Ecological Assessment

Trinity Point Helipad Trinity Point

Prepared for

Johnson Property Group

Final / April 2018

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EXECUTIVE SUMMARY

MJD Environmental has been engaged by Johnson Property Group (JPG), to prepare an Ecological Assessment associated with, a proposed 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.

This Ecological Assessment has been prepared to:

- Accompany the Part 3A Concept Plan Section 75W Modification Application known as MOD 3 currently being assessed by the NSW Department of Planning & Environmental (DPE). The modification application proposes the addition of a helipad to the Part 3A Concept Plan;
- to address the Secretary's Environmental Assessment Requirements (SEARs) for the proposed, Modification (SEARS MP06_0309 MOD3); and
- accompany an Environmental Impact Statement (EIS) that will form part of DA 1176/2014 (Lodged with Lake Macquarie City Council (LMCC)) for the construction and operation of the proposed helipad, which this application is a designated development. Requirements for the EIS are in the SEARs issued by the NSW DPE (SEAR 846) in July 2016.

The assessment aims to examine the likelihood of the proposed helipad having a significant effect on any threatened species, populations or ecological communities listed under the *NSW Threatened Species Conservation Act 1995* (TSC Act). This assessment recognises the relevant requirements of the EP&A Act 1979 as amended by the *NSW Environmental Planning and Assessment Amendment Act 1997*. Preliminary assessment was also made with regard to those threatened entities listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)

This ecological assessment specifically focused on threatened Avifauna species and their habitat, due to the fact the proposed development is situated entirely over water. No terrestrial flora and fauna surveys where undertaken as part of this assessment.

To assess the impacts of the proposal the Study Area selected for the project was based around the proposed flight paths and the air space between landing and take-off, to the cruising altitude of 1000ft. A 1km buffer surrounding the flight paths was set to provide a conservative separation from the flight paths that included all shoreline and woodland vegetation areas within Barden's Bay (location of Helipad). It was assumed that this area would provide an understanding of avifauna utilisation in the locality and provide a range of potential habitat for threatened bird species. Included in the Study was areas south west of the Helipad outside the1km buffer within higher quality vegetation found in the Lake Macquarie State Conservation Area (LM SCA).

A detailed assessment of the relative habitat value present within the Study Area was undertaken with a specific focus on shore bird and raptor species habitat. The assessment was undertaken via a three-stage process that included desktop appraisal, habitat validation surveys and a formal bird census.

- Stage 1: Desktop appraisal of potential habitat within the Study Area using GIS analysis including - Aerial Photograph Interpretation (API) and consultation of topographic map (Scale 1:25,000) layers for the site and cadastre boundary info (Private and Public land);
- Stage 2 habitat validation field survey was undertaken to ground truth the potential habitat and survey locations identified during the Stage 1 desktop habitat appraisal. Habitat surveys were based on the specific habitat requirements of each threatened bird species in regard to home range, feeding, roosting, breeding, movement patterns and corridor requirements; and
- Stage 3 Formal Bird census surveys where then undertaken at selected sites. Determination of the final site selection was carried out based on Stage 2 works.

Formal survey methods employed included:

Search area method: was used in areas where there was sufficient vegetation such as woodlands to undertaken 1ha 20-minute search.

Point survey method: was used along foreshores where birds were identified at pre-determined locations along a walking transect for a period of 30 minutes.

Additionally, secondary indications and incidental observations such as nests, whitewash, aural recognition of calls, where recorded in the Study Area.

During the habitat validation assessment, it was observed, habitat to support shore birds is very limited with no significant areas observed in the Study Area that provided roosting Foraging habit such as large mudflats, Sand flats and rocky outcrops. The limited occurrences of these habitat types were observed to be generally adjacent to high pedestrian usage areas, that in turn reduce protection and security for shore bird habitat. A total of 16 sites where selected from the 45 identified during desktop assessments.

Avifauna field survey results are as follows:

- A total of 51 bird species where observed within the Study Area;
- No threatened shorebirds were observed roosting or foraging at any site within this Study Area;
- The threatened White-bellied Sea-eagle (*Haliaeetus leucogaster*), was observed at Trinity Point (two occasions), Sandy Point Reserve, Belmont Airport and Lake Macquarie SCA during site surveys;
- The Threatened Eastern Osprey (*Pandion haliaeetus*) was observed roosting in trees in the enclosed bay south of the hospital within the National Park; and
- The Sooty Oyster Catcher (*Haematopus fuliginosus*) was observed flying past Sandy Point Reserve in a north-south direction. This species was not observed roosting anywhere in the Study Area (Summer 2017).

