# MARINE POLLUTION RESEARCH PTY LTD

Marine, Estuarine and Freshwater Ecology, Sediment and Water Quality Dynamics

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## AQUATIC ECOLOGY SURVEY & ASSESSMENT

## 52 STURDY LANE LOVETT BAY, PITTWATER

**Figure 1** Drone view of existing facility (centre) in June 2020 at neap low tide. Note that North is down to the right for this view.

## 1 INTRODUCTION

MPR was requested by Steven Crosby & Associates (SCA) to undertake a survey of possible aquatic ecological impacts of proposed refurbishment and alteration works at the above address. The site is located on the south-western shoreline of Lovett Bay, Pittwater and faces north-east. Properties to the east and west of the subject property have similar marine facilities comprising jetties, ramps, pontoons, mooring pens and sliprails.

The existing marine facility is shown in a drone photograph from June 2020 (**Figure 1**). **Figure 2** provides a view from the water looking south. **Figures 3 and 4** provide views north-east from the south end of the existing jetty looking along the western and eastern sides of the property jetty with **Figure 5** showing the inshore beach. SCA have prepared a plan showing the existing and proposed facility outlines (see plan DA01 attached to this report). The intent of the refurbishment is to remove the unsafe sea-stair facility and provide a ramp and pontoon facility plus a new berthing pen.

With respect to expected marine vegetation, estuarine vegetation mapping on NSW DPI Fisheries Map 37) indicate a *Posidonia australis* (Strapweed) bed off-shore at this location (see **Figure 6**).

**Figure 2** Existing Facility Jetty. Boatshed and sliprails looking inshore from Lovett Bay.

**Figure 3** View of western side of facility showing sliprails, stone jetty with wood deck and offshore jetty.

**Figure 4** View of eastern side of facility showing sandy beach inshore and jetty plus sea-stairs offshore.

**Figure 5** Sand beach inshore extends into the shallow subtidal and there is banked up algae debris inshore and immediately offshore.


**Figure 6** Distribution of marine vegetation along the Lovett Bay shoreline in the vicinity of the subject property (red arrow). Green = mangroves, Red = *Posidonia*., Blue = *Zostera*.

## 2 AQUATIC ECOLOGY OF THE SITE

A constraints and opportunities dive survey was made on 19 May 2020 and a sketch map provided to SCA showing the marine vegetation constraints. SCA then requested MPR to undertake a more detailed survey against a modified proposal, which was undertaken on 22 June 20. SCA provided a final proposal plan on 3 July 2020 (Plan DA01 attached to this report). **Figure 6** provides a drone view of the site with the proposal overlaid and the main fish habitats indicated. The aquatic ecology of the site is described as follows:

- The upper intertidal and shallow sub-tidal seabed in this locality comprises an irregular extended area of sand with some gravel shale with a banked-up layer of beach sand inshore (**Figures 1 & 3 to 5**). There is less exposed gravel offshore and the sand becomes progressively more silty.
- There is a rock rubble jetty located under the wood jetty (**Figures 3 and 6**) and the sub-tidal portion of this rubble supports a variety of brown macro-algae, mainly *Sargassum* and *Padina* (**Figures 7 to 9**). The intertidal rocks supported *o*ysters plus littorinid snails and Zebra Periwinkles *(Austrococchlea constricta)*. There were also sand whelks (*Velacumantus australi*) scattered throughout the rubble.
- There is a mixed and patchy *Caulerpa taxifolia* and *Zostera* seagrass distribution as indicated on **Figure 6** (see also **Figures 10 and 11**).
- Whilst there was no *Posidonia* bed found for the survey area, there were a few small patches of scattered shoots noted as indicated in **Figure 6** (see **Figures 12 to 14**). There were also a few individual *Posidonia* shoots noted within the patchy *Caulerpa* distribution off shore from the facility deck, but none were located in the area of the proposed mooring pen.
- The *Caulerpa* cover became progressively denser offshore from the outer deck support piles (see **Figures 15 and 16**).
- The deck support piles had oysters bands in the intertidal to shallow sub-tidal depth range which, together with the attached biota on the rock rubble (and on pontoon wetted surfaces, as observed on adjacent facilities) provided some shelter and feeding habitat for a range of juvenile reef fish (**Figures 15, 17 and 18**).

**W**ith respect to other possible aquatic ecological aspec requirements for DPI Fisheries:

- There are no saltmarsh or mangrove plants or patches at the site but there are mangroves in the bay to the west of the property as indicated on **Figure 6**.
- There are no aquacultural activities, or commercial fishing (hauling or meshing) in the locality (EPA 1992).


**Figure 6** Site at low tide showing main aquatic vegetated habitats; mixed *Zostera* seagrass plus Caulerpa distribution (green) and rock rubble with algae under jetty and ramp (brown).

