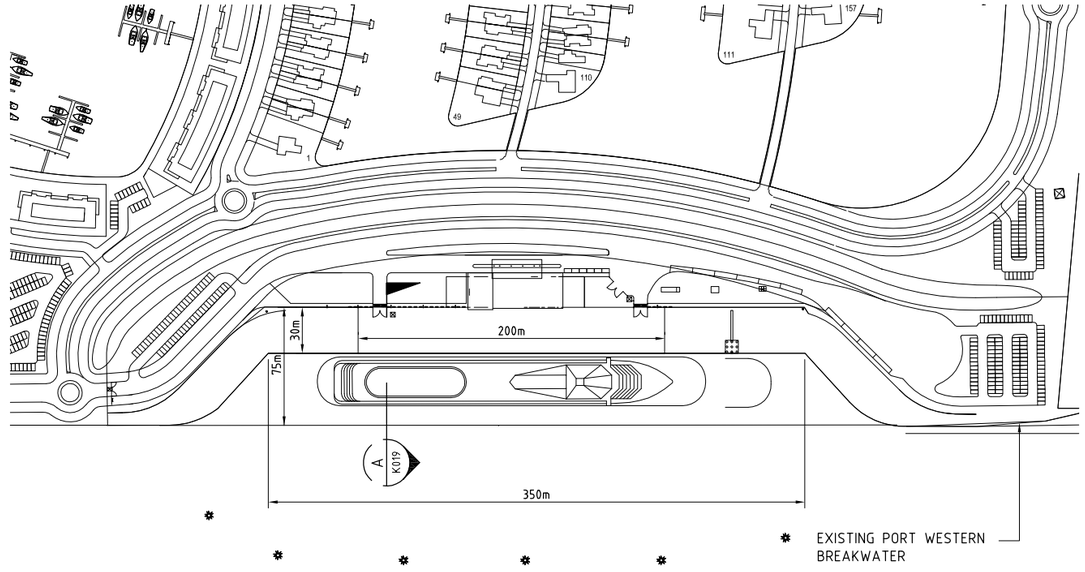
Drawing No.	Project No.	Issue
S003	QL00704	01

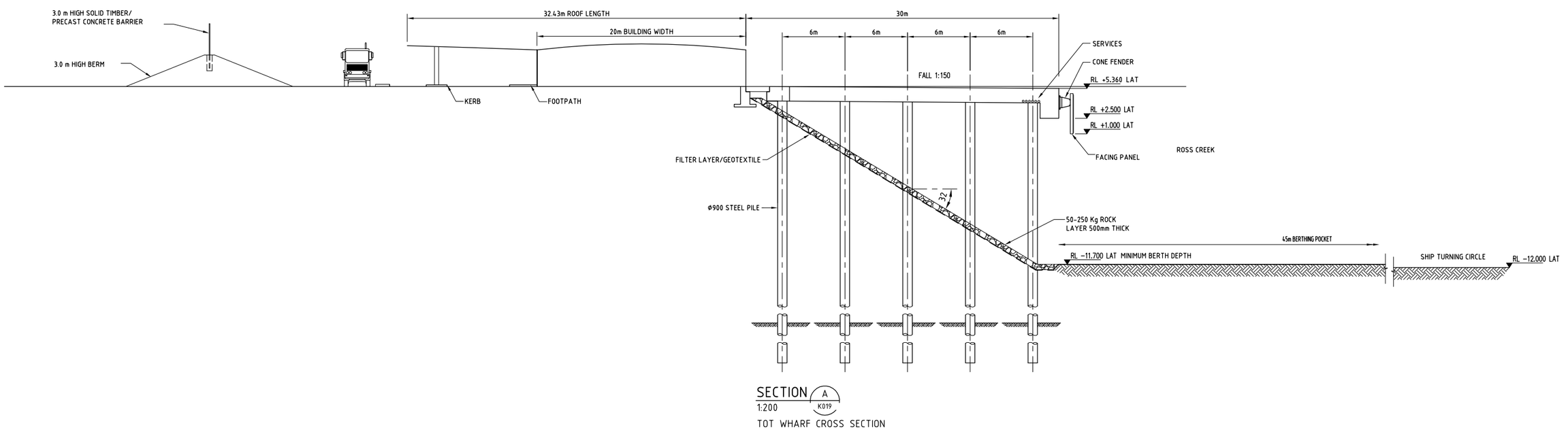
13/Sep/2007 3:24 PM F:\QL00704\E-CAD\C-Civil\B-Sketches\K204-QL00704-01-BREAKWATER LAYOUT.dwg V1



KEY PLAN
1:5000



PLAN A K019
1:2000



SECTION A K019
1:200
TOT WHARF CROSS SECTION

Issue	Description	Date
03	NEW LAYOUT	27.04.2007
02	AMENDED TOT PRECINCT	06.02.2007
01	ORIGINAL ISSUE	02.01.2007

100mm on Original

Scale (Plan): AS SHOWN
Scale (Sections): AS SHOWN
Surveyor: BRAZIER MOTTI
Architect: BUCHAN GROUP
Filename: K220-221-QL00704-01.DWG
Client: Townsville Ocean Terminal

Status: PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION
Approved
R.E.P.Q No :
Scales: AS SHOWN
Original Size: A1
Height Datum: A.H.D
Grid: LOCAL
Current Issue Signatures
Author P.S.M
Designer R.M
Reviewer L.J.O

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Project: TOWNSVILLE OCEAN TERMINAL PROJECT
Title: TOT PRECINCT DETAILS

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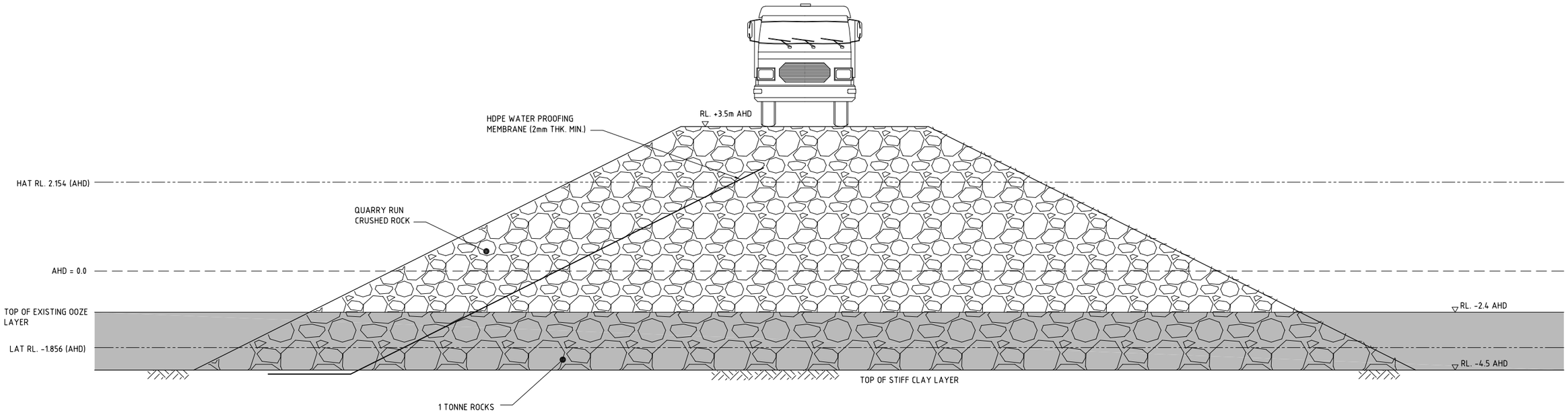
Drawing No. K019 — Project No. QL00704 — Issue 03

13/Sep/2007 5:11 PM F:\QL00704\E-CAD\C-Civil\B-Sketches\K220-221-QL00704-01.dwg V1



TYPICAL HAUL ROAD CONSTRUCTION BUND DETAIL
SCALE 1:50

Issue	Description	Date
01	ORIGINAL ISSUE	10.05.2007

100mm on Original

Scale (Plan): AS SHOWN
Scale (Sections): AS SHOWN
Surveyor: BRAZIER MOTTI
Architect: BUCHAN GROUP
Filename: K218-QL00704-01- ROCK HAUL ROAD.DWG
Client: Townsville Ocean Terminal

Status: **PRELIMINARY**
NOT TO BE USED FOR CONSTRUCTION
Approved
R.E.P.Q No :
Scales: AS SHOWN
Current Issue Signatures
Author P.S.M
Original Size: A1
Designer R.M
Height Datum: A.H.D
Reviewer L.J.O
Grid: LOCAL
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Project: TOWNSVILLE OCEAN TERMINAL PROJECT
Title: TYPICAL HAUL ROAD CONSTRUCTION BUND

