



# **New Seawall at Taylors Point Reserve**

## **148 Hudson Parade, Clareville**

### **Technical Specification**

Northern Beaches Council

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## 1 DESCRIPTION OF THE WORKS

### 1.1 Background

An existing seawall at Taylors Point Reserve, Clareville, near 148 Hudson Parade, collapsed during February 2020. The seawall had been found to be in poor condition by engineers engaged by Northern Beaches Council before its collapse. Following the collapse, Northern Beaches Council undertook works to stabilise temporarily the slope that had previously been retained by the collapsed seawall, until construction of a new permanent seawall and slope stabilisation using rock bolts. This specification applies to the construction of the permanent works, and removal of debris from the collapsed seawall.

### 1.2 Drawings

The Works shall be carried out in accordance with the Drawings and this Technical Specification. The Drawings are listed below.

Drawing No	Drawing Title
PA1900-RHD-00-DR-MA-0001	Title Sheet, Locality Plan and Drawing List
PA1900-RHD-00-DR-MA-0011	General Arrangement Plan
PA1900-RHD-00-DR-MA-0012	Seawall Sections & Details
PA1900-RHD-00-DR-MA-0013	Seawall Elevations
PA1900-RHD-00-DR-MA-0021	Miscellaneous Details
32115RMspecrev1 Fig 1	Site Plan Indicating Proposed Rock Bolts
32115RMspecrev1 Fig 2	Typical Section Sketch
32115RMspecrev1 Fig 3	Typical Rock Bolt Head Detail Supporting Steel Mesh Facing

### 1.3 General Specification Requirements

The Works to be carried out under the Contract include the supply of all materials, plant, equipment and labour required for the Works.

The Contractor must undertake all Works and activities shown on or described by the Drawings and Technical Specification. The Works include activities by the Contractor that are required to achieve the outcomes shown on the Drawings and/or described in the Technical Specification.

The Drawings shall be read in conjunction with all such other drawings and specifications and with such other written instructions that may be issued during the course of the Contract. Any discrepancy shall be referred to the Principal's Representative before proceeding with the work.

The Technical Specification shall be read in conjunction with any Preliminaries to the Specification included in the Contract. Any discrepancies between the Preliminaries and Technical Specification, and within the Technical Specification itself, shall be referred immediately to the Principal's Representative for clarification.



All materials and workmanship shall be in accordance with the relevant and current Standards Association of Australia (SAA) codes authorities except where varied by the Drawings and Technical Specification, and with the by-laws and ordinances of the relevant building.

#### **1.4 Hold Points**

All requirements to provide written information to the Principal's Representative for approval or certification confirming compliance with the Technical Specification shall be deemed as Hold Points, unless noted otherwise.

#### **1.5 Stability and Care of the Works**

During construction, the Works shall be maintained in a stable condition and no part shall be overstressed. Temporary bracing and batters shall be provided by the Contractor to keep the Works and excavations stable at all times.

The Contractor shall at all times be solely liable for the care and stability of all the works.

#### **1.6 Dimensions and Units**

Site dimensions shall be verified by the Contractor on site before work commences. Drawings shall not be scaled for dimensions.

Unless noted otherwise all levels are given in metres relative to Australian Height Datum (AHD).

Unless noted otherwise, all linear dimensions are in millimetres and all chainages (CH) are in metres.

#### **1.7 Envisaged Construction Procedure**

The following construction procedure was envisaged during the design. The Contractor is responsible for selecting the procedure adopted to undertake the Works, including temporary and sacrificial works. Temporary works and sacrificial works are to be undertaken as required during the Works.

1. Establish at the site.
2. Implement the Project Environmental Management Plan and other measures required by the Principal including the relevant parts of the development conditions. Note that implementation of the PEMP and development conditions is an ongoing process throughout the Works.
3. Install rock bolts at rows R1, R2 & R3 using hand-held equipment, inclusive of testing of rock bolts. This may require access by ropes or boom lift to avoid applying the load on the slope. Rock bolt installation to be completed in consultation with the geotechnical engineer appointed by the Principal's Representative.
4. Construct the concrete (shotcrete) seawall inclusive of:

- a. Excavation and disposal of soil, fill, debris, rock, bulka bag temporary wall etc that is seaward of the concrete seawall alignment, noting potential for asbestos. Excavation to be undertaken over a limited length at any given time to avoid instability of the slope. It is anticipated that approximately 3 m lengths of the seawall could be excavated at approximately 9 m centres, with only one work front open at any time, however this will need to be confirmed on site. It may also be necessary to excavate only part of the height of the proposed concrete seawall and place the concrete in separate upper and lower 'lifts'.
  - b. Install and test rock bolts at rows R4 and R5 in consultation with the geotechnical engineer appointed by the Principal's Representative. Sequencing of rock bolt installation will follow the excavation sequence and upper and lower shotcrete 'lifts' if adopted.
  - c. Install strip drains, sacrificial formwork, reinforcement, weep holes etc in preparation for concreting (shotcreting). Install temporary/sacrificial elements necessary to support the strip drains, sacrificial formwork, reinforcement, weep holes etc during concreting, and to support the hardened shotcrete panel until completion of construction, or until the permanent works support the concrete panel.
  - d. Shotcrete the excavated work front, finish the outer surface as specified, and cure the concrete. Prepare surfaces to be shotcreted as specified.
5. Place stone scour mattress including geotextile.
  6. Place concrete levelling pad for gabions. Install gabion cladding to face of concrete seawall.
  7. Remove concrete block platform from bedrock shelf.
  8. Disestablish from site.