**Figure 7** Brown *Sargassum* algae growing on shallow rock rubble under jetty.

**Figure 8** deeper sub-tidal rock rubble under proposed Access deck. Note sparse *Zostera* cover.

**Figure 9** Deep rock off the south-east corner of the existing Jetty (indicated by the white survey staff) at top right) with *Zostera* inshore (to the left of the photograph).

**Figure 10** Patchy *Zostera* bed in the shallows looking north with the existing jetty to the left (out of view) and a pile stump mid picture.

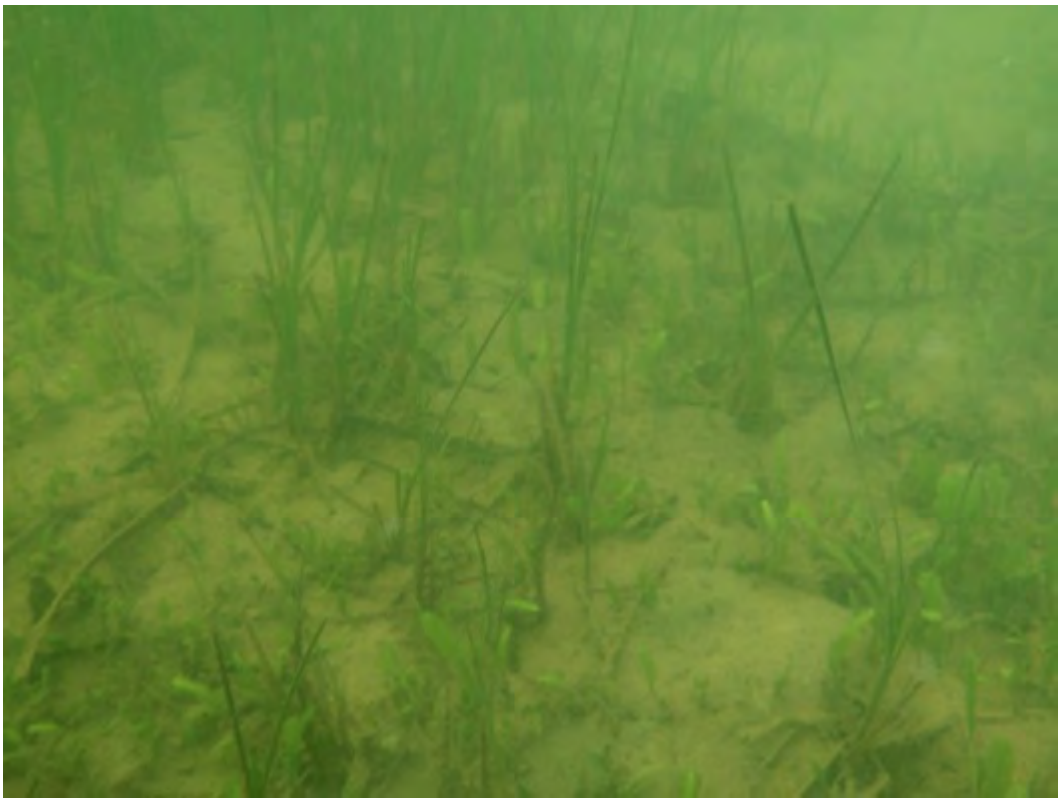

**Figure 11** Patchy *Zostera* cover with sparse *Caulerpa* about halfway between the two mooring piles.

**Figure 12** Scattered *Posidonia* patch located between the two mooring piles (see Figure 6).

**Figure 13** Outer snapped off mooring pile with very sparse *Posidonia* cover in vicinity.

**Figure 14** Close up view of *Posidonia* and *Caulerpa* patch in vicinity of snapped off pile (as indicated in Figure 6)