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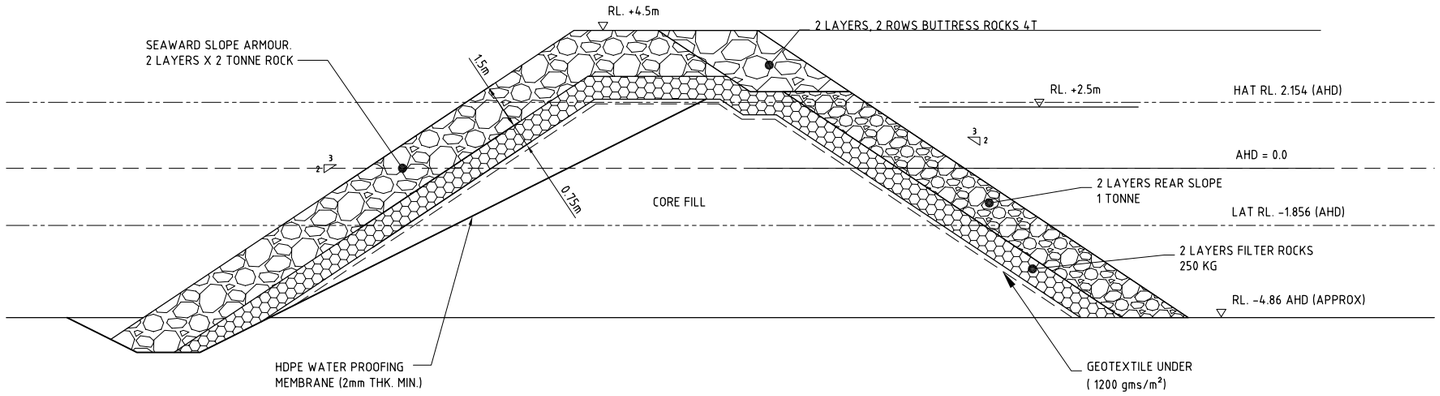
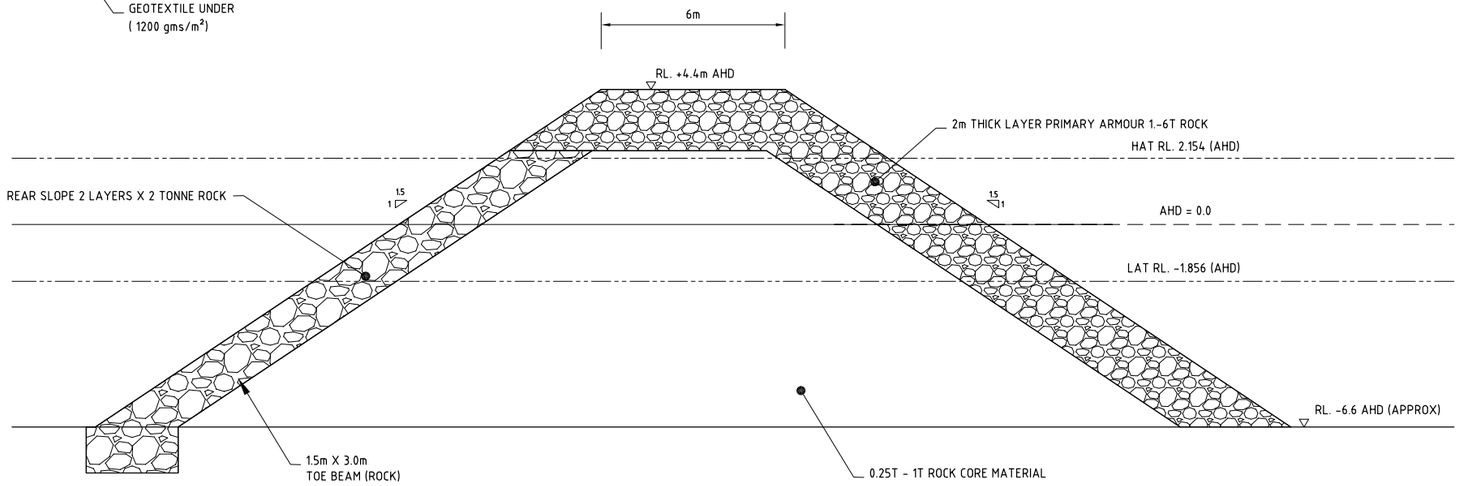
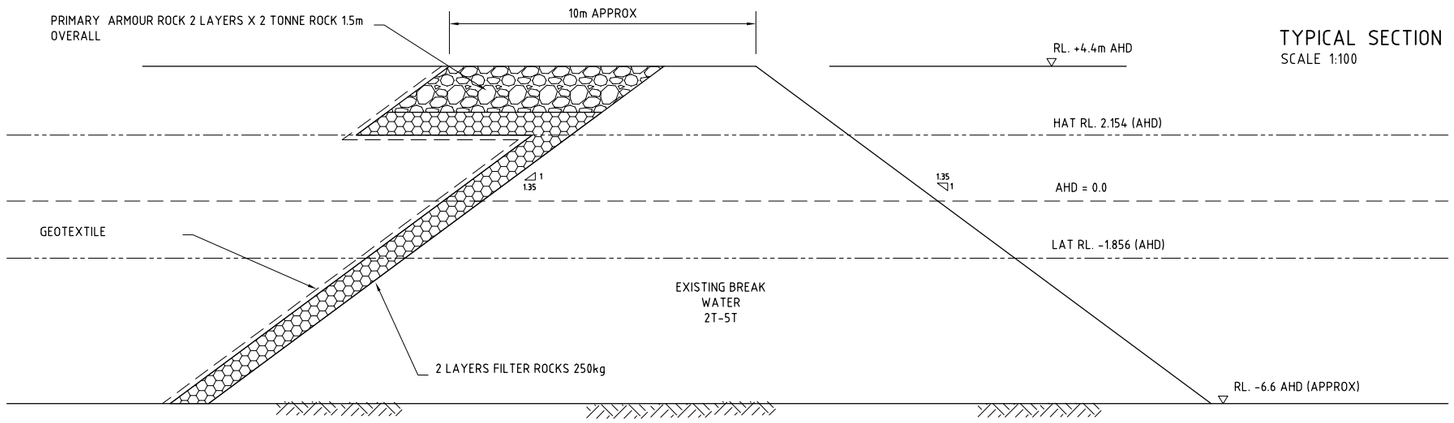
Drawing No. K218 — Project No. QL00704 — Issue 01

13/Sep/2007 5:08 PM F:\QL00704\E-CAD\C-Civil\B-Sketches\K218-QL00704-01- ROCK HAUL ROAD.dwg V1



TYPICAL SECTION OF THE STRAND BREAKWATER
SCALE 1:100





TYPICAL SECTION OF NORTHERN BREAKWATER EXTENSION
SCALE 1:100

TYPICAL SECTION OF EXISTING NORTHERN BREAKWATER UPGRADE
SCALE 1:100

Issue	Description	Date
01	ORIGINAL ISSUE	02.08.2007

100mm on Original

Scale (Plan): AS SHOWN
Scale (Sections): AS SHOWN
Surveyor: BRAZIER MOTTI
Architect: BUCHAN GROUP
Filename: K219-QL00704-01- BREAKWATER SECTIONS.DWG
Client: Townsville Ocean Terminal

Status: **PRELIMINARY**
NOT TO BE USED FOR CONSTRUCTION
Approved
R.E.P.Q No :
Scales: AS SHOWN
Current Issue Signatures
Author P.S.M
Original Size: A1
Designer R.M
Height Datum: A.H.D
Reviewer L.J.O
Grid: LOCAL
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Project: TOWNSVILLE OCEAN TERMINAL PROJECT
Title: BREAKWATER SECTIONS

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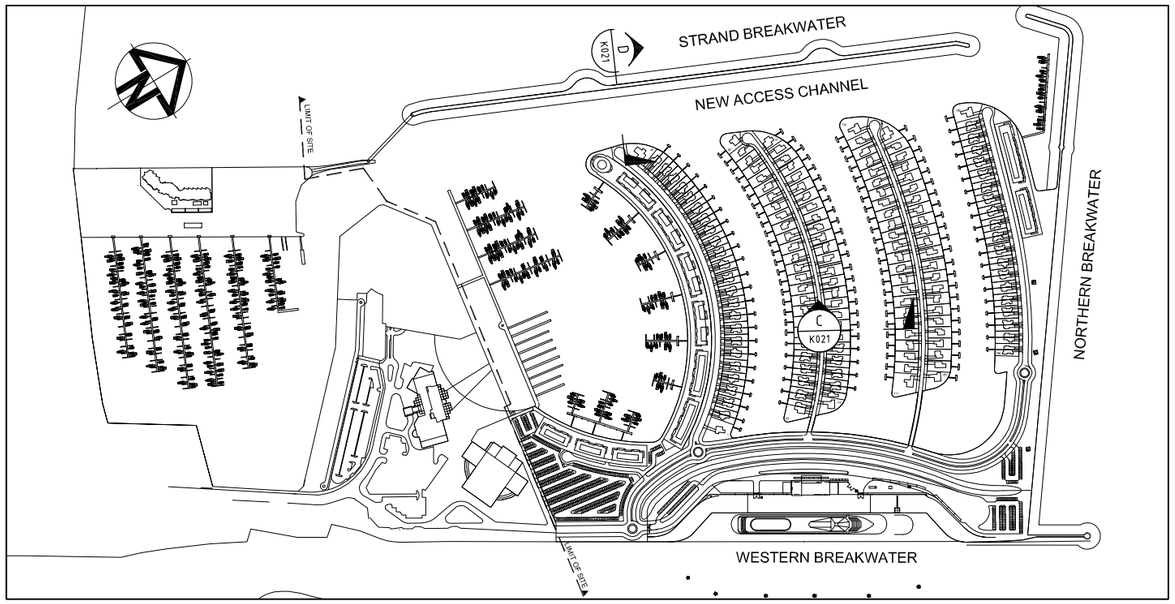
Drawing No. K219 — Project No. QL00704 — Issue 04

13/Sep/2007 5:09 PM F:\QL00704\E-CAD\C-Civil\B-Sketches\K219-QL00704-01- BREAKWATER SECTIONS.dwg V1



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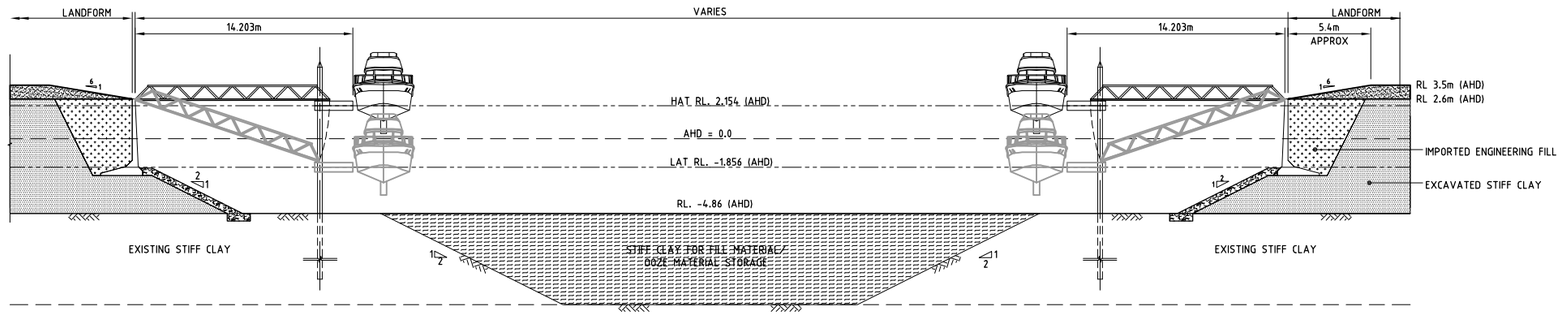
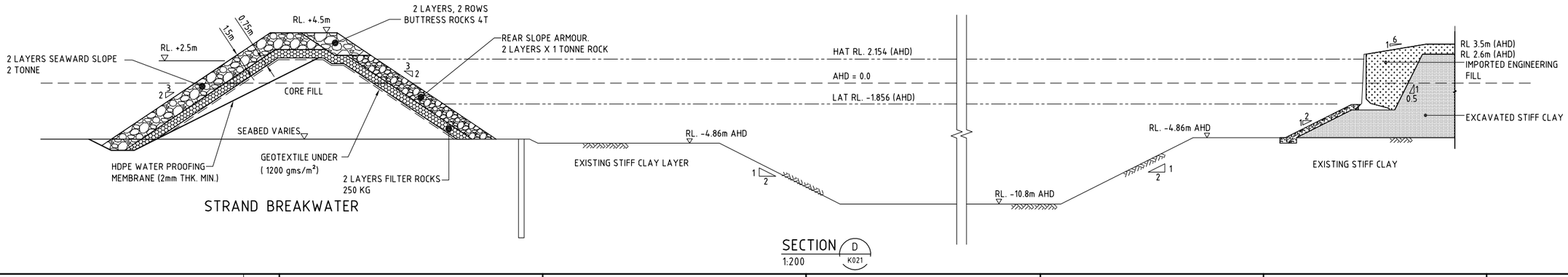