## **2 SITE ESTABLISHMENT**

### **2.1 Scope of Work**

Site establishment shall consist of the Contractor setting up temporary services and furnishing on Site all plant, equipment and personnel necessary for completion of the Works.

### **2.2 Existing Services**

Prior to undertaking Works, the Contractor shall establish all services locations within the footprint of the Works. The Contractor shall undertake a Dial Before You Dig survey of the site before any work is undertaken.

All relevant authorities shall be notified prior to any excavation on or near the site. A service locator shall identify the location of all services on site.

All work carried out shall be cognisant of existing services.

### **2.3 Temporary and Sacrificial Works**

The Contractor shall provide any temporary works as are necessary to carry out the Contract. Prior to commencing these works, the Principal's Representative's approval must be obtained. Such approval shall not relieve the Contractor of the Contractor's responsibility for the safety of the works.

Sacrificial works are works that are undertaken (including supply of materials) in order to construct the permanent works and are left in place at completion of construction. Sacrificial works therefore form part of the finished structure but are not part of the design of the permanent works. The Contractor must obtain written approval from the Principal's Representative for sacrificial works. Sacrificial works must not compromise the strength or durability of the permanent works.

### **3 CONTRACTOR'S WORKING AREA**

#### **3.1 General**

The Contractor's Working Area shall be restricted to those areas directly affected by the Works.

To prevent public access to the Works, a man-proof temporary fence shall be erected within the Contractor's Working Area where this is located above the Mean High Water Mark, where reasonably accessible by the public, and where practical to do so.

#### **3.2 Provision of Services**

The Contractor shall make arrangements at the Contractor's own expense for provision of all services required at the Contractor's Working Area.

#### **3.3 Protection of Existing Services**

The Contractor shall take every precaution to avoid damaging existing services. The Contractor shall make its own assessment of the location of any existing services. Any services damaged during the course of the Contract shall be reinstated by the Contractor at the Contractor's own expense.

#### **3.4 Surface Drainage**

The Contractor shall undertake all necessary works to ensure surface water is properly managed across the Site and does not interfere or damage the works in progress.

#### **3.5 Site to Be Kept Tidy**

The Contractor shall ensure that all rubbish collected and all waste generated on the Site during the course of the Contract is regularly disposed offsite in an environmentally acceptable manner to the approval of relevant authorities.

#### **4        SETTING OUT**

The Contractor shall be responsible for setting out the Works and shall engage a Registered Surveyor to undertake this activity.

All set out dimensions shown shall be verified by the Contractor on site before work commences.

Subject to specified construction tolerances, all work is to be constructed to the lines and levels shown on the Drawings.

## **5 SITE INFORMATION**

### **5.1 Planning Period**

The adopted design life for the Works is 50 years except for sacrificial elements.

### **5.2 Geotechnical**

Geotechnical investigations were undertaken by JK Geotechnics (JK). A copy of the final geotechnical report is provided in **Appendix A**.

Note that the geotechnical investigations were done before collapse of the original seawall, and the design option referred to in the report subsequently changed as a result of the collapse.

### **5.3 Contamination & Waste Classification**

Preliminary contamination and waste classification screening was undertaken by JK Environments (JK). A copy of the final report is provided in **Appendix B**.

Note that the contamination investigations were done before collapse of the original seawall.

### **5.4 Water Conditions at the Site**

Water levels at the Site are generally governed by the tide.

The Site is subject to waves due to swell, seas, and vessels.

### **5.5 Services**

Perform a Dial-Before-You-Dig search for the Works area.

Some drainage pipes were extended and/or diverted as a temporary stabilisation measure following the collapse of the original seawall and are present within the Works area. Any other drainage pipes found during the works shall also be extended or diverted as approved by the Principal.

## **6            INSTALLATION OF ROCK BOLTS**

Refer to Appendix C for design and specification of the rock bolts.

## **7 CONCRETE WORK FOR SEAWALL**

### **7.1 Method of Placement**

It is envisaged that the concrete seawall will be built using shotcrete and that is the method specified here. Formed and compacted concrete may be used at the Contractor's choice, subject to approval by the Principal of the materials, methodology and quality procedures.

### **7.2 Materials for Concrete**

The constituent materials of the concrete must be in accordance with TfNSW/RMS Specification B82 unless approved by the Principal.

