Our Ref: 16002 Trinity Point
Via: email

Date: 28 October 2016

Attn: Bryan Garland
Johnson Property Group
PO Box A1308
Sydney South NSW 1235

Dear Bryan

RE: TRINITY POINT HELIPAD OVERVIEW OF POTENTIAL MNES AND AQUATIC ECOLOGICAL IMPACTS

MJD Environmental has been engaged by Johnson Property Group (JPG), to prepare an overview of potential MNES and aquatic ecological impacts associated with, the Part 3A Concept Plan Modification application (MOD 3) for a helipad to be included as part of the concept approved marina and mixed use development at Trinity Point. The helipad is proposed to be integrated into the approved marina.

The need to assess for potential MNES and aquatic ecological impacts arose from the requirements provided in the Secretary's Environmental Assessment Requirements (SEARs) dated July 2016 (Ref: MP 06_0309 Mod 3). SEARs Item 5 of the General Requirements and Item 4 of the Key Issues outline matters to be considered as follows.

> *General Requirement's – Item 5*
>
> *Consideration of impacts, if any, on matters of national significance under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999.*
>
> *Key Issues – Item 4. Marina Development and Potential Impact's*
>
> *a) Address the potential marina impacts:*
>
> *- due to the marine structure and operations on the seabed, in particular on seagrass and benthic organisms including the shading effects of the structures proposed measures to prevent/mitigate impact (The design should minimise shading on the seagrass beds);*
>
> *- due to any structure located on the foreshore to interfere with the free movement of seagrass wrack along the foreshore, and on wave energy and the risk of deflection or refraction to other locations and proposed measures to prevent/mitigate impacts;*
>
> *- due to stormwater run-off on water quality and seagrass beds and proposed measures to prevent/mitigate impacts;*
>
> *- on navigation and existing swing moorings on or in the immediate area of Bardens Bay;*
>
> *- due to dredging activities including method to be used; dimension of area of works; nature of sediment; environmental safeguards;*

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- marine vegetation and include mapping and density distribution and measures to minimise harm to marine vegetation and details of compensatory habitat development to replace lost vegetation; and

- on fish species and their habitat.

b) Undertake an assessment of potential impacts of the marina development on hydrodynamic processes within Lake Macquarie and Bardens Bay including detailed hydrodynamic modelling undertaken to quantify potential impacts.

c) Address the principles of Crown lands management under Section 11 Crown Lands Act 1989 and Part 3 - the land assessment provisions.

This overview relies on the Aquatic Ecology and Baseline Investigations Report prepared by Marine Pollution Research (MPR 2014) Pty Ltd (September 2014) and Trinity Point Helipad - Aquatic Ecology Impact Report prepared by MPR (October 2016) (Refer to **Attachment 5**). On this basis, the overview is to be read in conjunction with the MPR (2014) and MPR (2016) reports. Additionally, the results of technical reports listed below have been relied upon when considering the nature and extent of potential impacts related to the proposed helipad.

- ADW Johnson Pty Ltd (2016). *Section 75 Modification (MP 06_0309 MOD 3) Environmental Assessment Report – Trinity Point Helipad.* October 2016;
- Avipro (2016). *Trinity Point HLS Report*. Letter Report. 25 October 2016;
- Royal Haskoning DHV (2016). *Environmental Assessment – Coastal Processes and Hydrodynamics. Letter Report*, 25 October 2016; and
- The Acoustic Group (2016). *Acoustic Assessment for a proposed Helipad- Trinity Point Development, Lake Macquarie*. ADW Johnson Acoustic Report 27th August

To this end, the SEAR matters for consideration have been addressed by the following technical studies.

Item	Addressed
General Requirement's – Item 5	
Consideration of impacts, if any, on matters of national significance under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999.	MJD Environmental overview
Key Issues – Item 4. Marina Development and Potential Impact's	
a) Address the potential marina impacts: *- due to the marine structure and operations on the seabed, in particular on seagrass and benthic organisms including the shading effects of the structures proposed measures to prevent/mitigate impact (The design should minimise shading on the seagrass beds);*	MJD Environmental overview referencing MPR (2014) and MPR (2016)
- due to any structure located on the foreshore to interfere with the free movement of seagrass wrack along the foreshore, and on wave energy and the risk of deflection or refraction to other locations and proposed measures to prevent/mitigate impacts;	RHDHV (2016)
- due to stormwater run-off on water quality and seagrass beds and proposed measures to prevent/mitigate impacts;	RHDHV (2016) and MPR (2016)
- on navigation and existing swing moorings on or in the immediate area of Bardens Bay;	ADW Johnson (2016)
- due to dredging activities including method to be used; dimension of area of works; nature of sediment; environmental safeguards;	ADW Johnson (2016) Note – there is no dredging associated with this proposal.
- marine vegetation and include mapping and density distribution and measures to minimise harm to marine	MJD Environmental overview referencing MPR (2014) and MPR (2016)

vegetation and details of compensatory habitat development to replace lost vegetation; and	
- on fish species and their habitat.	MJD Environmental overview referencing MPR (2014) and MPR (2016)
b) Undertake an assessment of potential impacts of the marina development on hydrodynamic processes within Lake Macquarie and Bardens Bay including detailed hydrodynamic modelling undertaken to quantify potential impacts.	RHDHV (2016)
c) Address the principles of Crown lands management under Section 11 Crown Lands Act 1989 and Part 3 - the land assessment provisions.	RHDHV (2016) ADW Johnson (2016)

Project Background

The Trinity Point Marina & Mixed Use Development was concept approved (MP 06_0309 for development of a staged 188 berth marina, tourism and hospitality buildings (including hotel accommodation, restaurant and function centre) and 8 accommodation buildings. Since Concept Approval, several components of the development have been approved by development application including:

- The first 94 marina berths and associated land based facilities (construction commenced February 2016) (LMCC DA Ref: DA 1503/2014).
- Tourism and hospitality (65 room hotel, restaurant and function centre) (LMCC DA Ref: DA 1731/2014).
- Apartments (4 x buildings consisting of 34 residential apartments and 93 tourist apartments) (LMCC DA Ref: DA 496/2015).

The overall concept approval of the development included an Environmental Assessment Report (EA) for the project area, of which an assessment of the development on terrestrial and aquatic flora and fauna had been undertaken and determined to have no potential impact to threatened species populations or ecological communities known from the locality listed under the NSW *Threatened Speceis Conservation Act (1995)* (TSC Act), NSW *Fisheries Management Act (1994)* (FM Act) or Commonwealth *Environment Protection and Biodiversity Conservation Act (1999)* (EPBC Act).

Proposal

Johnson Property Group are currently preparing an EA for the addition of a helipad to support the approved Trinity Point Marina and Mixed Use Development. The Helipad will be situated on the south-eastern side of the Trinity Point Marina, approximately 145m from the shore. The Helipad will be a 20m X 20m floating pontoon that will be secured by four telescopic piles. The helipad will be connected to the marina by a 17m long by 1.5m wide gangway and three 4x3m pontoons with up to one additional pile.

The Helipad operational hours will be restricted to daylight hours (season dependent) with no flights outside these times. The proposal seeks a maximum of 8 helicopter movements per day or 38 helicopter movements per week.

As part of the proposal several alternate flight paths for helicopter movements were tested. As a result of the testing, the proposal generally incorporates three preferred flight paths for the helicopter movements. Two of the paths are similar with their entry and exit points from the south coming in over Summerland Point and the third flight path enters and exits the helipad from the north over Barden's Bay. All three flight paths show a rapid ascent to 1,000ft (304.5m) from the helipad and have been designed to be predominately over water, during take-off and landing.

As part of the operational procedures for the Helipad a 30m safety management zone will be established during take-off and landing of helicopters only. This zone will be managed by a suitably qualified helicopter landing officer whose responsibility will be to ensure the area is clear of people and fauna when required

prior to all inbound and outbound helicopter movements. This management zone sits over the pontoon and water.

The helipad will not contain a refuelling facility. No helicopter maintenance will be undertaken on the helipad.

For the purpose of this assessment, the 'site' is defined as the helipad and 30m safety management zone from the edge of the helipad.

Refer to **Attachment 1** for plans of the proposal.

Assessment Methodology

The following methods have been employed to identify threatened species, populations and ecological communities listed under the TSC Act, FM Act and EPBC Act to be considered by this overview.

- Review of MPR (2014) and MPR (2016);
- NSW Bionet Wildlife Atlas search (10km buffer from the site) accessed 28-10-2016.
- Commonwealth Protected Matters of National Significance online search tool (10km buffer from the site) accessed 13-9-2016.

The marine and/or aquatic species recorded have been listed in **Attachment 2**.

Potential Impacts

The following section provides an overview of the potential direct, indirect and cumulative impacts associated with the proposal. This overview has been used to inform a likelihood of occurrence and potential for impacts to occur to threatened species, populations and ecological communities.

The proposed helipad and flight (approach and departure) paths will be located within the aquatic environment of Lake Macquarie. The proposals restriction to the aquatic environment has limited potential for impacts on terrestrial species and communities that were identified during the MNES search. The helipad will be connected to the approved Trinity Point Marina. We note potential impacts associated with the marina and foreshore development have been assessed (in the Environmental Impact Statement for the Stage 1 Marina that formed part of the DA Approval [LMCC DA Ref: DA 1503/2014]) and determined that impacts shall not occur, subject to approval conditions, and in turn the development was approved.

The terrestrial and ecological environment in which the helipad proposal sits has been the subject of extensive specialist study and is well known and documented and is summarised within broader EA reporting.

Construction Impacts

The impacts associated with the construction of the approved marina development adjacent to the current proposal have previously been assessed in the MPR (2014) and MPR (2016) reports. The current proposal is anticipated to be constructed in the same manner as the approved marina development as follows.

Pile Driving Works.

The construction of the helipad will require the installation of five piles into sand/ bare sediment habitat on the lake floor. The proposed helipad is to be installed approximately 145m from the shore line where established seagrass beds grow in the shallows. Potential impacts associated with pile driving activities are summarised per MPR (2014) and MPR (2016):

- The disturbance of sediments when pile driving activities are undertaken will disturb a small area of benthic habitat approximately 0.4m^2 per pile, thus 2m^2 total area. This was determined to have negligible impact on the habitat as sediments will be pushed aside and re-establish after works are completed.
- It was also observed that there is an abundance of bare sediment habitat located in Bardens bay resulting in colonisation of displaced sediments from adjacent areas.

Construction Noise

The main noise associated with construction will be from the pile driving activities. There is a total of five piles to be installed. The noise created from the pile driving was determined in MPR (2014) and MPR (2016) to be a temporary impact and was considered unlikely to impact on aquatic fauna in deeper waters over habitats containing bare sediment, being consistent with the helipad site.

In these areas MPR (2014) and MPR (2016) noted benthic foraging fish moving between feeding sites and ambush or schooling predators which were considered may be startled by noise during piling, however were considered unlikely to be preyed upon by larger predators as a result. However, the report considered aquatic fauna that tend to inhabit seagrass beds may be exposed and at greater risk to predation when startled.

Runoff and Water Quality Management

Unlike the marina, the proposed helipad does not involve any land based works that expose or disturb soil that would require runoff and water quality management during construction.

Operational Impacts

The helipad will be restricted to daylight operational times and a maximum of 8 movements per day (that is, 4 entry and 4 exit) or 38 per week under the proposal. The operational times have been assessed to reduce any impacts to micro and mega bats along with other nocturnal mammals identified in the PMST, due to their flight movements commonly occurring between dusk and dawn. Furthermore, there is no known Grey-headed Flying Fox camps located in the 10km PMST search area of the proposal (DoE 2016).

The restricted helicopter movements proposed each day and per week will be monitored by a trained Helicopter Landing Officer, that will ensure all fauna, if present, are moved from the pontoon and marina breakwater within the 30m managed safety zone prior to helicopter arrival and departure to limit any potential for fauna strike in the immediate area. This precaution coupled with the lack of suitable habitat within the proposed helipad location mitigates potential for impacts to fauna listed on the MNES search list.

The distance between potential shore habitats and the Helipad is approximately 145m. At the completion of development, these areas of potential habitat or refuge for birds will have a constant stream of human activity. Notably this was taken into consideration during the impact assessment considerations leading to the approval for the marina and associated land based development (LMCC DA Ref: DA 1503/2014, DA 1731/2014 and DA 496/2015). It is considered the altered background noise and activity levels will further limit any potential startling of birds during the helicopter take-off and landing process in-turn reducing impacts on bird species.

The preferred flight paths for approaching and departing the helipad have been refined to three preferred options (or a mix of the three) as a result of testing. All options have been assessed with the knowledge that ascent from the helipad will occur above water to the cruising height of 1000ft (304.5m). The assessment of bird species that may be affected by the flight paths, considered any habitat that the flight paths may cross during each daylight helicopter movement and risk of the movement resulting in bird strike

during the take-off and landing process. Flight paths to the south, do not reach land until the aircraft is in excess of the 1000ft cruising altitude. This height has been assessed to have low potential impact to terrestrial habitat of species using the area in and around Summerland Point. Similarly, the northern exit flight path does not reach land until above the cruising altitude (Refer to **Attachment 1**).

The helicopter approach and departures will be predominantly over the saline environment of the Lake Macquarie waterbody. The lack of terrestrial habitat directly within the path and the rapid climb to higher altitudes of the helicopter reduces potential for impact on fauna and bird strike. Other factors considered, is the sound of the helicopter approaching and departing the site, that is likely to act as a warning to birds in close proximity as well as the Helicopter Landing Officer who will clear the 30m safety management zone.

The proposed helipad will form part of the larger approved Marina. As part of the Marina approval MPR (2014) undertook detailed sea grass bed mapping. Mapped seagrasss beds proximate to the Marina will be largely retained as part of the approved marina footprint. The proposed helipad has a surface area of 20x20m to be established over an area with a sandy bottom and no mapped marine vegetation (sea grass). Due to the separation from shore (145m) where the mapped sea grass beds occur, no shadowing of the known sea grass beds shall occur. Furthermore, this limits potential for impacts to occur within potential breeding / refuge habitats offered by the sea grass beds.

Runoff and Water Quality Management

Royal Haskoning DHV (2016) assessment identifies that the proposed helipad introduces a very minor risk of water quality impacts associated with spills or leaks of hydrocarbons from helicopters. The likelihood of that occurring is identified as almost negligible due to no refuelling and helicopters are subject to stringent and regular safety checks including fuel containment systems. Options to include first flush treatment or similar has been identified, for consideration at detailed design stge. Given the co-location of the helipad with the marina, the helipad will have emergency procedures and spill management procedures and equipment aligned with the approved marina.

Noise associated with Helicopter Arrival and Departure

Noise associated with helicopter landing and take-off from the site has been assessed as part of the acoustic assessments relating to this proposal. The following information has been summarised from The Acoustic Group (2016) report.

- Helicopter movements will be capped to a maximum eight per day limiting noise exposure to aquatic fauna.
- The acoustic report noted that airborne noise levels are typically negligible under water due to the air water interface being a very good reflector of acoustic energy
- Noise produced underwater by passing vessels is generally at a similar or greater volume than noise likely to be produced above the air/water interface.

Helicopter rotor wash

The impacts associated with rotor wash have been considered by Avipro (2016) and summarised briefly as follows.

- The 20 X 20m solid helipad structure will reduce the surface area of the water subject to potential rotor wash.
- The zone of surface water likely to be affected by rotor downwash from the helicopters designed to land at the helipad generally sits within the 30m safety management zone.

Beneficial Impacts

The MPR 2014 and MPR (2016) reports outline a number of beneficial impacts associated with the installation of marine structures. These positive outcomes will be replicated with the current proposal. The following summarises the beneficial impacts that will relate to the current proposal.

- The hard surfaces associated with the pontoon and piles provide additional areas for aquatic biota to become established and will in time provide habitat;
- Areas that will receive sunlight have potential to support algae and algae habitat; and
- Deeper water areas where the hard surface of piles are exposed will provide potential habitat for encrusting fauna such as mussels.

Impact Assessment

A likelihood of occurrence and level of impact assessment (Refer to **Attachment 3**) has been completed taking into consideration the potential impacts discussed previously coupled with site context and species ecology.

By comparison to the approved marina, the potential impacts arising from the addition of a helipad to the concept plan, and the ultimate construction and operation of the marina, when undertaken in accordance with construction management and operational management procedures, are comparatively low. It is considered that the proposed helipad will not impact on threatened species, populations or ecological communities of fish or marine vegetation and their critical habitat.

The likelihood of occurrence forms part of an assessment of those MNES relevant to biodiversity has been undertaken in accordance within EPBC Act Policy Statement 1.1 Significant Impact Guidelines Matters of National Environmental Significance (DoE, 2013). The Matters of National Environmental Significance protected under national environment law include (refer to **Attachment 4**):

- Listed threatened species and communities;
- Listed migratory species;
- Ramsar wetlands of international importance;
- Commonwealth marine environment;
- World heritage properties;
- National heritage places;
- The Great Barrier Reef Marine Park;
- Nuclear actions; and
- A water resource, in relation to coal seam gas development and large coal mining development.

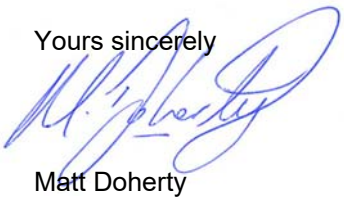
This assessment concluded the proposal is unlikely to have an impact on any MNES identified in a search for the locality. On this basis further assessment via a referral under the EPBC Act is not considered necessary.

Recommendations

- All works shall be conducted under an approved CEMP for aquatic works per MPR (2014) and MPR (2016) or as varied by a helipad development consent.
- Pile and pontoon establishment is to follow the methodology adopted in the Marina approval (MP 06_0309 and LMCC DA Ref: DA 1503/2014) or as varied by a helipad development consent.
- Stormwater controls and water quality management systems are to be installed in accordance with the Royal Haskoning DHV (2016) recommendations.
- Fauna clearance procedures are to be clearly documented and implemented as part of the Helipad Operational Plan of Management.

We trust this is sufficient for your purposes, however should you require any further information or clarification, please do not hesitate to contact Adam Cavallaro (Senior Ecologist) or the writer.

