

# CONSTRUCTION METHODOLOGY

## Appendix B



### PROJECT

**Element 1: New detached breakwater, existing breakwater upgrade to form new jetty access-way, northern car park upgrade, boat ramp upgrade and new toilet facilities in southern car park**

**Site Location: Clump Point – Mission Beach, QLD 4852**

**Project Commencement**

**Date: Dec 2018**

**Project Duration: 360 days**

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B	31 Dec 18	Project	Andrew Schweitzer	Guy Schweitzer
C	20 Feb 19	Included Basalt selection method	Andrew Schweitzer	Guy Schweitzer

## DISTRIBUTION LIST

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## **1 NEW DETACHED BREAKWATER (INCLUDING TEMPORARY ACCESS AND CULVERT)**

Given the constraints on clearing until after February MGN Civil will commence works on the detached breakwater. The first task is constructing a safe access to the new detached breakwater.

### **1.1 Temporary Access and Culvert**

To gain access to the new detached breakwater MGN Civil will initially remove sufficient armour from the Jetty Access Way (MC02) and replace with Class VIII Core Rock to provide a safe running surface. MGN Civil only propose to undertake the minimum works necessary at this early stage on the existing breakwater to provide access for our machinery and trucks. The running surface on the existing breakwater will be constructed above HAT to provide all tide access and will be a minimum of 5m/6m wide.

Once MGN Civil have created a safe and stable working area along the entire length of the existing breakwater, MGN Civil will commence construction of the culvert structure. This structure is required to provide a minimum flow cross sectional area of 1m<sup>2</sup> between RL-1.3m AHD and -RL0.67m AHD. MGN will construct the temporary causeway using a single row of 1,800 (w) x 600 (h) box culverts. These box culverts provide a cross sectional area of 1.08m<sup>2</sup>. The culverts will be placed on a bed of Class VIII core rock. The use of Class VIII core rock has the benefit of reuse as opposed to select quarry run. Further, the Class VIII rock is a cleaner product than select quarry product, thereby reducing the risk of turbidity. Depending on reach MGN Civil anticipate that these culverts will be lifted into position using a 100T mobile crane. The culverts will be backfilled and covered with Class VIII core rock to MHWS.

Prior to the commencement of the temporary causeway construction MGN Civil will provide to the Client a drawing depicting the coordinates of the extent of the causeway and proposed construction materials. Works will not commence until this drawing has been approved by the Client.

### **1.2 Basal Geotextile Placement**

The detached breakwater shall have a basal geotextile (600R or equivalent) layer placed under the entire structure in accordance with Drawing 724663. As the geotextile is being placed underwater the minimum lap for adjacent panels is 1.0m.

MGN Civil will use the 600R (subject to approval) equivalent product Terratex TT449. This product comes in a 6m wide, 100m long roll.

To maximise placement efficiency and minimise exposure risk MGN will place the basal geotextile in 12m wide strips transverse to the longitudinal direction of the detached

breakwater. Prior to placement MGN will sew together two 6m strips to create the 12m wide panel. The length of each panel will be commensurate with the width of the detached breakwater allowing for minor overfilling at each toe. MGN has significant experience (Nelsons Plains, Brisbane International Cruise Terminal, Berths 11, 12 and 13A – Port of Brisbane) in sewing large geotextile panels and have found it practical on projects such as Clump Point.

To place the basal geotextile MGN will use specialist industrial divers. The divers will be assisted by MGN personnel on land and our 50T excavator where required. Ideally the geotextile panels will be installed on the incoming to low tide of the day and in calm sea conditions.

The process to install each geotextile panel will generally be as follows:

- Pre-sew 12m wide geotextile panels on land;
- Pre-fold the 12m wide geotextile panel into a “pillow” shape for ease of transport and unfolding at the head of the works;
- Unfold the “pillow” at the leading edge of the works and temporarily anchor.
- With the assistance of divers (and support vessels) in the water each panel will be slowly pulled out into the water and held into position on the water’s surface at each of the corners. Once in position the edge closest to the leading edge will be slowly lowered to the sea bed by the divers carefully maintaining tension of the panel so as to maintain its integrity. At this stage the excavator may assist in lowering the edge nearest by slowly placing Class VIII rock onto the panel to act as an anchor.
- Once the edge closest to the leading edge is in position the divers will confirm that the minimum 1.0m lap has been achieved. Once the lap has been confirmed the excavator will slowly place rock out over the geotextile to hold it in position on the sea bed.
- Once on the seabed, the divers will confirm it has been satisfactorily placed and mark the corners with a vertical pipe (or similar) for ease of reference.

Please refer to Figures 1, 2 and 3 below of geotextile being placed at our Nelsons Plains project.



**Figure 1 - 600R Geotextile being pre sewn into 36m x 20m panels (Nelsons Plains)**



**Figure 2 - Divers assisting in placing 600R geotextile (Nelsons Plains)**



*Figure 3 - Divers and excavator placing 600R geotextile (Nelsons Plains)*

## 1.3 Core and Armour Rock Production

### 1.3.1 Proposed Quarry

For this project, MGN will source all core, filter and armour rock from the Bonassi Quarry located at Lauder Road, Bilyana. MGN has been operating in the Bonassi Quarry since May 2018 undertaking both the Flying Fish Stage 1 and 2 projects for the Cassowary Coast Regional Council. The rock from the Bonassi Quarry is a rhyodacite tuff/porphyry acid igneous rock. MGN Civil have during the course of the Flying Fish Point project undertaken extensive testing of this rock and can confirm it meets all the requirements of the Clump Point project.

### 1.3.2 Quarry Management

MGN currently is managing the armour rock supply in the Bonassi Quarry for our Flying Fish Point projects. This involves providing expertise, machinery and labour to coordinate blasts and patterns, sorting of rock into classes and loading/carting to site. For this MGN provides all plant and equipment. Prior to commencing on site MGN will pre-sort up to 10,000t in the quarry to ensure adequate rock is available once cartage commences.

### 1.3.3 Ongoing Sorting and Stockpiling

During the project MGN will sort through the existing stockpiles and coordinate new blasts as they are required. The general aim will be to always have a buffer stockpile in the quarry



to allow us to continue to cart rock to site without stoppages whilst new blasts are undertaken.

Typically, there will be up to two blasts per month in the quarry, one in each area/pit. As a minimum the trigger for a new blast will be when the stockpiled quantity within the quarry is approximately 5,000t to 10,000t. This equates to about 10 to 20 days cartage. This time frame will allow MGN up to 5 days to sort the armour and core rock from the new blast and allow the quarry manager time to remove the out of specification rock from the pit.

#### 1.3.4 Rock Classes

MGN will sort all rock (fresh and existing stockpiles) within the quarry into the required classes (ie. I to VIII) as summarised below.