Proposed direct Impacts of the development include:

- The loss of 436m^2 of potential foraging area on the lake surface due to the installation of the helipad (20m x 20m) on a floating pontoon and gangway connecting to the existing marina. The helipad pontoon will be secured to the lake bed by four piles. The gangway will be supported by an additional pile;

In additional, indirect impacts relating to bird strike by helicopter movements within the flight path, and noise impacts on threatened species during ascent and decent from cruising altitude (1000ft) were assessed as part of this proposal.

The ecological impact assessment and Seven-Part Test considered whether the proposed helipad to be included as part of the concept approved marina and mixed-use development at Trinity Point, would have the potential to constitute a significant impact on known threatened species (particularly Avifauna), and populations from the locality such that a local extinction may occur.

The assessment concluded that the proposal was unlikely to have a significant impact on the threatened entities assessed.

CONTENTS

LIST OF FIGURES

LIST OF TABLES

PLATES

APPENDICES

GLOSSARY OF TERMS AND ABBREVIATIONS

Term/ Abbreviation	Meaning
BC Act	Biodiversity Conservation Act
Council	Lake Macquarie City Council
DoEE	Commonwealth Department of the Environment and Energy
DPI Fisheries	NSW Department of Primary Industries - Fisheries
DPI Water	NSW Department of Primary Industries – Water
EP&A Act	NSW Environmental Planning and Assessment Act 1979
EPBC Act	Commonwealth Environment Protection and Biodiversity Conservation Act 1999
Ha	hectare
LGA	Local Government Area
LMCC	Lake Macquarie City Council
OEH	NSW Office of Environment and Heritage
TSC Act	NSW Threatened Species Conservation Act 1995 (Repealed)

1 Introduction

MJD Environmental has been engaged by Johnson Property Group (JPG), to prepare an Ecological Assessment associated with, a proposed helipad to be included as part of the concept approved marina and mixed-use development at Trinity Point (Refer to **Figure 1**). The helipad is proposed to be integrated into the approved marina.

This Ecological Assessment has been prepared to:

- Accompany the Part 3A Concept Plan Section 75W Modification Application known as MOD 3 currently being assessed by the NSW Department of Planning & Environmental (DPE). The modification application proposes the addition of a helipad to the Part 3A Concept Plan;
- to address the Secretary's Environmental Assessment Requirements (SEARs) for the proposed, Modification (SEARS MP06_0309 MOD3); and
- accompany an Environmental Impact Statement (EIS) that will form part of DA 1176/2014 (Lodged with Lake Macquarie City Council (LMCC)) for the construction and operation of the proposed helipad, which this application is a designated development. Requirements for the EIS are in the SEARs issued by the NSW DPE (SEAR 846) in July 2016.

1.1 Description of Proposal

Johnson Property Group have prepared an Environmental Assessment and Environmental Impact Statement (EIS) 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 from 8am (Mon-Sat) and 9am (Sunday and public holidays) and 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 four preferred flight paths for the helicopter movements. Three of the paths are similar with their entry and exit points from the south coming in over the lake and the other flight path enters and exits the helipad from the north over Barden's Bay. All 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 and air 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.

Refer to **Appendix 1** for a plan of the proposal.

1.2 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 Species Conservation Act (1995)* (TSC Act), NSW *Fisheries Management Act (1994)* (FM Act) or Commonwealth *Environment Protection and Biodiversity Conservation Act (1999)* (EPBC Act).

Current Setting

The need to assess for potential MNES and aquatic ecological impacts arose from the requirements provided in the Section 75W application: Secretary's Environmental Assessment Requirements (SEARs) dated July 2016 (Ref: MP 06_0309 Mod 3). The need to assess aquatic ecological impacts also arose from SEARS 846 for the Environment Impact Statement (DA1176/2014) also dated July 2016.

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;

- 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.

An overview of MNES was prepared by MJD Environmental (2016) and relied 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) (as Attachment 5 within **Appendix 4**). On this basis, the original overview was to be read in conjunction with the MPR (2014) and MPR (2016) reports. Additionally, the results of technical reports listed below had 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

The MOD 3 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 (2016) and this Ecological Report
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) and this Ecological Report
- 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 vegetation and details of compensatory habitat development to replace lost vegetation; and	MJD Environmental overview referencing MPR (2014) and MPR (2016) and this Ecological Report
- 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)

The Environmental Assessment Report for the modification was submitted in October 2016.