Yours sincerely



Matt Doherty
Director
MJD Environmental Pty Limited

Encl: Attachment 1 – Plans of the proposal
Attachment 2 – Threatened Speceis, Populations and Ecological Communities Results
Attachment 3 – Likelihood of Occurrence Assessment
Attachment 4 – MNES Assessment of Significance
Attachment 5 – Trinity Point Helipad – Aquatic Ecology Impact Report (MRP 2016)

References

ADW Johnson Pty Ltd (2016). *Section 75 Modification (MP 06_0309 MOD 3) Environmental Assessment Report – Trinity Point Helipad.* October 2016;

Avipro (2016). *Trinity Point HLS Report.* Letter Report. 25 October 2016

Department of the Environment (DoE) (2016). *Protected Matters Search*. Accessed 13th September 2016.

Marine Pollution Research Pty Ltd (MPR) (2014). *Trinity Point Lake Macquarie Aquatic Ecology Investigation Report - September 2014.*

Marine Pollution Research Pty Ltd (MPR) (2016). *Trinity Point Helipad - Aquatic Ecology Impact Report – October 2016.*

NSW OEH Bionet Atlas of NSW Wildlife - http://www.environment.nsw.gov.au/atlaspublicapp/UI_Modules/ATLAS_/AtlasSearch.aspx (accessed 28th October 2016)

Royal Haskoning DHV (2016). *Environmental Assessment – Coastal Processes and Hydrodynamics*. Letter Report, 25 October 2016;

The Acoustic Group (2016). *Acoustic Assessment for a proposed Helipad- Trinity Point Development, Lake Macquarie.* ADW Johnson Acoustic Report 27th August

Attachment 1- Plans of the Proposal

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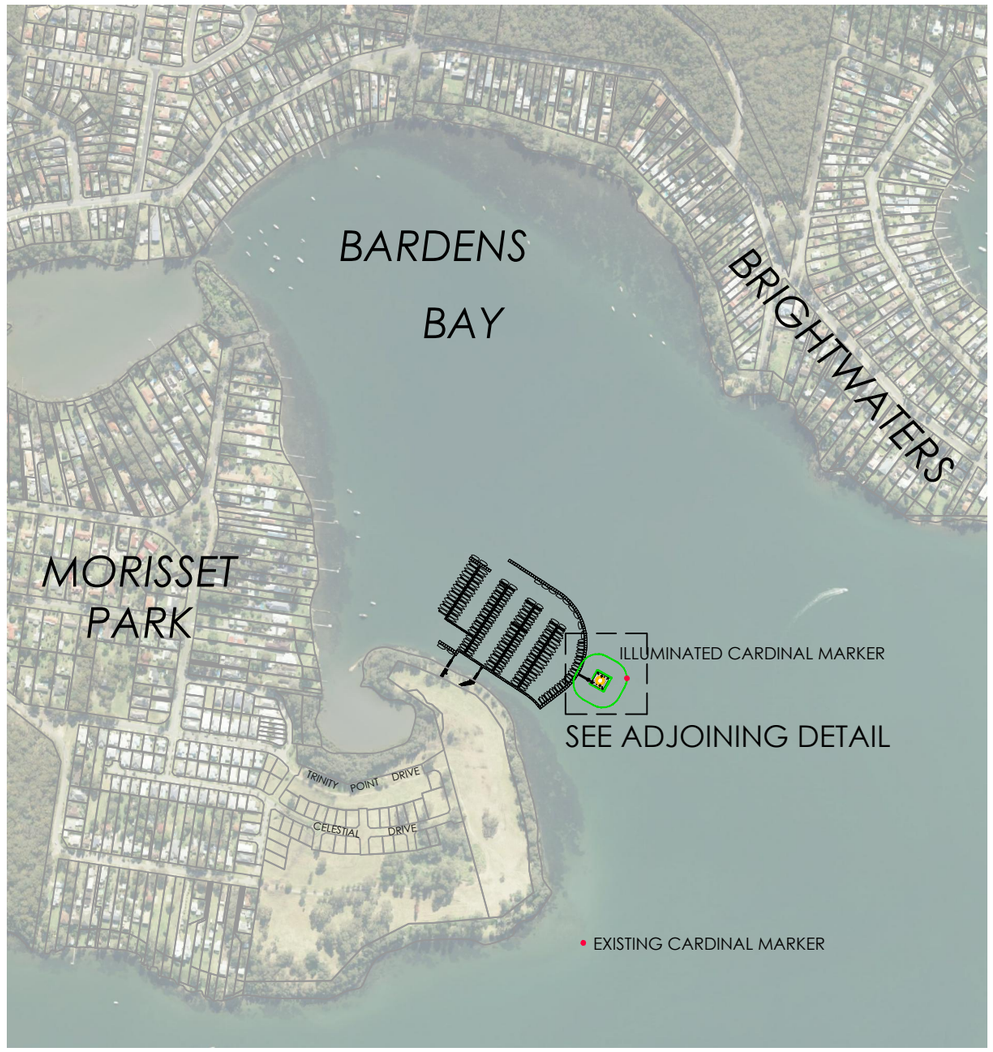

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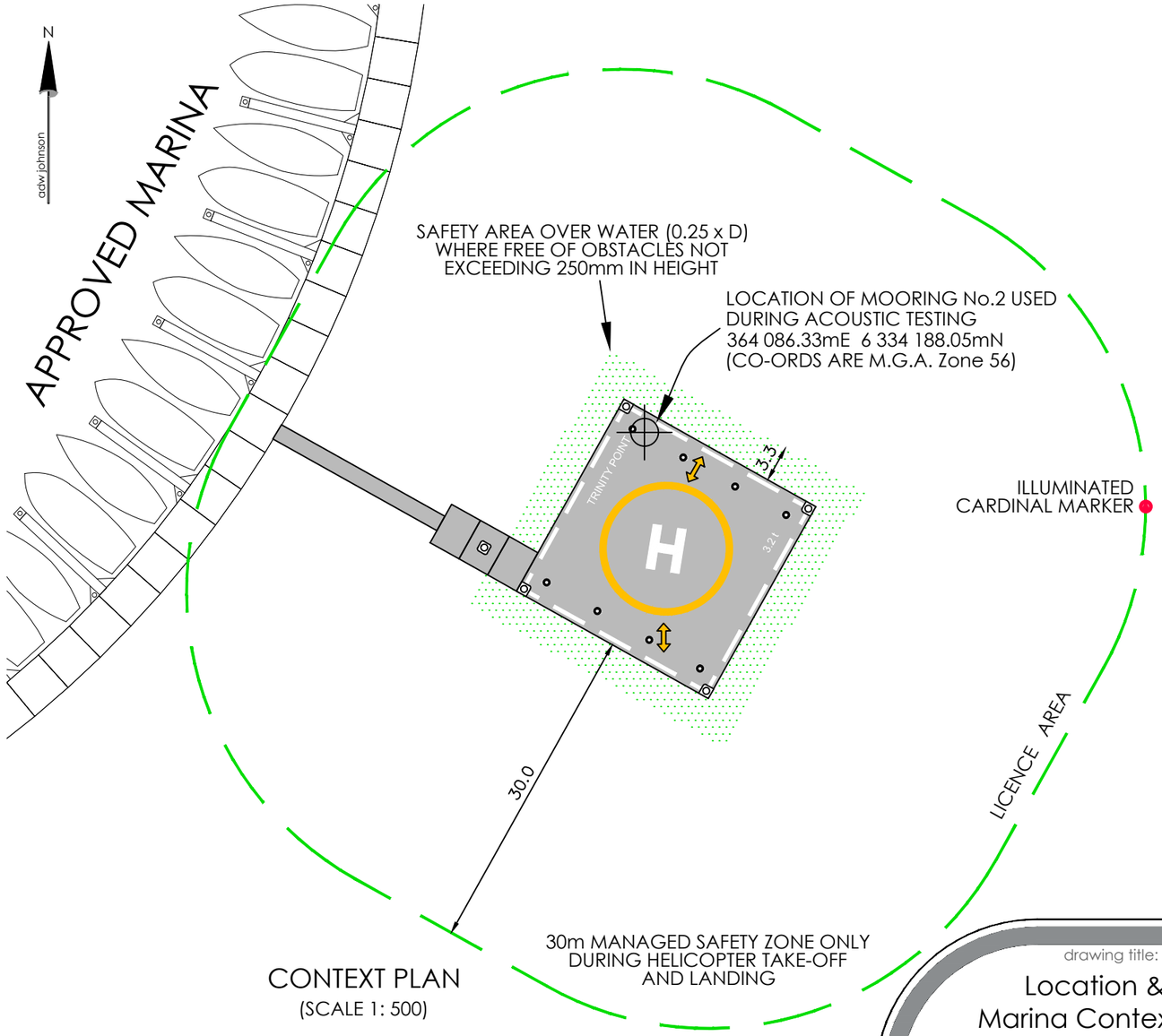

CONTEXT PLAN
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D	24.08.16	UPDATE HELIPAD DESIGN	-	Z.J.	M.D.	S.H.
E	25.08.16	UPDATE HELIPAD DESIGN	-	Z.J.	M.R.	S.H.
F	29.08.16	REVISE LAYOUT	-	Z.J.	M.R.	S.H.
G	12.09.16	UPDATE CARDINAL MARKER LOCATION	-	Z.J.	M.R.	S.H.

co-ordinate & level information

CO-ORDINATE SYSTEM:	M.G.A. 56
ORIGIN OF CO-ORDINATES:	P.M.58712
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ORIGIN OF LEVELS:	N/A
CONTOUR INTERVAL:	N/A

scale (A3 original size)

0 12.5 25.0m

SCALE: 1:500 (FULL)

page

1 OF 3

Date of Surv

drawing title:

Location & Marina Context of Proposed Helipad

location: Trinity Point Marina

council: LAKE MACQUARIE

dwg ref: 37429(4)-DA-001-G

client:

JOHNSON PROPERTY GROUP

adw johnson

central coast office ph: (02) 4305 4300
hunter office ph: (02) 4978 5100

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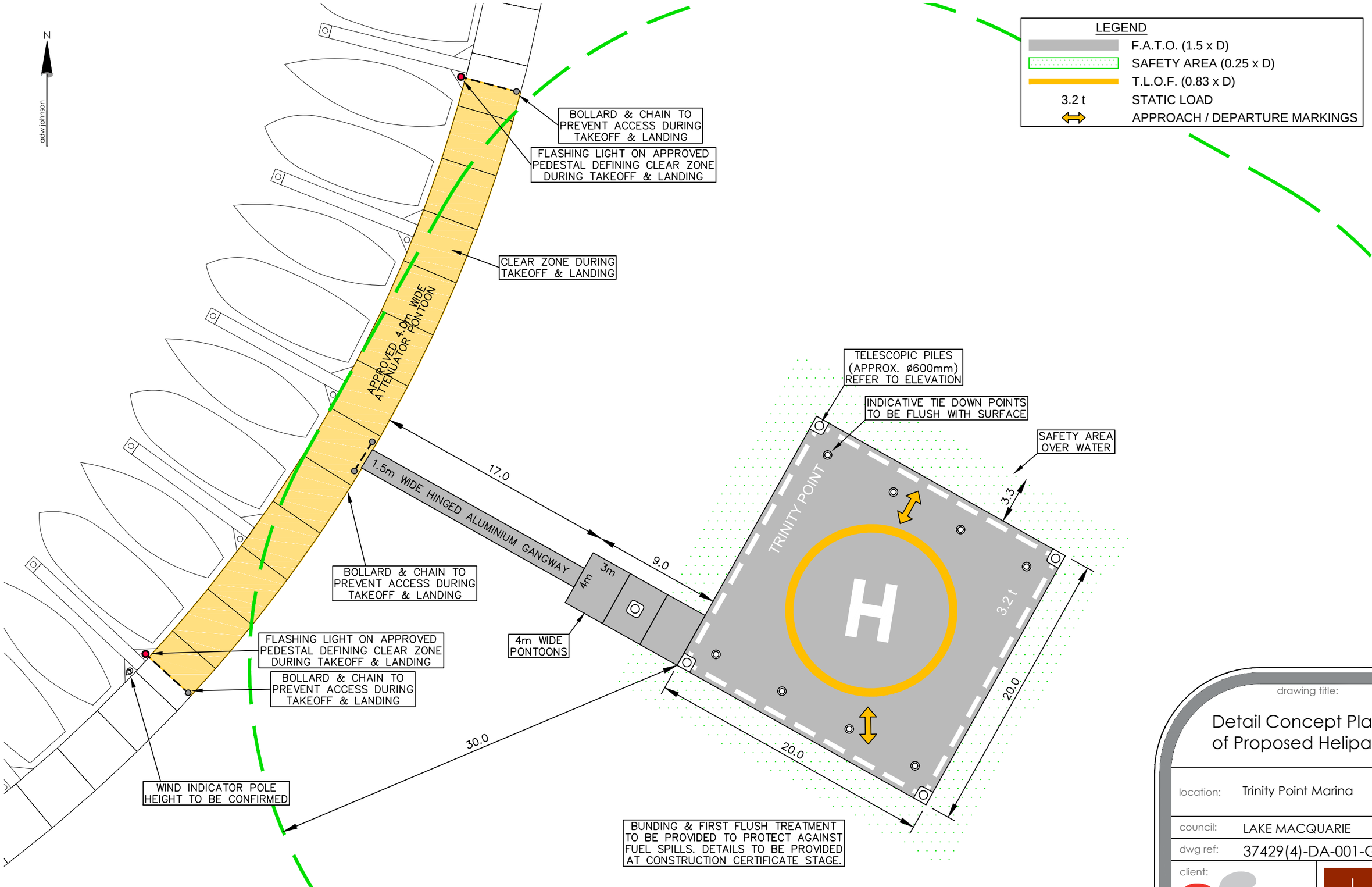

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co-ordinate & level information

CO-ORDINATE SYSTEM:	M.G.A. 56
ORIGIN OF CO-ORDINATES:	P.M.58712
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ORIGIN OF LEVELS:	N/A
CONTOUR INTERVAL:	N/A

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SCALE: 1:250 (FULL)

page

2 OF 3

Date of Surv

drawing title:

Detail Concept Plan of Proposed Helipad

location: Trinity Point Marina

council: LAKE MACQUARIE

dwg ref: 37429(4)-DA-001-G

client: JOHNSON PROPERTY GROUP

adw johnson

central coast office ph: (02) 4305 4300
hunter office ph: (02) 4978 5100

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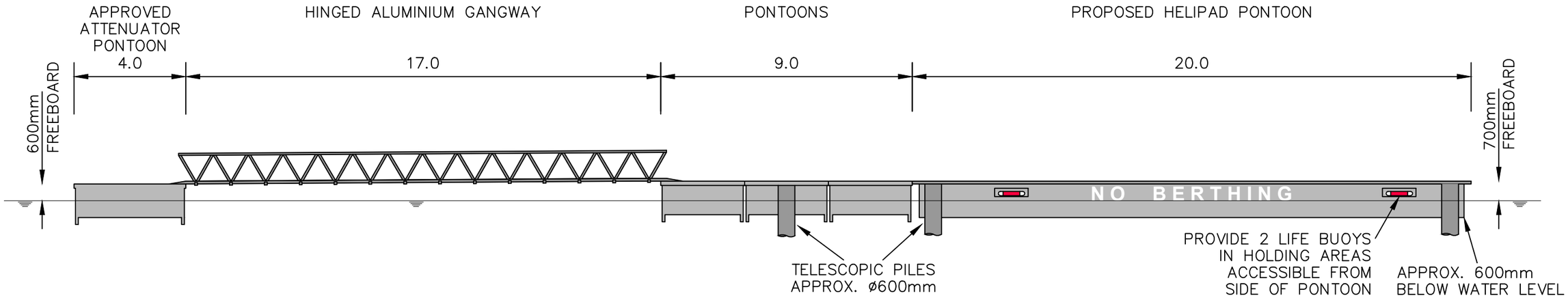

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ORIGIN OF LEVELS: N/A
CONTOUR INTERVAL: N/A

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SCALE: 1:200 (FULL)

page: 3 OF 3
Date of Surv

drawing title:
Typical Concept Elevation of Proposed Helipad

location: Trinity Point Marina
council: LAKE MACQUARIE
dwg ref: 37429(4)-DA-001-G

client: JOHNSON PROPERTY GROUP

adw johnson
central coast office ph: (02) 4305 4300
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APPENDIX B: PROPOSED FLIGHT PATHS

Approach Path A to meet Calm conditions, North, North East, North West and East winds.

Approach Path B1 to meet North West, West and South West winds.

Approach Path B2 designed to meet South East, South, South West winds.

Alternate Approach Path C for South West, South, South East winds. This is an Alternate to Path B2.

It is the pilot's responsibility to land the helicopter safely and in a direction that assists that outcome.
The HLS Operations Manual will stipulate the preferred paths for arriving and departing flights. Regular operators and visitors will be informed about these preferred paths through the HLS Operations Procedures Manual and Helipads.org web based HLS information portal.
The Manual will also tell pilots to fly neighbourly and inform them of noise sensitive areas to avoid where ever possible.