SECTION C
1:200



SECTION D
1:200

Issue	Description	Date
01	ORIGINAL ISSUE	02.08.2007

100mm on Original

Scale (Plan): AS SHOWN
Scale (Sections): AS SHOWN
Surveyor: BRAZIER MOTTI
Architect: BUCHAN GROUP
Filename: K220-221-QL00704-01.DWG
Client: Townsville Ocean Terminal

Status: **PRELIMINARY** NOT TO BE USED FOR CONSTRUCTION
Approved
R.E.P.Q No :
Scales: AS SHOWN
Original Size: A1
Height Datum: A.H.D
Grid: LOCAL
Current Issue Signatures
Author P.S.M
Designer R.M
Reviewer L.J.O
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Project: TOWNSVILLE OCEAN TERMINAL PROJECT
Title: TYPICAL CANAL SECTIONS

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Drawing No. K220 — Project No. QL00704 — Issue 01

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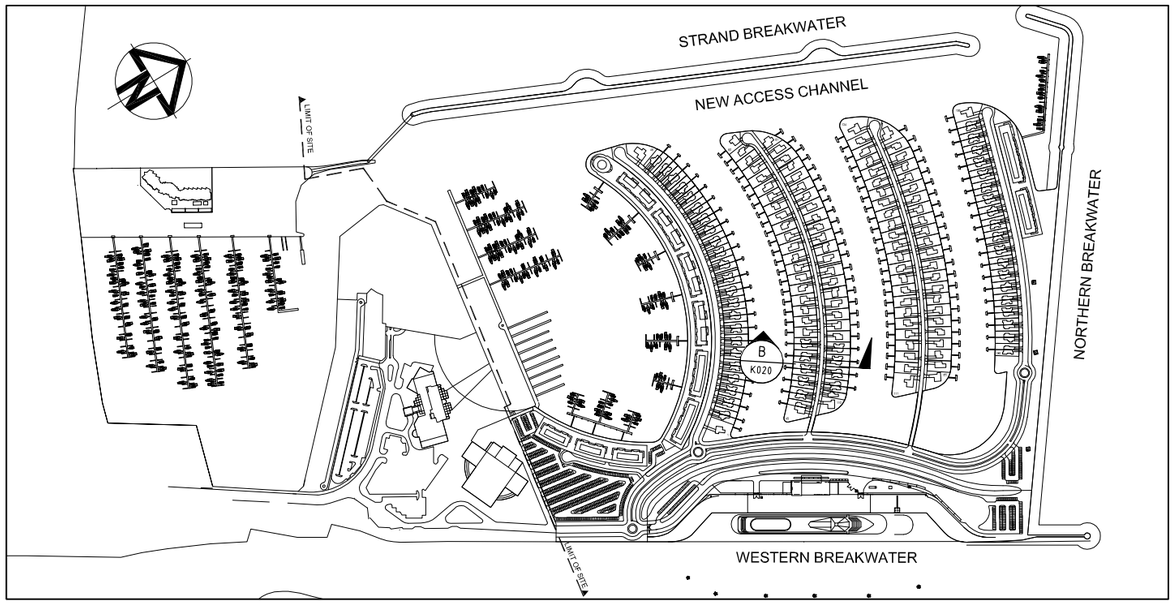

KEY PLAN
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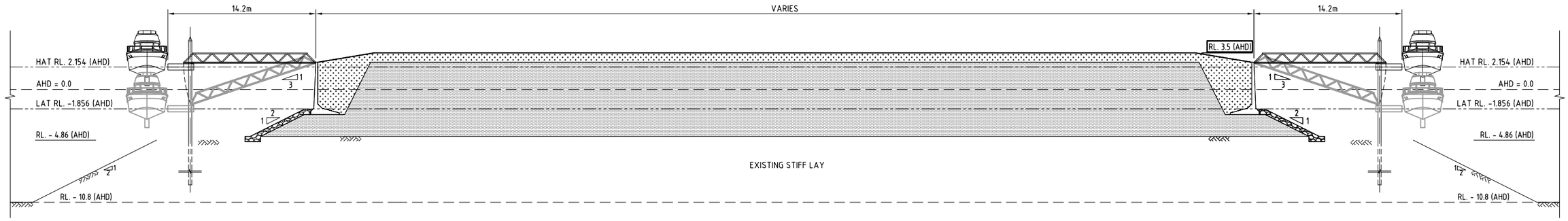

SECTION B K020
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TYPICAL LANDFORM CROSS SECTION

Issue	Description	Date
01	ORIGINAL ISSUE	02.08.07

100mm on Original

Scale (Plan): AS SHOWN
Scale (Sections): AS SHOWN
Surveyor: BRAZIER MOTTI
Architect: BUCHAN GROUP
Filename: K220-221-QL00704-01.DWG
Client: Townsville Ocean Terminal

Status: PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION
Approved
R.E.P.Q No :
Scales: AS SHOWN
Original Size: A1
Height Datum: A.H.D
Grid: LOCAL
Current Issue Signatures
Author P.S.M
Designer R.M
Reviewer L.J.O

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Title: TYPICAL LANDFORM SECTIONS

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Drawing No. K221 — Project No. QL00704 — Issue 01

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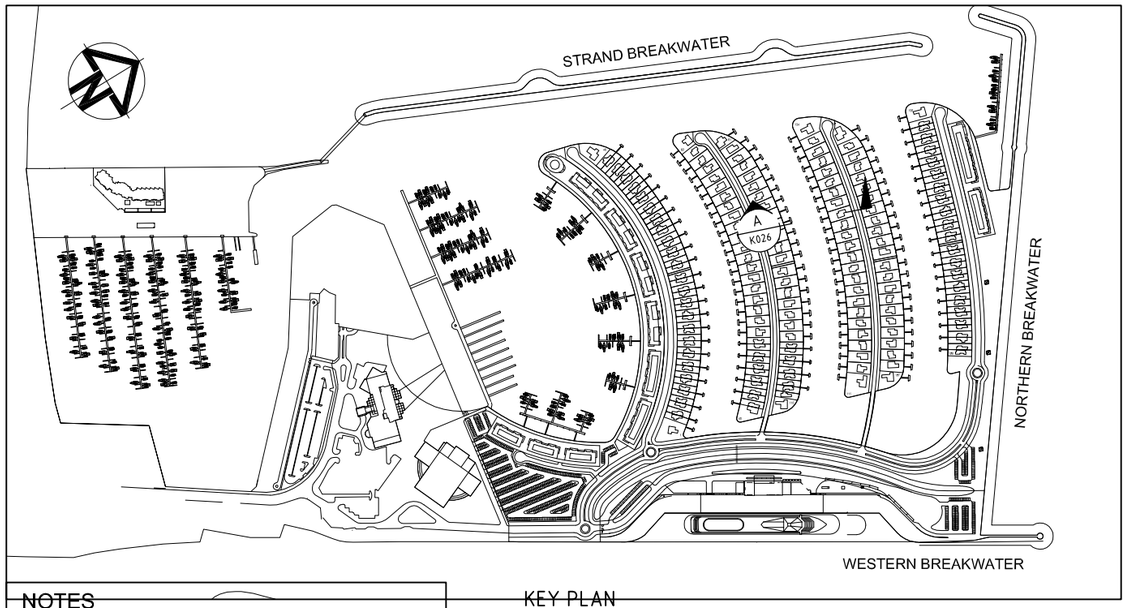
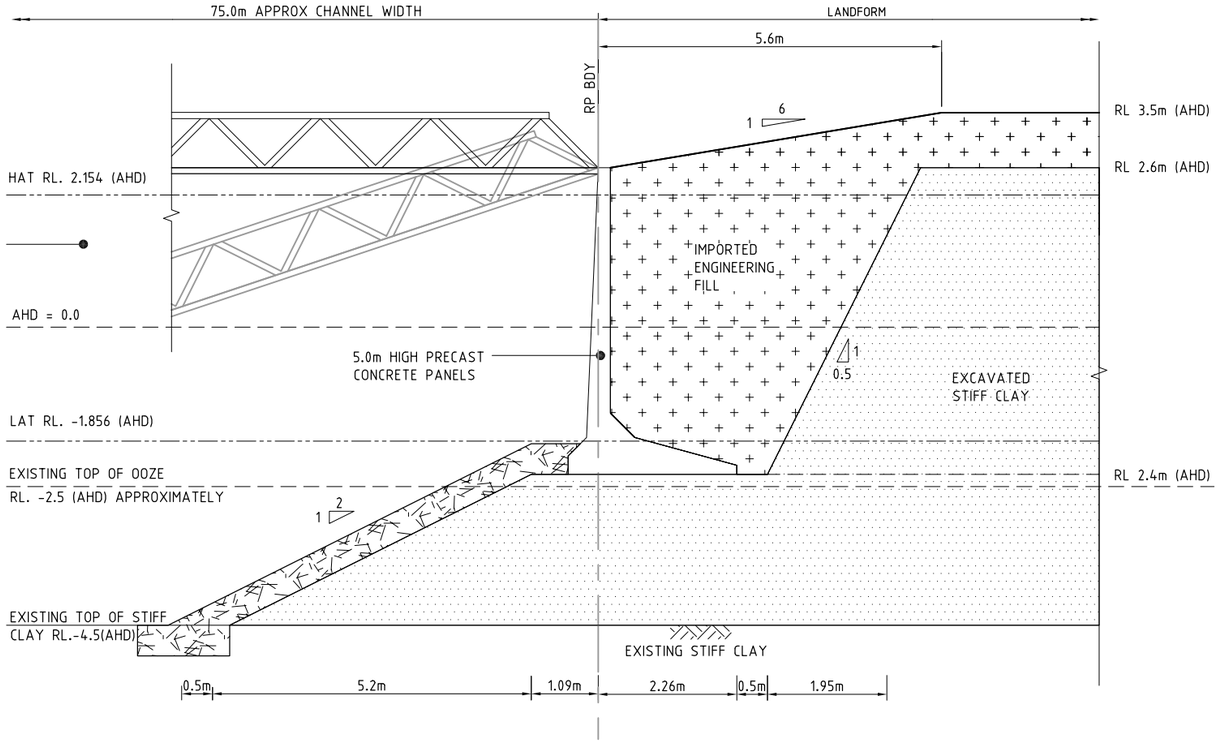