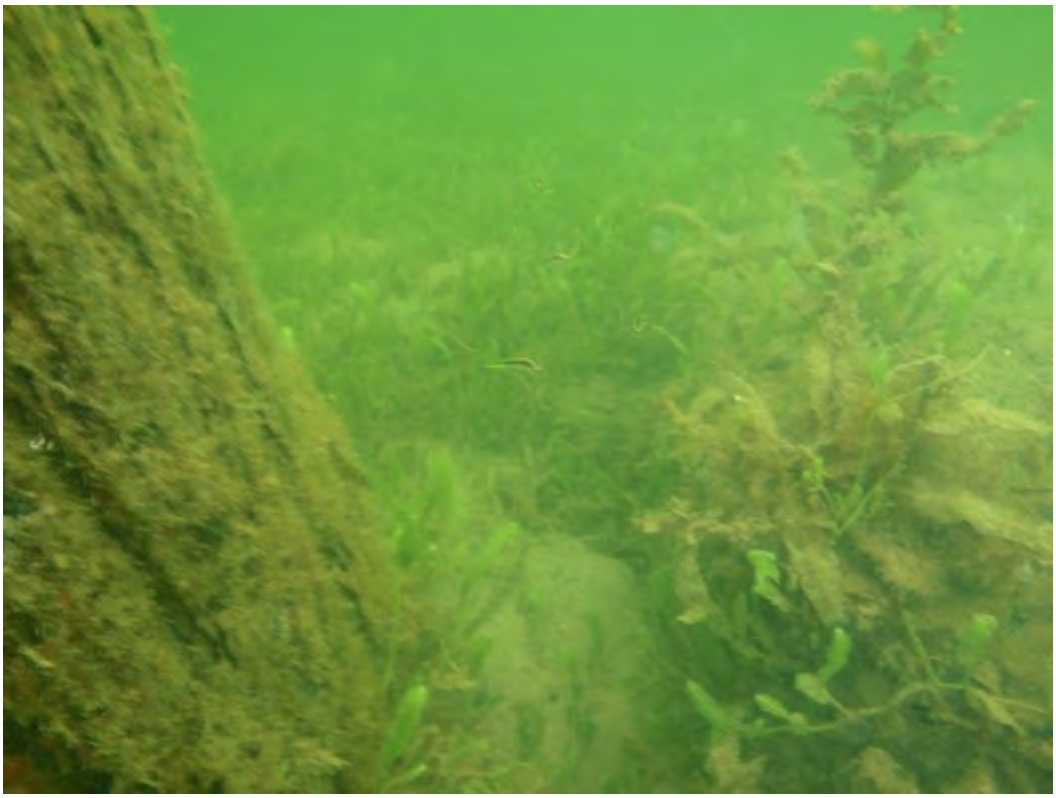

**Figure 15** North-Western Deck support pile with *Caulerpa* and *Sargassum* around the pile. Note also reef colonising eastern hula fish.

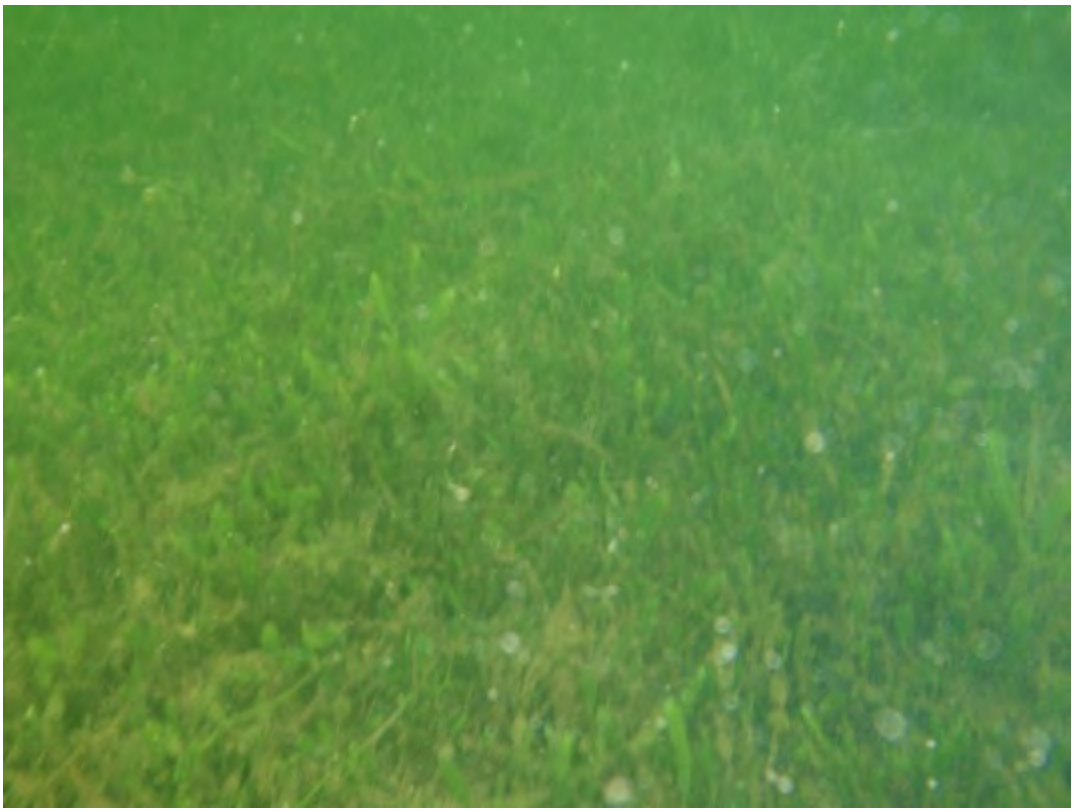

**Figure 16** Dense *Caulerpa* bed in deeper waters offshore.

**Figure 17** Bare sediment habitat around inner mooring pile between Nos 52 and 54 (to the east).

**Figure 18** Simple assemblage of algae and attached fauna on pontoon support drum (on adjacent facility).

## 3 IMPACT ASSESSMENT

The project will require the demolition of the existing facility sea-stairs plus a portion of the outer deck, including removal of at least six deck support piles. Construction will require placement of at least five support piles for the ramp access deck and for the cut back deck, plus two locator piles for the new pontoon:

- Removal of piles plus the removal of wetted portions of the sea-stairs will remove some marine biota habitat, and pulling of piles will disturb some seabed sediments, bringing some sediments to the surface adhered to the piles. The resultant pulses of sediments mobilised by the pile extraction procedure are rapidly dispersed in the estuarine waters.
- As there is *Caulerpa* in the vicinity of the piles to be pulled and is found growing generally on the seabed around the works, there is a risk of disturbing and fragmenting *Caulerpa,* with risk of transport to other estuaries via fragments adhered to equipment associated with the works (vessels, anchor gear and equipment). This risk can be mitigated by use of Caulerpa Management measures as set out in **Section 3.2** below.
- The new outer deck piles and the pontoon locator piles are to be driven into fragmented rock rubble plus bare or *Caulerpa*-supporting sediments, and the two ramp access deck piles will be placed into mixed rock rubble and sparse intertidal *Zostera* habitat. Up to 0.14m$^2$ of this habitat would be impacted for the Access Deck piles, of which at least half would be *Zostera* habitat.
- There will be no sub-surface sediments mobilised by pile placement as the pile driving or screwing action pushes and compresses soils aside with some entrained downwards via friction effects.
- Pile driving is associated with pulse turbidity, caused partly by rig and pile driving head lateral vibration, and also via compression of sediments, whereby the laterally-compressed sediments compress waters in adjacent benthic fauna burrows jetting turbid water up out from burrows. As the local waters are full marine salinity, these sediments rapidly fall back to re-settle on the seabed.
- Notwithstanding the low risk of aquatic ecology harm from turbid plumes associated with pile removal and placement, piling associate turbidity can be constrained by the use of a floating silt curtain around the active works.

The demolition and construction works would be undertaken from barges including a barge-mounted pile driving rig and potential impacts from construction related vessel movements

(propeller wash, cable scouring, damage to inshore habitats) can be mitigated by inclusion of specific aquatic ecology impact mitigation measures into the project **Construction Environment Management Plan (CEMP)**. These are set out in **Section 3.3** below.

### 3.1 Habitat Losses and Gains

Operationally, the new facility replaces a fixed deck plus sea-stairs with a deck and pontoon structure and the mooring pen is located in the same place as the present mooring facility. Accordingly, there are no new operational impacts associated with use of the new facility compared to use of the present facility.

The new ramp and ramp access deck shade additional seabed including seabed that supports marine algae and seagrass. However, given the orientation of the facility to available sunlight plus the shallow (intertidal depth) for the short form *Zostera* under the access deck, there will be sufficient available sunlight to prevent losses due to shading. This risk can be further mitigated by decking the ramp with metal mesh to allow additional light penetration to the seabed.

In terms of habitat losses and gains, the temporary loss of algae habitat from the wetted surfaces of sea-stairs and piles to be demolished will be directly offset by the new wetted surfaces of proposed piles and pontoon. Whilst placement of the two ramp access deck piles will result in the permanent loss of up to 0.14m$^2$ mixed rock rubble and sparse intertidal *Zostera* habitat, this loss will be offset by the additional 0.24m$^2$ vertical wetted surface areas of the new pontoon north and east faces (8m by 0.3m) that face the sun and which will be colonised by marine algae.

### 3.2 Pest Algae *Caulerpa* Management

Construction activities may also disturb and mobilise *Caulerpa taxifolia* fragments that can be carried to other estuaries not currently infested. Fragments can also adhere to equipment (ropes, cable, anchors) that can then be transported to other estuaries to infest these estuaries when the equipment is re-deployed (**Figure 19**). This risk will be mitigated by inclusion of the following *Caulerpa* Management protocols:

- The need for *Caulerpa* management will be included in inductions.
- Mooring lines or cables will not be laid across the marine vegetation habitats where there is any risk of these cables reaching the bottom and disturbing, fragmenting and mobilising the pest algae species *Caulerpa*.

- In order to prevent mobilisation of the pest algae *Caulerpa*, towing or pushing vessels must not use excessive power to manoeuvre barges into place near the designated marine vegetation habitats.
- All the wetted surface areas of demolition or construction related materials taken from the waters must be inspected for attached *Caulerpa taxifolia* plants and these must be collected and disposed of into plastic bags then placed into garbage bins on shore (i.e., in the manner recommended in the NSW Fisheries' *Caulerpa* Management Plan).
- All construction related equipment that comes in contact with the seabed (including mooring tackle, cables, ropes and anchors), must be inspected for attached fragments of the declared pest algae species *Caulerpa taxifolia* and any fragments found must be collected and disposed of into plastic bags then placed into garbage bins on shore.
- All construction offcuts must be removed from the site and no construction materials are to be placed or stored on the seabed. Any dropped offcuts are to be retrieved from the seabed immediately, inspected for *Caulerpa* fragments that are to be picked off and disposed to shore garbage facilities for appropriate off-site disposal