Class Designation	Description	Material Specification (EN 13383-1)	Target M <sub>50</sub> Mass
Class I	Armourstone 6.0–10.0 t	HMA <sub>5000/10000</sub>	8.0 t
Class II	Armourstone 3.0–6.0 t	HMA <sub>3000/6000</sub>	4.5 t
Class III	Armourstone 2.0–4.5 t	HMA <sub>2000/4500</sub> (non-standard)	3.5 t
Class IV	Armourstone 1.0–3.0 t	HMA <sub>1000/3000</sub>	2.0 t
Class V	Armourstone 0.3–1.0 t	HMA <sub>300/1000</sub>	600 kg
Class VI	Underlayer I	LMA <sub>60-300</sub>	200 kg
Class VII	Underlayer II	LMA <sub>40-200</sub>	80 kg
Class VIII	Core Material & Underlayer III	LMA <sub>5/40</sub> (Notionally 100–350 mm)	10–20 kg

#### 1.3.5 Mass Measurement

Each rock will be individually MGN weighed with our wheeled loader scales during the stockpiling operation.

Similarly, the wheeled loader when blending the rock into Classes during loading will use its scales to ensure the MGN side tipper is not overloaded. Once loaded, the side tipper will record its official mass by passing over the quarries certified weigh bridge. Once the side tipper has passed over the MGN weighbridge a docket will be produced which will form the basis of measurement/payment. The docket will include the following information:

- Project name;
- Loading date and time;
- Delivery location;
- Truck registration;
- Quarry owner and name;
- Unique docket identifier;
- Mass of rock in the load.

All information will then be captured daily in an excel spreadsheet and provided to the Client as required.

#### **1.3.6 Inspection and Testing**

MGN will coordinate all rock testing at the frequencies outlined in the Specification. MGN will use Construction Sciences for this work. Construction Sciences are currently undertaking all testing for our Flying Fish Point project.

#### **1.4 Rock Cartage**

MGN will cart all rock to site using at least five of its Side Tippers. These trucks each have a capacity of 22t per load and each is bizalloy lined to specifically handle armour rock up to 12/13t in size. Please refer photos below of our Side Tippers carting rock.

MGN Civil anticipate that rock will be both delivered directly to the working face and to the stockpile on site. Given the limited space at the Clump Point site, stockpiling will be limited to one or two days' supply.



**Figure 4 - Side Tipper with 5t to 8t Armour Rock**



**Figure 5 - Side Tipper Carting Rock to Iluka Breakwater**

MGN Civil has inspected all available routes into and out of the project site from the Bonassi Quarry. MGN Civil will use a single one-way loop route to distribute the Side Tippers. Side Tippers will arrive to the project site by heading north on Bruce Hwy turning onto Tully

Mission Beach Road through to the project area. The return journey to the Bonassi Quarry will be via El Arish Mission Beach Road and south on the Bruce Highway. This single loop formation will reduce each route's vehicle movements per day by 50% and reduce wear on road assets.

Rock delivery to the project site will begin at 7am and the last load of each day would occur prior to 5pm.

### 1.5 Rock Rehandling

At the Clump Point site MGN will maintain a temporary rock stockpile (as required). Rock from this stockpile will be rehandled using a 50T excavator and carted onto the wall using a 35T articulated dump truck. Please refer photos below.



*Figure 6 - Filter Rock Stockpile at Flying Fish Point*



*Figure 7 – 35T Articulated Dump Truck Unloading Armour Rock at Brunswick Heads Breakwater*

## 1.6 Rock Placement

Given the width of the detached breakwater is over 40m wide and the base is between RL-4.0 and RL-5.0 a careful placement strategy is required. In addition to the dimensional constraints, the following Specification placement restrictions include:

- Geotextile cannot be left uncovered for over 48 hours;
- No more than 25m of core at 4m in depth can be left unarmoured.

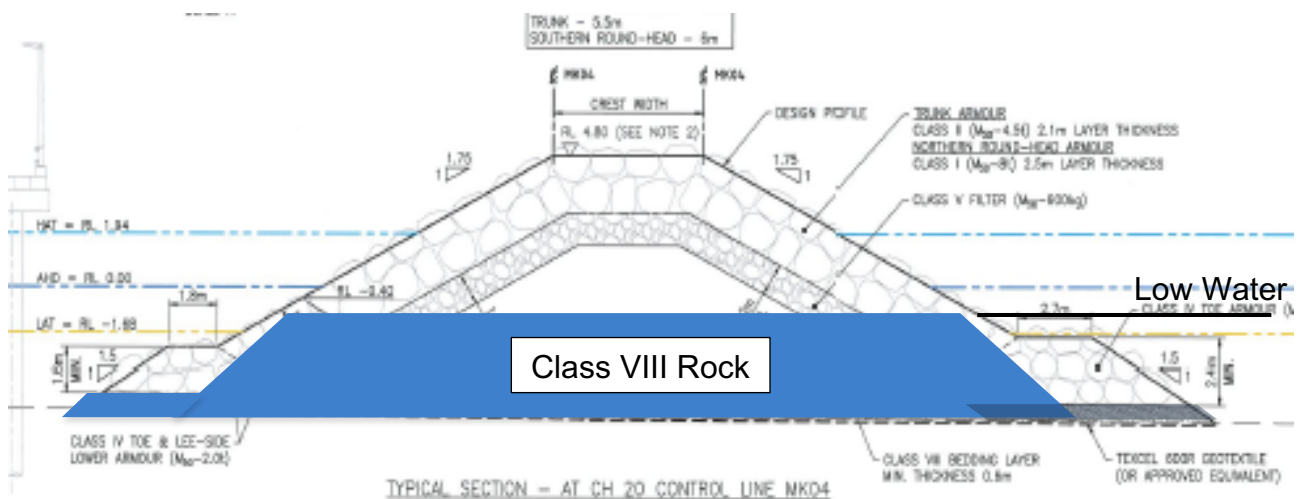
To achieve the required construction tolerances and placement constraints MGN will use the following placement sequence:

- Place 12.0m wide geotextile panel as noted in Section 1.2;
- Construct leading edge of breakwater initially at low water using Class VIII core rock;
- The Class VIII core rock will be initially overfilled (Stage 1) at the low water level to facilitate reach to the outer extremities of the breakwater (refer Figure 8). By placing rock to low water at this stage MGN Civil maximise our ability to reach the extremities of the breakwater;
- Place Class VIII core rock over the entire 12.0m wide geotextile panel to ensure coverage is achieved within 48 hours of geotextile placement. Placement at this stage will exclude a 2m leading edge to allow the lapping of the next geotextile panel;
- Once the Class VIII rock is spread sufficiently to reach the extremities of the breakwater the toe rock will be placed (Stage 2). The placement of the toe rock will require a staged approach (Refer Figure 9) to ensure the design profile is achieved. This will include the following:

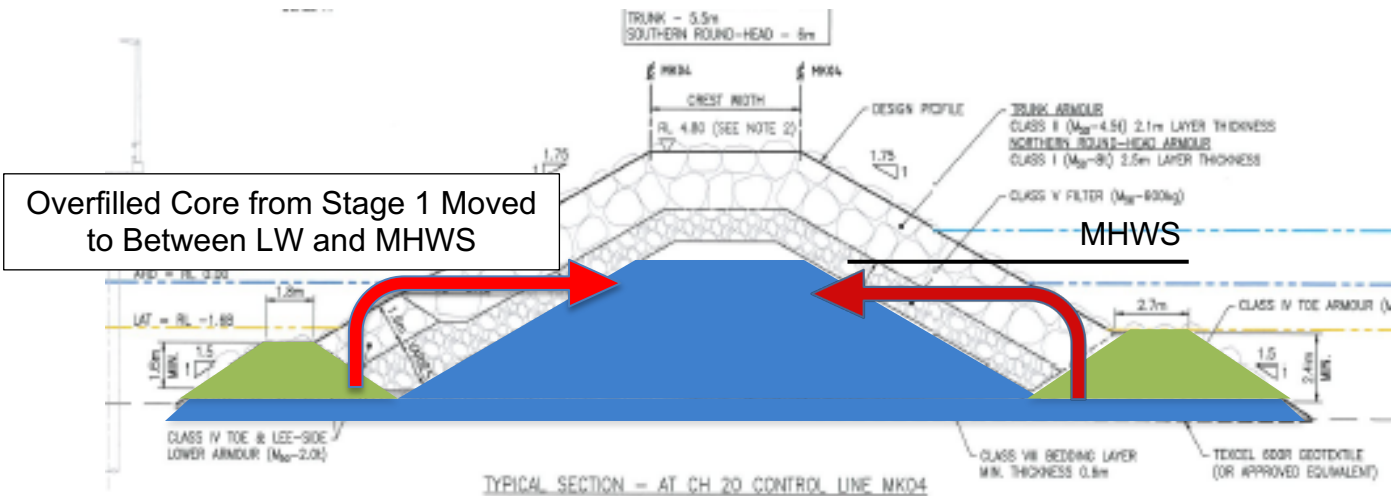
- Place outer edge of toe rock;
- Remove overfilled core rock on the inner side of the toe rock and place above low water behind the excavator;
- Place inner edge of toe rock.
- Once the toe rock is in place and the overfilled core is moved to its final position (no higher than MHWS at this stage), placement of the filter and armour layers will commence (Stage 3) – refer Figure 10;
- Once this cycle is completed for each 12.0m geotextile panel, the process is repeated until the end of the breakwater is reached. At this point all rock will be placed to MHWS with the crest still accessible on the Class VIII core rock layer;
- Once the end of the breakwater is reached, the placement of the crest filter and armour layers commences (Stage 4). This rock will be progressively placed commencing from the end of the detached breakwater and working back towards the existing breakwater - *note the crest rock will be placed in conjunction with the solar lights to ensure a safe access for our electrical subcontractor is maintained.*
- Final armour rock will be carefully placed around the footings of the solar lights.
- At the completion of the detached breakwater and following Client approval the temporary causeway will be removed. The Class VIII rock will be reused in the carpark area where required. Redundant culverts will be disposed off site.

All rock will be placed using the excavator. No rock will be tipped into position

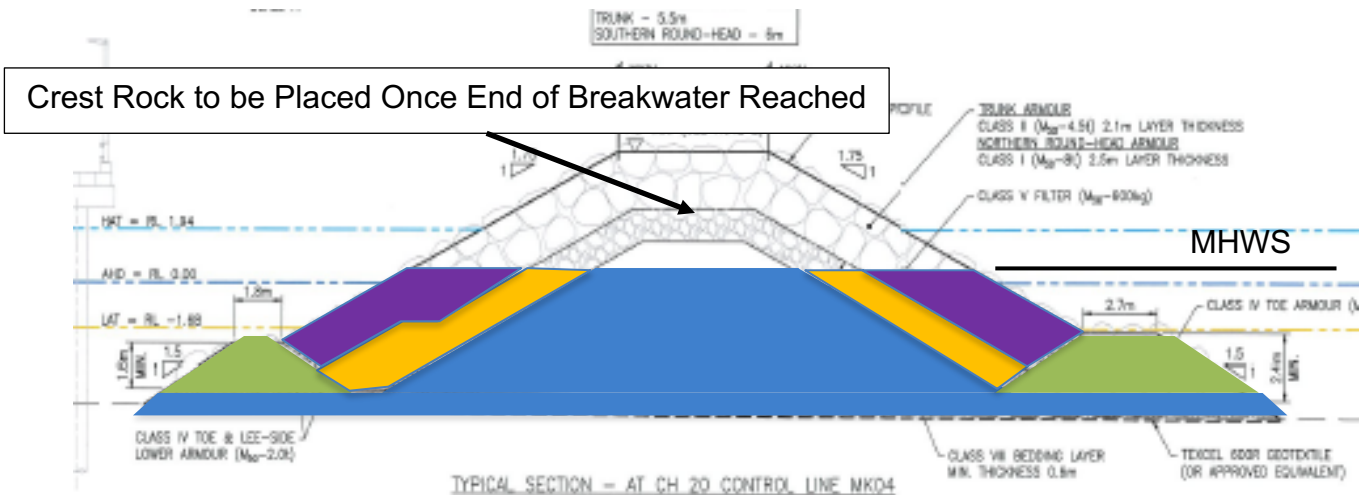
During rock placement MGN Civil will use our on-board GPS to provide progressive survey of the placed rock layers. This will be confirmed monthly via our independent Surveyor.