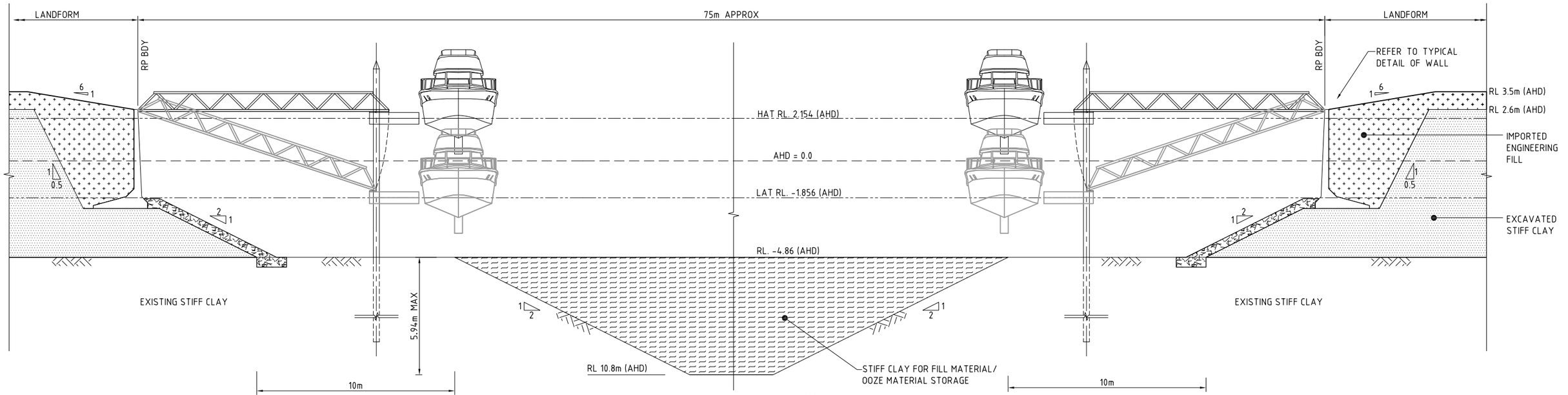
KEY PLAN
1:5000

NOTES

1. THE MAXIMUM SLOPE OF A GANGWAY & TREADPLATE FOR PRIVATE PONTOONS WITH NO PUBLIC ACCESS SHALL NOT EXCEED 1:3 AS PER AS 3962-2001
2. GANGWAY TO BE IN ACCORDANCE WITH AS 1657
3. WALKING SURFACE TO BE FINISHED IN ACCORDANCE WITH AS 4586



TYPICAL DETAIL OF WALL
1:50



TYPICAL CANAL SECTION A 26
1:100

Issue	Description	Date
01	ORIGINAL ISSUE	02.08.2007

100mm on Original

Scale (Plan): AS SHOWN
Scale (Sections): AS SHOWN
Surveyor: BRAZIER MOTTI
Architect: BUCHAN GROUP
Filename: K222-QL00704-05 TYPICAL LANDFORM INTERFACE CANAL.DWG
Client: Townsville Ocean Terminal

Status: **PRELIMINARY** NOT TO BE USED FOR CONSTRUCTION
Approved
R.E.P.Q No :
Scales: AS SHOWN
Original Size: A1
Height Datum: A.H.D
Grid: LOCAL
Current Issue Signatures
Author R.M
Designer R.M
Reviewer L.J.O
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Project: TOWNSVILLE OCEAN TERMINAL PROJECT
Title: TYPICAL LANDFORM INTERFACE OF CANAL PROFILE

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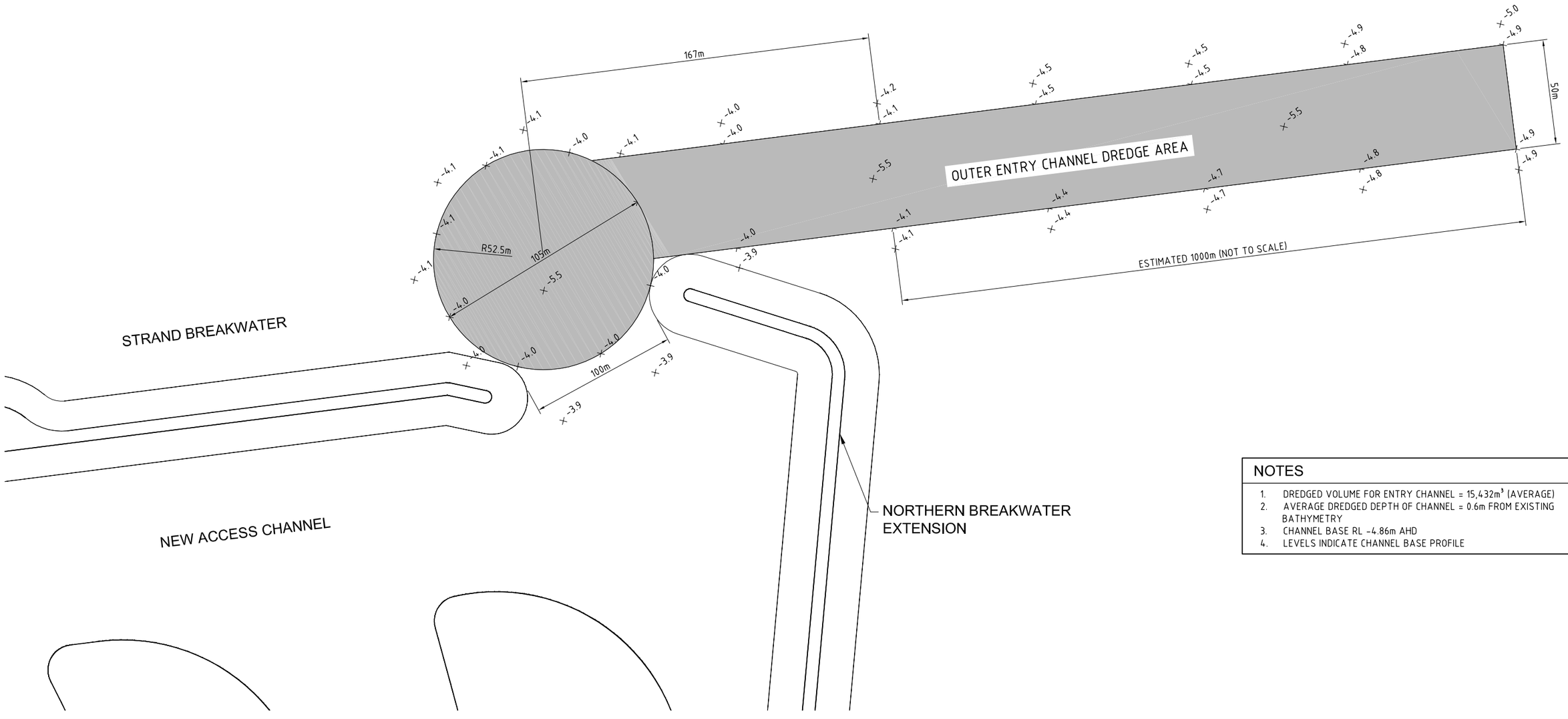
Drawing No. K222 — Project No. QL00704 — Issue 01

13/Sep/2007 5:12 PM F:\QL00704\E-CAD\C-Civil\B-Sketches\K222-QL00704-05 TYPICAL LANDFORM INTERFACE CANAL.dwg V1



NOTES

1. DREDGED VOLUME FOR ENTRY CHANNEL = 15,432m³ (AVERAGE)
2. AVERAGE DREDGED DEPTH OF CHANNEL = 0.6m FROM EXISTING BATHYMETRY
3. CHANNEL BASE RL -4.86m AHD
4. LEVELS INDICATE CHANNEL BASE PROFILE

Issue	Description	Date
02	AMENDED ENTRY CHANNEL	13.09.2007
01	ORIGINAL ISSUE	27.07.2007

100mm on Original

Scale (Plan)

Scale (Sections)

Surveyor: BRAZIER MOTTI

Architect: BUCHAN GROUP

Filename: K223-QL00704-01- DREDGE AREA.DWG

Client: Townsville Ocean Terminal

Status: **PRELIMINARY**
NOT TO BE USED FOR CONSTRUCTION

Approved

R.E.P.Q No :

Scales	1:1000 @ A1 1:2000 @ A3	Current Issue Signatures	
		Author B.W	
Original Size	A1	Designer R.J.M	
Height Datum	AHD	Reviewer J.S	
Grid	LOCAL	© Copyright reserved	

Project: TOWNSVILLE OCEAN TERMINAL PROJECT

Title: PROPOSED OUTER ENTRY CHANNEL DREDGE AREA

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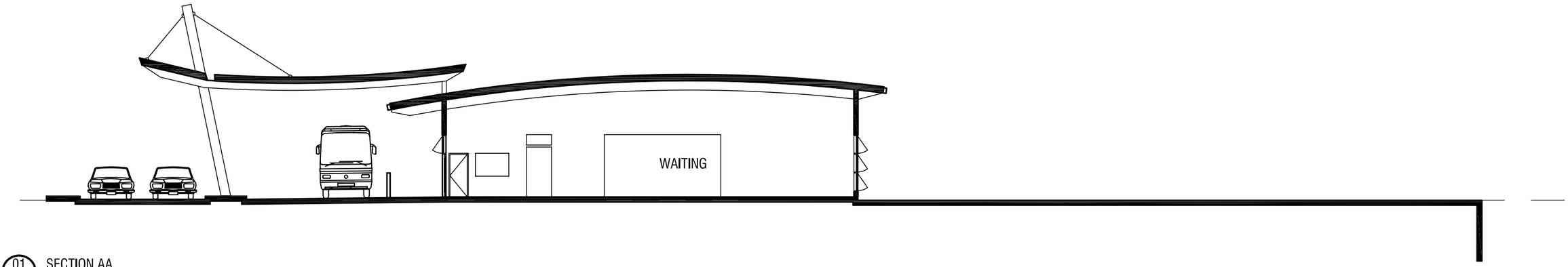
Drawing No.	Project No.	Issue
K223	QL00704	02