**Figure 19** The pest algae *Caulerpa taxifolia* attached to a segment of chain.

### 3.3 Minimising Potential impact from Construction Vessels

All contractors undertaking construction work associated with the project shall ensure that their activities do not cause any harm to the marine vegetation habitats (i.e., yellow, brown, green and purple outlines, as identified on **Figure 7** above**.** In order to achieve this aim, contractors shall implement the following precautions:

- By virtue of the shallow depths over the inshore vegetated habitats, no vessel is to be taken over the indicated marine vegetation areas unless there is sufficient depth to prevent vessel or propulsion damage, including damage from wash.
- There will be no stockpiling of construction materials on the seabed.
- No vessel is to be moored with anchor or other bottom tackle located in the marine vegetation habitats indicated on **Figure 6**.
- Mooring lines or cables must not be laid across the marine vegetation habitats if there is any risk of these cables reaching the bottom due to wave action or low tides.
- If cables are deployed, they must be suitably buoyed prior to laying, and kept buoyed once laid, to prevent cable drag and cable swing damage (scalping) to marine vegetation areas. Where this is impractical, contractors should use floating rope.
- In order to minimise wash and prevent bottom scouring of the marine vegetation habitats, towing or pushing vessels must not use excessive power to manoeuvre barges into place near the designated marine vegetation habitats. Scouring damage can also be minimised by 'working the wind and tides', i.e., only moving floating plant into place on high tides and under favourable or no winds.
- The potential for demolition and construction materials and liquids to be accidentally spilt into the waters can be minimised by the use of best practice construction management procedures to be included in the overall Project Construction Environmental Management Plan (CEMP).

### 3.4 Fisheries Management Act Permit Requirements

Part 7 of the Fisheries Management Act 1994 (FMA) sets out the conditions under which permits are required for various construction activities, and the conditions under which a permit may be granted are specified in the Fisheries NSW Policy and Guidelines (NSW Fisheries 2013). With respect to estuarine activities, permits are required *inter alia* for the "*taking or harming of marine vegetation"* or for "*reclamation or dredging works"*:

- The present proposal does not include dredging or reclamation.
- Other than the access ramp deck plus new ramp, the proposed facilities will not

shade any existing marine vegetated habitats and there is a low risk of shading impact due to the orientation of the facility to available sunlight. Residual risk is further decreased by use of metal mesh to deck the proposed ramp.

- The proposal requires removal of wetted sea-stair and pile structures that support marine vegetation, and the placement of two new piles will result in a loss of up to 0.14m$^2$ of mixed intertidal rock rubble and short-form *Zostera* habitat. The proposed facility will provide a larger wetted surface area for recolonisation by similar assemblages of marine biota than is to be lost, and as there is proportionally more of this wetted surface area directly exposed to sunlight, there will an overall net increase in wetted surface area for colonisation by marine algae offsetting the intertidal *Zostera* area loss.

As there is no dredging or reclamation required and as the risk of harm for marine vegetation is minimised by appropriate construction safeguards it is concluded that the project is not likely to require a Part 7 Permit under the *FMA*.

### 3.5 Acid Sulfate Soil Assessment

The Pittwater LEP 2014 (PLEP) classifies the waters of Lovett Bay as *Class 1* Acid Sulphate Soils (ASS), the land at the site is classified *Class 5*, and the site is within 170m of *class 2 ASS* (to the west - see **Figure 20**).