Attachment 2- Threatened Speceis, Populations and Ecological Communities Results

Scientific Name	Common Name	TSC Act	FM Act	EPBC Act	Notes & Source
Threatened Ecological Communities					
Posidonia australis seagrass meadows of the Manning-Hawkesbury ecoregion				E	Community likely to occur within area[1] Recorded within 10km of the site[2]
Subtropical and Temperate Coastal Saltmarsh				V	Community likely to occur within area[1]
Birds					
Anthochaera phrygia	Regent Honeyeater	E4A		CE	Species or species habitat known to occur within area[1] Recorded within 10km of the site[2]
Botaurus poiciloptilus	Australiasian Bittern			E	Species or species habitat known to occur within area[1]
Calidris carnutus	Red Knot			E (M, A)	Species or species habitat known to occur within area[1]
Calidris ferruginea	Curlew Sandpiper	E1		CE (M, A)	Species or species habitat known to occur within area[1] Recorded within 10km of the site[2]
Calidris tenuirostris	Great Knot			CE (M, A)	Species or species habitat known to occur within area[1]
Charadrius mongolus	Lesser Sand Piper	V		E (M, A)	Species or species habitat known to occur within area[1] Recorded within 10km of the site[2]
Dasyomis brachypterus	Eastern Bristlebird			E	Species or species habitat likely to occur within area[1]
Diomedea antipodensis	Antipodean Albatross			V (M, A)	Foraging, feeding or related behaviour likely to occur within area[1]
Diomedea antipodensis gibsoni	Gibson's Albatross			V (M, A)	Foraging, feeding or related behaviour likely to occur within area[1]
Diomedea epomophora (senso stricto)	Southern Royal Albatross			V (M, A)	Foraging, feeding or related behaviour likely to occur within area[1]
Diomedea exulans (Sensu lato)	Wandering Albatross	V		V (M, A)	Foraging, feeding or related behaviour likely to occur within area[1]

Scientific Name	Common Name	TSC Act	FM Act	EPBC Act	Notes & Source
					Recorded within 10km of the site[2]
Diomedea sanfordi	Northern Royal Albatross			E (M, A)	Foraging, feeding or related behaviour likely to occur within area[1]
Grantiella picta	Painted Honeyeater			V	Species or species habitat may occur within area[1]
Haematopus fuliginosus	Sooty Oystercatcher	V			Recorded within 10km of the site[2]
Haematopus longirostris	Pied Oystercatcher	E			Recorded within 10km of the site[2]
Lathamus discolor	Swift Parrot	E1		CE (A)	Species or species habitat likely to occur within area[1] Recorded within 10km of the site[2]
Limosa lapponica baueri	Bar Tailed Godwit			V (A)	Species or species habitat known to occur within area[1]
Limosa lapponica menzbieri	Northern Siberian Bar-tailed Godwit			CE	Species or species habitat known to occur within area[1]
Macronectes giganteus	Southern Giant Petrel	E1		E (M, A)	Species or species habitat known to occur within area[1] Recorded within 10km of the site[2]
Macronectes halli	Northern Giant Petrel			V (M, A)	Species or species habitat may occur within area[1]
Numenius madagascariensis	Eastern Curlew			CE (M, A)	Species or species habitat known to occur within area[1]
Pachyptila turtur subantarctica	Fairy Prion (Southern)			V (A)	Species or species habitat known to occur within area[1]
Rostratula australis	Australian Painted Snipe			E	Species or species habitat likely to occur within area[1]
Thalassarche bulleri	Buller's Albatross			V (M, A)	Species or species habitat may occur within area[1]
Thalassarche bulleri platei	Northern Buller's Albatross, Pacific Albatross			V	Species or species habitat may occur within area[1]

Scientific Name	Common Name	TSC Act	FM Act	EPBC Act	Notes & Source
Thalassarche cauta cauta	Shy Albatross, Tasmanian Shy Albatross			V (M, A)	Foraging, feeding or related behaviour likely to occur within area[1]
Thalassarche cauta steadi	White-capped Albatross			V (M, A)	Foraging, feeding or related behaviour likely to occur within area[1]
Thalassarche eremita	Chatham Albatross			E (M, A)	Foraging, feeding or related behaviour likely to occur within area[1]
Thalassarche impavida	Campbell Albatross, Campbell Black-browed Albatross			V (M, A)	Species or species habitat may occur within area[1]
Thalassarche melanophris	Black-browed Albatross			V (M, A)	Species or species habitat may occur within area[1]
Thalassarche salvini	Salvin's Albatross			V (M, A)	Foraging, feeding or related behaviour likely to occur within area[1]
Fish					
Epinephelus daemelii	Black Rockcod	V	V	V	Species or species habitat likely to occur within area[1]
Pristis zijsron	Green Sawfish	Presume EX	Presume EX		MPR 2014[3].
Syngnthiformes	Seahorses & pipefish		P		Recorded within 10km of the site[2]
Frogs					
Heleioporus australiacus	Giant Burrowing Frog			V	Species or species habitat likely to occur within area[1]
Litoria aurea	Green and Golden Bell Frog			V	Species or species habitat known to occur within area[1]
Litoria littlejohni	Littlejohn's Tree Frog, Heath Frog			V	Species or species habitat may occur within area[1]
Mixophyes balbus	Stuttering Frog			V	Species or species habitat likely to occur within area[1]
Mixophyes iteratus	Giant Barred Frog, Southern Barred Frog			E	Species or species habitat likely to occur within area[1]
Mammals					
Chalinolobus dwyeri	Large-eared Pied Bat, Large Pied Bat			V	Species or species habitat likely to occur within area[1]

Scientific Name	Common Name	TSC Act	FM Act	EPBC Act	Notes & Source
Dasyurus maculatus maculatus (SE mainland population)	Spot-tailed Quoll, Spotted-tail Quoll			E	Species or species habitat known to occur within area[1]
Petauroides volans	Greater Glider			V	Species or species habitat likely to occur within area[1]
Petrogale penicillata	Brush-tailed Rock-wallaby			V	Species or species habitat may occur within area[1]
Phascolarctos cinereus	Koala			V	Species or species habitat known to occur within area[1]
Potorous tridactylus tridactylus	Long-nosed Potoroo (SE mainland)			V	Species or species habitat likely to occur within area[1]
Pseudomys novaehollandiae	New Holland Mouse, Pookila			V	Species or species habitat known to occur within area[1]
Pteropus poliocephalus	Grey-headed Flying-fox			V	Foraging, feeding or related behaviour known to occur within area[1]
Plants					
Caladenia tessellata	Thick-lipped Spider-orchid			V	Species or species habitat likely to occur within area[1]
Corunastylis insignis	Wyong Orchid 1			CE	Species or species habitat known to occur within area[1]
Cryptostylis hunteriana	Leafless Tongue-orchid			V	Species or species habitat known to occur within area[1]
Diuris praecox	Newcastle Doubletail			V	Species or species habitat known to occur within area[1]
Eucalyptus camfieldii	Camfield's Stringybark			V	Species or species habitat likely to occur within area[1]
Eucalyptus parramattensis subsp. *decadens*	Earp's Gum			V	Species or species habitat known to occur within area[1]
Grevillea parviflora subsp. *parviflora*	Small-flower Grevillea			V	Species or species habitat known to occur within area[1]
Melaleuca biconvexa	Biconvex Paperbark			V	Species or species habitat known to occur within area[1]

Scientific Name	Common Name	TSC Act	FM Act	EPBC Act	Notes & Source
Microtis angusii	Angus's Onion Orchid			E	Species or species habitat known to occur within area[1]
Pelargonium sp. *striatellum*	Omeo Stork's-bill			E	Species or species habitat may occur within area[1]
Pterostylis gibbosa	Illawarra Greenhood			E	Species or species habitat may occur within area[1]
Rutidosis heterogama	Heath Wrinklewort			V	Species or species habitat likely to occur within area[1]
Syzygium paniculatum	Magenta Lilly Pilly			V	Species or species habitat likely to occur within area[1]
Tetratheca juncea	Black-eyed Susan			V	Species or species habitat known to occur within area[1]
Thelymitra adorata	Wyong Orchid			CE	Species or species habitat likely to occur within area[1]
Thesium australe	Austral Toadflax			V	Species or species habitat may occur within area[1]
Reptiles					
Caretta caretta	Loggerhead Turtle	E1		E (M, A)	Foraging, feeding or related behaviour likely to occur within area[1] Recorded within 10km of the site[2]
Chelonia mydas	Green Turtle	V		V (M, A)	Foraging, feeding or related behaviour likely to occur within area[1] Recorded within 10km of the site[2]
Dermochelys coriacea	Leatherback Turtle			E (M, A)	Species or species habitat known to occur within area[1]
Eretmochelys imbricata	Hawksbill Turtle			V (M, A)	Foraging, feeding or related behaviour likely to occur within area[1]
Hoplocephalus bungaroides	Flatback Turtle			V (M, A)	Foraging, feeding or related behaviour likely to occur within area[1]
Hoplocephalus bungaroides	Broad-headed Snake			V	Species or species habitat likely to occur within area[1]
Migratory Species					

Scientific Name	Common Name	TSC Act	FM Act	EPBC Act	Notes & Source
Migratory Marine Birds					
Apus pacificus	Fork-tailed Swift			(A)	Species or species habitat likely to occur within area[1]
Puffinus carneipes	Flesh-footed Shearwater	V			Species or species habitat likely to occur within area[1] Recorded within 10km of the site[2]
Sterna albifrons	Little Tern	E1		(A)	Breeding likely to occur within area[1] Recorded within 10km of the site[2]
Migratory Marines Species					
Carcharias taurus	Grey Nurse Shark	CE	CE	CE	MPR 2014[3].
Dugong dugong	Dugong			(A)	Species or species habitat may occur within area[1]
Eubalaena australis	Southern Right Whale	E1		(A)	Recorded within 10km of the site[2]
Lamna nasus	Mackeral Shark				Species or species habitat likely to occur within area[1]
Manta alfredi	Reef Manta Ray				Species or species habitat may occur within area[1]
Manta birostris	Giant Manta Ray				Species or species habitat may occur within area[1]
Sousa chinensis	Indo-Pacific Humpback Dolphin			(A)	Species or species habitat likely to occur within area[1]
Migratory Terrestrial Species					
Cuculus optatus	Oriental Cuckoo			(A)	Species or species habitat may occur within area[1]
Hirundapus caudacutus	White-throated Needletail			V (A)	Species or species habitat known to occur within area[1]
Monarcha melanopsis	Black-faced Monarch			V (A)	Species or species habitat known to occur within area[1]
Monarcha trivirgatus	Spectacled Monarch			V (A)	Species or species habitat known to occur within area[1]
Motacilla flava	Yellow Wagtail			V (A)	Species or species habitat likely to occur within area[1]

Scientific Name	Common Name	TSC Act	FM Act	EPBC Act	Notes & Source
Myiagra cyanoleuca	Satin Flycatcher			E (A)	Species or species habitat known to occur within area[1]
Rhipidura rufifrons	Rufous Fantail			(A)	Species or species habitat known to occur within area[1]
Migratory Wetlands Species					
Actitis hypoleucos	Common Sandpiper			(A)	Species or species habitat known to occur within area[1]
Arenaria interpres	Ruddy Turnstone			(A)	Species or species habitat known to occur within area[1]
Calidris acuminata	Sharp-tailed Sandpiper			(A)	Species or species habitat known to occur within area[1]
Calidris alba	Sanderling			(A)	Species or species habitat known to occur within area[1]
Calidris melanotos	Pectoral Sandpiper			(A)	Species or species habitat known to occur within area[1]
Calidris ruficollis	Red-necked Stint			(A)	Species or species habitat known to occur within area[1]
Charadrius bicinctus	Double-banded Plover			(A)	Species or species habitat known to occur within area[1]
Gallinago hardwickii	Latham's Snipe			(A)	Species or species habitat known to occur within area[1]
Gallinago megala	Swinhoe's Snipe			(A)	Roosting likely to occur within area[1]
Gallinago stenura	Pin-tailed Snipe			(A)	Roosting likely to occur within area[1]
Heteroscelus brevipes	Grey-tailed Tattler			(A)	Species or species habitat known to occur within area[1]
Limosa limosa	Black-tailed Godwit			(A)	Species or species habitat known to occur within area[1]
Numenius minutus	Little Curlew			(A)	Roosting likely to occur within area[1]
Numenius phaeopus	Whimbrel			(A)	Species or species habitat known to occur within area[1]

Scientific Name	Common Name	TSC Act	FM Act	EPBC Act	Notes & Source
Pandion haliaetus	Osprey	V		(A)	Breeding Known to occur within area[1] Recorded within 10km of the site[2]
Pluvialis fulva	Pacific Golden Plover			(A)	Species or species habitat known to occur within area[1]
Pluvialis squatarola	Grey Plover			(A)	Species or species habitat known to occur within area[1]
Tringa nebularia	Common Greenshank			(A)	Species or species habitat known to occur within area[1]
Tringa stagnatilis	Marsh Sandpiper			(A)	Species or species habitat known to occur within area[1]
Xenus cinereus	Terek Sandpiper			(A)	Species or species habitat known to occur within area[1]
Marine Species					
Birds					
Ardea alba	Great Egret			(A)	Breeding known to occur within area[1]
Ardea ibis	Cattle Egret			(A)	Species or species habitat may occur within area[1]
Charadrius ruficapillus	Red-capped Plover			(A)	Species or species habitat known to occur within area[1]
Haliateetus leucogaster	White Bellied Sea-eagle			(A)	Species or species habitat known to occur within area[1]
Himantopus himantopus	Black-winged stilt			(A)	Species or species habitat known to occur within area[1]
Merops ornatus	Rainbow Bee-eater			(A)	Species or species habitat may occur within area[1]
Rostratla benghalaensis (sensu lato)	Painted Sniper			E (A)	Species or species habitat likely occur within area[1]
Merops ornatus	Rainbow Bee-eater			(A)	Species or species habitat may occur within area[1]
Thalassarche sp.*nov.*	Pacific Albatross			V(A)	Species or species habitat may occur within area[1]

V = Vulnerable | M = Migratory | A =Marine species
E = Endangered | CE = Critically Endangered | P = Protected (FM Act)

1 Commonwealth Protected Matters Search Tool, Department of the Environment (Accessed 13-9-2016)
2. Bionet Atlas of NSW Wildlife (Accessed 28-10-2016)
3. MPR (2014) and MPR (2016)

Attachment 3 – Likelihood of Occurrence Assessment

Threatened Species & Communities Likelihood of Occurrence Assessment

Threatened flora and fauna species (listed under the TSC Act, FM Act and EPBC Act) that have been gazetted and recorded within a 10 kilometres radius of the Site have been considered. Each species / community is considered for its likelihood to occur on the Site and potential for impact arising from the proposal.

'Species / Community' – Lists each threatened species / EEC known from the locality (10 km radius). The status and number of records along with source and notes for each threatened entity under the TSC Act and the EPBC Act are also provided.

'Habitat / Species Descriptions' – for up to date threatened species profiles including habitat descriptions and other key ecological information reference is made to the following online resources:

- NSW OEH Threatened Species Profile Search - http://www.environment.nsw.gov.au/threatenedSpeciesApp/
- Commonwealth Biodiversity: Species Profile and Threats Database (SPRAT) – http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

'Likelihood of Occurrence on Site' – Assesses the likelihood of each locally recorded species and EEC to occur within the Site, using knowledge of each species' habitat and lifecycle requirements and with regard the habitat types present within the Site, results of the literature review and database searches and field investigations. The location and number of records of the species (OEH Atlas of NSW Wildlife) were also considered in determining probability of occurrence.

'Potential for Impact' – Assesses the likelihood of impacts to each species / community that would result from the proposed development, taking into account direct and indirect short and long-term impacts.

Common Name	Scientific Name	Likelihood of Occurrence / Likely Level of Impact
Birds		
Anthochaera phrygia	Regent Honeyeater	The proposal does not seek to modify or alter habitats that this species could utilise for foraging or refuge habitat as a stepping stone across the local landscape during its seasonal migration. On this basis it is **unlikely** the species will be impacted by the proposal.
Botaurus poiciloptilus	Australasian Bittern	There is no suitable habitat for this species to utilise within the proposed project area (Heli-Pad). The proposed helicopter flight entry and exit paths will be over open water and once above land will be generally greater than 1,000ft. On this basis it is **unlikely** the species will be impacted by the proposal.
Calidris carnutus	Red Knot	There is no suitable habitat for this species to utilise within the proposed project area (Heli-Pad). The proposed helicopter flight entry and exit paths will be over open water and once above land will be generally greater than 1,000ft. On this basis it is **unlikely** the species will be impacted by the proposal.
Calidris ferruginea	Curlew Sandpiper	There is no suitable habitat for this species to utilise within the proposed project area (Heli-Pad). The proposed helicopter flight entry and exit paths will be over open water and once above land will be generally greater than 1,000ft. On this basis it is **unlikely** the species will be impacted by the proposal.
Calidris tenuirostris	Great Knot	There is no suitable habitat for this species to utilise within the proposed project area (Heli-Pad). The proposed helicopter flight entry and exit paths will be over open water and once above land will be generally greater than 1000ft. On this basis it is **unlikely** the species will be impacted by the proposal.
Charadrius mongolus	Lesser Sand Piper	There is no suitable habitat for this species to utilise within the proposed project area (Heli-Pad). The proposed helicopter flight entry and exit paths will be over open water and once above land will be generally greater than 1000ft. On this basis it is **unlikely** the species will be impacted by the proposal.

Common Name	Scientific Name	Likelihood of Occurrence / Likely Level of Impact
Dasyomis brachypterus	Eastern Bristlebird	There is no suitable habitat for this species to utilise within the proposed project area. This species rarely fly's and coupled with the lack of habitat, the helicopter flight paths would not impact this species. On this basis it is **unlikely** the species will be impacted by the proposal.
Diomedea antipodensis	Antipodean Albatross	There is no suitable habitat for this species to utilise within the proposed project area (Helipad) and flight paths. This species is known to spend significant portions of its life on the open ocean and only ventures to land (subantarctic Islands) to breed. On this basis it is **unlikely** the species will be impacted by the proposal.
Diomedea antipodensis gibsoni	Gibson's Albatross	There is no suitable habitat for this species to utilise within the proposed project area (Helipad) and flight paths. This species is known to spend significant portions of its life on the open ocean and only ventures to land (subantarctic Islands) to breed. On this basis it is **unlikely** the species will be impacted by the proposal.
Diomedea epomophora (senso stricto)	Southern Royal Albatross	There is no suitable habitat for this species to utilise within the proposed project area (Helipad) and flight paths. This species is known to spend significant portions of its life on the open ocean and only ventures to land (subantarctic Islands) to breed. On this basis it is **unlikely** the species will be impacted by the proposal.
Diomedea exulans (Sensu lato)	Wandering Albatross	There is no suitable habitat for this species to utilise within the proposed project area (Helipad) and flight paths. This species is known to spend significant portions of its life on the open ocean and only ventures to land (subantarctic Islands) to breed. On this basis it is **unlikely** the species will be impacted by the proposal.
Diomedea sanfordi	Northern Royal Albatross	There is no suitable habitat for this species to utilise within the proposed project area (Helipad) and flight paths. This species is known to spend significant portions of its life on the open ocean and only ventures to land (Chatham Islands) to breed. On this basis it is **unlikely** the species will be impacted by the proposal.