13/Sep/2007 3:54 PM F:\QL00704\E-CAD\C-Civil\B-Sketches\K223-QL00704-01- DREDGE AREA.dwg V1

APPENDIX C:

TERMINAL BUILDING AND WHARF DRAWINGS



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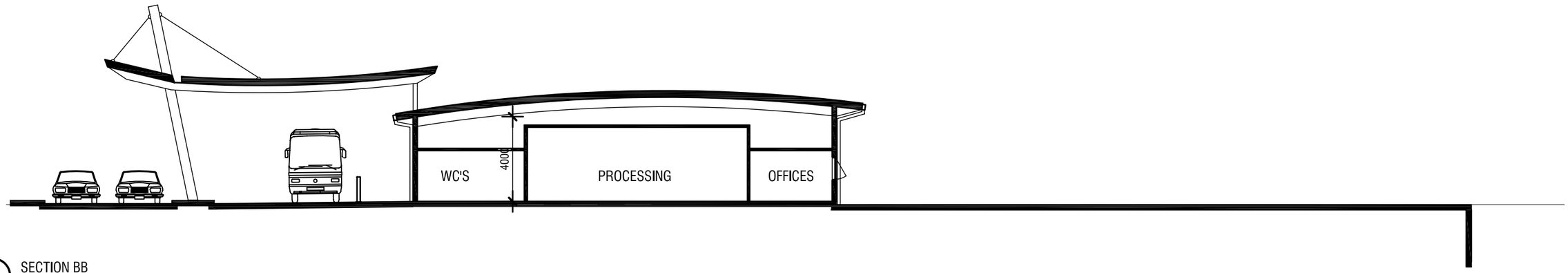
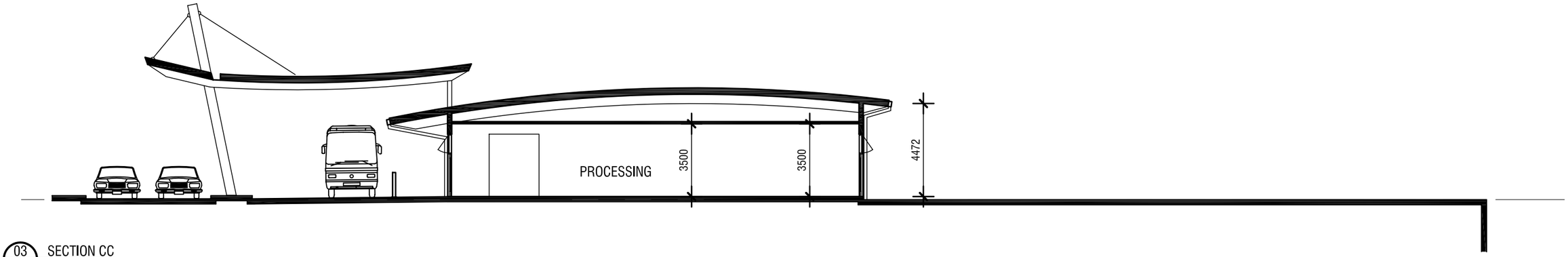
SCALE 1:200



02 SECTION BB
SCALE 1:200



03 SECTION CC
SCALE 1:200

issue	date	description	ints	auth
A	04.07.07	FIRST ISSUE	NC	NC
B	11.07.07	ROOF POP UP REMOVED WAITING ONLY HIGH CEILING	NC	NC
C	18.07.07	REDUCED SCALE FOR COST PLAN	NC	NC
D	27.07.07	REDUCED PORTE COCHERE	NC	NC

issue date description ints auth

0 10m

Townsville Ocean Terminal

City Pacific Limited

THE BUCHAN GROUP
GOLD COAST
Malone Buchan Laird & Bawden Pty Ltd
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project
PROPOSED OCEAN TERMINAL
TOWNSVILLE
SECTIONS

purpose
FOR INFORMATION

scale 1:200 @ A3 **date** JUNE 2007

project no 707052

dwg no SKa3-11 **issue** D

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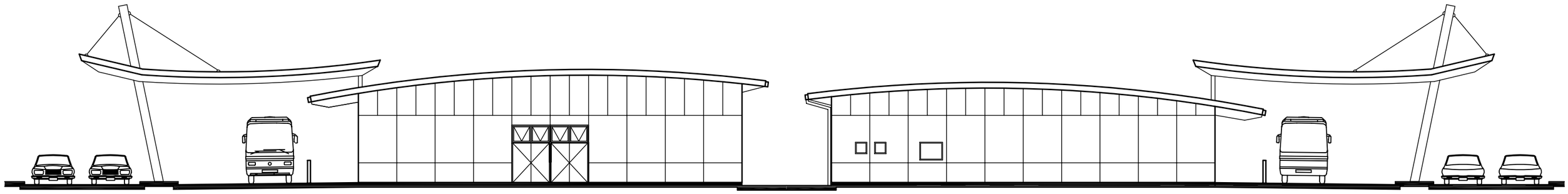
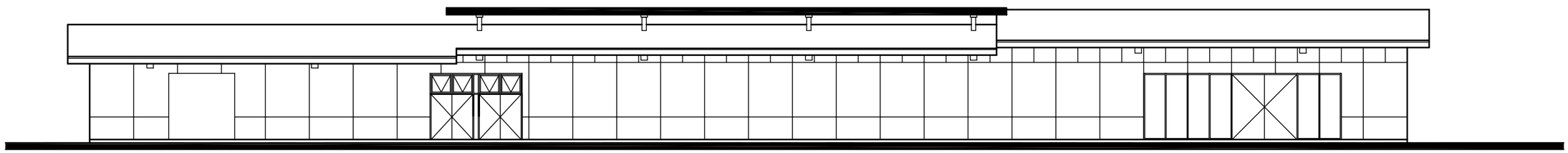


01 SOUTH ELEVATION
SCALE 1:200

02 NORTH ELEVATION
SCALE 1:200



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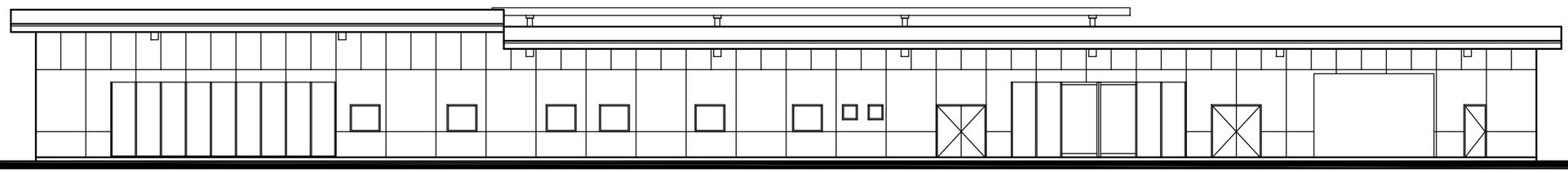
SCALE 1:200



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SCALE 1:200

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C	18.07.07	REDUCED SCALE FOR COST PLAN	NC	NC
D	27.07.07	REDUCED PORTE COCHERE	NC	NC

issue	date	description	ints	auth

0 10m

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project
PROPOSED OCEAN TERMINAL
TOWNSVILLE
ELEVATIONS

purpose
FOR INFORMATION

scale 1:200 @ A3 **date** JUNE 2007

project no 707052

dwg no SKa3- 10 **issue** D

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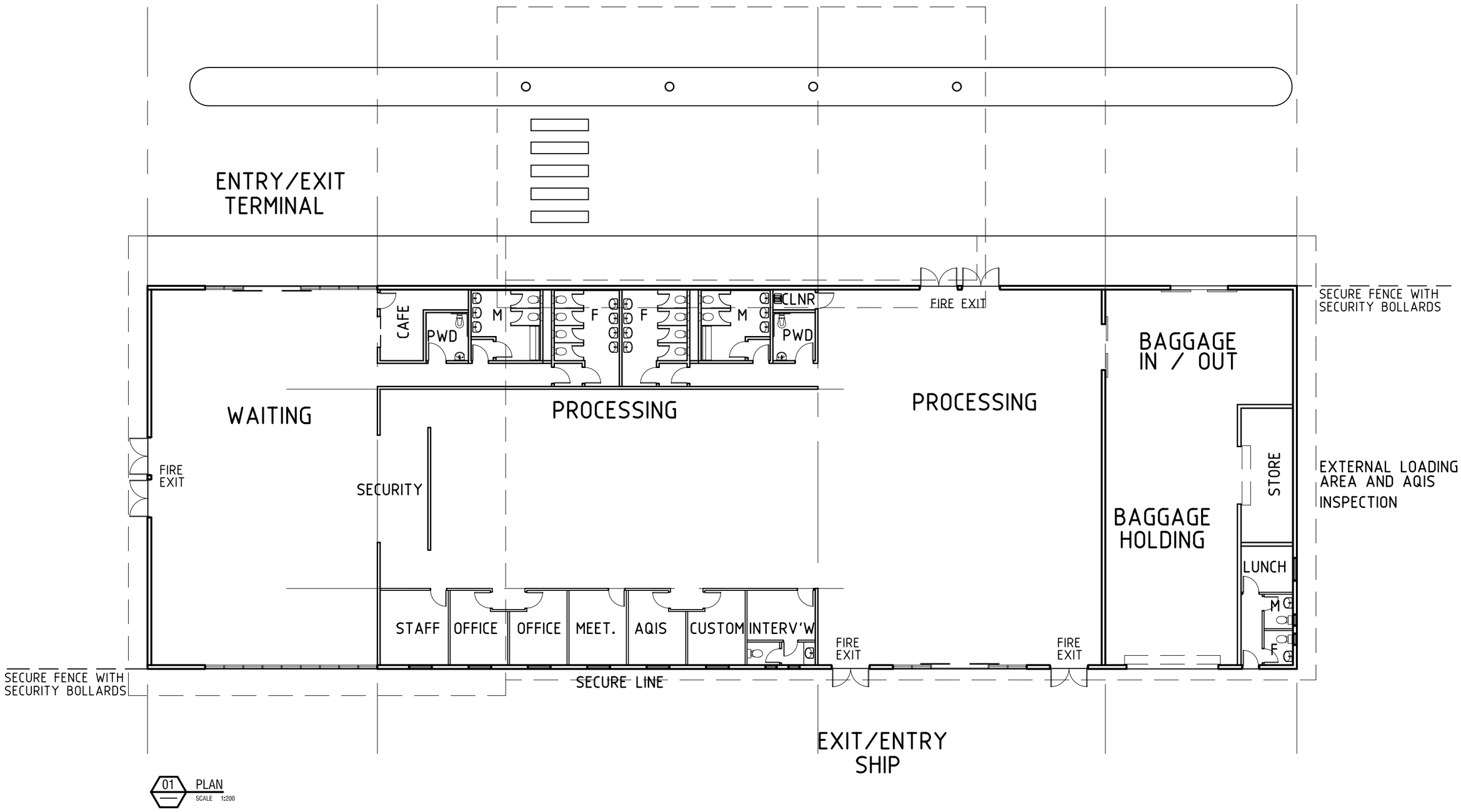