A review of the Environmental Assessment Report was undertaken by the Lake Macquarie City Council ecologist (Refer to **Appendix 5)** and concluded:

- *There are no objections from a flora and fauna perspective to the helipad.*

A review of the Environmental Assessment Report was undertaken by the Office of Environment and Heritage (Refer to **Appendix 6**), and concluded that:

- *The Environmental Assessment Report did not adequately assess threatened species with respect to impact assessment and survey requirements associated with threatened birds. As such the OEH was unable to support the findings of the EA until this matter is adequately addressed.*
- *OEH Acknowledged that the proposal is unlikely to impact on threatened reptiles (e.g. marine turtles) and marine mammals (e.g. dugong), including known foraging resources such as seagrass beds. OEH notes that the proposal is not located within the known sea grass beds that occur along the eastern shoreline of Trinity Point, nor will the proposed helipad present any shadowing impacts on these beds. As such OEH is of the opinion the EA and associated Appendices have adequately addressed issues that related to these threatened species.*

The acknowledgment of OEH's assessment that the overview did not adequately assess threatened species has led to the undertaking of the current ecological assessment to provide additional information to inform the OEH assessment.

Environmental Impact Statement (DA1176/2014)

SEARs items for consideration are as follows:

Key Issues

- **Water Quality issues**- including:
    - Benthic morphology; water flow in and around the helipad, flushing, and wave bounce; and
    - Measures implemented to mitigate impacts to water quality and shadowing on the nearby seagrass beds.

- **Aquatic flora and fauna –** particularly with regard to critical habitats, protected species, threatened species, populations or ecological communities, or habitats, marine vegetation and the presence and potential spread of the pest species.
- **Establishment of helipad and helicopter Noise Impacts -**including:
    - provide a Noise Assessment Report, prepared by a qualified acoustic consultant which investigates potential noise impacts associated with the take-off, approaches and route of helicopters to the helipad. The report shall address potential impacts on residential areas and other noise sensitive locations/uses; fauna and flora habitats in particular threatened species, populations, or ecological communities of fish or marine vegetation and critical habitat.

An overview of MNES was prepared by MJD Environmental (2016) and relied on the Aquatic Ecology and Baseline Investigations Report prepared by Marine Pollution Research (MPR 2014) Pty Ltd (September 2014) (completed as part of the marina approval DA1503/2014) and Trinity Point Helipad - Aquatic Ecology Impact Report prepared by MPR (October 2016). A copy of the MJD Environmental (2016), overview of potential MNES and Aquatic Ecological Impacts is provided within **Appendix 4** and the MRP (2016) Aquatic Ecology Impact Report is provided as Attachment 5 within **Appendix 4**. It should be noted that these two documents refer to the MOD 3 SEARs, however as confirmed in the below table, the two documents as well as this ecological assessment fully address the SEARs for the EIS preparation (SEAR 846).

The MJD Environmental (2016) overview is to be read in conjunction with the MPR (2014) and MPR (2016) reports. Additionally, the results of technical reports listed below had been relied upon when considering the proposed helipad in relation to SEARs 846:

- ADW Johnson Pty Ltd (2018). *Environmental Impact Statement* April 2018;
- Avipro (2018). *Trinity Point HLS Report*. Letter Report. April 2018;
- Royal Haskoning DHV (2018). *Environmental Assessment – Coastal Processes and Hydrodynamics. Letter Report*, April 2018; and
- The Acoustic Group (2018). *Acoustic Assessment for a proposed Helipad- Trinity Point Development, Lake Macquarie*. ADW Johnson Acoustic Report April 2018.

The EIS SEARs (846) matters for consideration have been addressed by the following technical studies.