**Figure 8 - Stage 1 Detached Breakwater Construction**



**Figure 9 - Stage 2 Detached Breakwater Construction**



**Figure 10 - Stage 3 Detached Breakwater Construction**

## 2 UPGRADING OF THE EXISTING BREAKWATER TO FORM A JETTY ACCESS-WAY

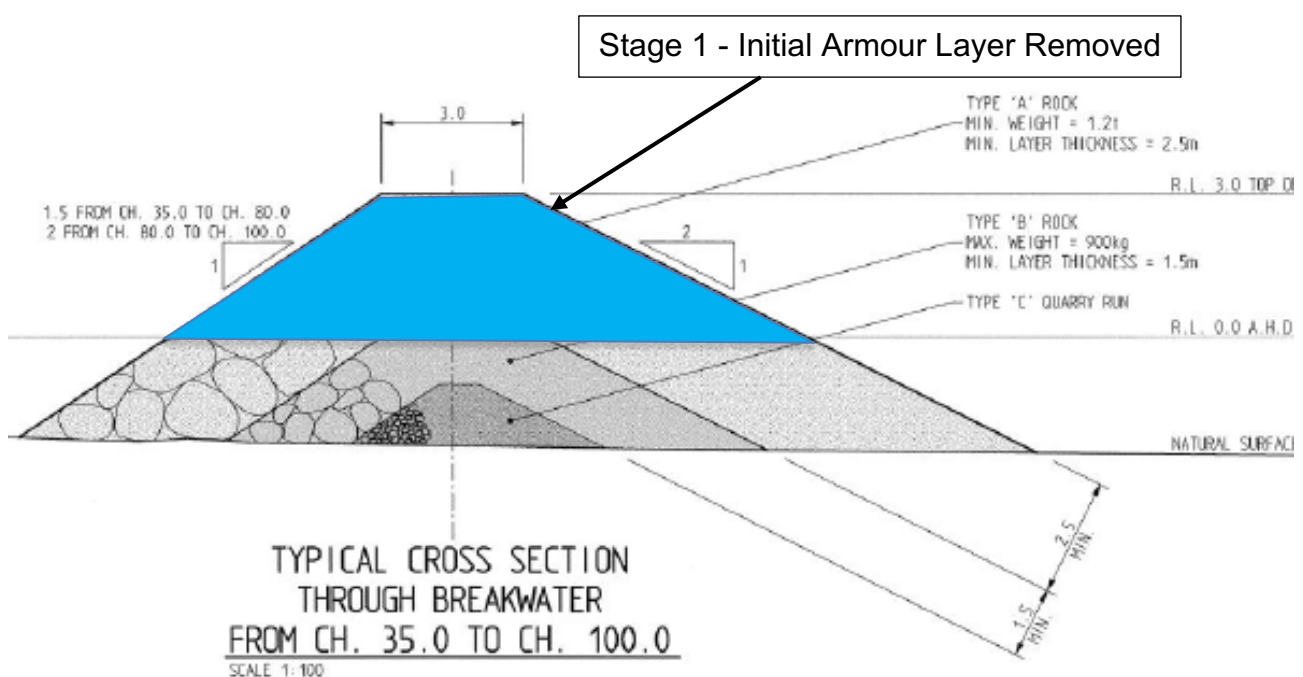
Given the limited stockpile capacity of the Northern Carpark, upgrade of the existing breakwater will not likely commence until the carpark has been partly or fully widened (this is described in Section 3). Widening of the carpark not only provides additional stockpile capacity but also the potential to cart recycled rock directly to one of the carpark revetments (ie. Type A, B, C, F, G and H revetments). It is acknowledged that there is in theory more rock to be removed than replaced. As noted in the Addendums, MGN will work with the Client to ensure that the maximum reuse of rock possible.

### 2.1 Removal of Class R-I and R-II Rock

To limit the exposure to the existing breakwater structure, it will be dismantled and rebuilt progressively. Where possible removed armour will be carted directly to one of the car park revetments for incorporation into those works. Where this is not possible the removed rock will be temporarily stockpiled. MGN Civil anticipate that the removal and reconstruction works will commence at the head of the breakwater and work back towards the carpark.

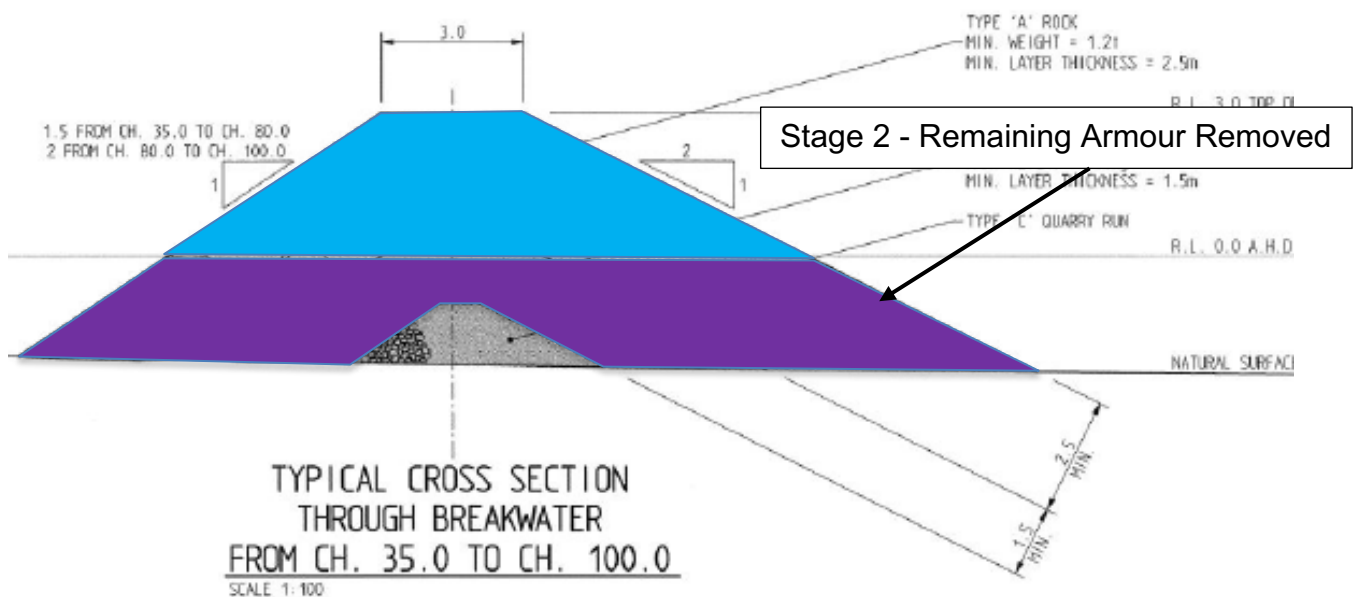
The rock will be removed using our 50T short arm excavator and carted to stockpile/revetment using a 35T articulated dump truck. The dismantling will generally follow the following sequence:

- Stage 1: Remove armour rock down to at or near RL0.0 AHD. By initially cutting the breakwater down to this level, the 50T excavator will be able to reach the toe. Refer Figure 11.
- Stage 2: Remove the armour from both outer edges of the breakwater. Refer Figure 12. A maximum of 25m of existing breakwater will be stripped at any one time.



**Figure 11 - Stage 1 Removal of Armour Existing Breakwater**





**Figure 12 - Stage 2 Removal of Armour Existing Breakwater**

## 2.2 Placement of Class VIII Core Rock

Once each 25m section of armour has been removed from the breakwater, this void will be replaced with Class VIII core rock. MGN Civil anticipate that due to the ease of access to this part of the breakwater that rock will be delivered directly from the quarry to the working face in Side Tippers. Alternatively, MGN Civil will aim to coordinate our activities so that some of this rock may be won from the temporary causeway to minimise wastage and reduce overall project costs. The core rock will be placed to the (underside of Class VI or VII underlayer) and temporarily capped at MHS (or such level that does not prohibit excavator reach to the toe).

## 2.3 Placement of Geotextile Layers

The existing breakwater shall have a geotextile (600R, 900R, 1,200R or equivalent) layer placed beneath the underlayer (Class VI or VII rock) in accordance with Drawings 724665 and 724666. As the geotextile is being placed primarily underwater the minimum lap for adjacent panels is 1.0m.