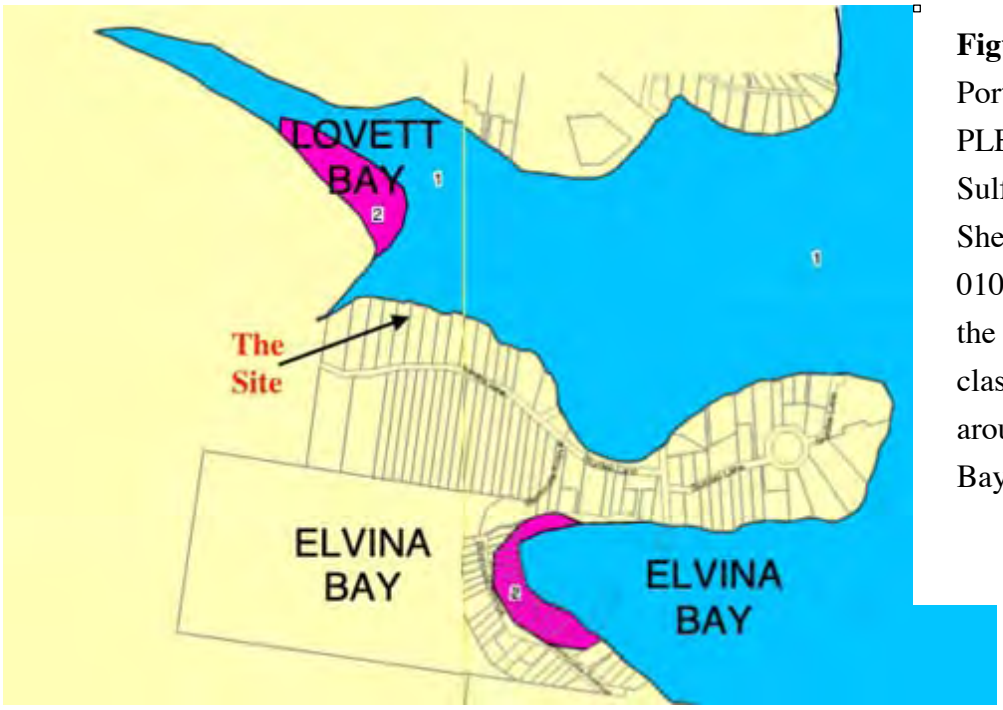


**Figure 20** Portions of PLEP Acid Sulfate Soils Sheets 005 and 010 showing the ASS soil classifications around Lovett Bay.

**PLEP Clause 7.1 (2)** states that *Development Consent is required for the carrying out of works described in the Table to this subclause on land shown on the Acid Sulfate Soils Map as being of the class specified for those works* and for Class 1 Lands the works are described as "*any works*". **PLEP Clause 7.1 (6)** states that *Despite subclause (2), development consent is not required under this clause to carry out any works if:*

*(a) the works involve the disturbance of less than 1 tonne of soil* ***and***

*(b) the works are not likely to lower the water-table.*

These two clauses are encapsulated in the ASS Manual (ASSMAC 1998) model ASS LEP that states *inter alia*:

*The Model Acid Sulfate Soils LEP requires that if works:*

- *involve disturbance of more than one (1) tonne of soil or lowering of the water-table;* ***and***
- *trigger the criteria relating to the land (see the ASS Planning Maps which are based on the level of risk associated with the soil characteristics and the depth and type of works),*

*a preliminary test must be undertaken to determine if an ASS Management Plan is required. If an ASS Management Plan is required, a development application must be lodged for the works. The Model ASS LEP clauses only apply to works likely to result in environmental impacts from the disturbance of acid sulfate soil.*

The proposal as indicated on the project Site Proposal Plan requires the removal of a portion of the present facility and replacement with a new jetty, ramp, pontoon and mooring pen facility. The proposal is located in Lovett Bay draining to West Pittwater, which has the full tide range of around 0m Lowest Astronomical Tide (LAT) to +2m HAT (Highest Astronomical Tide).

### 3.5.1 Potential for ASS Soil Disturbance During Demolition

In terms of disturbance of the seabed for the demolition phase, the proposal requires the removal of six piles for present pontoon:

- Piles are generally driven to around 3m depth on average in Pittwater and due to remobilisation and bioturbation of surface sediments by physical and faunal activity over time, the top half metre of seabed sediment is saturated by overlaying oxygenated waters so that there is no significant PASS remaining in this upper layer.

- Assuming a (conservative) consistent level of PASS in sub-surface sediments, up to 2.5m of pile surface are driven into PASS sediments. At 0.3m diameter, each pile has a maximum 2.35m$^2$ of pile surface in contact with PASS sediments prior to pulling.
- For the pile removal to generate the 1000kg of disturbed PASS required for PLEP Clause 7.6, each of the 0.3m diameter piles would need to disturb and bring to the surface 167kg of PASS sediment.
- Pile removal will be undertaken using barge mounted pulling equipment with the pile extracted through tidal waters:
    - For the most part there is very low adhesion of sub-surface soils extracted with the piles, as friction effects from the surrounding pressurised soils during the extraction process rubs the soils off, with residual sub-surface soil mixing with shallow saline and non-ASS surface sediments on final extraction.
    - Accordingly, for the most part there is a short pulse of adhered soil material dispersed to the overlaying waters as the pile is extracted through the water column.
    - Rarely, where there are adhesive clays, there may be some sediment adhering to the piles as it is raised above the surface and these are likely to be PASS. These layers are thin (no more than 5mm) and non-uniform in areal distribution around the pile.
    - Assuming a conservative and unlikely case that the pile brings a uniform 5mm layer of adhering clay to the surface, this would result in around 12kg of PASS being brought to the surface per pile for a total load of 72 kg or about 7% of the one Tonne required by the PLEP and ASS Manual.
- In practice, the resultant pulse sub-surface sediments mobilised by the pile extraction procedure are mostly dispersed in the estuarine waters and do not provide any ASS hazard, as they remain saturated in the estuarine waters and ASS/PASS require time out of the water for these soils to be oxygenated (in air) to trigger or start the acid forming process. These soils will eventually be dispersed and reincorporated into estuarine sediments and pose no ASS/PASS risk to overlaying waters or to seabed sediments and seabed biota.
- Whilst the small amount of PASS that may remain adhered to the piles that are brought to the surface can become ASS, this requires considerable time (up to 18 hours exposure to air). Whilst overall this is a low risk given the small amounts of soils that are actually brought out of the water, the risk can be further minimised by appropriate pile removal management as detailed in **Section 3.5.4** below.