Common Name	Scientific Name	Likelihood of Occurrence / Likely Level of Impact
Grantiella picta	Painted Honeyeater	There is no suitable habitat for this species to utilise within the proposed project area. This species habitat is predominantly Box-gum Woodlands of which no known occurrences of this community is present in the aquatic environ of the helipad or surrounding flight path where the helicopter is flying at low elevations during ascent and descent. On this basis it is **unlikely** the species will be impacted by the proposal.
Haematopus fuliginosus	Sooty Oystercatcher	There is no suitable habitat for this species to utilise within the proposed project area (Helipad). When in flight there is no potential habitat in the saline environment of the Lake Macquarie water body. When the helicopter reaches land on the proposed flight paths it will be at an elevation of generally greater than 1,000ft. As such low interaction shall occur with this species terrestrial habitat where present. On this basis it is **unlikely** the species will be impacted by the proposal.
Haematopus longirostris	Pied Oystercatcher	There is no suitable habitat for this species to utilise within the proposed project area (Helipad). When in flight there is no potential habitat in the saline environment of the Lake Macquarie water body. When the helicopter reaches land on the proposed flight paths it will be at an elevation of generally greater than 1,000ft. As such low interaction shall occur with this species terrestrial habitat where present. On this basis it is **unlikely** the species will be impacted by the proposal.
Lathamus discolor	Swift Parrot	The proposal does not seek to modify or alter habitats that this species could utilise for foraging or refuge habitat as a stepping stone across the local landscape during its seasonal migration. On this basis it is **unlikely** the species will be impacted by the proposal.
Limosa lapponica baueri	Bar Tailed Godwit	There is no suitable habitat for this species to utilise within the proposed project area (Heli-Pad). The proposed helicopter flight entry and exit paths will be over open water and once above land will be generally greater than 1000ft. On this basis it is **unlikely** the species will be impacted by the proposal.
Limosa lapponica menzbieri	Northern Siberian Bar-tailed Godwit	There is no suitable habitat for this species to utilise within the proposed project area (Heli-Pad). The proposed helicopter flight entry and exit paths will be over open water and once above land will be generally greater than 1000ft. On this basis it is **unlikely** the species will be impacted by the proposal.

Common Name	Scientific Name	Likelihood of Occurrence / Likely Level of Impact
Macronectes giganteus	Southern Giant Petrel	There is no suitable habitat for this species to utilise within the proposed project area (Helipad) and flight paths. This species is known to spend significant portions of its life on the open ocean and only ventures to land, to breed on off shore Islands. On this basis it is **unlikely** the species will be impacted by the proposal.
Macronectes halli	Northern Giant Petrel	There is no suitable habitat for this species to utilise within the proposed project area (Helipad) and flight paths. This species is known to spend significant portions of its life on the open ocean and only ventures to land, to breed on off shore Islands. On this basis it is **unlikely** the species will be impacted by the proposal.
Numenius madagascariensis	Eastern Curlew	There is no suitable habitat for this species to utilise within the proposed project area (Heli-Pad). The proposed helicopter flight entry and exit paths will be over open water and once above land will be generally greater than 1000ft. On this basis it is **unlikely** the species will be impacted by the proposal.
Pachyptila turtur subantarctica	Fairy Prion (Southern)	There is no suitable habitat for this species to utilise within the proposed project area (Helipad) and flight paths. This species is known to spend significant portions of its life on the open ocean and only ventures to land, to breed on off shore Islands. On this basis it is **unlikely** the species will be impacted by the proposal.
Rostratula australis	Australian Painted Snipe	There is no suitable habitat for this species to utilise within the proposed project area (Helipad) or within proposed flight paths. On this basis it is **unlikely** the species will be impacted by the proposal.
Thalassarche bulleri	Buller's Albatross	There is no suitable habitat for this species to utilise within the proposed project area (Helipad) and flight paths. This species is known to spend significant portions of its life on the open ocean and only ventures to land (Islands off New Zealand) to breed. On this basis it is **unlikely** the species will be impacted by the proposal.

Common Name	Scientific Name	Likelihood of Occurrence / Likely Level of Impact
Thalassarche bulleri platei	Northern Buller's Albatross, Pacific Albatross	There is no suitable habitat for this species to utilise within the proposed project area (Helipad) and flight paths. This species is known to spend significant portions of its life on the open ocean and only ventures to land (Islands off New Zealand) to breed. On this basis it is **unlikely** the species will be impacted by the proposal.
Thalassarche cauta cauta	Shy Albatross, Tasmanian Shy Albatross	There is no suitable habitat for this species to utilise within the proposed project area (Helipad) and flight paths. This species is known to spend significant portions of its life on the open ocean and only ventures to land (Offshore Islands of Tasmania) to breed. On this basis it is **unlikely** the species will be impacted by the proposal.
Thalassarche cauta steadi	White-capped Albatross	There is no suitable habitat for this species to utilise within the proposed project area (Helipad) and flight paths. This species is known to spend significant portions of its life on the open ocean and only ventures to land (Offshore Islands of New Zealand) to breed. On this basis it is **unlikely** the species will be impacted by the proposal.
Thalassarche eremita	Chatham Albatross	There is no suitable habitat for this species to utilise within the proposed project area (Helipad) and flight paths. This species is known to spend significant portions of its life on the open ocean and only venture to land to breed on the Chatham Islands(NZ). On this basis it is **unlikely** the species will be impacted by the proposal.
Thalassarche impavida	Campbell Albatross, Campbell Black-browed Albatross	There is no suitable habitat for this species to utilise within the proposed project area (Helipad) and flight paths. This species is known to spend significant portions of its life on the open ocean and only breed on Campbell Islands (NZ). On this basis it is **unlikely** the species will be impacted by the proposal.

Common Name	Scientific Name	Likelihood of Occurrence / Likely Level of Impact
Thalassarche melanophris	Black-browed Albatross	There is no suitable habitat for this species to utilise within the proposed project area (Helipad) and flight paths. This species is known to spend significant portions of its life on the open ocean and only ventures to land (subantarctic Islands) to breed. On this basis it is **unlikely** the species will be impacted by the proposal.
Thalassarche salvini	Salvin's Albatross	There is no suitable habitat for this species to utilise within the proposed project area (Helipad) and flight paths. This species is known to spend significant portions of its life on the open ocean and only ventures to land (subantarctic Islands) to breed. On this basis it is **unlikely** the species will be impacted by the proposal.
Fish		
Epinephelus daemelii	Black Rockcod	There is no suitable habitat for this species to utilise within the proposed project area (Helipad). This species is found in rocky substrates, whereas the project area sits within bare silty sand habitat at a depth of around 5.6m Chart datum (MPR 2014). On this basis it is **unlikely** the species will be impacted by the proposal.
Pristis zijsron	Green Sawfish	This species is presumed to be extinct in NSW On this basis it is highly **unlikely** the species will be impacted by the proposal.
Syngnthiformes	Seahorse & Pipefish	There is no suitable habitat for this species to utilise within the proposed project area (Helipad). This species is found in seagrass beds whereas the project area sits within bare silty sand habitat at a depth of around 5.6m Chart datum (MPR 2014). Mapped seagrasss beds proximate to the project area will be retained as part of the approved marina. The proposal does not occur in the known preferred habitat for this species, therefore it is considered highly **unlikely** that any impacts would occur to the *Syngnthiformes*

Common Name	Scientific Name	Likelihood of Occurrence / Likely Level of Impact
Frogs		
Heleioporus australiacus	Giant Burrowing Frog	There is no suitable habitat for this species to utilise within the proposed project area (Helipad). When in flight there is no potential habitat in the saline environment of the Lake Macquarie water body. When the helicopter reaches land on the proposed flight paths it will be at an elevation of generally greater than 1,000ft. As such no interaction shall occur with this species terrestrial habitat where present. On this basis it is **unlikely** the species will be impacted by the proposal.
Litoria aurea	Green and Golden Bell Frog	There is no suitable habitat for this species to utilise within the proposed project area (Helipad). When in flight there is no potential habitat in the saline environment of the Lake Macquarie water body. When the helicopter reaches land on the proposed flight paths it will be at an elevation of generally greater than 1,000ft. As such no interaction shall occur with this species terrestrial habitat where present. On this basis it is **unlikely** the species will be impacted by the proposal.
Litoria littlejohni	Littlejohn's Tree Frog, Heath Frog	There is no suitable habitat for this species to utilise within the proposed project area (Helipad). When in flight there is no potential habitat in the saline environment of the Lake Macquarie water body. When the helicopter reaches land on the proposed flight paths it will be at an elevation of generally greater than 1,000ft. As such no interaction shall occur with this species terrestrial habitat where present. On this basis it is **unlikely** the species will be impacted by the proposal.
Mixophyes balbus	Stuttering Frog	There is no suitable habitat for this species to utilise within the proposed project area (Helipad). When in flight there is no potential habitat in the saline environment of the Lake Macquarie water body. When the helicopter reaches land on the proposed flight paths it will be at an elevation of generally greater than 1,000ft. As such no interaction shall occur with this species terrestrial habitat where present. On this basis it is **unlikely** the species will be impacted by the proposal.
Mixophyes iteratus	Giant Barred Frog, Southern Barred Frog	There is no suitable habitat for this species to utilise within the proposed project area (Helipad). When in flight there is no potential habitat in the saline environment of the Lake Macquarie water body. When the helicopter reaches land on the proposed flight paths it will be at an elevation of generally greater than 1,000ft. As such no interaction shall occur with this species terrestrial habitat where present. On this basis it is **unlikely** the species will be impacted by the proposal.

Common Name	Scientific Name	Likelihood of Occurrence / Likely Level of Impact
Mammals		
Chalinolobus dwyeri	Large-eared Pied Bat, Large Pied Bat	There is no suitable habitat for this species to utilise within the proposed project area. This species frequents low to mid elevation dry open forest and woodland close to roosting habitat (Caves, crevices in cliffs in well-timbered areas.). This is a nocturnal species and all flights are diurnal after dawn and before dusk when this species is active, therefore rotor strike is highly unlikely to occur at any time during the helicopter flight to and from including decent/ ascent the helipad. On this basis it is **unlikely** the species will be impacted by the proposal.
Dasyurus maculatus maculatus (SE mainland population)	Spot-tailed Quoll, Spotted-tail Quoll	There is no suitable habitat for this species to utilise within the proposed project area (Helipad). When in flight there is no potential habitat in the saline environment of the Lake Macquarie water body. When the helicopter reaches land on the proposed flight paths it will be at an elevation of generally greater than 1,000ft. As such no interaction shall occur with this species terrestrial habitat where present. On this basis it is **unlikely** the species will be impacted by the proposal.
Petauroides volans	Greater Glider	There is no suitable habitat for this species to utilise within the proposed project area (Helipad). When in flight there is no potential habitat in the saline environment of the Lake Macquarie water body. When the helicopter reaches land on the proposed flight paths it will be at an elevation of generally greater than 1,000ft. As such no interaction shall occur with this species terrestrial habitat where present. Additionally, this species is a nocturnal mammal, whereas all flights shall be diurnal therefore limiting any potential for impact to this species. On this basis it is **unlikely** the species will be impacted by the proposal.
Petrogale penicillata	Brush-tailed Rock-wallaby	There is no suitable habitat for this species to utilise within the proposed project area. On this basis it is **unlikely** the species will be impacted by the proposal.
Phascolarctos cinereus	Koala	There is no suitable habitat for this species to utilise within the proposed project area (Helipad). When in flight there is no potential habitat in the saline environment of the Lake Macquarie water body. When the helicopter reaches land on the proposed flight paths it will be at an elevation of generally greater than 1,000ft. As such no interaction shall occur with this species terrestrial habitat where present. On this basis it is **unlikely** the species will be impacted by the proposal.
Potorous tridactylus tridactylus	Long-nosed Potoroo (SE mainland)	There is no suitable habitat for this species to utilise within the proposed project area (Helipad). When in flight there is no potential habitat in the saline environment of the Lake Macquarie water body. When the helicopter reaches land on the proposed flight paths it will be at an elevation of generally greater than 1,000ft. As such no interaction shall occur with this species terrestrial habitat where present. Additionally, this species is mainly

Common Name	Scientific Name	Likelihood of Occurrence / Likely Level of Impact
		nocturnal with limited diurnal foraging known to occur during the cooler winter months, whereas all helicopter movements shall occur during the daylight hours therefore limiting any potential for impact to this species. On this basis it is **unlikely** the species will be impacted by the proposal.
Pseudomys novaehollandiae	New Holland Mouse, Pookila	There is no suitable habitat for this species to utilise within the proposed project area (Helipad). When in flight there is no potential habitat in the saline environment of the Lake Macquarie water body. When the helicopter reaches land on the proposed flight paths it will be at an elevation of generally greater than 1,000ft. As such no interaction shall occur with this species terrestrial habitat where present. Additionally, this species is nocturnal, whereas all flights shall be diurnal therefore limiting any potential for impact to this species. On this basis it is **unlikely** the species will be impacted by the proposal.
Pteropus poliocephalus	Grey-headed Flying-fox	There is no suitable foraging or roosting habitat for this species to utilise within the proposed project area. The proposal will not affect the flight paths of this species due to this species flight activities occurring in the evening. This is a nocturnal species and all flights are diurnal after dawn and before dusk when this species is active, therefore rotor strike is highly unlikely to occur at any time during the helicopter flight to and from including decent/ ascent the helipad. On this basis it is **unlikely** the species will be impacted by the proposal.
Reptiles		
Caretta caretta	Loggerhead Turtle	This species forging/feeding habitat will not be impacted by the proposed helipad, due to the limited surface area (20x20m) the structure would cover in the aquatic environment of Lake Macquarie. This structure will form part of the larger approved Marina that has been assessed to have no impacts on this species. There is no favoured habitat for breeding of this species within the project area as they require sandy beaches. On this basis it is **unlikely** the species will be impacted by the proposal.
Chelonia mydas	Green Turtle	This species is known to forage on the inshore seagrass beds of Lake Macquarie. The proposed helipad will form part of the larger approved Marina. As part of the Marina approval MPR (2014) undertook detailed sea grass bed mapping. Mapped seagrass beds proximate to the Marina will be largely retained as part of the approved marina footprint. The proposed helipad has a surface area of 20x20m to be established over an area with a sandy bottom and no mapped marine vegetation (sea grass). No shadowing of the known sea grass beds shall occur. The proposal occurs over an aquatic environment and does not occur adjacent to any known breeding / nesting habitat Given the retention of foraging habitat for this species and avoidance of breeding / nesting habitat it is considered **unlikely** the species will be impacted by the proposal.

Common Name	Scientific Name	Likelihood of Occurrence / Likely Level of Impact
Dermochelys coriacea	Leatherback Turtle	According to the SPRAT profile, this species is a pelagic species with a significant (global) home range. The Leatherback Turtle requires coastal sandy beaches as part of its breeding cycle to lay clutches of eggs. The species forages on soft bodied marine species such as jellyfish and squid. While foraging within Lake Macquarie during any part of this species life cycle cannot be discounted, the proposed helipad has a surface area of 20x20m to be established over an area with a sandy bottom and no mapped marine vegetation (sea grass) or with deep benthic inclines where preferred food species may congregate or breed before heading to the ocean as part of their life cycle (squid). There are no known breeding / nesting locations proximate to the project area and noting the coastal preferences coupled with the required sand temperatures for incubation known from the limited species ecology (SPRAT) it is unlikely the Lake Foreshore would provide any suitable locations. On this basis it is **unlikely** the species will be impacted by the proposal.
Eretmochelys imbricata	Hawksbill Turtle	According to the SPRAT profile, this species is a pelagic species with known populations off northern and western Australia. The species is omnivorous around the waters of Australia with a wide diet based reflective of their large home range and food availability. Feed species includes sponges, gastropods, jellyfish and seagrass. While foraging within Lake Macquarie during any part of this species life cycle cannot be discounted, the proposed helipad has a surface area of 20x20m to be established over an area with a sandy bottom and no mapped marine vegetation (sea grass) the may provide foraging habitat. Mapped seagrasss beds proximate to the project area will be retained as part of the approved marina. The area of bed disturbance from the installation of up to 5 piles is considered to be minor in the context of this species home range and board foraging preferences. On this basis it is **unlikely** the species will be impacted by the proposal.
Natator depressus	Flatback Turtle	According to the SPRAT profile, this species is found only in tropical waters of northern Australia. The proposal does not occur in the known geographic region for this species, therefore it is considered highly that any impacts would occur to the Flatback Turtle.
Hoplocephalus bungaroides	Broad-headed Snake	There is no suitable habitat for this species to utilise within the proposed project area (Helipad). When in flight there is no potential habitat in the saline environment of the Lake Macquarie water body. When the helicopter reaches land on the proposed flight paths it will be at an elevation of generally greater than 1,000ft. As such no interaction shall occur with this species terrestrial habitat where present. Additionally, this species is nocturnal, whereas all flights shall be diurnal therefore limiting any potential for impact to this species. On this basis it is **unlikely** the species will be impacted by the proposal.

Common Name	Scientific Name	Likelihood of Occurrence / Likely Level of Impact
Threatened Ecological Communities		
Posidonia australis seagrass meadows of the Manning-Hawkesbury ecoregion		This ecological community does not occur within the proposal area. Aquatic ecology assessments of the larger approved Marina development, have indicated that the project area sits within bare silty sand habitat at a depth of around 5.6m Chart datum (MPR 2014 and MPR 2016). On this basis it is **unlikely** the species will be impacted by the proposal.
Subtropical and Temperate Coastal Saltmarsh		This ecological community does not occur within the proposal area.
Flora		
Acacia bynoeana	Bynoe's Watle	The proposal will be within an aquatic environment; therefore, this terrestrial species will not be impacted by the proposal.
Angophora inopina	Charmhaven Apple	The proposal will be within an aquatic environment; therefore, this terrestrial species will not be impacted by the proposal.
Caladenia tessellata	Thick-lipped Spider Orchid	The proposal will be within an aquatic environment; therefore, this terrestrial species will not be impacted by the proposal.
Corunastylis insignis	Wyong Midge Orchid 1, Variable Midge Orchid 1	The proposal will be within an aquatic environment; therefore, this terrestrial species will not be impacted by the proposal.
Cryptostylis hunteriana	Leafless Tongue-orchid	The proposal will be within an aquatic environment; therefore, this terrestrial species will not be impacted by the proposal.
Diuris praecox	Newcastle Doubletail	The proposal will be within an aquatic environment; therefore, this terrestrial species will not be impacted by the proposal.