At time of tender MGN Civil proposes to use the 600R, 900R and 1,200R (subject to approval) equivalent products Terratex TT449, TT464 and TT1,200. These products come in a 6m wide rolls.

To maximise placement efficiency and minimise exposure risk MGN will place the geotextile in 12m to 18m wide strips laid down the revetment batter. Prior to placement MGN propose to sew together two or three 6m strips to create the 12m/18m wide panel. The length of each panel will be commensurate with the length of batter allowing for the toe works. MGN has significant experience (Nelsons Plains, Brisbane International Cruise Terminal, Berths 11, 12 and 13A – Port of Brisbane) in sewing large geotextile panels and have found it practical

on projects such as Clump Point. The key is to size the panel so as to not make it unwieldy to handle during placement.

To place the geotextile MGN will use specialist industrial divers. The divers will be assisted by MGN personnel on land and our 50T excavator where required. Ideally the geotextile panels will be installed on the incoming to low tide of the day and in calm sea conditions.

The process to install each geotextile panel will generally be as follows:

- Pre-sew 12m/18m wide geotextile panels on land;
- Pre-fold the 12m/18m wide geotextile panel into a “pillow” shape for ease of transport and unfolding at the head of the works;
- Unfold the “pillow” at the leading edge of the works and temporarily anchor.
- With the assistance of divers (and support vessels) in the water each panel will be slowly pulled out into the water and held into position on the water’s surface at each of the corners. Once in position, the edge closest to the leading edge will be slowly lowered to the sea bed by the divers carefully maintaining tension of the panel so as to maintain its integrity. At this stage the excavator may assist in lowering the edge nearest to him by slowly placing the underlayer rock onto the panel to act as an anchor.
- Once the edge closest to the leading edge is in position the divers will confirm that the minimum 1.0m lap has been achieved. Once the lap has been confirmed the excavator will slowly place rock out over the geotextile to hold it in position on the sea bed.
- Once on the seabed, the divers will confirm it has been satisfactorily placed and that the toe has been covered.

Please refer to Figures 1, 2 and 3 of geotextile being placed at our Nelsons Plains project.

## 2.4 Rock Placement

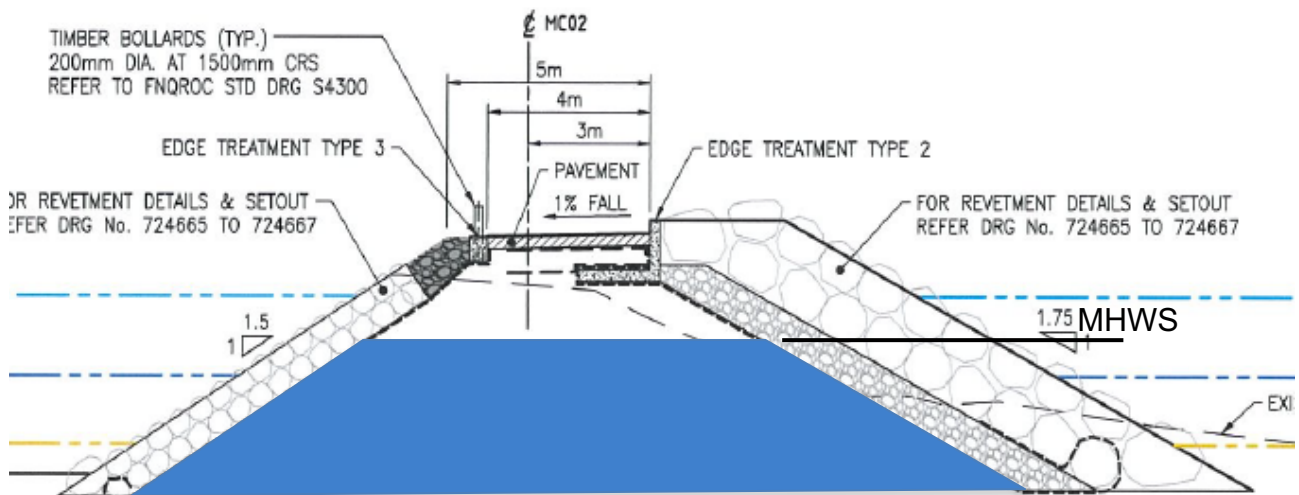
Given the width of the upgraded existing breakwater is at least 25m wide from toe to toe a careful placement strategy is required to ensure excavator reach is maintained. In addition to the dimensional constraints, the following Specification placement restrictions include:

- Geotextile cannot be left uncovered for over 48 hours;
- No more than 25m of core at 4m in depth can be left unarmoured.

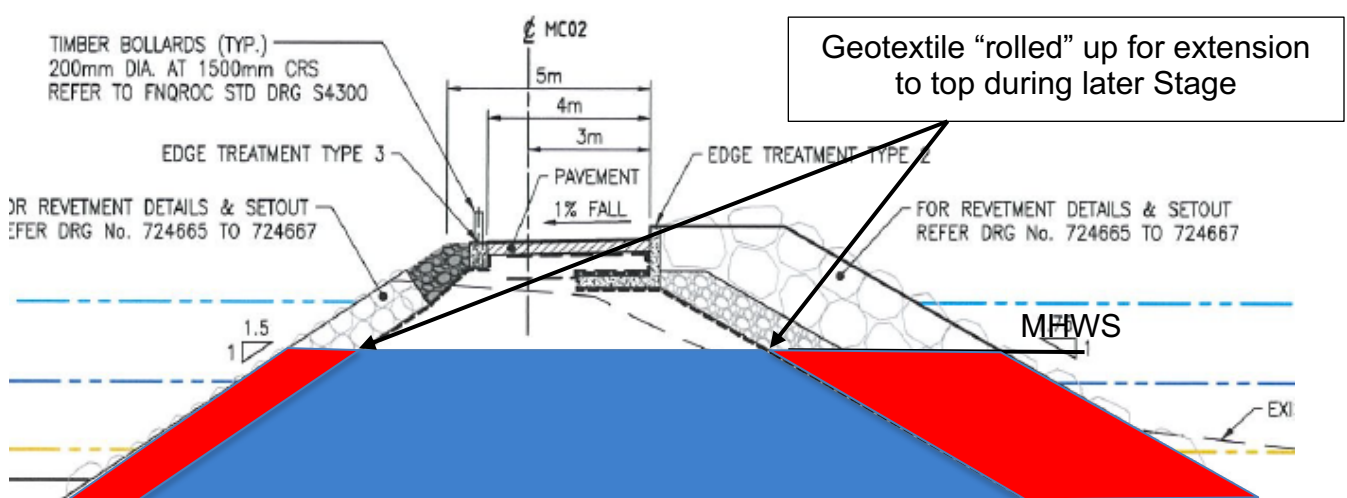
To achieve the required construction tolerances and placement constraints MGN propose the following placement sequence:

- Place Core Rock to approximately MHWS (Stage 1) – refer Figure 13;
- Place 12.0m/18.0m wide geotextile panel as noted in Section 2.3. The top of the geotextile will be carefully rolled and positioned so as not to be damaged during the placement of the armour layer. This “rolled” section will later be unrolled and pulled up the batter to design height;
- Working from the temporarily low platform (approximately MHWS) place the rock underlayer;

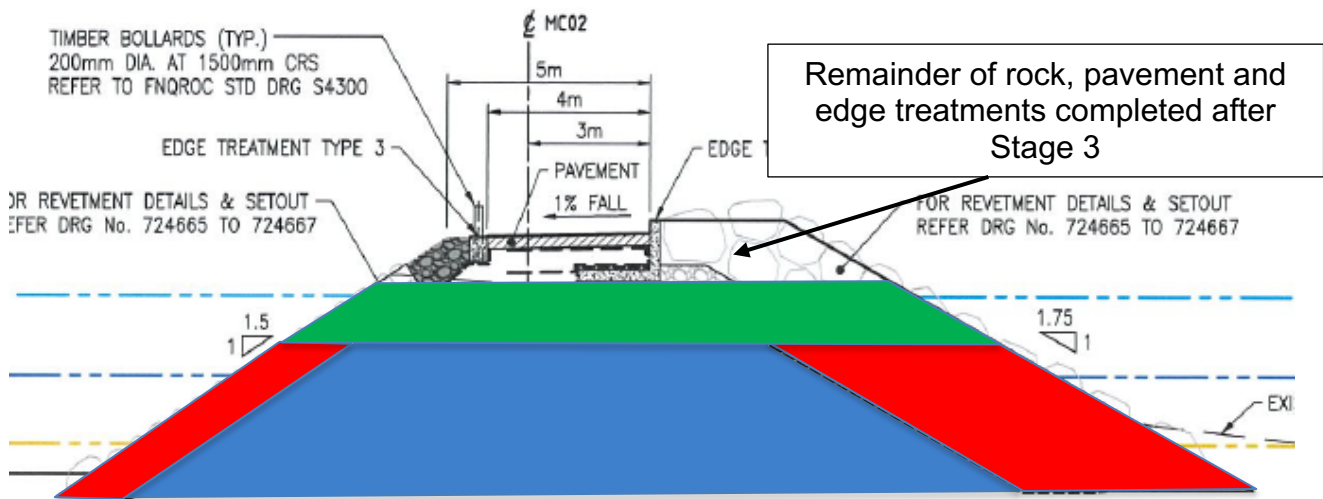
- Working from the temporarily low platform (approximately MHWS) place the rock armour (Stage 2) – refer Figure 14;
- Once the underlayer and armour rock has been placed to the top of the working platform (ie. approx. MHWS), dot points one to three will be repeated until the entire breakwater has been completed to that level;
- Core rock will then be placed to the underside of the proposed concrete edge treatment (Stage 3) – refer Figure 15;
- Following the completion of the core rock to the underside of the concrete edge treatment, the top of the geotextile will be unrolled and pulled into the final design position. Care will be taken to ensure the “rolled” geotextile is not damaged during this process (Stage 3) – refer Figure 15;
- Both the underlayer and armour rock layers will at this point be brought up to the underside of the concrete edge treatment levels;
- The remainder of the core, underlayer and armour rock will be placed to design following completion and satisfactory curing of the concrete edge treatment.



**Figure 13 - Stage 1 Existing Breakwater Reconstruction**



**Figure 14 - Stage 2 Existing Breakwater Reconstruction**



**Figure 15 - Stage 3 Existing Breakwater Reconstruction**

## 2.5 Concrete Edge Treatment 1 and 3

The concrete edge treatment works will be undertaken by our concrete crew. Prior to forming up the Edge Treatments a 30mm blinding layer will be placed. Both the Edge Treatments 1 and 3 will be formed up, steeled and poured in alternating sections between expansion joints. Depending on program constraints at the time MGN Civil will either pour multiple sections at once or individually. After the required curing time has been reached, the forms will be stripped and re-erected between those areas already poured. Similarly, the forms and the curing regime will remain in place until the required strength gain has been achieved.

The timber bollards on the existing breakwater will be cast in as part of the Edge Treatment 3 works.

## 2.6 CTB and Concrete Pavement

Following the completion of the Concrete Edge Treatments 1 and 3 and their corresponding backfill up to the underside of pavement, placement of the CTB and concrete pavement layers will proceed.

Given the relatively small quantity of CTB, narrow width of the breakwater and potential to damage the Edge Treatment MGN Civil propose to use small equipment to place this layer. To spread the CTB MGN Civil will use a pozi track and spreader bar. MGN Civil will use a CB224 roller (or equivalent) to compact this layer and trim with either the pozi track or small excavator.

The concrete pavement will be placed in a standard checkerboard pattern between expansion joints by our concrete crew. Depending on program constraints at the time MGN Civil will either pour multiple panels at once or individually. After the required curing time has been reached, the alternate panels will be steeled and poured. Similarly, the curing regime will remain in place until the required strength gain has been achieved. Refer similar pavement MGN Civil constructed at the Coffs Harbour Eastern Breakwater (Figure 16).



**Figure 16 - Concrete Pavement Coffs Harbour Eastern Breakwater**

### **3 UPGRADING OF THE NORTHERN CARPARK**

Given the limited stockpile capacity of the Northern Carpark MGN Civil propose to widen this as early as possible. The earliest at which the widening can take place is after February, when clearing is permitted.

#### **3.1 Clearing**

Prior to the commencement of clearing MGN Civil will engage a fauna spotter and Ecologist to assist in the production of a clearing plan. Further, the fauna spotter will visit the site prior to clearing operations to ensure no existing habitat will be adversely affected by the clearing operations.

Once the site has been inspected by the fauna spotter MGN Civil will have our Surveyor mark out the strip limits to ensure MGN Civil do not clear any vegetation beyond the limit of works.

MGN Civil will engage a clearing subcontractor to undertake all clearing works. This will require all trees to be cut at ground level with the root system left intact to minimise the risk of PASS contamination. Cut vegetation will then be brought onto the carpark area and mulched. Mulched vegetation will be carted off site for beneficial reuse.

#### **3.2 Removal of Existing Armour Rock Revetment**

To limit the exposure to the existing carpark revetment, it will be dismantled and rebuilt progressively. Where possible removed armour will be carted directly to one of the car park revetments for incorporation into those works. Where this is not possible the removed rock will be temporarily stockpiled for later reuse.

The rock will be removed using our 50T short arm excavator and carted to stockpile/revetment using a 35T articulated dump truck.