Item	Addressed
Key Issues – Item 3 Establishment of Helipad and Helicopter Noise Impacts	
Part 4: *provide a Noise Assessment Report, prepared by a qualified acoustic consultant which investigates potential noise impacts associated with the take-off, approaches and route of helicopters to the helipad. The report shall address potential impacts on residential areas and other noise sensitive locations/uses; fauna and flora habitats in particular threatened species, populations, or ecological communities of fish or marine vegetation and critical habitat.*	Acoustic Group (2018)
Key Issues – Item 4. Water quality Issues	
Benthic morphology; water flow in and around the helipad, flushing, and wave bounce; and *Measures implemented to mitigate impacts to water quality and shadowing on the nearby seagrass beds*	MPR (2014) and MPR (2016)

Item	Addressed
Key Issues – Item 5. Aquatic Flora and Fauna	
particularly with regard to critical habitats, protected species, threatened species, populations or ecological communities, or habitats, marine vegetation and the presence and potential spread of the pest species.	MPR (2014) and MPR (2016) and this Ecological assessment

1.3 Aims & Scope

The assessment aims to examine the likelihood of the proposed helipad having a significant effect on any threatened species, populations or ecological communities listed under the *NSW Threatened Species Conservation Act 1995* (TSC Act). This assessment recognises the relevant requirements of the EP&A Act 1979 as amended by the *NSW Environmental Planning and Assessment Amendment Act 1997*. Preliminary assessment was also made with regard to those threatened entities listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The scope of this Ecological assessment is to:

- identify and assess the extent of suitable habitat for threatened bird species within the Study Area, including listed under the TSC Act or EPBC Act;
- identify any fauna species including; threatened and migratory species, populations or their habitats, occurring within the Site and are known or likely to occur within 10 km of the Site (locality);
- assess the potential of the proposed development to have a significant impact on any threatened species, populations or ecological communities (or their habitats) identified from the Site; and
- describe measures to be implemented to avoid, minimise, manage or monitor potential impacts of the proposal.

In addition to the survey work conducted within the Site, consideration has been afforded to habitats within the Site in order to appreciate the environmental context of the overall Study Area. This has included assessment of potential direct and indirect impacts.

1.4 Site Particulars

Locality	**Site:** The site has been defined as the 20x20m Helipad, associated structures and 30m safety management zone from the edge of the helipad. **Study Area:** The Study Area is comprised by three areas as follows (refer to **Figure 2**): ▪ A 1km buffer from the proposed helicopter flight paths ▪ An area of shoreline approx. 3km to the west of the site around the Morisset and Woods Point within the Lake Macquarie State Conservation Area ▪ The Lake Macquarie frontage to the Lake Macquarie Airport approx. 11km to the north-east of site.
LGA	Lake Macquarie City Council
Boundaries	The Study Area is bound to the north by Brightwaters, to the west by Morisset Park, and to the south east by Summerland Point. All other boundaries consist of open waters of Lake Macquarie.
Current Land Use	The Study Area consists of open waters of Lake Macquarie with a marina and moored boats in Barden's Bay. Recreational activities such as fishing, jet skiing, and sailing occur within the Study Area. Land borders generally consist of existing residential areas.
Topography	The Study Area consists of the waters of Lake Macquarie and shorelines generally less than 4m in elevation.

1.5 Qualifications & Licencing

Qualifications

Field investigations and reporting were conducted by Adam Cavallaro (B.Env Sc), Bret Stewart (B. Sc.) and Matt Doherty (BLMC) of MJD Environmental Pty Ltd.

Licencing

Research was conducted under the following licences:

- NSW National Parks and Wildlife Service Scientific Investigation Licence SL101684 (Valid 28 February 2018).
- Animal Research Authority (Trim File No: 16/170) issued by NSW Department of Primary Industries (Valid 8 February 2019).
- Animal Care and Ethics Committee Certificate of Approval (Trim File No: 16/170) issued by NSW Department of Primary Industries (Valid 8 February 2019).