01 PLAN
SCALE 1:200

issue	date	description	ints	auth
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issue	date	description	ints	auth

0 10m

Townsville Ocean Terminal

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project
PROPOSED OCEAN TERMINAL
TOWNSVILLE
TRANSIT PORT option
BASE PLAN

purpose
FOR INFORMATION

scale 1:200 @ A3 **date** JUNE 2007
project no 707052
dwg no SKa3-12 **issue** A

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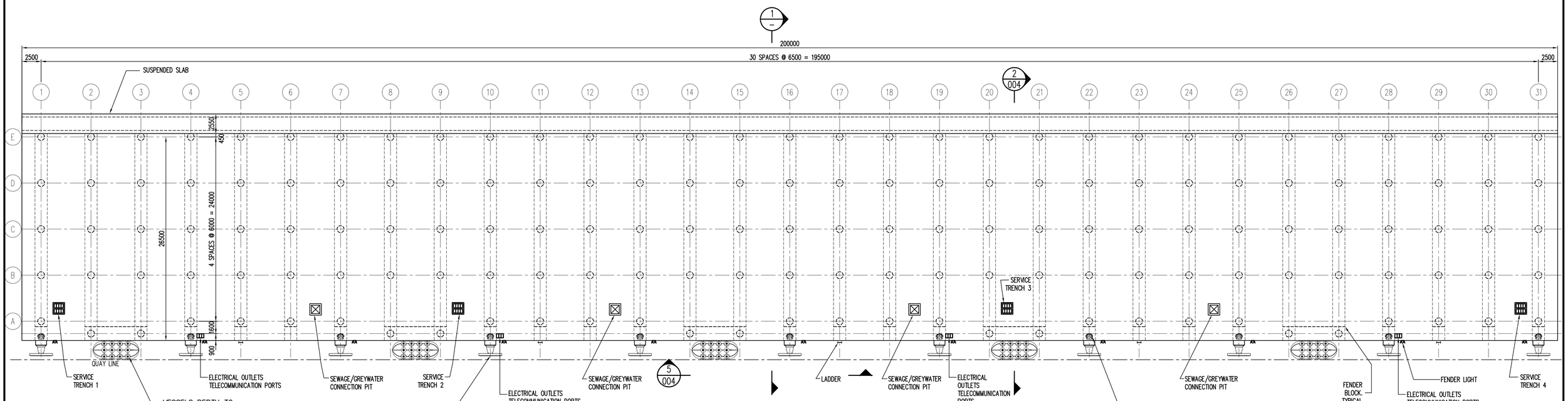

WHARF DECK PLAN
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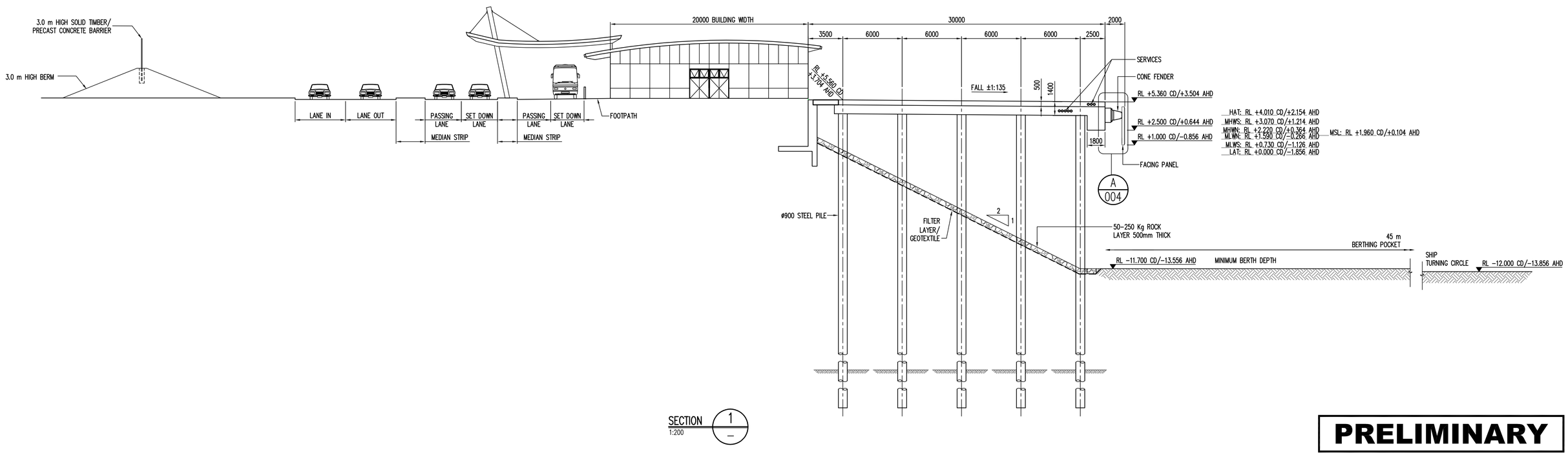

SECTION 1
1:200

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Rev'n	Description	Date
6	ADDITIONAL SEWERAGE CONNECTION PITS ADDED	21.08.07
5	REVISED TO SUIT CLIENT'S COMMENTS	08.08.07
4	WHARF GEOMETRY REVISED	07.08.07
3	REVISED CONCEPT DESIGN	23.01.07
2	REVISED CONCEPT DESIGN	16.01.07
1	CONCEPT DESIGN	18.10.06

Designed	AF
Drawn	FGV
Checked	TK
Approved	CAG
Date	23.01.07
Scale	AS SHOWN

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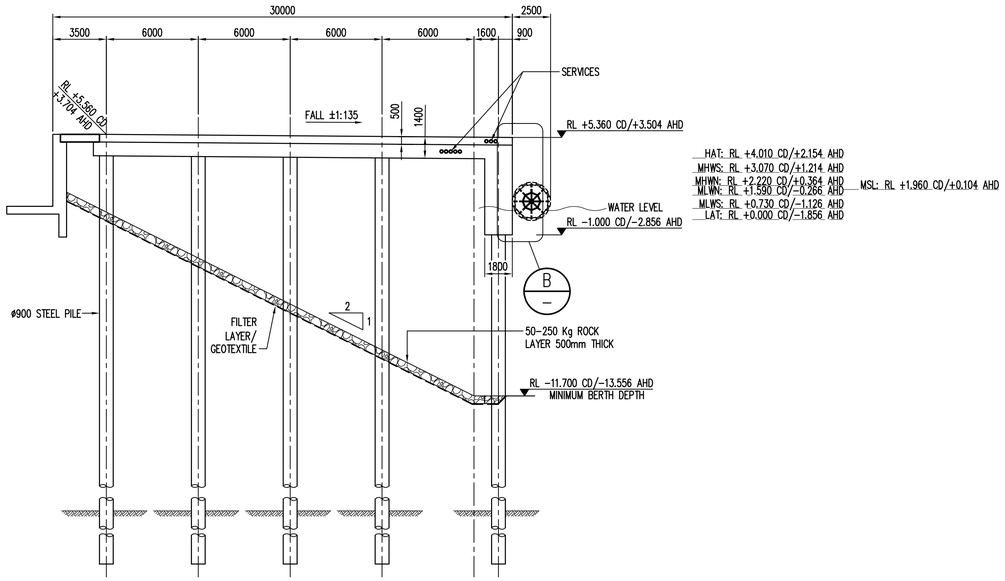
Internet: www.cgrgroup.com

Client: CITY PACIFIC LIMITED

Project: TOWNSVILLE OCEAN TERMINAL

Discipline/Title: WHARF DECK DETAIL & SECTION

Sheet	Drawing number	Revision
A1	HWH–001–003	6



SECTION 2 / 003
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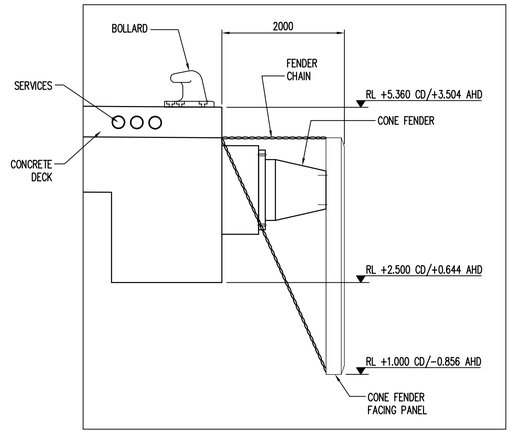
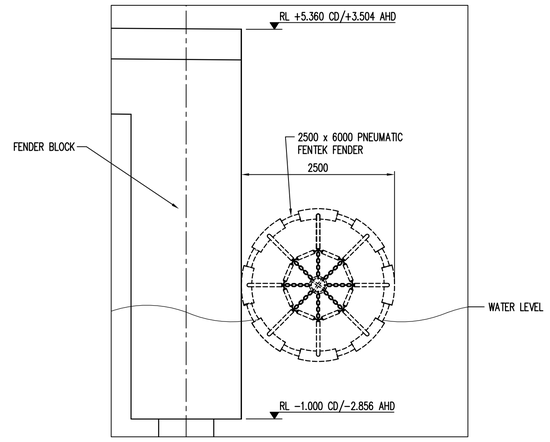
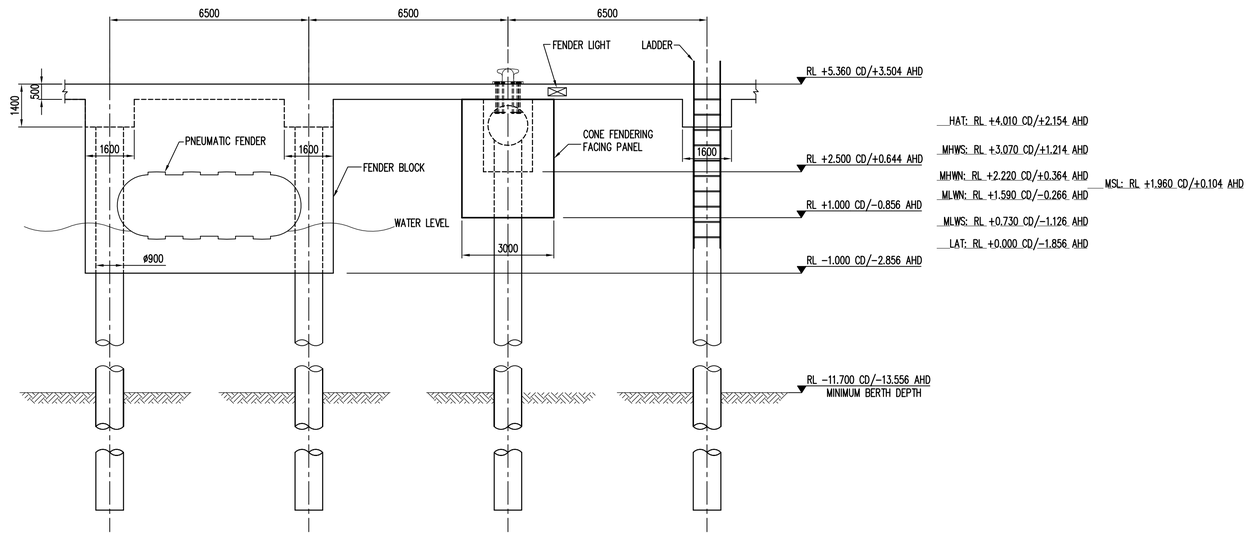