### **7.3 Design of Shotcrete Mix**

The mix design must be in accordance with TfNSW/RMS Specification B82 unless approved by the Principal.

The Exposure Classification is 'C'.

The minimum compressive strength is 40 MPa.

Neither steel nor synthetic fibres are required in the mix. Synthetic fibres may be included at the Contractor's option. Steel fibres must not be included in the mix without the approval of the Principal.

Corrosion inhibitors are not required in the mix.

### **7.4 Supply and Fixing of Steel Reinforcement and Embedments**

All reinforcement must be stainless steel. Stainless steel reinforcement must be deformed bars, deformed wire or welded wire mesh. Stainless steel reinforcement must be strength grade B500 in accordance with Table 8 of BS 6744:2016 and conform to designation 1.4362, 1.4429, 1.4436 or 1.4462 to BS 10088 (as identified by Table 5 of BS 6744:2016).

Tools for fabricating stainless steel reinforcement must not have been used and must not be used for other materials. Tools and processes for cutting stainless steel must not reduce the strength of the stainless steel reinforcement or cause contamination with grease, oil, iron or other steels.

Tools for bending stainless steel reinforcement must not have been used and must not be used for other materials. Pins used for bending stainless steel must be made from stainless steel. Do not heat stainless steel reinforcement for bending.

Secure reinforcement in place by tying. Tie with stainless steel wire having a diameter of not less than 1.2 mm. Wire used to tie stainless steel must conform to designation 1.4362, 1.4429, 1.4436 or 1.4462 to BS 10088 (as identified by BS 6744:2001).

At the time concrete is placed, the surface condition of reinforcement must be such as not to impair its bond to the concrete or its performance in the member.

Support the reinforcement clear of surface to be shotcreted, with the cover as stated on the Drawings. Where no cover is shown on the Drawings, maintain a minimum cover of 30 mm unless specified otherwise.

#### 7.4.1 Welding Reinforcement

All welding for stainless steel reinforcement must comply with Specification TfNSW/RMS B203 and the following:

- (a) Weld stainless steel reinforcement only in a welding shop set up for the purpose. Any such facility must maintain conditions that prevent any contamination of the stainless steel and any consumables and allow proper welding.
- (b) Store, condition and handle all consumables in accordance with the bar manufacturer's recommendations.
- (c) Welding procedures and consumables must comply with the bar manufacturer's recommendations. Welds must conform to Category 1B to AS 1554.6 Table 6.1.1. Assess defects in accordance with AS 1554.3 Sections 9 and 10. Examine welds using dye penetrant or magnetic particle examination methods. Treat any arc strikes as welds.
- (d) Demonstrate that the weld does not result in the loss of ductility and corrosion resistance. Test welds in accordance with AS 1554.3 Clause 7.1 and Table 7.2.
- (e) Keep the weld area clean and free of any contamination.
- (f) Clean and passivate completed welds by stainless steel wire brushing and pickling to finish Category II to AS 1554.6 Table 6.2.1. Pickling compounds must be chloride free.
- (g) Test welds and the welded bars in the vicinity of the welds for corrosion resistance against pitting and intergranular corrosion in accordance with AS 1554.6 Appendix E using a laboratory with appropriate NATA registration. Corrosion resistance testing must include qualification tests and be carried out on not less than 10% of all welds performed in the Works.
- (h) Where any of the tested bars fails the corrosion resistance test, test all welds and bars in the vicinity of the welds for corrosion resistance.

#### 7.5 Supply and Delivery of Concrete

Supply and delivery of concrete must be in accordance with TfNSW/RMS Specification B82 unless approved by the Principal.



## **7.6 Application of Shotcrete and Curing**

Surface preparation and application of shotcrete and curing of shotcrete must be in accordance with TfNSW/RMS Specification B82 unless approved by the Principal. Construction joints must comply with the surface preparation requirements for concrete surfaces.

The surface finish is to be steel float.

The tolerance on thickness of concrete is -0 / +50 mm.

The maximum deviation of concrete surface from a plane over any 2 m x 2 m area is +/- 5 mm, after steel float finishing. This requirement is to provide a generally planar surface for attachment of the gabion cladding without excessive distortion of the walls of the gabion cages or excessive gaps between the gabions and the concrete wall.

Curing must be undertaken in an appropriate manner for the exposed and tidal conditions at the Site. Reapply curing measures as necessary to maintain effective curing for a minimum of seven days.

## **8 EXCAVATION**

### **8.1 Scope of Work**

The Contractor shall supply all plant, materials and labour for excavation. This generally comprises:

- (i) baseline excavation of fill soils and rubble to clear the Site for the seawall;
- (ii) excavation of bedrock to receive concrete levelling pads for seating of the base gabions and to restrain the base of the concrete seawall;
- (iii) additional excavation as required to remove unacceptable soft or unstable zones of residual soils as determined by the Geotechnical Engineer (JK Geotechnics).