Figure 1 Site Location

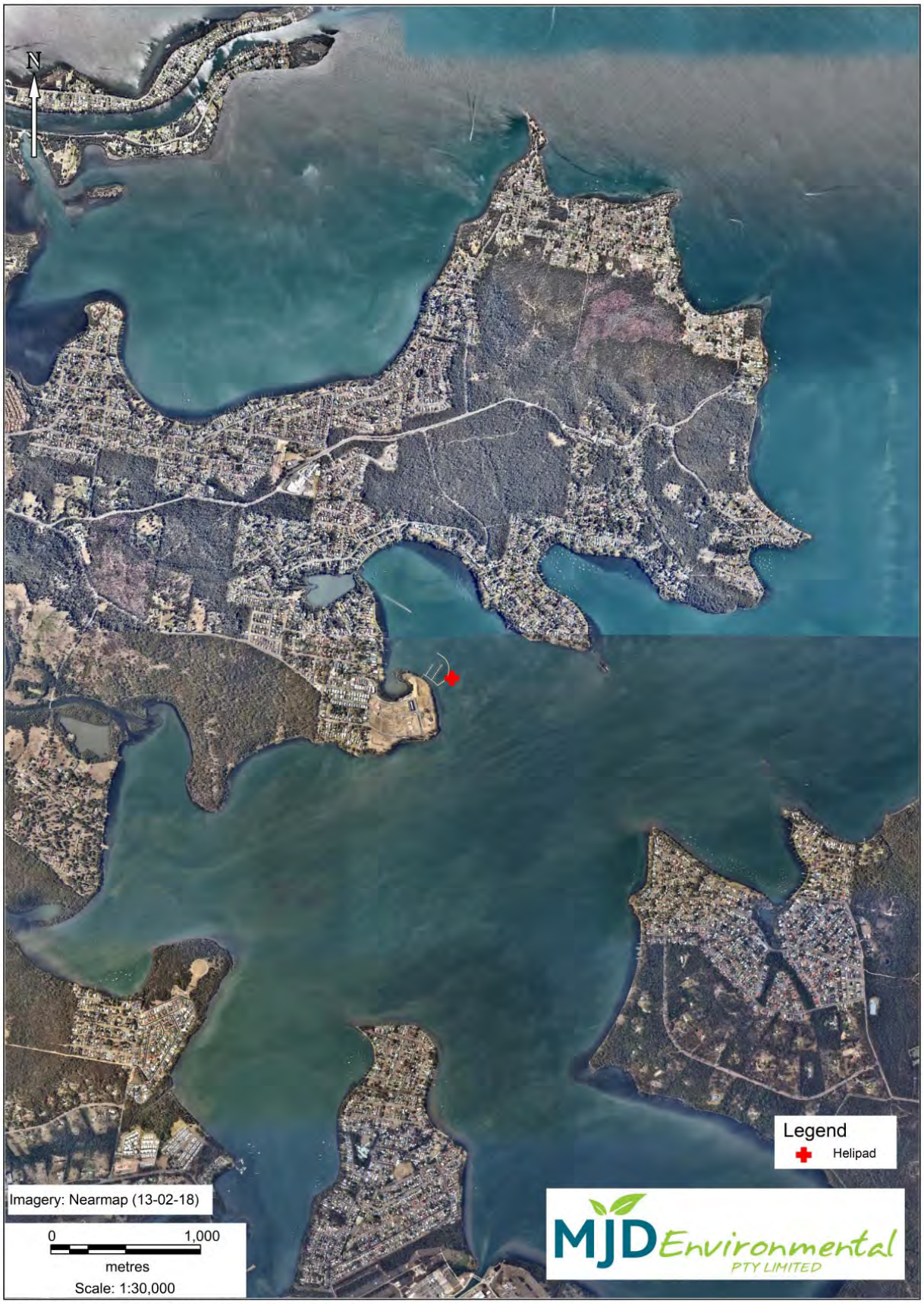

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Figure 2 Site & Study Area Location

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2 Methodology

The ecological assessment has been prepared in general accordance with The *Threatened Biodiversity Survey and Assessment: Guidelines for development and activities* (DECC 2004),), *Survey guidelines for Australia's Threatened Birds* (DEWHA 2010) and the Lake Macquarie Council Flora and Fauna Survey Guidelines (LMCC 2012) specifically for Avifauna surveys. These guidelines have informed all survey efforts associated with this assessment, to ensure compliance for the ecological assessment.

The techniques employed to inform this impact assessment are described in further detail below.

2.1 Study Area Identification

The Study Area selected for the project was based around the proposed flight paths and the air space between landing and take-off, to the cruising altitude of 1000ft. A 1km buffer surrounding the flight paths was set to provide a conservative separation from the flight paths that included all shoreline and woodland vegetation areas within Barden's Bay (location of Helipad). It was assumed that this area would provide an understanding of avifauna utilisation in the locality and provide a range of potential habitat for threatened bird species. Included in the Study was areas south west of the Helipad outside the1km buffer within higher quality vegetation found in the Lake Macquarie State Conservation Area (LM SCA).

During the initial project research, contact was made with local bird enthusiasts and members of the Hunter Bird Observes Club to sort information on any known locations of Shorebird foraging and roosting habitat and Raptor nesting sites. Information provided indicated that shorebird habitat is limited within the lake due to the pressures of development around the lakes edge limiting the presences of the required habitat for shore birds.