Common Name	Scientific Name	Likelihood of Occurrence / Likely Level of Impact
Eucalyptus camfieldii	Camfield's Stringybark	The proposal will be within an aquatic environment; therefore, this terrestrial species will not be impacted by the proposal.
Eucalyptus parramattensis subsp. *decadens*	Earp's Gum, Earp's Dirty Gum	The proposal will be within an aquatic environment; therefore, this terrestrial species will not be impacted by the proposal.
Grevillea parviflora subsp. *parviflora*	Small-flower Grevillea	The proposal will be within an aquatic environment; therefore, this terrestrial species will not be impacted by the proposal.
Melaleuca biconvexa	Biconvex Paperbark	The proposal will be within an aquatic environment; therefore, this terrestrial species will not be impacted by the proposal.
Microtis angusii	Angus's Onion Orchid	The proposal will be within an aquatic environment; therefore, this terrestrial species will not be impacted by the proposal.
Pelargonium sp. *Striatellum (G.W.Carr 10345)*	Omeo Stork's-bill	The proposal will be within an aquatic environment; therefore, this terrestrial species will not be impacted by the proposal.
Pterostylis gibbosa	Illawarra Greenhood	The proposal will be within an aquatic environment; therefore, this terrestrial species will not be impacted by the proposal.
Rutidosis heterogama	Heath Wrinklewort	The proposal will be within an aquatic environment; therefore, this terrestrial species will not be impacted by the proposal.
Syzygium paniculatum	Magenta Lilly Pilly	The proposal will be within an aquatic environment; therefore, this terrestrial species will not be impacted by the proposal.
Tetratheca juncea	Black-eyed Susan	The proposal will be within an aquatic environment; therefore, this terrestrial species will not be impacted by the proposal.
Thelymitra adorata	Wyong Sun Orchid	The proposal will be within an aquatic environment; therefore, this terrestrial species will not be impacted by the proposal.
Thesium australe	Austral Toadflax	The proposal will be within an aquatic environment; therefore, this terrestrial species will not be impacted by the proposal.

Common Name	Scientific Name	Likelihood of Occurrence / Likely Level of Impact
Listed Migratory Species		
Migratory Marine Birds		
Apus pacificus	Fork-tailed Swift	There is no suitable habitat for this species to utilise within the proposed project area (Helipad). This species primarily forages at high altitudes on insects. This would generally result in this species being outside the entry and exit flight path elevations. On this basis it is **unlikely** the species will be impacted by the proposal.
Puffinus carneipes	Flesh-footed Shearwater	There is no suitable habitat for this species to utilise within the proposed project area (Helipad) and flight paths. This species is known to spend significant portions of its life on the open ocean and nests on Lord Howe Island. On this basis it is **unlikely** the species will be impacted by the proposal.
Sterna albifrons	Little Tern	There is no suitable habitat for this species to utilise within the proposed project area (Helipad) and flight paths. On this basis it is **unlikely** the species will be impacted by the proposal.
Migratory Marine Species		
Carcharias taurus	Grey Nurse Shark	There is no suitable habitat within the proposed project area (helipad). This species is known to frequent reefs off coastal location in NSW and often return to the same sites during migration. No records were found as part of 10km search of the area. The proposal does not occur in the known preferred habitat for this species, therefore it is considered highly **unlikely** that any impacts would occur to the Grey Nurse Shark.

Common Name	Scientific Name	Likelihood of Occurrence / Likely Level of Impact
Dugong dugong	Dugong	This species has a large home range and is known to occasionally forage on the inshore seagrass beds of Lake Macquarie during periods of warm water temperature (SPRAT). The proposed helipad will form part of the larger approved Marina. As part of the Marina approval MPR (2014) undertook detailed sea grass bed mapping. Mapped seagrass beds proximate to the Marina will be largely retained as part of the approved marina footprint. The proposed helipad has a surface area of 20x20m to be established over an area with a sandy bottom and no mapped marine vegetation (sea grass). No shadowing of the known sea grass beds shall occur. Given the retention of foraging habitat for this species coupled with it's large home range it is considered **unlikely** the species will be impacted by the proposal.
Eubalaena australis	Southern Right Whale	This is a pelagic species found in oceanic and coastal waters. The proposal does not occur in the known preferred habitat for this species, therefore it is considered highly **unlikely** that any impacts would occur to the Southern Right Whale.
Lamna nasus	Mackerel Shark	According to the SPRAT profile, this is a pelagic species found in oceanic waters off the continental shelf and occasionally enter coastal waters. The shark predominantly feeds on pelagic fish species. The proposal does not occur in the known preferred habitat for this species, therefore it is considered highly **unlikely** that any impacts would occur to the Mackerel Shark.
Manta alfredi	Reef Manta Ray	This is a pelagic species found in oceanic and coastal waters. The proposal does not occur in the known preferred habitat for this species, therefore it is considered highly **unlikely** that any impacts would occur to the Reef Manta Ray.
Manta birostris	Giant Manta Ray	This is a pelagic species found in oceanic and coastal waters. The proposal does not occur in the known preferred habitat for this species, therefore it is considered highly **unlikely** that any impacts would occur to the Giant Manta Ray.

Common Name	Scientific Name	Likelihood of Occurrence / Likely Level of Impact
Sousa chinensis	Indo-Pacific Humpback Dolphin	According to the SPRAT profile, this species is found in northern Australian waters above 34^{0}S. The proposal does not occur in the known geographic region for this species, therefore it is considered highly **unlikely** that any impacts would occur to the Indo-Pacific Humpback Dolphin.
Migratory Terrestrial Species		
Cuculus optatus	Oriental Cuckoo	There is no suitable habitat for this species to utilise within the proposed project area (helipad). Proposed helicopter flight paths will not impact the low flying species that glides just above the water whilst inhabiting Australian Wetlands. On this basis it is **unlikely** the species will be impacted by the proposal.
Hirundapus caudacutus	White-throated Needletail	There is no suitable habitat for this species to utilise within the proposed project area (Helipad). This species primarily forages at high altitudes on insects. This would result in this species being outside the entry and exit flight path elevations. On this basis it is **unlikely** the species will be impacted by the proposal.
Monarcha melanopsis	Black-faced Monarch	There is no suitable habitat for this species to utilise within the proposed project area (Helipad). When in flight there is no potential habitat in the saline environment of the Lake Macquarie water body. When the helicopter reaches land on the proposed flight paths it will be at an elevation of generally greater than 1,000ft. As such low interaction shall occur with this species terrestrial habitat where present. On this basis it is **unlikely** the species will be impacted by the proposal.
Monarcha trivirgatus	Spectacled Monarch	There is no suitable habitat for this species to utilise within the proposed project area (Helipad). When in flight there is no potential habitat in the saline environment of the Lake Macquarie water body. When the helicopter reaches land on the proposed flight paths it will be at an elevation of generally greater than 1,000ft. As such low interaction shall occur with this species terrestrial habitat where present. On this basis it is **unlikely** the species will be impacted by the proposal.
Motacilla flava	Yellow Wagtail	There is no suitable habitat for this species to utilise within the proposed project area (Helipad). When in flight there is no potential habitat in the saline environment of the Lake Macquarie water body. When the helicopter reaches land on the proposed flight paths it will be at an elevation of generally greater than 1,000ft. As such low interaction shall occur with this species terrestrial habitat where present.

Common Name	Scientific Name	Likelihood of Occurrence / Likely Level of Impact
		On this basis it is **unlikely** the species will be impacted by the proposal.
Myiagra cyanoleuca	Satin Flycatcher	There is no suitable habitat for this species to utilise within the proposed project area (Helipad). When in flight there is no potential habitat in the saline environment of the Lake Macquarie water body. When the helicopter reaches land on the proposed flight paths it will be at an elevation of generally greater than 1,000ft. As such low interaction shall occur with this species terrestrial habitat where present. On this basis it is **unlikely** the species will be impacted by the proposal.
Rhipidura rufifrons	Rufous Fantail	There is no suitable habitat for this species to utilise within the proposed project area (Helipad). When in flight there is no potential habitat in the saline environment of the Lake Macquarie water body. When the helicopter reaches land on the proposed flight paths it will be at an elevation of generally greater than 1,000ft. As such low interaction shall occur with this species terrestrial habitat where present. On this basis it is **unlikely** the species will be impacted by the proposal.
Migratory Wetlands Species		
Actitis hypoleucos	Common Sandpiper	There is no suitable habitat for this species to utilise within the proposed project area (helipad). Proposed helicopter flight paths will not impact the low flying species that glides just above the water whilst inhabiting Australian Wetlands. On this basis it is **unlikely** the species will be impacted by the proposal.
Arenaria interpres	Ruddy Turnstone	There is no suitable habitat for this species to utilise within the proposed project area (Helipad). When in flight there is no potential habitat in the saline environment of the Lake Macquarie water body. When the helicopter reaches land on the proposed flight paths it will be at an elevation of generally greater than 1,000ft. As such low interaction shall occur with this species terrestrial habitat where present. On this basis it is **unlikely** the species will be impacted by the proposal.
Calidris acuminata	Sharp-tailed Sandpiper	There is no suitable habitat for this species to utilise within the proposed project area (Helipad). When in flight there is no potential habitat in the saline environment of the Lake Macquarie water body. When the helicopter reaches land on the proposed flight paths it will be at an elevation of generally greater than 1,000ft. As such low interaction shall occur with this species terrestrial habitat where present. On this basis it is **unlikely** the species will be impacted by the proposal.

Common Name	Scientific Name	Likelihood of Occurrence / Likely Level of Impact
Calidris alba	Sanderling	There is no suitable habitat for this species to utilise within the proposed project area (Helipad). When in flight there is no potential habitat in the saline environment of the Lake Macquarie water body. When the helicopter reaches land on the proposed flight paths it will be at an elevation of generally greater than 1,000ft. As such low interaction shall occur with this species terrestrial habitat where present. On this basis it is **unlikely** the species will be impacted by the proposal.
Calidris melanotos	Pectoral Sandpiper	There is no suitable habitat for this species to utilise within the proposed project area (Helipad). When in flight there is no potential habitat in the saline environment of the Lake Macquarie water body. When the helicopter reaches land on the proposed flight paths it will be at an elevation of generally greater than 1,000ft. As such low interaction shall occur with this species terrestrial habitat where present. On this basis it is **unlikely** the species will be impacted by the proposal.
Calidris ruficollis	Red-necked Stint	There is no suitable habitat for this species to utilise within the proposed project area (Helipad). When in flight there is no potential habitat in the saline environment of the Lake Macquarie water body. When the helicopter reaches land on the proposed flight paths it will be at an elevation of generally greater than 1,000ft. As such low interaction shall occur with this species terrestrial habitat where present. On this basis it is **unlikely** the species will be impacted by the proposal.
Charadrius bicinctus	Double-banded Plover	There is no suitable habitat for this species to utilise within the proposed project area (Helipad). When in flight there is no potential habitat in the saline environment of the Lake Macquarie water body. When the helicopter reaches land on the proposed flight paths it will be at an elevation of generally greater than 1,000ft. As such low interaction shall occur with this species terrestrial habitat where present. On this basis it is **unlikely** the species will be impacted by the proposal.
Gallinago hardwickii	Latham's Snipe	There is no suitable habitat for this species to utilise within the proposed project area (Helipad). When in flight there is no potential habitat in the saline environment of the Lake Macquarie water body. When the helicopter reaches land on the proposed flight paths it will be at an elevation of generally greater than 1,000ft. As such low interaction shall occur with this species terrestrial habitat where present. On this basis it is **unlikely** the species will be impacted by the proposal.
Gallinago megala	Swinhoe's Snipe	There is no suitable habitat for this species to utilise within the proposed project area (Helipad). When in flight there is no potential habitat in the saline environment of the Lake Macquarie water body. When the helicopter reaches land on the proposed flight paths it will be at an elevation of generally greater than 1,000ft. As such low interaction shall occur with this species terrestrial habitat where present. On this basis it is **unlikely** the species will be impacted by the proposal.

Common Name	Scientific Name	Likelihood of Occurrence / Likely Level of Impact
Gallinago stenura	Pin-tailed Snipe	There is no suitable habitat for this species to utilise within the proposed project area (Helipad). When in flight there is no potential habitat in the saline environment of the Lake Macquarie water body. When the helicopter reaches land on the proposed flight paths it will be at an elevation of generally greater than 1,000ft. As such low interaction shall occur with this species terrestrial habitat where present. On this basis it is **unlikely** the species will be impacted by the proposal.
Heteroscelus brevipes	Grey-tailed Tattler	There is no suitable habitat for this species to utilise within the proposed project area (Helipad). When in flight there is no potential habitat in the saline environment of the Lake Macquarie water body. When the helicopter reaches land on the proposed flight paths it will be at an elevation of generally greater than 1,000ft. As such low interaction shall occur with this species terrestrial habitat where present. On this basis it is **unlikely** the species will be impacted by the proposal.
Limosa lapponica	Bar-tailed Godwit	There is no suitable habitat for this species to utilise within the proposed project area (Helipad). When in flight there is no potential habitat in the saline environment of the Lake Macquarie water body. When the helicopter reaches land on the proposed flight paths it will be at an elevation of generally greater than 1,000ft. As such low interaction shall occur with this species terrestrial habitat where present. On this basis it is **unlikely** the species will be impacted by the proposal.
Limosa limosa	Black-tailed Godwit	There is no suitable habitat for this species to utilise within the proposed project area (Helipad). When in flight there is no potential habitat in the saline environment of the Lake Macquarie water body. When the helicopter reaches land on the proposed flight paths it will be at an elevation of generally greater than 1,000ft. As such low interaction shall occur with this species terrestrial habitat where present. On this basis it is **unlikely** the species will be impacted by the proposal.
Numenius minutus	Little Curlew	There is no suitable habitat for this species to utilise within the proposed project area (Helipad). When in flight there is no potential habitat in the saline environment of the Lake Macquarie water body. When the helicopter reaches land on the proposed flight paths it will be at an elevation of generally greater than 1,000ft. As such low interaction shall occur with this species terrestrial habitat where present. On this basis it is **unlikely** the species will be impacted by the proposal.
Numenius phaeopus	Whimbrel	There is no suitable habitat for this species to utilise within the proposed project area (Helipad). When in flight there is no potential habitat in the saline environment of the Lake Macquarie water body. When the helicopter reaches land on the proposed flight paths it will be at an elevation of generally greater than 1,000ft. As such low interaction shall occur with this species terrestrial habitat where present. On this basis it is **unlikely** the species will be impacted by the proposal.

Common Name	Scientific Name	Likelihood of Occurrence / Likely Level of Impact
Pandion haliaetus	Osprey	This species forging habitat will not be impacted by the proposed helipad, due to the limited surface area (20x20m) the structure would cover in the aquatic environment of Lake Macquarie. This structure will form part of the larger approved Marina that has been assessed to have no impacts on this species. The roosting or perching habitat of this species will not be impacted as there is no vegetation to be removed as part of this proposal or from the shore line associated with the adjacent Trinity Point development. The forging habit (aquatic environment) of this species has been observed to fly at low elevations and plunging to water retrieve food from heights between 10-50m (Pizzey and Knight 2007). This forging coupled with noise (from helicopter) and the rapid ascent to cruising altitude (1000ft.), will limit interactions within the flight path. The large open water of Lake Macquarie of which the proposal site is part of, will also provide significant habitat for this species to forage without interaction associated with the helipad and helicopters. When the helicopter reaches land on the proposed flight paths it will generally be at an elevation greater than 1,000ft. as such low potential exists for any interaction to occur with this species terrestrial habitat where present. On this basis it is **unlikely** the species will be impacted by the proposal.
Pluvialis fulva	Pacific Golden Plover	There is no suitable habitat for this species to utilise within the proposed project area (Helipad). When in flight there is no potential habitat in the saline environment of the Lake Macquarie water body. When the helicopter reaches land on the proposed flight paths it will be at an elevation of generally greater than 1,000ft. As such low interaction shall occur with this species terrestrial habitat where present. On this basis it is **unlikely** the species will be impacted by the proposal.
Pluvialis squatarola	Grey Plover	There is no suitable habitat for this species to utilise within the proposed project area (Helipad). When in flight there is no potential habitat in the saline environment of the Lake Macquarie water body. When the helicopter reaches land on the proposed flight paths it will be at an elevation of generally greater than 1,000ft. As such low interaction shall occur with this species terrestrial habitat where present. On this basis it is **unlikely** the species will be impacted by the proposal.
Tringa nebularia	Common Greenshank	There is no suitable habitat for this species to utilise within the proposed project area (Helipad). When in flight there is no potential habitat in the saline environment of the Lake Macquarie water body. When the helicopter reaches land on the proposed flight paths it will be at an elevation of generally greater than 1,000ft. As such low interaction shall occur with this species terrestrial habitat where present. On this basis it is **unlikely** the species will be impacted by the proposal.