#### **3.3 Placement of Class VIII Core Rock Wrapped Geotextile**

Once the armour has been stripped from the revetment the geotextile wrapped Class VIII layer will be placed to RL1.0. Where possible and tide timings permit, MGN Civil will place this layer at low tide. Accordingly, MGN Civil expect that much of this work could be completed in the dry negating the need for specialist divers. Similar to other works MGN Civil expect that much of this rock will be carted directly to the placement area using Side Tippers. Alternatively, MGN Civil will aim to coordinate our activities so that some of this rock may be won from the temporary causeway reducing wastage and overall project costs. As much of this layer will be placed in the dry, geotextile laps will be 500mm.

Initially the top of the Class VIII rock fill will remain unwrapped. This will allow us to traverse this layer with our 50T excavator to place the underlayer and revetment armour.

### 3.4 Placement of Revetment Geotextile Layers

The carpark revetment shall have a geotextile (900R or equivalent) layer placed beneath the underlayer (Class VII rock) in accordance with Drawings 724665. As the geotextile is being placed partially underwater the minimum lap for adjacent panels is 1.0m. That said it is anticipated that in some areas MGN Civil may be able to place the geotextile on the lowest tides and effectively complete this work in the dry. In this case the geotextile laps may be reduced to 500mm.

To maximise placement efficiency and minimise exposure risk MGN will place the geotextile in 12m to 18m wide strips laid down the revetment batter. Prior to placement MGN propose to sew together two or three 6m strips to create the 12m/18m wide panel. The length of each panel will be commensurate with the length of batter allowing for the toe works. MGN has significant experience (Nelsons Plains, Brisbane International Cruise Terminal, Berths 11, 12 and 13A – Port of Brisbane) in sewing large geotextile panels and have found it practical on projects such as Clump Point. The key is to size the panel so as to not make it unwieldy to handle during placement.

To place the geotextile, MGN will use specialist industrial divers when placing underwater. The divers will be assisted by MGN personnel on land and our 50T excavator where required. Ideally the geotextile panels will be installed on the incoming to low tide of the day and in calm sea conditions.

The process to install each geotextile panel will generally be as follows:

- Pre-sew 12m/18m wide geotextile panels on land;
- Pre-fold the 12m/18m wide geotextile panel into a “pillow” shape for ease of transport and unfolding at the head of the works;
- Unfold the “pillow” at the leading edge of the works and temporarily anchor;
- With the assistance of divers (and support vessels) where required each panel will be slowly pulled out into the water and held into position on the water’s surface at each of the corners. Once in position, the edge closest to the leading edge will be slowly lowered to the sea bed carefully maintaining tension of the panel so as to maintain its integrity. At this stage the excavator may assist in lowering the edge nearest to him by slowly placing the underlayer rock onto the panel to act as an anchor.
- Once the edge closest to the leading edge is in position the divers (if required) will confirm that the minimum 1.0m (or 500mm for dry placement) lap has been achieved. Once the lap has been confirmed the excavator will slowly place rock out over the geotextile to hold it in position on the sea bed.
- Once on the seabed, the divers (if required) will confirm it has been satisfactorily placed and that the toe has been covered.

Please refer to Figures 1, 2 and 3 of geotextile being placed at our Nelsons Plains project.

### 3.5 Rock Placement

Given the width of the upgraded revetment is outside the reach of our 50T excavator from crest to toe a careful placement strategy is required to ensure excavator reach is maintained. In addition to the dimensional constraints, the following Specification placement restrictions include:

- Geotextile cannot be left uncovered for over 48 hours;
- No more than 25m of core at 4m in depth can be left unarmoured.

To achieve the required construction tolerances and placement constraints MGN propose the following placement sequence:

- Excavate toe rock material and temporarily stockpile for dewatering/PASS treatment using a 50T excavator and 35T articulated dump truck;
- Place 12.0m/18.0m wide geotextile panel as noted in Section 3.4. The top of the geotextile will be carefully rolled and positioned so as not to be damaged during the placement of the armour layer. This “rolled” section will later be unrolled and pulled up the batter to design height;
- Working from the temporarily low platform (RL1.0 – top of Class VIII wrapped geotextile layer) place the rock underlayer to RL1.0;
- Working from the temporarily low platform (RL1.0 – top of Class VIII wrapped geotextile layer) place the rock armour to RL1.0 – refer Figure 14 for a similar methodology;
- Embankment material will then be placed to design (refer paragraph 3.6 below);
- Following the completion of the embankment to the underside of the pavement, the top of the revetment geotextile will be unrolled and pulled into the final design position. Care will be taken to ensure the “rolled” geotextile is not damaged during this process;
- Both the underlayer and armour rock layers will at this point be brought up to the underside of the concrete edge treatment levels.

### **3.6 Placement of Embankment**

Once the revetment layers have been brought up to the top of the Class VIII geotextile wrapped rock layer (RL1.0) the remainder of geotextile will be placed over this Class VIII layer.

Fill material (in accordance with the Specification) will be sourced from the Bonassi Quarry. This material will either be carted to site using MGN’s Side Tipper’s or subcontracted Trucks and Dog configurations. The fill material will be carted directed to its final location and spread in 150mm layers with a grader. The material will be placed, compacted and trimmed using standard techniques. I.e. grader, pad foot roller and water cart.

The embankment will continue to be placed in compacted layers until the underside of the pavement layers are reached.



### **3.7 Basalt Boulders**

Part of the works footprint overlaps with the Clump Point basalt boulder field. Due to the aesthetic and cultural heritage significance of this area, select basalt boulders identified by approved Djiru monitors that will be impacted will be recorded with GPS (Easting/Northing) prior to excavation. The boulders will then be carefully excavated using a 50T excavator. The Basalt Boulders will be temporarily stockpiled in the Northern Carpark.

At the completion of the eastern reclamation works and the new revetment structure, the stockpiled boulders will be placed at the toe of the new revetment structure to maintain the connection to the existing field.

### **3.6 Concrete Edge Treatments 2 and 4**

The concrete edge treatment works will be undertaken by our concrete crew. Prior to forming up the Edge Treatments a 30mm blinding layer will be placed. Edge Treatments 2 and 4 will be formed up, steeled and poured in alternating sections between the expansion joints. Depending on program constraints at the time MGN Civil will either pour multiple sections at once or individually. After the required curing time has been reached, the forms will be stripped and re-erected between those areas already poured. Similarly, the forms and the curing regime will remain in place until the required strength gain has been achieved.

### **3.7 Base Layers and Asphalt**

Following the completion of the Concrete Edge Treatments 2 and 4 the subgrade will be tested, and pavement thickness reconfirmed.

The placement of the Type 2.3 and 2.1 base layers will be undertaken by conventional means using a grader, smooth drum roller and watercart.

Following confirmation by our Surveyor that the top of the Type 2.1 pavement layer has been placed within design tolerances and the kerb/stormwater/subsoils has been completed and backed up, the seal and AC layer will be placed. For this work MGN Civil will use Pioneer Pty Ltd.

### **3.8 Road Furniture and Footpath**

All road furniture and ancillary works will be installed following the completion of AC. This includes the following:

- Guardrail;
- Signage;
- Bollards;
- Line Marking;
- Footpath.