The extent of excavation shall be determined from previous survey undertaken by the Principal, the geotechnical investigations (**Appendix A**), and the design for the Works as described in the Technical Specification and shown on the Drawings.

### **8.2 Excavation Generally**

The Contractor shall advise the Principal's Representative when excavation works are to commence.

Excavation shall be undertaken in a careful manner, with a minimum of disturbance and with every possible precaution taken to prevent damage to property and injury to personnel.

Any services which require relocation as part of the work shall be relocated in accordance with the requirements of the Principal's Representative and any relevant authorities and codes.

All excavated materials not reused in the Works shall be removed from the Site and lawfully disposed. Under no circumstances shall excavated materials be disposed in the adjacent waterway.

### **8.3 Excavation Works Design**

The Contractor is to be, and shall remain, solely responsible for the excavation methods, procedures and practices. The method of excavation shall be as stated in the Contractor's Method Statement.

No approval will be given for claims arising from the Contractor's ignorance or lack of understanding of the extent of excavation.

## 9 GABION WORK

### 9.1 Scope of Work

The Contractor shall supply all plant, materials and labour for the construction of the gabion wall cladding.

The main works activities required to construct the gabion wall cladding comprise:

- (i) establishment of mass concrete levelling pads;
- (ii) supply and placement of gabions including cages, spirals and lacing, and rock filling; and,
- (iii) fixing of the gabion cages to the concrete wall before filling.

The extent of gabion works shall be determined from the Pre-Construction Survey and design for the Works as described in the Technical Specification and shown on the Drawings.

### 9.2 Concrete Work for Gabions

Concrete work for gabions comprises a mass concrete levelling layer and drainage infill to the bottom course of gabions. Refer to the Drawings.

Concrete used in the works shall be mass concrete as noted on the Drawings and shall comply with the requirements for Normal Class concrete.

All workmanship and materials shall be in accordance with AS 3600 current edition with amendments, except where varied by the contract documents.

### 9.3 Gabions

#### 9.3.1 General

Gabions shall be Grade 316L welded wire mesh, 75mm x 75mm mesh size, 4mm wire thickness, by Permathene Australia (or approved equivalent). Provide additional Grade 316L components to substitute for Grade 302 where necessary.

#### 9.3.2 Wire Acceptance

Use wire which satisfies the following:

Parameter	Specification	Method and other criteria
<i>Mesh-wire</i>	Grade 316L stainless steel.	ASTM A580
Nominal mesh size	75mm x 75mm	
Internal wire diameter	4mm	+/- 0.1 mm
External wire diameter	4mm	+/- 0.1 mm

Parameter	Specification	Method and other criteria
<i>Lacing wire</i>	Grade 316L stainless steel.	ASTM A580
Internal wire diameter	2.2mm	+/- 0.1 mm
External wire diameter	2.2 mm	+/- 0.1 mm
<i>Spiral wire</i>	Grade 316L stainless steel.	ASTM A580
Internal wire diameter	4mm	+/- 0.1 mm
External wire diameter	4mm	+/- 0.1 mm
<i>All wires</i>		
Tensile strength	650-1100 MPa	EN 10233-3
Elongation	40% min	ASTM A370-97
Weld shear strength	4600 N minimum at every wire intersection	ASTM A185

Prior to delivery of gabions to the Site, provide to the Principal's Representative for approval written certification from supplier confirming that the gabions meet wire acceptance requirements.

### 9.3.3 Assembly

Assemble the gabion baskets in accordance with the manufacturer's instructions and recommendations. Use spiral wires to connect mesh panels. Alternatively, a lacing wire may be used to connect the rear edge of the lid to the rear wall of the basket if a spiral wire is not feasible due to proximity to the concrete seawall. Provide a double loop to connect the lid to the rear wall in every second mesh aperture, and a single loop in the other apertures.

C-rings or U-rings may be used subject to the Principal's approval. Rings must be Grade 316 stainless steel or superior corrosion resistance.

Gabion baskets are to have internal diaphragms at maximum 1050 centres.

Install internal stiffener wires as recommended by the gabion basket manufacturer.

Panels that are shared by adjacent baskets must be connected by spiral wires to the adjacent panels of both baskets.

### 9.3.4 Rough Angular Rock Filling for Gabions

Rock shall be dense, hard durable and clean sandstone rock. The minimum and maximum rock size shall be 100 mm and 225 mm respectively. The rock shall have a range of sizes and a degree of angularity that ensures mechanical interlocking between rocks.

Rock filling for gabions must meet the requirements of AS 2758.4. Use the Los Angeles value and unsound and marginal stone content provisions to assess durability compliance with AS 2758.4. The Los Angeles value (abrasion loss) shall be a maximum of 25%.

Rock filling for gabions shall have a wet strength of at least 100 kN when tested in accordance with Test Method TFNSW/RMS T215. The rock may be crushed by the testing authority so as to produce material that is suitable for testing by Test Method TFNSW/RMS T215.