### 3.5.2 Potential for PASS Soil Disturbance During Construction

In terms of PASS soil disturbance during construction, there will be no excavation required for the project as all piles are to be driven into the seabed.

- All piles are to be driven into shallow intertidal or sub-tidal sediments from a barge-mounted pile driving rig which will require high tides for its operation, and therefore there will be no sediments mobilised, as the pile driving action pushes and compresses soils aside with some entrained downwards via friction effects. As a result, the sediments remain intact and under water, and as they are not exposed to air, there is no risk of acid generation arising from piling activities.
- Pile driving is associated with pulse turbidity, and this is caused partly by rig and pile driving head lateral vibration, and also via compression of sediments, whereby the laterally-compressed sediments compress waters in adjacent benthic fauna burrows jetting turbid water up out from burrows.
- As the local waters are generally full marine salinity, these sediments rapidly fall back to re-settle on the seabed due to the particle clumping effect in saline waters.
- There is therefore no 'secondary excavation' or any exposure to air of sediments associated with turbidity caused by pile placement/driving.

### 3.5.3 Potential for Alteration of the Water Table

The level of the water table below the tidal seabed will fluctuate dynamically according to the interplay of gravity pressure from fresh groundwater flow (which varies with the rate of wet or dry weather infiltration), and the back pressure imposed by the tidal waters that saturate the seabed sediments down to the water table.

Accordingly, removal or placement of piles will have no material effect on the sub-surface water table levels nor on the rates of exchange/mixing of freshwater groundwater with overlaying saline waters. That is, there is no potential for alteration of the water table associated with pile removal or driving activities into intertidal and sub-tidal waters. Further, as there are no temporary or permanent excavations associated with the project inshore, there will be no lowering of the local water table.

### 3.5.4 Assessment against Pittwater LEP 2014 Clause 7.1

In sum, no soil is to be excavated for the project, there will be far less than 1 tonne of PASS disturbed for the project, and the small amounts of PASS that would be disturbed and brought from the seabed surface would for the most part be returned to the estuarine waters to be dispersed and re-incorporated into the seabed sediments with no exposure to air, and no opportunity to become ASS. Accordingly, the project would meet **both** provisions of Pittwater LEP Clause 7.1 (6) and thus the project should not require development consent under Section 7.1 (2), there is no requirement for the preparation of an ASS Management Plan as per Clause 7.1 (3) and there is no requirement for preliminary testing against the Model ASS LEP provisions set out in the ASS Manual.

Over and above this conclusion, it is also concluded that there is likely to be a very small residual amount of PASS adhering to the single pile that is to be removed which, if left intact on the piles, and with the piles subsequently stored exposed to air, could generate a small amount of acid. Whilst, the project as described above meets the objectives of Clause 7.1 (1), in that the development would not disturb, expose or drain acid sulfate soils OR cause environmental damage to the locality or to the waters and ecology of Pittwater, it is recommended that residual risk from the small amounts of sediments adhering to pulled piles as described above be managed *in situ* via the following recommended pile removal management plan to be incorporated into the project CEMP:

1. Pile removal and placement works are to be enclosed using a floating silt curtain to facilitate rapid dispersal of disturbed sediments back to the seabed.
2. All seabed sedimental material on the demolished pile is to be hosed off the pile prior to the pile leaving the silt curtain area, preferably as it is being pulled.
3. If the removed pile has adhered sub-surface seabed sediment and cannot be cleaned immediately but still needs to be stored exposed to air prior to cleaning, it must be washed and hosed off into estuarine waters contained by the floating silt curtain as soon as practicable with a maximum exposure time of 18 hours.

## 4 CONCLUSIONS

The part demolition of the existing jetty end plus replacement with a ramp, pontoon and locator piles at 52 Sturdee Lane Lovett Bay has been designed to prevent impact on the main seagrass beds identified in the location. Placement of two access ramp deck piles will result in a loss of 0.14m$^2$ of mixed rock rubble and intertidal *Zostera* habitat, and this loss will be offset by the provision of overall greater areas of pile and pontoon wetted surface areas, with proportionally more of this new colonisation area bathed in sunlight and thus available for colonisation by marine algae. The new pontoon is confined to the area of deck to be removed and the mooring pen is in the same location as the existing vessel berthing area, so there are no new operational impacts arising from the proposal.

Marine habitat loss and *Caulerpa* fragmentation plus export risks from construction activities have been assessed, and the report provides risk minimisation measures to be incorporated into the project Construction Environment Management Plan (CEMP).