DETAIL A / 003
1:50



DETAIL B / —
1:50



ELEVATION 5 / 003
1:100

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Rev'n	Description	Date
5	REVISED TO SUIT CLIENT'S COMMENTS	08.08.07
4	WHARF GEOMETRY REVISED	07.08.07
3	REVISED CONCEPT DESIGN	22.01.07
2	REVISED CONCEPT DESIGN	16.01.07
1	CONCEPT DESIGN	18.10.06

Designed	AF
Drawn	FGV
Checked	TK
Approved	CAG
Date	22.01.07
Scale	AS SHOWN

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Client: CITY PACIFIC LIMITED

Project: TOWNSVILLE OCEAN TERMINAL

Discipline/Title: WHARF DECK SECTIONS

Sheet	Drawing number	Revision
A1	HWH−001−004	5

664
EP2106

639
EP2106

795
CP846293

CONVENTION
CENTRE

100
RP840355

ENTERTAINMENT DRIVE

MOORING
BOLLARD

122m

TERMINAL

WHARF

30m

CRUISE SHIP

BRESTING
DOLPHIN

MOORING
BOLLARD

EXISTING WESTERN PORT
BREAK WATER

39m

55.245m

215.496m

38.64m

ROSS CREEK

CENTRE LINE OF
"PLATYPUS CHANNEL"

DREDGED BERTH BASIN

A
SK#4

260m

300m

SWING BASIN

448
SP126597

449
SP126597

450
SP126597

1
49
110
111
157
158

NOTE:
SUBJECT TO EIS ASSESSMENT
AND FINAL DESIGN

TOWNSVILLE
OCEAN TERMINAL

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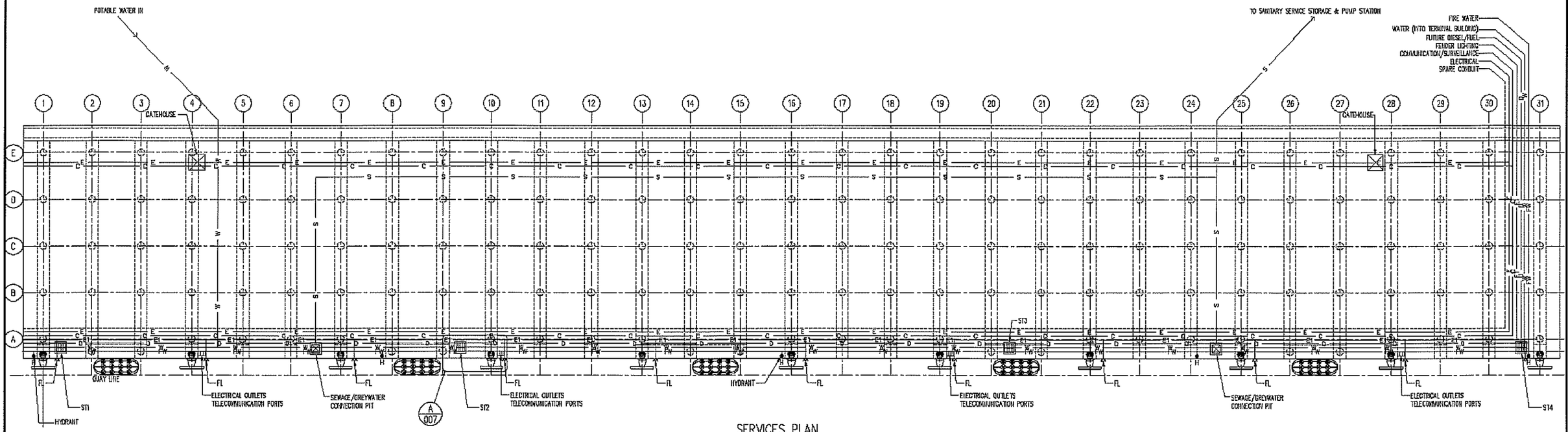
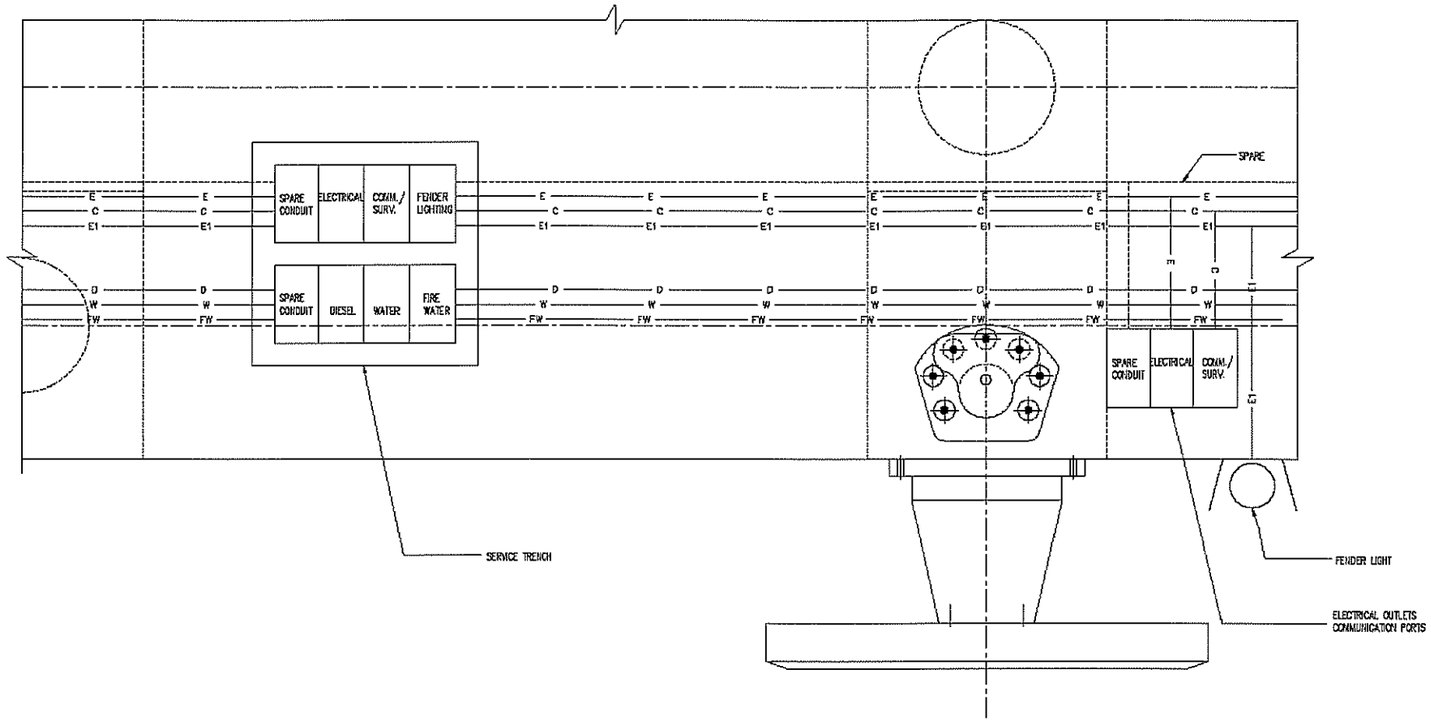
TOWNSVILLE OCEAN TERMINAL - MASTER PLAN
PLAN VIEW

NOV 2005

DRAWING NUMBER	REVISION
QL00017-SK-02	C



SERVICES PLAN



DETAIL A 007 1:20

PRELIMINARY

GENERAL NOTES

W	POTABLE WATER	S	SULLAGE FROM SHIP
E	ELECTRICITY		
C	COMMUNICATIONS		
D	FUTURE DIESEL/FUEL		
E1	FENDER LIGHTS ELECTRICITY		
FW	FIRE WATER		
LT	LIGHT TOWER		
FL	FENDER LIGHT		
ST	SERVICE TRENCH		

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Rev'n	Description	Date
2	REVISED CONCEPT DESIGN	23.01.07
1	PRELIMINARY ISSUE	16.01.07

Designed: TK	Approved: CAG
Drawn: LJA	Date: 23.01.07
Checked: TK	Scale: 1:250 U.N.O.