Rock filling for gabions shall have an average weighted sodium sulfate loss of 9% maximum when tested in accordance with AS 1141.24.

Prior to delivery of rock filling to the Site, provide to the Principal's Representative for approval written certification from supplier confirming that the rock filling meets the requirements of the Technical Specification.

#### 9.3.5 Gabion Installation

The assembly, erection, filling and final lacing of gabions shall be undertaken in accordance with the gabion manufacturer's instructions. Obtain written instructions from the manufacturer. Fixing of the gabion cladding to the concrete seawall shall be as shown on the Drawings.

#### 9.3.6 Gabion Filling

Fill gabions in accordance with TfNSW/RMS Specification R55.

### 9.4 Hold Points and Witness Points

All Hold Points and Witness Points required by the Specification TFNSW/RMS R55 shall apply to the gabion works.

## **10 FILLING**

### **10.1 Scope of Work**

The Contractor shall supply all plant, materials and labour for filling. This generally comprises:

- (i) Supply (where existing material available within the temporary Bulka Bags at the Site is not suitable or of sufficient quantity) and placement of no-fines gravel behind the gabions;
- (ii) supply and place engineered fill to replace excavated soil and/or unacceptable residual soil (ie. soft or unstable soil as determined by the Geotechnical Engineer, JK Geotechnics);
- (iii) supply and placement of geotextile filter.

The extent of filling shall be determined from the Pre-Construction Survey and design for the Works as described in the Technical Specification and shown on the Drawings.

### **10.2 No-Fines Gravel**

No-fines gravel shall comprise clean, durable, angular single size igneous material. The size of the no-fines gravel shall satisfy the following grading:

**Percentage Passing Australian Standard Sieve Size by Mass**

<b>26.5 mm</b>	<b>19.0 mm</b>	<b>13.2 mm</b>	<b>9.50 mm</b>	<b>6.70 mm</b>	<b>4.75 mm</b>	<b>2.36 mm</b>	<b>1.18 mm</b>
<b>100 %</b>	<b>0-85 %</b>		<b>0-10 %</b>		<b>0-5%</b>		<b>0%</b>

The coefficient of uniformity must be less than 10.

The material must not be gap graded (i.e. it must not have two or more distinct sections of the grading curve separated by sub-horizontal portions).

In all other respects, the no-fines gravel shall comply with TFNSW/RMS QA Specification 3580.

Provide a certificate of compliance verifying that the no-fines gravel complies with all the requirements of this Specification together with test results reported on NATA endorsed test documents. The certificate is for tests not more than six (6) months old.

### **10.3 Engineered Fill**

Engineered fill specified in the Works shall be granular and free draining.

The maximum particle size shall be limited to 50mm. The Plasticity Index as determined by Test Method TFNSW/RMS T109 shall not be less than 2 or more than 12.

The pH shall not be less than 5.0 when determined by Test Method TFNSW/RMS T123.

At least seven (7) days prior to delivery of the engineered fill to the Site, the Contractor shall provide, to the Principal's Representative for approval, a certificate from a laboratory with the appropriate NATA registration, stating the material to be supplied meets the requirements of the Technical Specification.

Materials not satisfying the above size and Plasticity Index criteria may be accepted provided that the internal frictional angle as determined by an appropriate test method is greater than 32 degrees.

#### **10.4 Placement and Compaction of Engineered Fill**

The engineered fill shall be compacted in lifts not exceeding 150mm and to a minimum characteristic relative compaction of 98.0% in accordance with Specification TFNSW/RMS R44.

The Contractor shall take care to ensure that heavy compaction equipment does not come within 2m of the seawall.

Compact backfill adjacent to the gabions using small rollers or plate compacters.

#### **10.5 Geotextile Filter**

##### **10.5.1 Acceptance**

The geotextile filter shall be a non-woven type meeting the requirements of Geotextile Strength Class C and Filtration Class 2 in accordance with Specification TFNSW/RMS R63.

Prior to delivery of the geotextile filter to the Site, provide to the Principal's Representative for approval written certification from supplier confirming that the geotextile filter meets the requirements of the Technical Specification.

##### **10.5.2 Storage and Installation**

On site storage and handling of the geotextile filter, the preparation of subgrades for covering by geotextile filter, and laying of the geotextile filter shall satisfy the following:

- (i) Ground Preparation – sharp edged rocks and the like shall be removed prior to laying of filter fabric.
- (ii) Joining of Fabric Elements – fabric elements shall be joined by either overlapping or sewing. Overlap widths are to be no less than 0.5 m with the overlap direction taking account of fill supply direction. For sewing assembly 0.1 m overlap is sufficient to ensure continuity.



## **11 LANDSCAPE PLANTING**

### **11.1 Scope of Work**

Landscaping works will be undertaken by others.

## 12 CONSTRUCTION TOLERANCES AND COMPLIANCE SURVEY

### 12.1 Construction Tolerances

Construction tolerances shall comply with relevant TfNSW/RMS Specifications except as specified in **TABLE 12.1**.