The project ASS risk assessment concludes that development would not disturb, expose or drain acid sulfate soils OR cause environmental damage to the locality or to the waters and ecology of Pittwater and that residual risk from sediments adhering to pulled piles can be managed by implementation of a pile removal management plan as provided in the report and which would be incorporated into the project CEMP.

It is concluded that the project can be constructed and used with no measurable alteration of residual risk for the protection of marine fish habitats of Pittwater and meets the aims of aquatic ecological conservation of the *Fisheries Management Act* (1994) and of the Northern Beaches Council DCP (Pittwater 21).

## 5 REFERENCES

DPI Fisheries (2013)

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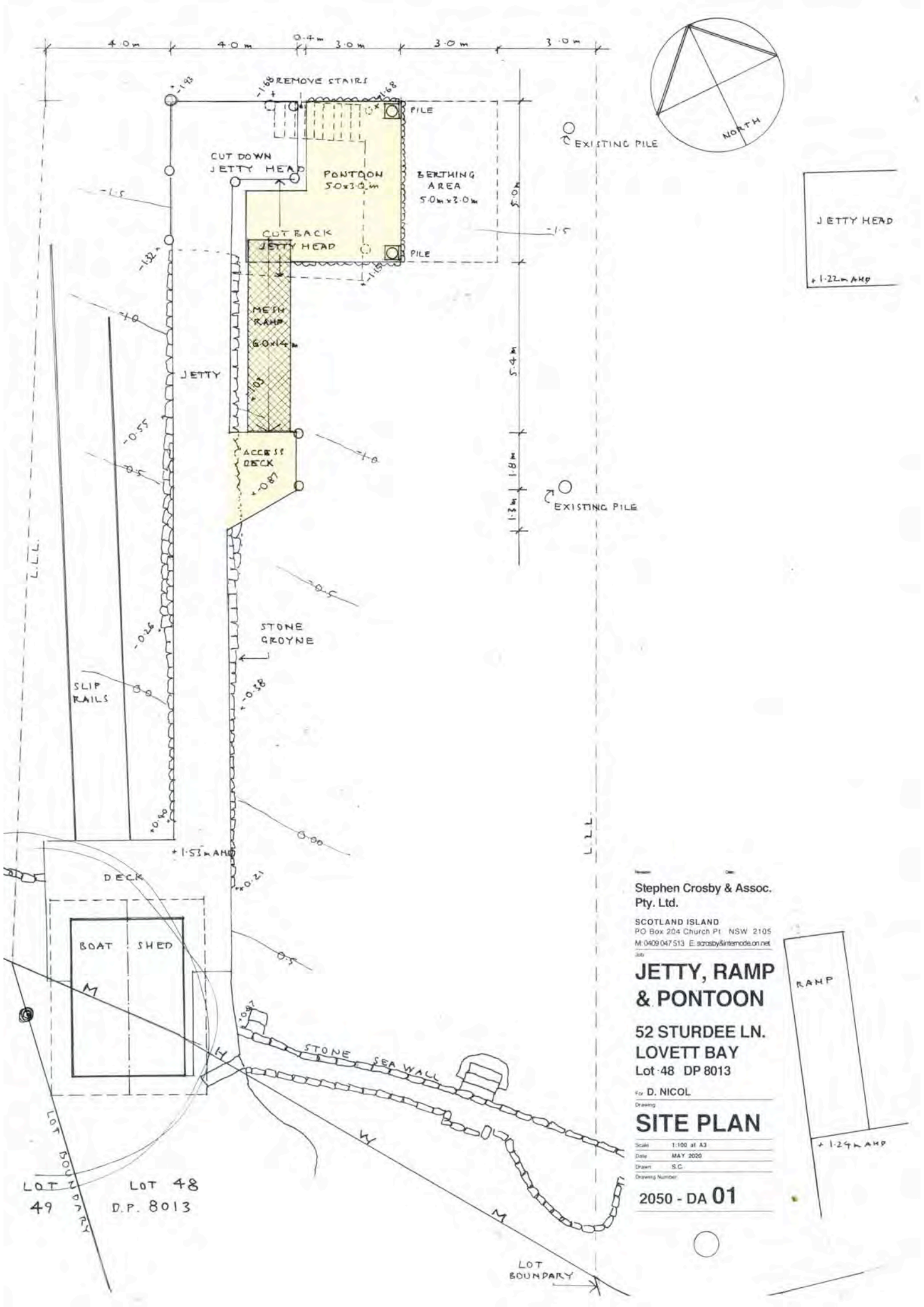


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Job

# JETTY, RAMP & PONTOON

## 52 STURDEE LN. LOVETT BAY

Lot 48 DP 8013

For D. NICOL

Drawing

# SITE PLAN

| | |
|---|---|
| Scale | 1:100 at A3 |
| Date | MAY 2020 |
| Drawn | S.C. |
| Drawing Number | |

2050 - DA 01