### **3.9 Watermain and Electrical**

These works will be undertaken by specialist subcontractors. All pipework for the fire and potable water will be installed following the completion of the embankment works. All finishing works including the booster box and access pit lids will be completed following the placement of the pavement layers.

As the electrical is solar, no underground electrical installations are required. Other than the concrete footings (which will be installed prior to AC works) will be completed following the AC works.

### **3.10 Stormwater**

All stormwater works including the 375mm diameter RCP, Klassik drain, subsoils and associated manhole will be installed by MGN in accordance with the relevant TMR standards Drawings and Specifications and/or manufacturers requirements. These works will be completed following the placement of the embankment and prior to placement of the pavement layers.

## **4 MAINTENANCE DREDGING OF BOAT RAMP BASIN**

### **4.1 Environmental Control**

Prior to the commencement of the maintenance dredging MGN will deploy with the aid of our diving crew a full drop silt curtain around the perimeter of the works. MGN Civil will deploy the silt curtain in such a way that access to and from the boat ramp for the six operators remains unaffected.

### **4.2 Dredged Material Treatment Area**

Prior to the commencement of maintenance dredging MGN will construct a small earth bunded area to temporarily store the dredged silt. Given the limited space the bunded area will be kept to a minimum.

### **4.3 Dredging Methodology**

Given the very small area to temporarily stockpile the dredged material, flexibility in the dredging operation is paramount. Accordingly, MGN will construct a series of temporary access fingers into the boat ramp basin to remove the silt. It is proposed that the access finger(s) will be constructed from the Class VIII core rock. To minimise the volume used in the access fingers the crest height will be limited to at or near the low tide. Silt will be

removed using machinery already available on site including a 50T excavator and 35T articulated dump truck.

MGN successfully adopted this technique within the Coffs Harbour Marina. Refer Figure 17 for an aerial image of the Coffs Harbour project. Note the effectiveness of the silt curtain in containing the turbid water.



*Figure 17 - Maintenance Dredging Coffs Harbour Marina*

Once stockpiled within the car park area the silt will be tested for PASS and treated or otherwise. Once the dredged silt has been treated and or confirmed clean, the dried material will be carted and disposed of at the nearest licenced refuse facility.

Upon successful completion of the dredging works, the temporary access fingers will be removed and incorporated into the works. Any contaminated rock will be disposed of off-site.

MGN Civil will pair with RPS to complete pre and post hydrographic surveys using a small light utility boat and sonar equipment. RPS is very familiar with this site, conducting the previous silt hydrographic survey.

#### **4.4 Benefits of This Methodology**

This methodology offers significant flexibility when compared to traditional dredging activities. These include:

- No specialist equipment will be used meaning that the dredging works can proceed progressively during the project.
- Given the limited stockpile capacity of the site, MGN Civil anticipate that this method will dovetail with all other project tasks. MGN Civil do not need to create a bunded area capable of stockpiling the entire 480m<sup>3</sup>.
- The flexibility of using existing equipment already based onsite is that there will be no urgent requirement to demobilise potentially expensive dredging equipment.
- No additional mobilisation/demobilisation costs to that already expended elsewhere.

## **5 UPGRADING OF BOAT RAMP**

As required by the project documentation, the upgrade of the boat ramp will occur in the winter months. The boat ramp upgrade works will run concurrently with the breakwater construction and upgrades.

To maintain access for as long as possible to the six operators MGN will upgrade the boat ramp in two stages. First stage will involve the widening of the western side of the boat ramp. The second stage will involve the upgrade of the eastern side of the boat ramp.

### **5.1 Preparation Works**

The first task in widening the western side of the boat ramp is to complete the reclamation works. This involves initially removing excess silt above the design level near the toe of the boat ramp (similar on the eastern side of the boat ramp). This material will be removed whilst the silt curtain is still in place to avoid water contamination outside the works zone. Similar to Section 4 this material will be excavated using a 50T excavator and 35T dump truck and placed in the temporary stockpile for dewatering, PASS testing and treatment. Once declared clean, this material will be transported off site to a licensed refuse facility.

The second task is the placement of a geogrid wrapped 75mm crushed rock fill layer to the underside of the 275mm thick crushed rock subgrade (both east and west side of the boat ramp). This work is very similar to that previously described Section 3.3. Rather than repeat the methodology, refer to Section 3.3 for the methodology. The key difference here is that the rock is a 75mm crushed rock and a geogrid layer is used in addition to the geotextile.

### **5.2 Revetment Geotextile and Rock Placement**

Whilst subtly different the placement of the geotextile underneath the rock revetment and rock placement is a similar operation to that described in Sections 3.4 and 3.5. Rather than repeat the methodology, refer to Sections 3.4 and 3.5 for the methodology.

### **5.3 Crushed Rock Subgrade**

The geogrid encapsulated rock subgrade layer will be placed as detailed on drawings 724684 and 724686. As the geogrid is being placed partially underwater the minimum lap

for adjacent panels is 1.0m. That said, it is anticipated that the majority of this layer will be placed in the dry (ie. low tide works). In this case the geogrid laps may be reduced to 500mm.

The geogrid/subgrade layer will be progressively placed from the toe of the boat ramp toward the carpark. Rock will be progressively placed using a 50T excavator and trimmed to design using the onboard GPS. The subgrade layer will be completed with the installation of the top layer of geogrid. Once again when required, divers will assist in this operation.

#### **5.4 Precast Plank Supply and Placement**

MGN will source the pre-cast planks for this project from Wagners Pre Cast. Wagners have offered to supply the planks as specified. Alternatively, for no additional cost, Wagners have offered to supply the planks constructed from their environmentally friendly “Earth Friendly Concrete” geopolymer based concrete.

For the western side of the boat ramp the planks will be placed progressively from the ramp toe set out point, towards the top of the ramp. For the eastern side planks will commence at the upper side adjacent to the existing planks and proceed down the ramp to the toe.

Planks will be lifted into position using either a 100T or 150T mobile crane depending on the position of the crane. At this stage MGN Civil envisage the mobile crane will be positioned either at the top of the existing ramp or on the adjacent existing breakwater.

Divers and/or riggers will assist the crane to accurately place each plank into position.

#### **5.5 Completion Works**

Once all of the planks are in position and bolted together the toe rock will be placed to ensure that there is no slippage post placement. This rock will be placed with either our 50T excavator (or smaller).

The last component of work will be the construction of the cast in situ slab at the top of the MGN western side of the boat ramp. This slab will be placed in a similar fashion to that previously described for the existing breakwater pavement.

## **6 NEW TOILET FACILITIES**

The new toilet facility will be constructed by a fully qualified and registered Builder in Queensland. The works will be undertaken in accordance with the relevant Australian Standards.

Our intention is to engage a local builder for this work. Works will commence after February once clearing is allowed and will run concurrently with the breakwater works.