<b>TABLE 12.1</b>	<b>CONSTRUCTION TOLERANCES</b>	
<b>Finished Surface of Works Item</b>	<b>Tolerance to Design Lines and Levels</b>	
	<b>Horizontal</b>	<b>Vertical</b>
Concrete seawall	50 mm	50 mm
Gabions	50 mm	50mm

### 12.2 Compliance Surveys

#### 12.2.1 Scope

The Contractor is required to submit to the Principal's Representative for approval compliance survey drawings, prepared in AutoCAD, showing finished surface levels for the Works.

The Contractor shall be responsible for the collection and processing of survey data and provision of all survey equipment required to complete this activity to the satisfaction of the Principal's Representative. All compliance survey work shall be carried out by or under the supervision of a Registered Surveyor.

#### 12.2.2 Extent and Detail of Compliance Surveys

Compliance survey drawings shall include:

- (i) plan covering the full extent of the finished works;
- (ii) surveyed as-constructed concrete seawall and gabion-cladding on design cross-sections at 2.5m intervals
- (iii) surveyed as-constructed locations of all rock bolts.

The vertical datum for all compliance surveys shall be Australian Height Datum (AHD).

### 12.3 Approval and Rectification

In the event that the Principal's Representative determines that the surveyed work does not meet the requirements of the Technical Specification, the Principal's Representative may instruct the Contractor to make good that component of the Works and resubmit the survey for approval. The Time for Practical Completion shall not be affected by such rectification activities, and the cost of all works associated with the rectification including re-survey shall be borne by the Contractor.

## **13 PROJECT ENVIRONMENTAL MANAGEMENT PLAN (PEMP)**

### **13.1 General**

The Contractor's Project Environmental Management Plan (PEMP) shall comply with this Technical Specification.

During the execution of the Works, the Contractor shall ensure that Northern Beaches Council's ordinances relating to environmental protection, as well as any other environmental requirements of relevant authorities are adhered to.

During the execution of the Works, the Contractor shall ensure that all rubbish or surplus material is progressively removed and disposed offsite in an environmentally acceptable manner to the approval of the relevant authorities.

### **13.2 Implementation of PEMP**

The Principal is responsible for:

- ensuring that the Contractor's PEMP meets the requirements of the Contract Documents; and,
- auditing the Contractor's implementation of the PEMP and for issuing corrective action requests to the Contractor as appropriate.

The Contractor is responsible for preparation of a PEMP, which states the Contractor's policy and methods of implementation for:

- compliance with all relevant local, state and Commonwealth environmental legislation, guidelines, permits and licences and industry codes of practice;
- design of temporary environmental measures to mitigate any unfavourable environmental impacts;
- construction, operation, maintenance and monitoring of all environmental measures during construction and the relevant defects liability period;
- reporting and correcting PEMP non-conformances during construction and the relevant defects liability period; and,
- correcting PEMP matters raised by the Principal's Representative on corrective action requests.

The PEMP must be submitted and approved by the Principal at least seven (7) days prior to the commencement of construction works.

The Principal's Representative will be responsible for periodic monitoring and auditing of the PEMP, reporting the results and issuing Corrective Action Requests.

Corrective Action Requests (CAR) will specify the PEMP non-conformance and require the person/organisation responsible to state the corrective action being taken and its time of completion. The CAR will require a statement of preventive actions to be prepared by the Contractor to ensure that similar non-conformances do not occur in future.

### **13.3 Reporting of PEMP**

An Environmental Management File (EMF) shall be maintained by the Contractor, containing all documentation pertaining to environmental management of the project. The EMF should take the form of a traditional correspondence file. The Contractor shall undertake weekly inspections of the construction area to identify any Environmental Management non-conformances with construction phase actions. A report providing details of these inspections is to be maintained on the EMF.

The Contractor shall prepare a monthly report including a description of monitoring activities, non-conformance notices and corrective action notices (both completed and pending). The monthly reports shall be made available to the Principal's Representative for review.

During construction, the Contractor's Environmental Representative shall make periodic visual inspections of the Site and any discharges from the Site.

The Contractor and any sub-contractors shall report any non-conformance with the PEMP to the Principal's Representative. Reporting shall be done immediately after the non-conformance has occurred.

The Contractor is responsible for carrying out preventative action and corrective action resulting from a non-conformance.

### **13.4 Training, Awareness and Competence for PEMP**

All activities on the project which have a potential to cause environmental harm shall be identified by the Contractor and personnel competent to carry them out shall be selected by the Contractor or, alternatively, others shall be given specific training and assessed for competency.

All staff shall be trained and assessed in environmental responsibilities by the Contractor.

The Contractor should be aware that compliance with the PEMP does not remove the responsibility of compliance with the law.

### **13.5 Standards, Legislation and Guidelines for PEMP**

Compliance with the PEMP shall be made a condition of acceptance of the contract to work on the Site by the Contractor and any sub-contractor.