Common Name	Scientific Name	Likelihood of Occurrence / Likely Level of Impact
Tringa stagnatilis	Marsh Sandpiper	There is no suitable habitat for this species to utilise within the proposed project area (Helipad). When in flight there is no potential habitat in the saline environment of the Lake Macquarie water body. When the helicopter reaches land on the proposed flight paths it will be at an elevation of generally greater than 1,000ft. As such low interaction shall occur with this species terrestrial habitat where present. On this basis it is **unlikely** the species will be impacted by the proposal.
Xenus cinereus	Terek Sandpiper	There is no suitable habitat for this species to utilise within the proposed project area (Helipad). When in flight there is no potential habitat in the saline environment of the Lake Macquarie water body. When the helicopter reaches land on the proposed flight paths it will be at an elevation of generally greater than 1,000ft. As such low interaction shall occur with this species terrestrial habitat where present. On this basis it is **unlikely** the species will be impacted by the proposal.
Listed Marine Species		
Birds		
Ardea alba	Great Egret, White Egret	There is no suitable habitat for this species to utilise within the proposed project area (Helipad). When in flight there is no potential habitat in the saline environment of the Lake Macquarie water body. When the helicopter reaches land on the proposed flight paths it will be at an elevation of generally greater than 1,000ft. As such low interaction shall occur with this species terrestrial habitat where present. On this basis it is **unlikely** the species will be impacted by the proposal.
Ardea ibis	Cattle Egret	There is no suitable habitat for this species to utilise within the proposed project area (Helipad). When in flight there is no potential habitat in the saline environment of the Lake Macquarie water body. When the helicopter reaches land on the proposed flight paths it will be at an elevation of generally greater than 1,000ft. As such low interaction shall occur with this species terrestrial habitat where present. On this basis it is **unlikely** the species will be impacted by the proposal.
Charadrius ruficapillus	Red-capped Plover	There is no suitable habitat for this species to utilise within the proposed project area (Helipad). When in flight there is no potential habitat in the saline environment of the Lake Macquarie water body. When the helicopter reaches land on the proposed flight paths it will be at an elevation of generally greater than 1,000ft. As such low interaction shall occur with this species terrestrial habitat where present. On this basis it is **unlikely** the species will be impacted by the proposal.

Common Name	Scientific Name	Likelihood of Occurrence / Likely Level of Impact
Haliateetus leucogaster	White Bellied Sea-eagle	This species forging habitat will not be impacted by the proposed helipad, due to the limited surface area (20x20m) the structure would cover in the aquatic environment of Lake Macquarie. This structure will be part of the larger approved Marina that has been assessed to have no impacts on this species. The roosting or perching habitat of this species will not be impacted as there is no vegetation to be removed as part of this proposal or from the shore line associated with the adjacent Trinity Point development. The forging habit (in aquatic environments) of this species has been observed to fly/glide at low elevations whilst scanning for food over water and then plunging to the water. This forging coupled with noise (from helicopter) and the rapid ascent to cruising altitude (1000ft.), will limit interactions within the flight path. The large open water of Lake Macquarie of which the proposal site is part of, will also provide significant habitat for this species to forage without interaction s associated with the helipad and helicopters. When the helicopter reaches land on the proposed flight paths it will generally be at an elevation greater than 1,000ft. As such low potential exists for any interaction to occur with this species terrestrial habitat where present. On this basis it is **unlikely** the species will be impacted by the proposal.
Himantopus himantopus	Black-winged stilt	There is no suitable habitat for this species to utilise within the proposed project area (Helipad). When in flight there is no potential habitat in the saline environment of the Lake Macquarie water body. When the helicopter reaches land on the proposed flight paths it will be at an elevation of generally greater than 1,000ft. As such low interaction shall occur with this species terrestrial habitat where present. On this basis it is **unlikely** the species will be impacted by the proposal.
Merops ornatus	Rainbow Bee-eater	There is no suitable habitat for this species to utilise within the proposed project area (Helipad). When in flight there is no potential habitat in the saline environment of the Lake Macquarie water body. When the helicopter reaches land on the proposed flight paths it will be at an elevation of generally greater than 1,000ft. As such low interaction shall occur with this species terrestrial habitat where present. On this basis it is **unlikely** the species will be impacted by the proposal.
Rostratla benghalaensis (sensu lato)	Painted Sniper	There is no suitable habitat for this species to utilise within the proposed project area (Helipad). When in flight there is no potential habitat in the saline environment of the Lake Macquarie water body. When the helicopter reaches land on the proposed flight paths it will be at an elevation of generally greater than 1,000ft. As such low interaction shall occur with this species terrestrial habitat where present. On this basis it is **unlikely** the species will be impacted by the proposal.

Common Name	Scientific Name	Likelihood of Occurrence / Likely Level of Impact
Thalassarche sp.*nov.*	Pacific Albatross	There is no suitable habitat for this species to utilise within the proposed project area (Helipad) and flight paths. This species is known to spend significant portions of its life on the open ocean and only ventures to land (Offshore Islands of New Zealand) to breed. On this basis it is **unlikely** the species will be impacted by the proposal

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Attachment 4 – MNES Assessment of Significance

An assessment of those MNES relevant to biodiversity has been undertaken in accordance within EPBC Act Policy Statement 1.1 Significant Impact Guidelines Matters of National Environmental Significance (DoE, 2013). The Matters of National Environmental Significance protected under national environment law include:

- Listed threatened species and communities;
- Listed migratory species;
- Ramsar wetlands of international importance;
- Commonwealth marine environment;
- World heritage properties;
- National heritage places;
- The Great Barrier Reef Marine Park;
- Nuclear actions; and
- A water resource, in relation to coal seam gas development and large coal mining development.

Listed Threatened and Communities

A total of 109 threatened species and 2 threatened ecological communities listed under the EPBC Act have been recorded on the protected matters search within a 10km buffer search area. A likelihood of occurrence assessment for these MNES has been completed in **Attachment 3**.

This assessment concluded that the proposal is unlikely to impact the listed threatened species.

No Threatened Ecological Communities (TEC) listed under the EPBC Act have been recorded within the project area or have been identified within any areas that have potential to be affected by indirect impacts.

Listed Migratory Species

The protected matters search nominated 60 migratory species or species habitat may occur with the 10km site buffer search area. The assessment contained in **Attachment 3** concluded that although migratory species may occupy and utilise various habitats throughout the locality during their life cycle, no habitat on the project area is critical to their survival. Therefore, it is unlikely that the proposal over the project area will impact migratory species.

Wetlands of International Significance (declared Ramsar wetlands):

The site is not a wetland of international significance or declared Ramsar wetland.

Commonwealth Marine Areas:

The Site is not part of or within close proximity to any Commonwealth Marine Area.

World Heritage Properties:

The Site is not a World Heritage area, and is not in close proximity to any such area.

National Heritage Places:

The Site is not a National Heritage area, and is not in close proximity to any such area.

Great Barrier Reef Marine Parks:

The Site is not part of or within close proximity to any Great Barrier Reef Marine Park.

Nuclear Actions:

The proposal over the site is not and does not form part of a Nuclear action.

Water Resources in relation to Coal Mining and CSG:

The proposal over the site is related to land development and as such is not or does not for part of a coal mining and/or CSG proposal.

Summary

In summary the proposed action is unlikely to have an impact to MNES and as such Commonwealth referral under the EPBC Act is not required.

Attachment 5 – Trinity Point Helipad – Aquatic Ecology Impact Report (MPR 2016)

trinity point

LAKE MACQUARIE

Trinity Point Helipad

Aquatic Ecology Impact Report

October 2016

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1 INTRODUCTION

Johnson Property Group (JPG) is preparing an **Environmental Assessment (EA)** for the installation and use of a floating helipad in Bardens Bay Lake Macquarie (initially by addition of that into the concept plan under MP 06.0309, and in future, for physical installation and use). The helipad proposal is proposed to form part of concept approved development that includes the construction and operation of a staged 188 berth marina, associated hotel accommodation, restaurant and function centre, and eight accommodation buildings, located at Trinity Point, Morisset Park on the shores of Lake Macquarie and in Bardens Bay. Specifically, the concept is intended to be attached to Stage 1 of the marina, which has development consent and is under construction.

This Aquatic Ecology Impact Assessment Report provides an assessment of the proposal against the Secretary's Environmental Assessment Requirements (SEARs) for MP 06_0309 MOD3, dated July 2016 (see **Appendix B of the EA**). The SEARs require a **Noise Assessment Report** that addresses *inter alia*, "potential impacts on…fauna and their habitats in particular threatened species, populations, or ecological communities of fish or marine vegetation and their critical habitat". The SEARS also require "a consideration of the impacts of the proposal on matters of national significance under the Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999" and this has been assessed in a companion report to this aquatic ecology impact report, prepared by MJD Environmental (see also **Appendix F of the EA**). The Companion **Noise Assessment Report** for the EA is provided at **Appendix E of the EA**.

1.1 The Concept Helipad Proposal

Concept construction details and operational parameters for the use of the helipad are provided in **Section 3.0** of the Project EA - see also Figures 1 and 2 below. The following concept construction and operational details are relevant for assessment of aquatic ecological impact:

Concept Proposed Helipad Design:

- The helipad will comprise a 20m by 20m barge helipad with a draught of around 600mm, which will be kept in place by four telescopic piles driven into the lake seabed.
- The helipad will be located 26 m south east of the marina breakwater over seabed depths of around -5.5 m, and will be located some 145 m off the riparian shoreline and at least 100 m offshore from the outer limits of the *Zostera* seagrass bed fringing the riparian shore (see Figure 3).

- Access to the helipad will be from the floating pontoon breakwater via a 17m long and 1.5m wide gangway attached to three (3m by 4m) linked pontoons attached to the side of the helipad barge, with one additional telescopic pile (see Figure 2).

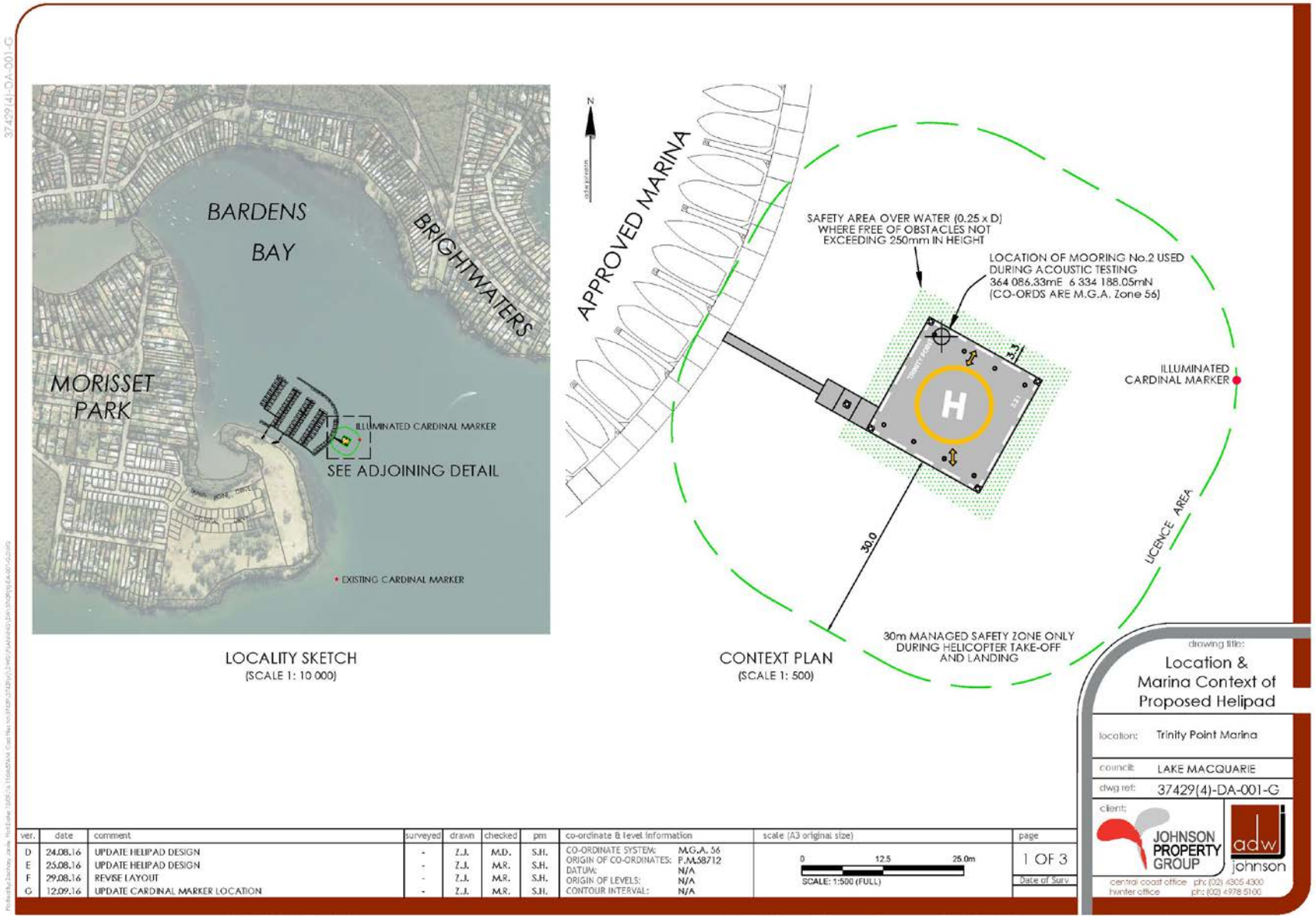

Figure 1 Trinity Point Marina showing location of proposed Helipad in relation to the marina.

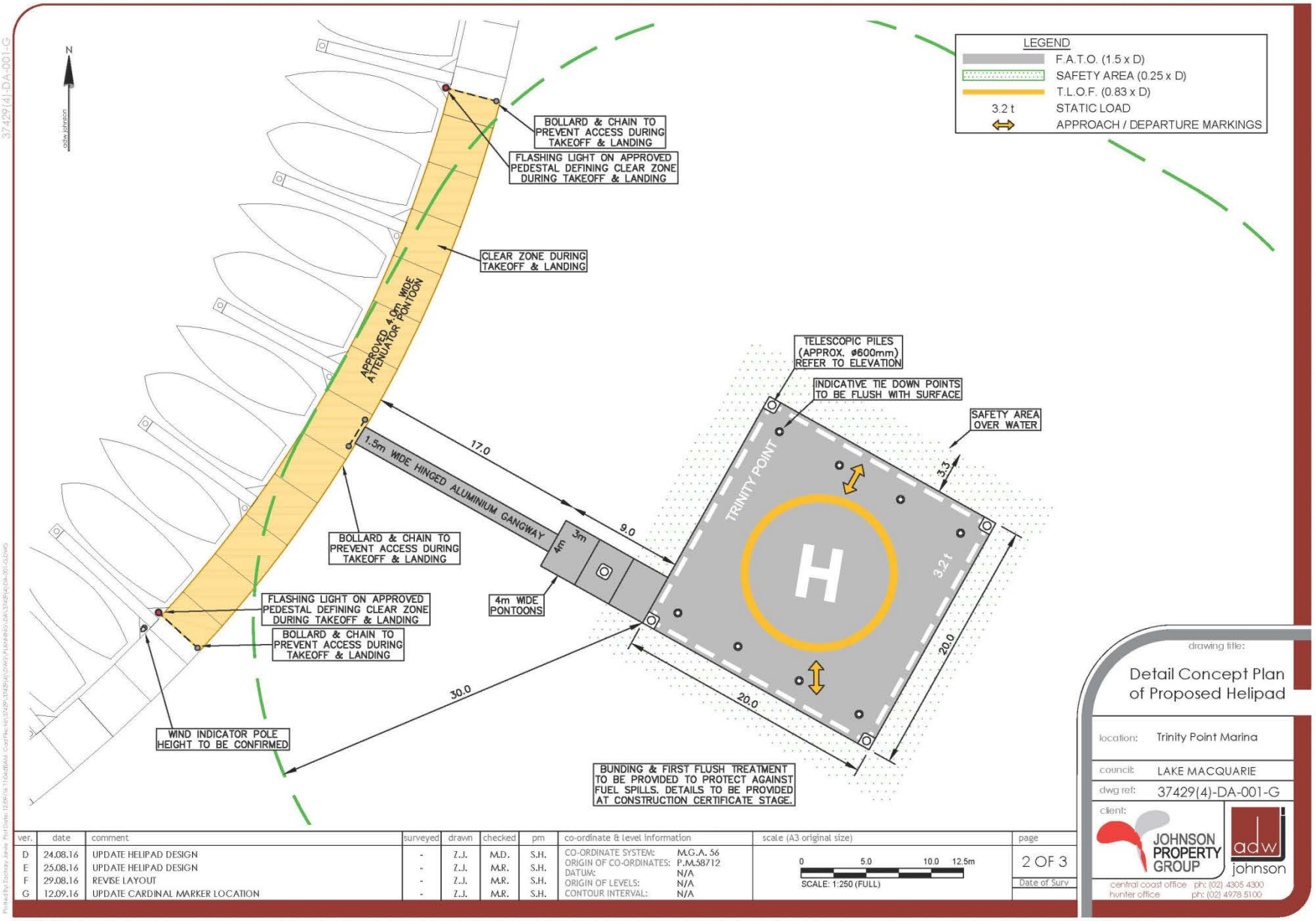

Figure 2 Detailed Concept Plan for Proposed Helipad

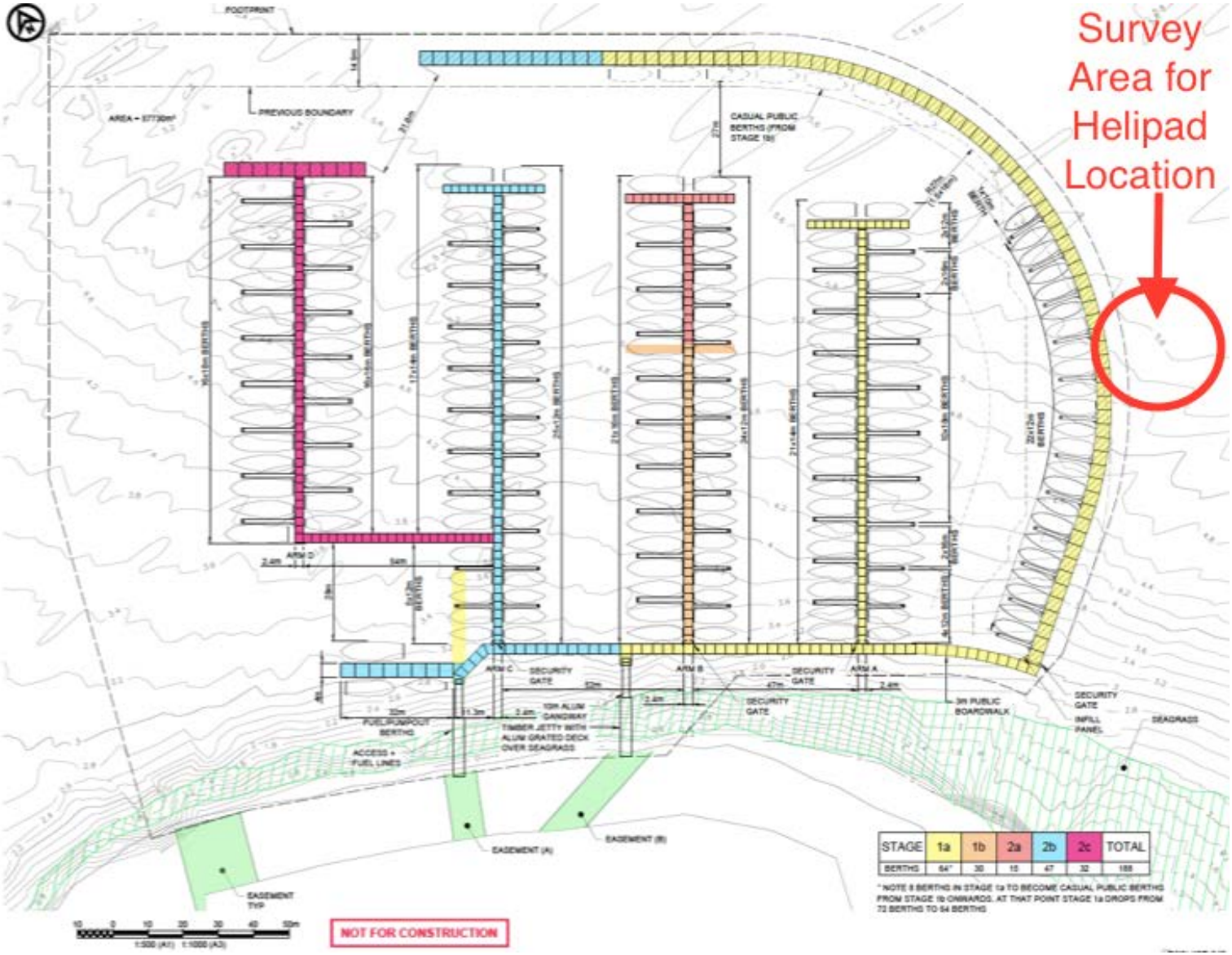

Figure 3 Location of Helipad Seabed Survey Area and relation of Helipad site to inshore *Zostera* Seagrass beds