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Client: CITY PACIFIC LIMITED

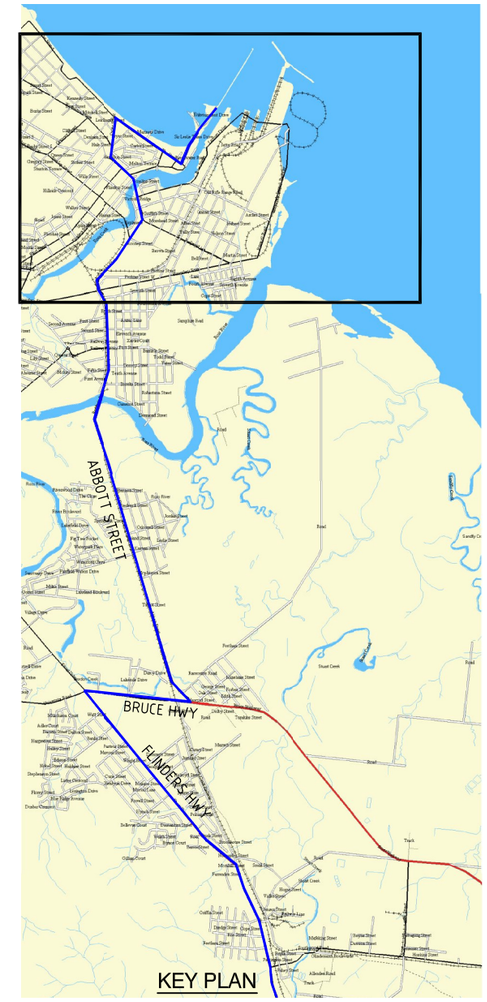
Project: TOWNSVILLE OCEAN TERMINAL

Discipline/Title: SERVICES PLAN FOR WHARF

Sheet	Drawing number	Revision
A1	HWH-001-007	2

APPENDIX D:

HAUL ROUTE MAPS



01	ORIGINAL ISSUE	19.07.2007
Issue	Description	Date

100mm on Original

Scale (Plan): NOT TO SCALE

Scale (Sections):

Surveyor: BRAZIER MOTTI

Architect: BUCHAN GROUP

Filename: K204-QL00704-01-BREAKWATER LAYOUT.DWG

Client: Townsville Ocean Terminal

Status: **PRELIMINARY** NOT TO BE USED FOR CONSTRUCTION

Approved

R.E.P.Q No :

Scales: NTS

Current Issue Signatures

Original Size: A1

Author P.S.M

Designer R.M

Height Datum: AHD

Reviewer J.S

Grid: GRID

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Project: TOWNSVILLE OCEAN TERMINAL PROJECT

Title: CBD ROAD HAUL ROUTE

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Drawing No.	Project No.	Issue
K401	QL00704	01

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01	ORIGINAL ISSUE	23.07.2007
Issue	Description	Date

100mm on Original

Scale (Plan): NOT TO SCALE

Scale (Sections):

Surveyor: BRAZIER MOTTI

Architect: BUCHAN GROUP

Filename: K204-QL00704-01-BREAKWATER LAYOUT.DWG

Client: Townsville Ocean Terminal

Status: PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

Approved

R.E.P.Q No :

Scales	NTS	Current Issue Signatures	
		Author P.S.M	
Original Size	A1	Designer R.M	
Height Datum	AHD	Reviewer J.S	
Grid	GRID	© Copyright reserved	

Project: TOWNSVILLE OCEAN TERMINAL PROJECT

Title: BARGE POINT HAUL ROUTE MARATHON QUARRY

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Drawing No.	Project No.	Issue
K405	— QL00704	— 01

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KEY PLAN

01	ORIGINAL ISSUE	23.07.2007
Issue	Description	Date

100mm on Original

Scale (Plan): NOT TO SCALE

Scale (Sections):

Surveyor: BRAZIER MOTTI

Architect: BUCHAN GROUP

Filename: K204-QL00704-01-BREAKWATER LAYOUT.DWG

Client: Townsville Ocean Terminal

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		Author P.S.M	
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Drawing No.	Project No.	Issue
K412 —	QL00704 —	01

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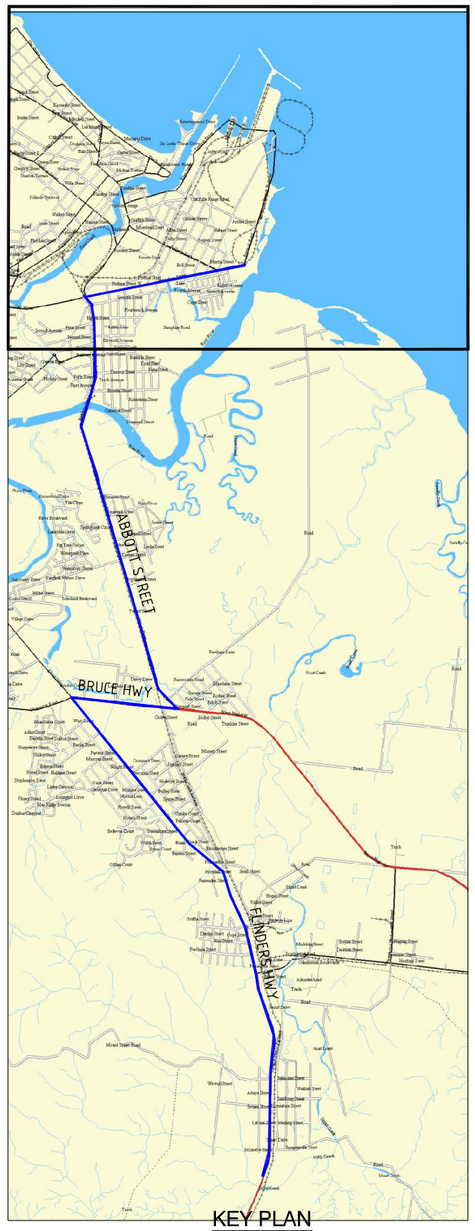

KEY PLAN

			Scale (Plan) NOT TO SCALE	Surveyor BRAZIER MOTTI	Client Townsville Ocean Terminal	Status **PRELIMINARY** NOT TO BE USED FOR CONSTRUCTION	Project TOWNSVILLE OCEAN TERMINAL PROJECT
			Scale (Sections)	Architect BUCHAN GROUP		Approved / R.E.P.Q No :	
				Filename: K204-QL00704-01-BREAKWATER LAYOUT.DWG		Scales NTS; Original Size A1; Height Datum AHD; Grid GRID	Current Issue Signatures: Author P.S.M; Designer R.M; Reviewer J.S
01	ORIGINAL ISSUE	23.07.2007				© Copyright reserved	Title BARGE POINT HAUL ROUTE ROSENEATH QUARRY
Issue	Description	Date					

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Drawing No.	Project No.	Issue
K414	— QL00704	— 01

100mm on Original

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01	ORIGINAL ISSUE	23.07.2007
Issue	Description	Date

100mm on Original

Scale (Plan): NOT TO SCALE

Scale (Sections):

Surveyor: BRAZIER MOTTI

Architect: BUCHAN GROUP

Filename: K204-QL00704-01-BREAKWATER LAYOUT.DWG

Client: Townsville Ocean Terminal

Status: **PRELIMINARY**
NOT TO BE USED FOR CONSTRUCTION

Approved

R.E.P.Q No :

Scales	NTS	Current Issue Signatures	
		Author P.S.M	
Original Size	A1	Designer R.M	
Height Datum	AHD	Reviewer J.S	
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Project: TOWNSVILLE OCEAN TERMINAL PROJECT

Title: TEMPORARY BRIDGE HAUL ROUTE MARATHON QUARRY

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Drawing No.	Project No.	Issue
K417	— QL00704	— 01

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Issue	Description	Date

Scale (Plan): NOT TO SCALE

Scale (Sections):

Surveyor: BRAZIER MOTTI

Architect: BUCHAN GROUP

Filename: K204-QL00704-01-BREAKWATER LAYOUT.DWG

Client: Townsville Ocean Terminal

Status: PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

Approved — R.E.P.Q No :

Scales	NTS	Current Issue Signatures	
		Author P.S.M	
Original Size	A1	Designer R.M	
Height Datum	AHD	Reviewer J.S	
Grid	GRID	© Copyright reserved	

Project: TOWNSVILLE OCEAN TERMINAL PROJECT

Title: TEMPORARY BRIDGE HAUL ROUTE PINNACLE QUARRY

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HYDER CONSULTING
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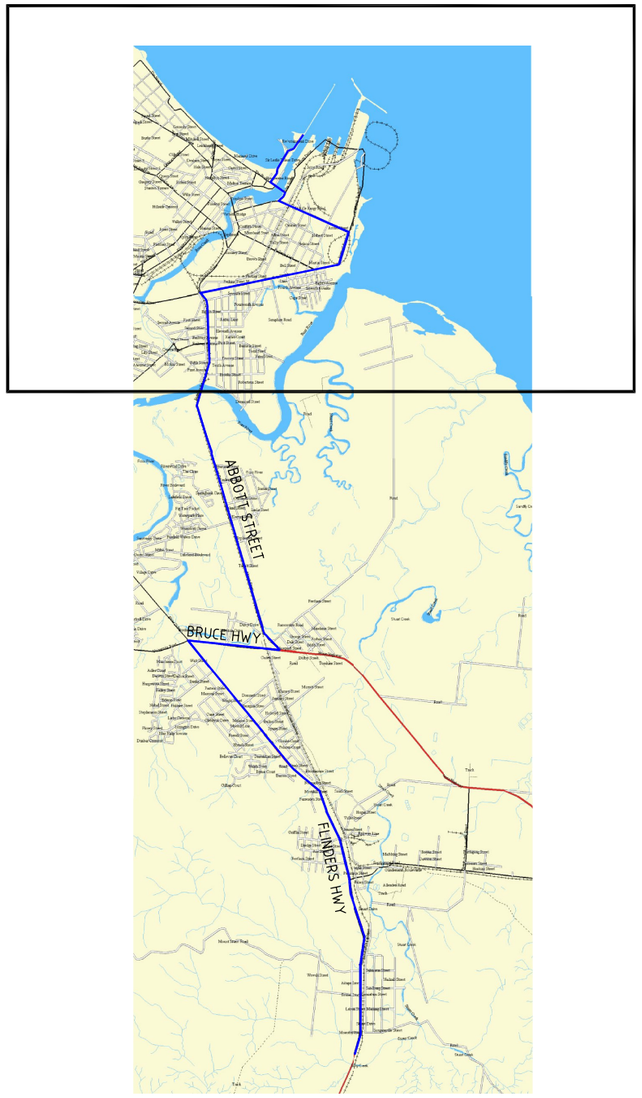
Web: www.hyderconsulting.com

Drawing No. K424 — Project No. QL00704 — Issue 01



KEY PLAN

			Scale (Plan): NOT TO SCALE	Surveyor: BRAZIER MOTTI	Client: Townsville Ocean Terminal	Status: PRELIMINARY — NOT TO BE USED FOR CONSTRUCTION	Project: TOWNSVILLE OCEAN TERMINAL PROJECT
01	ORIGINAL ISSUE	23.07.2007	Scale (Sections):	Architect: BUCHAN GROUP		Approved / R.E.P.Q No.:	
Issue	Description	Date		Filename: K204-QL00704-01-BREAKWATER LAYOUT.DWG		Scales: NTS; Original Size: A1; Height Datum: AHD; Grid: GRID	Current Issue Signatures: Author P.S.M; Designer R.M; Reviewer J.S
100mm on Original						© Copyright reserved	Title: TEMPORARY BRIDGE HAUL ROUTE ROSENEATH QUARRY

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