The Contractor shall plan and execute the construction to prevent or minimise environmental harm and in accordance with best practice environmental management as required by the *Protection of the Environmental Operations Act 1997*.

The following shall apply to monitoring and auditing of performance:

Item	Relevant Act or Guideline
Water	Protection of the Environment Operations Act 1997 Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG, August 2018).
Soils	Contaminated Land Management Act 1997 National Environment Protection (Assessment of Site Contamination) Measure 1999 (April 2013).Waste Classification Guidelines. Part 1: Classifying Waste NSW EPA NSW November 2014
Air	Protection of the Environment Operations Act 1997
Noise and Vibration	Protection of the Environment Operations Act 1997 Interim Construction Noise Guideline
Flora and Fauna	Biodiversity Conservation Act 2016 Fisheries Management Act 1994
Dangerous Goods	Dangerous Goods (Road and Rail Transport) Act 2008 Environmentally Hazardous Chemicals Act 1985 AS1940 Storage and Handling of Flammable and Combustible Liquids
Soil Erosion and Sediment Control	Soil Erosion and Sediment Control – Engineering Guidelines for Construction Sites - Institution of Engineers 1996. Managing Urban Stormwater: Soils and Construction (Blue Book)

### 13.6 PEMP Elements

The following elements are considered the minimum requirements for the PEMP. Management measures identified in the environmental assessment document and any measures noted in approvals, permit or licences should also be included in the PEMP.

PEMP #1	Erosion Control, Stormwater and Marine Water Quality Management
PEMP #2	Management of Marine Ecology
PEMP #3	Navigation and Road and Pedestrian Traffic Management
PEMP #4	Air Quality Management
PEMP #5	Noise and Vibration Management

#### 13.6.1 PEMP #1: Erosion Control, Stormwater and Marine Water Quality Management

##### **General**

The Contractor shall determine the control measures appropriate to the Site. Prior to the commencement of the Works, the Contractor shall prepare an Erosion and Sediment Control Plan in consultation with the Principal.

Management measures shall incorporate the following items:

- Local stormwater runoff from undisturbed areas upstream of the Site should be diverted away from the Site and discharged to existing drains if possible. Minimise any alteration of existing drainage patterns in undisturbed areas, and stabilise to protect against erosion as required.
- Refuelling should be done off site. However, if refuelling on site is required, due care shall be taken to avoid spilling fuel and a tray should be used to catch any accidentally spilt fuel. Plant refuelling/servicing activities to be completed on-land and away from waterway areas.
- Industry standards and pollution prevention regulations shall be adhered to during refuelling, transfer, storage and handling of hazardous materials
- Contractor to ensure that all plant is maintained in good working order with regular servicing.
- Spill response kits to be maintained onsite for use as required by trained Contractor personnel.
- No major maintenance of equipment shall be undertaken on-site.
- Timing of works should be planned to avoid, where possible, periods of high rainfall or during storm/wind warnings. Where this is not possible, preparation and tidying should occur around the worksite to reduce the potential for contamination of the waterway from stormwater runoff.

- Weather and tide forecasts need to be checked regularly during construction. Where flooding or inundation is forecast to the any work area, all equipment and materials need to be removed from the landside construction zone or appropriately secured above expected flood levels in the area.
- The lowest level of hydrocarbons (oil, grease, petrol, diesel) practicable will be stored on site.
- Appropriate controls should be used when working on the rock platform to capture any materials that may be produced by the demolition or construction works and to prevent them entering the marine environment.
- If storage on-site of hazardous substances is required then effective bunding should be used in construction areas.
- Sleeves should be fitted over hydraulic hoses on equipment operating on or near the waterway to capture any hydraulic fluid that may be spilt from a ruptured hose or an alternative mitigation measure in lieu of sleeving that achieves the same water quality management intent such as use of biodegradable hydraulic oil, regular pre-start hose/pump inspections, floating boom or other suitable measures.
- Any worn or damaged hoses, joints or connections identified during inspections need to be replaced prior to their use.
- Non-toxic and/or biodegradable chemicals should be used for curing of concrete.
- Appropriate site and project inductions/training detailing potential water quality impacts and relevant construction measures and spill and emergency response procedures should be used.
- Filtering devices, silt and sediment traps and other devices shall be utilised where feasible to prevent sediment, turbidity and other pollutants which result from the Works being discharged into the marine environment.
- The extent of disturbance shall be the minimum required for construction activity or that provided in any Development Consent and/or relevant permit(s), whichever is the lesser.
- At completion of construction the Site shall be cleared of potentially polluting materials.
- Inspections of the construction area and observations of work practices shall be undertaken daily to identify any existing potential problems.

### **Protection of Pittwater**

The Contractor shall ensure that the water quality and ecology of Pittwater is not impacted by the Contractor's work.