Operational Details:

- The proposal seeks a maximum of eight helicopter movements per day or 38 helicopter movements per week, with operational hours restricted to daylight hours (8am start Mon-Sat, 9am start Sun, and sunset finish times variable as per season).
- Flight paths are from the south or north over Lake Macquarie.
- The helipad will not be used to refuel or maintain helicopters.
- A 30m managed safety zone will be established during take-off and landing of helicopters to be managed by a helicopter landing officer whose responsibility will be to ensure the management zone is clear of people and fauna prior to all inbound and outbound helicopter movements.

1.2 Update of Aquatic Ecology Information

The original EIS aquatic ecology report provides a comprehensive literature review for the aquatic ecology of Lake Macquarie as it relates to the Trinity Point Marina project and this review remains relevant for the present proposal and Figure 4 shows the aquatic ecology habitats for the immediate study area around the marina:

- There is a coastal riparian to intertidal vegetation complex around the un-named inlet to the south-west of the marina that comprises a *Casuarina glauca* she-oak stand above the intertidal, a saltmarsh complex in the mid to upper intertidal and a grey mangrove fringe in the lower intertidal around the rim of the un-named inlet.
- The north-east to east riparian shore supports terrestrial pasture grasses with a fringe of *C. glauca*, *Eucalyptus tereticornis* and *Angophora floribunda* (to the south). There are a few isolated and stunted grey mangroves and individual saltmarsh plants located along this shoreline.
- The inlet itself is very shallow with a soft silty-sand bottom. It supports a mixed seagrass (*Zoster*a and *Halophila*) cover that is patchy with variable cover over time.
- There is a continuous fringing *Zostera* bed along the north-eastern and eastern shores of the property which is generally of even cover and density along the shoreline shown in Figure 4. The seagrass bed is narrow along the north and north-east shoreline and confined to depths between 0.2m and 1.4m chart datum (CD). It broadens out along the property eastern shoreline and occurs to 2.4 m CD.
- The seabed beyond the seagrass bed comprises bare silty sand habitat that reaches a depth of around 5.6m CD under the marina breakwater.

In summary, the available aquatic habitats at and in the immediate locality of the proposed helipad comprise unvegetated seabed sediment habitat and overlying estuarine water some 5m

deep. These habitats support a benthic (bottom dwelling) fauna in the sediments plus fish assemblages that feed off the benthos. These are considered in further detail below.

Figure 4
Aquatic Habitats around and at the Concept Approved Trinity Point Marina

1.2.1 Sediment Benthos and Fish Assemblages within the Marina and Under the Helipad

The whole of the floating marina complex including the proposed helipad is located over soft sediment habitat varying in depth from around -2m CD to -5.6m CD.

There have been a number of studies of the soft sediment habitats including detailed analysis of the physical and chemical characteristics of the sediments (Concept Approval 06-0309 EAR Appendices AC, F and G). Additional reports that include reviews and updates of the original studies were prepared for the Stage 1 marina project EIS (Appendices H, N and O). The geochemical studies indicated that the lake bed sediments at marina sampling sites varied from brown sandy mud to fine grey silty mud and that sediments were not contaminated by metals or TBT. Cadmium concentrations in several samples were slightly elevated with regard to the ANZECC (2000) Interim Sediment Quality Guideline (ISQG) – low range value of 1.5mg/kg, with a maximum value of 1.9mg/kg, well below the ISQG high range value of 10mg/kg. The studies also indicated an area around the eastern boundary of the present marina site that had slightly elevated arsenic values (range 20.4 to 22 mg/kg) compared to the ISQG Low value of 20 mg/kg.

Sediment benthic sampling was undertaken for the original Concept Plan EAR (Appendix R). All these sites were located within the present marina envelope and Table 2 above provides a summary of the survey results:

Table 2 Summary Statistics for Marina Benthos Sampling (2008)

Arm and Location	Ain	Aout	Bin	Bout	Cin	Cout	Din	Dout
Mean Taxa	17.0	9.0	18.3	3.0	15.3	2.7	14.0	4.0
Mean Abund	75.0	34.7	95.7	13.3	81.3	11.7	75.7	20.0
Med Size (mm)	0.23	0.10	0.30	<.075	0.26	<.075	0.26	<.075
Fines (<75 µm)	30	48	18	94	20	81	16	95
Sand (>75 µm)	69	47	81	4	80	9	83	5
Gravel (>2mm)	1	5	1	2	0	10	1	0

- The study found that inshore sediments were generally silty-sands (with silt proportions between 16 and 30%) whilst the off-shore sediments including sediments from near the helipad site were more muddy with silt proportions between 80 and 95%. Site Aout was the exception with proportionally more sand than the other three outer sites (47% compared to 4 to 9%).
- There were 1222 individual animals found from 45 taxa identified from the survey (with most identified to Family level); 17 polychaete worm taxa (900 individuals or 74% total), 14 molluscs (259 individuals or 21% total), 9 crustaceans (16 individuals), and 47 individuals

from five other phyla (generally worm like phyla and one echinoderm, a brittle star that accounted for 13 of the 47 minor taxa individuals.

- There was a clear difference in benthic assemblages based on sediment characteristics, with the more sandy *inner* sites supporting 41 of the taxa and 983 individuals and the more silty *outer* sites supporting 20 taxa for 239 individuals. Of the 20 *outer* site taxa, four were only found at *outer* sites, three as single individuals with 20 polychaete worm Sigalionidae individuals found in ten of the 12 *outer* replicate sites.
- *Cirratulid* polychaete worms were only found at inner sites and accounted for 28.3% abundance. Semelid bivalves were the next most abundant (12.6%) and were found at both inner and outer sites albeit in greater abundances at outer sites. Four other polychaete worm taxa; *Capatellids, Magelonids, Maldanids* and *Oweniids,* accounted for 30% abundance. All were confined to the inner sandier sites.

TEL (2008) noted that the taxa found at the marina site are also present in similar habitats throughout Lake Macquarie, and it is concluded that the soft unvegetated sediments support healthy benthic assemblages with primary differences in community structure related to sediment composition.

Dive survey investigations of the seabed area under the proposed helipad footprint undertaken on 8 May 2014 (see Figure 3) indicated that the seabed had the same silty-sand character to the adjacent marina benthic sites studied in 2008, and that the sediments supported a diversity of benthic organisms as evidenced by the abundance and variability of burrows (see Figures 5 and 6). There are also no aquatic plants (seagrass or algae) found and at these depths none are expected.

Table 2 provides a compilation of fish studies from the literature review and from the specific studies undertaken for the Marina EIS. In addition to these studies there were numerous observations of fish and other fauna obtained from the various inshore seagrass surveys as summarised below:

- Adult cuttle-fish *Sepia sp* were observed during both 2012 and 2014 seagrass verification surveys and juveniles were observed at two of the 13 replicate sites for the syngnathid survey.
- 16 juvenile squid were observed in eight of the 13 replicate sites for the syngnathid survey and several sub-adults (2-3cm) were observed during the May 2012 seagrass survey.
- Gastropod molluscs occurred in six replicates with sea hares in three replicates. Sea hares were also reported for both the May 2012 and 2014 surveys.
- Numerous hermit crabs occupying the shells of the mud whelk (*Batillaria australis*) were observed within the marina transects.
- There were a variety of small crustaceans noted in the syngnathid survey samples, including caprellids (4 replicates) amphipods (3 replicates) and one isopod.
- Copepods plus juveniles and sub-adult shrimp and prawns were common throughout most replicates (9 replicates each).

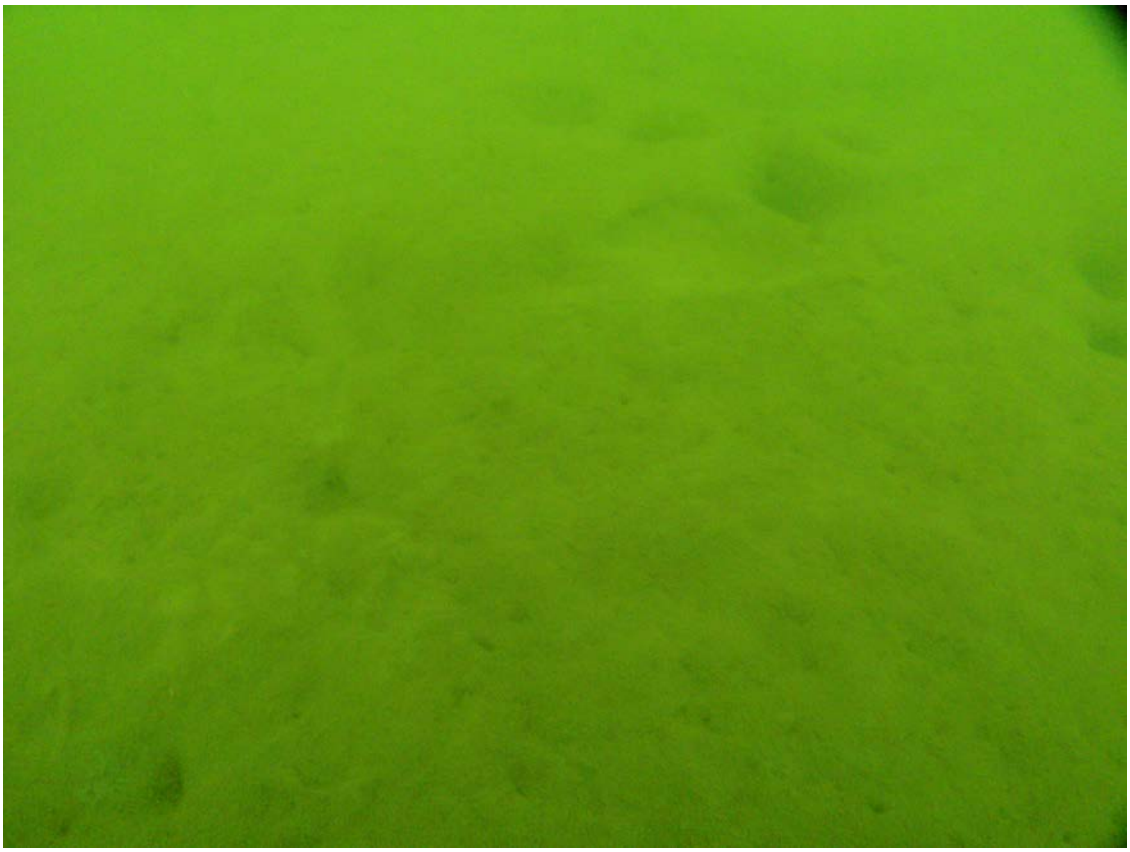

Figure 5 Silty-Sand Habitat under Helipad Footprint 8 May 2014.

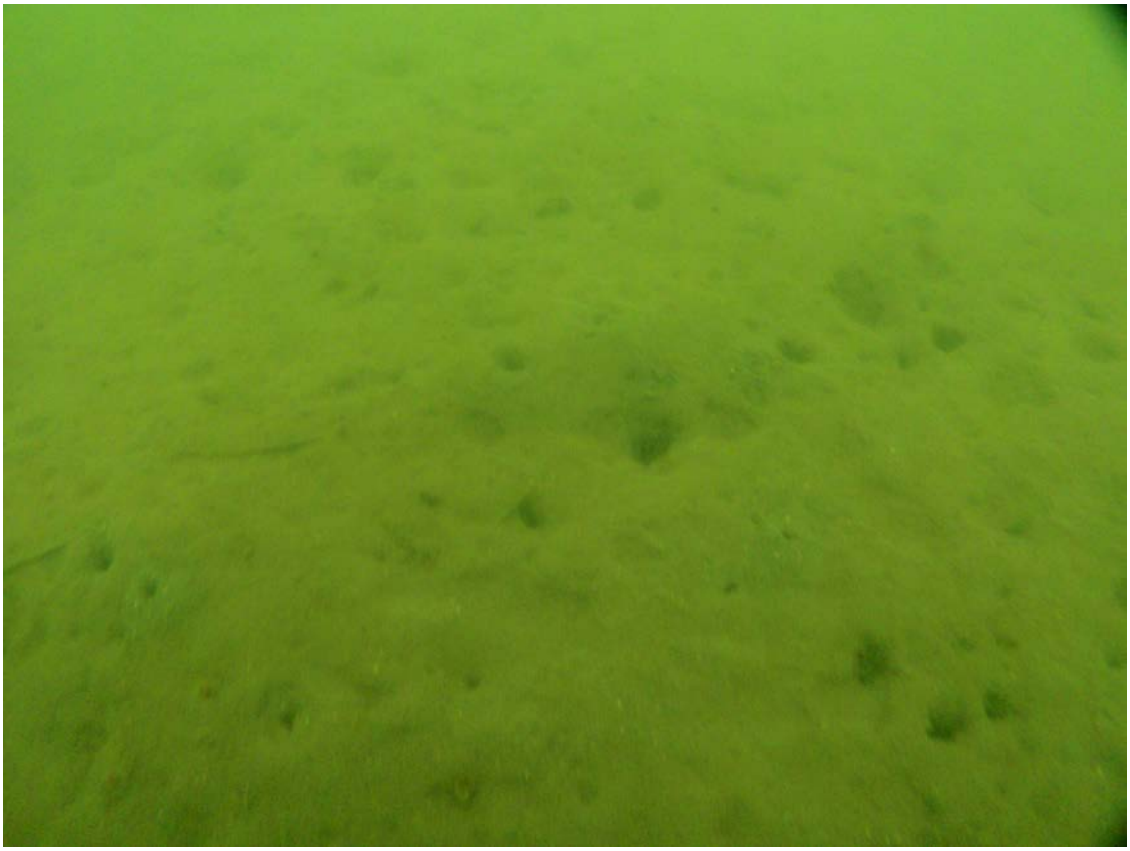

Figure 6 Silty-Sand Habitat under Helipad Footprint 8 May 2014. Note variety of small to large burrows.

Table 2 Fish reported from Bardens Bay and at Trinity Point)

Family	*Species*	Common Name	Marina Site	Lake Shore	Bardens Bay*
Ambassidae	*Ambassis marianus*	Glassfish	x		
Apogonidae	Siphamia cephalotes	Wood's Siphonfish			x
Belonidae	*Tylosurus gavialoides*	Stout Longtom		x	x
Blenniidae	*Omobranchus anolius*	Oyster Blenny	x	x	x
Blenniidae	*Omobranchus rotundiceps*	Rotund Blenny			x
Blenniidae	*Parablennius intermedius*	Horned Blenny	x		
Blenniidae	*Parablennius tasmanianus*	Tasmanian Blenny			x
Engraulidae	*Engraulis australis*	Australian Anchovy			x
Gerreidae	*Gerres subfasciatus*	Silver Biddy	x		
Girellidae	*Girella tricuspidata*	Luderick	x	x	x
Gobiidae	*Arenigobius bifrenatus*	Bridled Goby	x	x	
Gobiidae	*Bathygobius kreffti*	Frayed-fin Goby	x		
Monacanthidae	*Meuschenia trachylepis*	Yellowfin Leatherjacket			x
Monodactylidae	*Monodactylus argenteus*	Diamond fish			x
Mugilidae	*Myxus elongatus*	Sand Mullet	x		x
Sillaginidae	*Sillago burra*	Western Trumpeter Whiting			x
Sillaginidae	*Sillago ciliata*	Sand Whiting	x	x	x
Sillaginidae	Sillago maculata	Trumpeter Whiting			x
Sparidae	*Acanthopagrus australis*	Bream	x	x	x
Sparidae	*Rhabdosargus sarba*	Tarwhine	x	x	x
Sphyraenidae	*Sphyraena obtusata*	Striped Sea Pike	x		
Syngnathidae	*Filicampus tigris*	Tiger pipefish			x
Syngnathidae	*Hippocampus whitei*	White's Seahorse			x
Syngnathidae	*Stigmatopora nigra*	Wide-bodied Pipefish	x		x
Syngnathidae	*Urocampus carinirostris*	Hairy Pipefish	x		x
Syngnathidae	*Vanacampus margaritifer*	Mother-of-pearl Pipefish			x
Tetraodontidae	*Tetractenos glaber*	Smooth Toadfish	x	x	x

*Note: The Bardens Bay Records are obtained from an Atlas of Living Australia Search. All other listing were actually observed in the seagrass beds along the lake shore to Bluff Point.

- Brittle stars occurred in two replicates.
- In terms of juvenile fish there were part of the seagrass syngnthid sampling by-catch, batfish and trumpeter whiting juveniles were identified and small gobies plus a gudgeon could not be identified.
- A number of razor clams (*Pinna bilcolor*) and solitary ascidians (the sea squirt *Herdmania momus)* were observed throughout the study area in May 2014. These were generally located towards and beyond the deeper limits of the seagrass beds in the marina footprint. Some empty clam shells provided useful shelter or breeding habitats for fish, octopus and cuttlefish.
- Small to large clumps of the bearded mussel (*Trichomya hirsuta*) were prevalent within the seagrass beds and there is a large bed at Bluff Point.

1.2.2 Biota on Piles and Pontoons

Once the marina and the helipad are built there will be large expanses of constructed wetted surface areas available to be colonised by a variety of algae and encrusting biota. In order to understand what the range of organisms that may colonise the marina structures could be, a survey was made of piles and pontoons for the first three private facilities along the Bardens Bay shore north of the un-named inlet and at the public wharf at Brightwaters on the Bardens Bay western shore on 9 September 2014:

- There was very little growth above the waterline on the piles, only barnacles (*Balanus trigonus*). Other barnacles noted were *Elminius* at site 4 on piles from water surface to 30cm below surface.
- Wetted surfaces in the shallows on piles and pontoons supported a proliferation of macroalgae including *Sargassum sp, Codium fragile, Laurencia obtusa, Cystoseira trinodis, Colpomenia sinuosa, Enteromorpha sp.* The depth to which the algae occurs on piles is dependent on the mean turbidity at the site and therefore piles in shallow waters generally have limited algae growth due to constant turbidity from boat or wind wave action mobilising inshore sediments. In contrast piles in deeper water (such as the piles on the public wharf at Brightwater) supported a luxuriant growth of *Sargassum* algae almost to the bottom of the pile at 1.5 m depth.
- The main encrusting and attached fauna growing amongst the algae or below the algae in deeper waters included bryzoans (encrusting and *Bugula sp*), sponges, *Herdmania momus*,,hydrozoans, plus Sydney rock oysters.
- Although there were localised and dense accumulations of the hairy mussel on the bases of some piles, generally there were more piles with little or no encrusting fauna at the base.
- As pontoon wetted surfaces remain in the shallow sub-tidal zone all the time, they provide particularly high quality colonisation surfaces for mixed algae and encrusting plus attached

fauna, and achieve a more complex surface structure (Figure 7) that in turn provides both important feeding and shelter habitat for small reef fish or juveniles.

Figure 7 Complex assemblage of algae and encrusting fauna on pontoon vertical surface at Jetty 3 north of the unnamed inlet.

1.3 Other Fauna Utilising Aquatic Habitats

There are a variety of other fauna that utilise marine aquatic habitats in Lake Macquarie either exclusively (e.g., cetaceans and marine turtles) or for feeding and shelter (shore, wading and fishing birds and some land mammals such as Australian water rat and the fishing bat *Myotis adversus*). The original aquatic and terrestrial ecology reports for the Concept Approval EAR (Appendixes R and S; TEL 2008 and RPS 2008 respectively) and the Stage 1 Marina EIS provided information of the utilisation of the site these species. A number of these species are listed as threatened under one or another of the NSW *Threatened Species Conservation Act 1995 (TSC Act),* the NSW *Fisheries Management Act 1994 (FMA)* or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999, (EP{BC Act),* they were considered in detail in the three previous reports. For the present study species listed under the Commonwealth *Environment Protection and Biodiversity*

Conservation Act 1999" have been assessed in a companion report to this aquatic ecology impact report, prepared by MJD Environmental (see **Appendix F of the EA**).

In terms of aquatic bird life around the marina study area it was noted that wading birds in Lake Macquarie are found predominantly on exposed intertidal mudflats; a habitat not found in the vicinity of the proposed marina. Fishing bird species observed by terrestrial ecologists (RPS 2008) included black swan, pelican, egret, cormorant, royal spoonbill, silver gull, crested tern, masked lapwing, chestnut teal, pacific black duck, wood duck, white-faced heron, sacred ibis. Two raptors, the white-bellied sea-eagle and osprey were reported from resident's records.

1.3.1 Threatened Species, Populations and Ecological Communities

For the *FM Act, TSC Act* and *EPBC Act* to have relevance there must be likelihood that one or more threatened species occur in or encroach upon the study area, which could then be impacted upon by the proposed works. A review was made of the existing database records on aquatic species to confirm the threatened species, populations or communities identified as likely to occur in Lake Macquarie. These included the *EPBC Act* database, the Fisheries NSW database (no result) and the *TSC Act* BioNet database. The results of these searches were compared against the Lake Macquarie City Council (LMCC) State of the Environment Report updated listings for 2012/13 as these listings separate many species that may occur in the lake from those that occur on the coast and open ocean offshore from the LGA. From these searches:

- There are no fish or shark species that are listed as threatened under the FMA or under the EPBC Act that are likely to occur in Bardens Bay.
- Two marine turtles, the Loggerhead and Green Turtle are listed as Endangered and Vulnerable respectively under both the TSC and EPBC Acts.
- Syngnatthiformes ((seahorses, seadragons, pipefish, pipehorses, ghost pipefishes and sea moths) are *Protected* under the FMA and are *Listed Marine Species* under the EPBC Act. Several species of pipefish plus a possible sea-horse species are known or reported from seagrass beds in Bardens Bay.

TEL (2008) and RPS (2008) assessed the likelihood of occurrence and likelihood of impact on a number of marine aquatic related threatened species listed under the TSC and EPBC Act and provided Tests of Significance under the TSC Act and FMA plus EPBC Act and MJD Environmental (2016) prepared review for the present Helipad proposal. In terms of potential aquatic biota, *Significant Impact Guidelines* assessments where prepared for Grey Nurse Shark, Loggerhead and Green Turtles and Dugong. In regard to the likelihood of impact TEL (2008), RPS (2008) and MJD Environmental (2016) all concluded that it is unlikely the marina and by extension the helipad proposal would have a significant impact upon a local population of nationally listed migratory species such that local extinctions would occur.

Key Threatening Processes (KTPs) are listed under both the *TSC Ac*t and *FMA*. In regard to marine aquatic habitats and biota the following KTPs under the FMA are potentially relevant:

- *The degradation of native riparian vegetation along NSW water-courses*. In regard to the protection of the mangroves and saltmarsh around the un-named inlet and the northern shore there are no threats of degradation arising from the helipad proposal.
- *The installation and operation of in-stream structures and other mechanisms that alter natural flow regimes of rivers and streams*. The Hydrodynamic Processes Report (Appendix I) for the Marina EIS considered the potential impacts for the total marina proposal on natural flow regimes and concluded that there would not be a significant impact. As the helipad proposal only increases the number of piles in the total marina footprint area by a very small fraction, there are unlikely to be any changes to the original assessment conclusions arising from placement of the helipad.
- *The introduction of non-indigenous fish and marine vegetation to the coastal waters of NSW*. Whilst the helipad will provide additional wetted surface area for colonisation by aquatic the presence of the proposed helipad would not alter in any significant way the potential for introduction of non-indigenous fish and vegetation to the locality.

In terms of practical survey observations no individual aquatic species listed as threatened in the schedules of the three relevant acts were observed in the whole marina survey area, including the helipad location during field work for the original EAR in 2007 nor during field work for the marina and helipad proposals in May, July and September 2014, nor during subsequent marina construction monitoring surveys through to October 2016.

In regard to the protection of syngnathids (listed as protected under the *FMA* and as listed marine species under the *EPBC Ac*t), this study has indicated that the seagrass beds adjacent to the marina inner floating walkway provide important habitat for adults and juveniles of at least two species of pipefish. The surveys of unvegetated seabed sediment offshore from the seagrass beds did not provide any observations or indications of syngnathids and it is concluded that syngnathids are almost entirely limited to the inshore seagrass bed habitats. They are unlikely to be found over the bare sediment habitats under the helipad footprint and would only occur rarely as transients.

On the basis of the extensive assessments for the potential impacts of threatened species arising from the construction and operation of the proposed marina, as contained in the 2008 terrestrial and aquatic ecology assessments and the updated reviews provided for the marina EIS it is concluded that the construction of the proposed helipad is unlikely to affect listed threatened and protected species of fish, marine mammals and reptiles that occur in, or encroach upon, the proposal site.

Hence, there is no need to prepare any Species Impact Statements under state legislation or refer the Proposal to the Commonwealth under the EPBC Act for further consideration and approval (see also **Appendix F to the EA**).

1.4 Key Fish Habitat Assessment

With regard to the Fisheries NSW waterway classification scheme as shown in Table 2 of the revised Policy and Guidelines document (NSW Fisheries 2013), Lake Macquarie is a Class 1 "Major key fish habitat" (KFH).

In regard to the sensitivity classification of the specific habitats identified at the site (as defined in Table 1 of Fisheries NSW 2013):

- The saltmarsh stands and *Zostera/Halophila* seagrass beds are Type 1 "highly sensitive KFH.
- The mangrove stands are Type 2 "moderately sensitive KFH"
- The rock reef and mussel beds south off Bluff Point are also Type 2 "moderately sensitive KFH" by virtue of the presence of the macroalgae species *Sargassum spp*.
- The un-vegetated silty-sand and shell habitat offshore from the inshore rocky rubble reef habitat are also Type 2 "moderately sensitive KFH" by virtue of their stability and good in-faunal (benthic) populations.

2 IMPACT ASSESSMENT, MITIGATION & MONITORING

The Trinity Point Helipad project is described in Section 1.1 above and shown in Figures 1 to 2. The relationship of the project to the aquatic habitats at the site is shown in Figure 3 and the likely aquatic habitats plus the biota of these habitats is reviewed in Sections 1.2 to 1.4.

2.1 Management of Construction Impacts

The Helipad construction requires placement of four locator piles to hold the heipad barge in place and one for pontoon, placement of cardinal marker for navigation, floating in the helipad barge plus associated pontoons and placement of the gangway to connect the helipad to the marina breakwater walkway. Accordingly, the main direct impact from the construction works would be the disturbance of the lake bed sediments from pile placement.

The five helipad locator piles will be up to 600 mm diameter steel telescopic piles and these will be driven or vibrated into bare sediment habitat more than 100m offshore from the seagrass beds. Each pile will displace up to 0.4m^2 of benthic habitat. However, as the pile driving activity pushes most sediment aside rather than entraining it downwards, the actual loss of benthic biota is minimal as most organisms are pushed aside with the displaced sediments, and are able to successfully re-establish after pile driving is completed. Further, as there is abundant bare sediment habitat in Bardens Bay, colonisation of displaced sediments would occur rapidly from the adjacent sediments. Accordingly it is concluded that the overall impact of pile driving on bare sediment benthic habitats would be negligible.

Impact noise can startle aquatic fauna (fish, marine mammals and turtles) disrupting their normal behaviours and potentially making them more susceptible to predation. This is particularly of concern for cetaceans where mothers and juveniles can become separated.

- The production of impact noise from pile driving activities will occur for the duration of piling works as most piles will be driven or vibrated to refusal and then driven into underlying rock.
- Impacts noise from piling operations is not considered a risk factor for the aquatic ecology of the locality:
    - There are few reports of cetaceans in Lake Macquarie and Bardens Bay. Dolphins that do occur are generally sub-adults or adults, more often seen in the Swansea Channel and the immediate waters around the lake inner entrance than elsewhere in the lake.
    - Green turtle observations are more widespread in Lake Macquarie but again the turtles observed are generally sub-adults and are more likely to be observed in the larger seagrass beds along the eastern shore closer to the entrance channel.
    - The piling works are being undertaken over bare sediment habitat where the majority of

fish are more likely to be transient adult or sub-adult benthic foraging, ambush or schooling predators and thus not susceptible to predation if startled.

There are a number of potential indirect impacts on aquatic habitats arising from the pile driving activities:

- The risk of excessive disturbance of lake bed sediments that can arise from work vessels, barges and floating pontoon segments bottoming out, or from propeller wash scour and from pile driving activities is not considered high, as there is more than sufficient depth over all tides at the helipad site to ensure these impacts cannot arise
- Whilst use of anchors, mooring blocks and chains or wires for holding barges in place have the potential to disturb bottom sediments, the actual risk to the benthic habitats is considered low as there is an abundance of this habitat and any disturbance would be mitigated by rapid recolonisation following the disturbance.
- Any potential loss of soft sediment benthic habitat would also be offset by the creation of additional hard-substratum wetted surface areas in the form of pile and barge plus pontoon vertical surfaces which together with the horizontal surfaces under the barge and pontoons provide a large additional area for colonisation by aquatic biota including algae.
- Fuel or oil spills from plant and vessel re-fuelling or on-water plant maintenance would be minimised by application of the existing Marina Project Construction Environment Management Plan (CEMP).

2.2 Management of Operational Impacts

The main potential impacts on aquatic biota arising from the operation of the Helipad relate to:

- Water quality impacts arising from fuel and engine oil leakages or from fuel dumps or other accident related fuel and hydrocarbon spills, including fires.
- The possibility of bird strike during take offs and landings.
- The possible impacts of noise generated during landings and take-offs.

Water Quality Impacts:

- Water quality impacts are minimised by not allowing fuelling or routine engine or other machinery maintenance procedures to be undertaken at the helipad.
- Fuel, oil and grease spills from helicopter machinery will be minimised by ensuring that the helicopters meet their stringent air safety maintenance requirements. If some maintenance procedures are require at the helipad to make the helicopter safe for take-offs (i.e., replacing a broken hydraulic line), there will be adequate and suitable materials available and at hand at the helipad to contain and prevent hydrocarbon liquid spills to the waters of Lake Macquarie.

- Accidental fuel and oil spills will be managed by the provision of oil spill containment equipment at the helipad site including adequate and appropriate training of helipad supervision staff in the deployment and use of oil spill containment equipment and in cleanup procedures.
- Fire containment procedures for the helipad will also include procedures and suitable training of fire fighting staff in regard to the use and containment of fire retardant chemicals plus training in the potential impacts of fire retardant chemicals to the environment.

Bird Strike:

There are two aspects of bird strike arising from the use of the helipad, bird strike of birds that are in the local vicinity of the helipad (swimming and roosting birds) and birds that are overflying the helipad:

- In regards to birds in the vicinity of the helipad, the main species at risk would be fishing birds (cormorants, seagulls, terns and pelicans) roosting or fishing. One of the operational procedures is that each of the helicopter landings or take-offs will be supervised by a landing supervisor who is to ensure that the 30m managed safety zone is clear of actual and potential obstacles.
- Whilst roosting birds (or rafting birds on local waters within the exclusion zone) can generally be frightened away, birds diving on schools of fish in the vicinity of the helipad may not be as easy to scare away. In order to minimise the risk of local bird strike, the flight supervisor is to be trained in fishing bird recognition and general fishing behaviour to be able to ensure that bird fishing manoeuvres are interrupted or have been allow to be completed before authorising flight landings or takeoffs.
- The potential for bird strike of fly-over birds has been assessed in a companion report prepared by MJD Environmental (see **Appendix F** for the EA).

Helicopter Noise Impacts:

There are two aspects of helicopter noise that have the potential for harming aquatic biota; physical harm from noise energy and startling impacts on biota:

- The companion Noise Report for the EA (**Appendix E**) has assessed the in-air and underwater noise transmission impacts for humans and animals include aquatic animals (fish, mammals and turtles) and concluded that the noise spectrums of helicopters would not result in physical harm to biota in the vicinity of the helicopter pad either in on or under the water.
- The companion terrestrial biota report for the EA (**Appendix F**) has assessed the potential impacts on these species and has also concluded that there are low risks of impacts on these biota arising from the proposed helipad operational use parameters.

- Whilst noise generated by helicopter landings and takeoffs have the potential to startle air breathing aquatic mammals such as turtles and dolphins that come up to the surface to breath just when noise levels are high, the actual possibility of this happening is considered low as there are few sightings of turtles and dolphins in Bardens Bay and these animals are more likely to already be alert to noise generated from passing boats. Further, individual startled aquatic mammals or turtles would simply crash-dive with no actual impact on the individual. Accordingly the only actual individuals at risk would be groups or pairs that contain young where avoidance diving could split young from mothers or groups. Given the rarity of observations of groups of marine mammals and turtles in Burdens Bay, the risk is considered very low.

On the basis of the combined conclusions of this report and the two companion reports cited above, it is concluded that fish and other animals in, on or underwater are not at direct risk of physical noise damage and can move away from the noise source without risk of physical damage and that fish and other animals are not at risk from startling to the effect that individuals and groups would be placed at risk.

2.3 Fisheries Management Act Permit & Habitat Protection Requirements

Part 7 of the Fisheries Management Act 1994 (FM Act) 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 NSW Fisheries Revised Policy and Guidelines (NSW Fisheries 2013). With respect to estuarine activities, permits are required for reclamation or dredging works and for the taking or harming of marine vegetation:

- The present proposal does not include activities that fall under the definition of dredging and reclamation and does not require taking or harming of marine vegetation and consequently would not require a permit.

2.4 Conclusions

It is concluded that a helipad attached to the Marina at Trinity Point, Lake Macquarie can be constructed and operated with low or minimal risk to aquatic biota and habitats provided that the facility is constructed and operated as per the detailed descriptions provided in the EA main report and that Landing Supervisors have the training and resources available to minimise and contain potential impacts, as suggested in the Noise and Flora Fauna assessment reports, including this report.

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