No demolition or excavation material, or any other materials supplied to the Site, shall be lost or disposed of into the marine environment, irrespective of whether this action occurs illegally or accidentally. Upon any such incident, the following shall occur:

- the Contractor shall immediately provide sufficient resources to retrieve the loss or disposal;
- the date, time, exact location and extent of the placement or disposal shall be recorded by the Contractor in writing and by photographs;
- the incident shall be reported to the Principal's Representative within three (3) hours; and,
- the placement or disposal shall be recovered from the river to the satisfaction of, and within a timeframe stipulated by, the Principal's Representative.

The cost to the Contractor of protecting the marine environment in accordance with this clause shall be fully borne by the Contractor, and shall be deemed to be included in the Tender price for the Works.

#### 13.6.2 PEMP #2: Management of Ecology

The Contractor shall ensure that construction activities are carried out in a manner that minimises the impact on flora and fauna.

The following shall be included in the PEMP:

- The Works shall minimise the destruction of flora and interference with fauna.
- Minimise area disturbed by construction activity. The extent of disturbance will be the minimum required for the construction activity or that prescribed in any Development Consent and/or relevant permit(s), whichever is the lesser.
- The Contractor shall mark the boundaries of areas proposed to be cleared and obtain approval from the Principal's Representative before clearing commences.
- The Contractor shall undertake a site walkover immediately prior to the commencement of excavation with the objective of relocating any fauna in the work area to nearby similar habitats.
- The Contractor shall ensure that work practices prevent injury to, or death of, any native fauna on the construction site. Any native fauna injured by the Works shall be transported to an animal hospital or refuge without delay.

#### 13.6.3 PEMP #3: Navigation and Road and Pedestrian Traffic Management

The Contractor shall be responsible to undertake and invoke all necessary navigation and road and pedestrian traffic management measures during construction as required by the relevant authorities. The cost of all such measures as required and requested by the relevant authorities is deemed to be included within the Contractor's tendered price.

Navigation and road traffic management shall comply with the requirements of NSW Roads and Maritime Services and NBC. The Contractor shall comply with the following minimum requirements:

- coordinate transport to ensure minimum damage to public and other access roads;
- be familiar with proper navigational procedures and adhere to all regulations including speed and other navigational requirements when travelling to and from the site;
- utilise materials sourced locally wherever possible to limit the use of public roads for long distance hauling of bulk construction materials;
- ensure that the transportation of dangerous goods is in accordance with the regulations and the relevant codes and standards published by Standards Australia;
- ensure that a regular program of street cleaning is undertaken within public road entries and exists from the Contractors Work Area; and,
- any use of the Clareville Beach car park or local roads for parking or works operations should be discussed with Council and also local residents and businesses in order to address concerns and issues early on.
- washout of concrete trucks and cleaning of equipment and/or vehicles used during the construction shall not be undertaken in locations that permit flow of untreated wastewater directly to the open drainage system or Pittwater.

#### 13.6.4 PEMP #4: Air Quality Management

The Contractor is responsible for ensuring that the operation of construction plant and equipment results in minimum impact on air quality.

Best management practices shall be implemented including:

- minimising areas disturbed and exposed at any one time;
- revegetating or otherwise stabilising disturbed areas as soon as practicable;
- ensuring exhaust emissions from construction machinery and trucks remain within NSW EPA emission standards;
- watering or covering as required earthworks, spoil stockpiles and the like to minimise dust emissions;
- ensuring that all vehicles and equipment are fitted with appropriate exhaust control measures and are adequately maintained in line with manufacturer's requirements;
- covering all vessels/trucks transporting earth and fill materials where dust could be generated; and,

- ensuring that all vessels/trucks leaving the construction site are checked daily for mud/dust and cleaned as necessary.

Burning of any waste arising from construction activities is prohibited.

#### 13.6.5 PEMP #5: Noise and Vibration Management

The Contractor shall ensure that noise and vibration on the Site are within acceptable limits as set out in relevant NSW legislation and guidelines.

To minimise noise impacts during construction, all construction activities on the Site including entry and departure of heavy vehicles shall be restricted to the Working Hours.

The Contractor shall utilise best practices and policies to minimise noise and vibration from construction. These shall include the following:

- All construction plant to be fitted with current best practice noise control and attenuation devices and maintained and operated to ensure that noise emissions are minimised.
- Avoid sudden stop/start movements of tracked equipment.
- Qualitatively monitor ground vibrations when using mechanical plant for demolition and excavation. If vibrations are excessive (i.e. clearly perceptible to a hand placed over adjoining structures) then use of the plant should cease and geotechnical advice sought. If damaging vibrations are occurring, it will be necessary to use lower energy equipment such as smaller hammers, grinder attachments or grid sawing techniques.
- Blasting is not permitted.
- Ensure vehicles and construction equipment is maintained within service guidelines to minimise noise emissions from malfunctioning equipment.

## **APPENDIX A: GEOTECHNICAL REPORT**

## **APPENDIX B: CONTAMINATION REPORT**

## **APPENDIX C: SPECIFICATION FOR ROCK BOLTS**