In addition, information was provided of a known roosting and nesting site (general location) for the Eastern Osprey within the Morisset Hospital/ LM SCA and known foraging and roosting sites for Shore birds around Woods Point and Pourmalong Creek within the LM SCA. These communications were used to justify the survey of additional areas outside the original 1km buffered Study Area.

Lake Macquarie Airport and its proximity to open water on the lake was also included in the Study Area to provide information of presences or absence of threatened bird species during the operation of a small-scale airport.

2.2 Desktop Assessment

Online database searches involving a 10-km buffer around the site were undertaken from the NSW Bionet Wildlife Atlas and Commonwealth Protected Matters of National Significance online search tool initially on 13 September 2016 and 24 August 2017. The searches provided a current list of potentially occurring threatened flora and fauna and migratory species under both the TSC Act and EPBC Act.

2.3 Field Survey

Field surveys were undertaken over 13 days between 10th February 2017 and 17th August 2017. The prevailing weather conditions during the survey are presented in Table 1 below.

Table 1 Prevailing Weather Conditions

Date	Min Temp (°C)	Max Temp (°C)	Rain (mm)	Wind (km/h)	Sunrise-Sunset
9 Feb 2017	20.4	30.2	4	NNE 7 to NNE 15 gusts to E26	0555-1922
10 Feb 2017	18.9	38.9	0	Calm to E 15 Gust to E 22	0556- 1921
16 Feb 2017	15.2	32	0.2	Calm to E 13 gusts to ESE31	0601 – 1915
28 Feb 2017	18.5	26.6	3.8	S 7 to SSE 15 gusts to SSE 31	0612 - 1944
01 Mar 2017	19.8	27.5	28.6	SSW 2 to SE 9 gusts to E 22	0612 – 1900
02 Mar 2017	17.5	27.8	1.0	SSW 6 to SSE 6 gusts ESE 31	0613 -1859
20 Mar 2017	20.1	29.0	0.4	Calm to NE 9 gusts to NE 22	0627 – 1836
22 Mar 2017	21.8	31.4	0.6	WSW 4 to NNW 7 gusts to WSW 26	0629 – 1833
29 Mar 2017	21.5	33.4	0.2	Calm to N 7 gusts to N 20	0634 – 1824
31 Mar 2017	21.7	26.2	0.2	Ne 4 to S 9 gusts to S28	0635 - 1821
18 May 2017	6.3	21.8	0	Calm to E 9 gusts to E 28	0710 – 1731
19 May 2017	11.5	19.7	0.2	Calm to NNE 4 gusts to NNE 26	0710 - 1731
15 Aug 2017	4.3	24.6	0	Calm to N 4 gusts to NNE 19	0702 – 1755
17 Aug 2017	3.6	23.4	0	NNW 4 to NW 13 gusts to W 37	0701 - 1756

Sources: http://www.bom.gov.au/climate/dwo/201703/html/IDCJDW2159.201703.shtmll
http://www.ga.gov.au/bin/geodesy/run/sunrisenset

2.3.1 Vegetation & Significant Flora Survey

Desktop analysis of regional mapping of the Study Area and its surrounds was informed by large-scale vegetation mapping projects and aerial photography, including:

- Preliminary consultation of the Mapping the habitats of NSW Estuaries (Creese et. Al. 2009) to determine broad aquatic and intertidal vegetation within the Study Area;
- Preliminary consultation of the Vegetation Community Profiles, Lake Macquarie Local Government Area. Working Draft v2 (Bell 2016), to determine the broad categorisation of the foreshore vegetation within the Study Area; and
- GIS analysis including - Aerial Photograph Interpretation (API) and consultation of topographic map (Scale 1:25,000) layers for the site.

Formal terrestrial vegetation surveys were not undertaken as part of this ecological assessment due to the proposal being situated over water. When crossing land at the northern or southern Study Area extent a helicopter will be close too or at the 1000 foot being the study area upper height limit. Terrestrial environs immediately adjacent to the site have been subject to ecological assessment and approvals as part of state and local approvals. The helipad operation does not require trimming, removal or management of terrestrial vegetation in the immediate area surrounding the site. On this basis no formal terrestrial flora surveys have been undertaken as part of this assessment.

2.3.2 Habitat Survey and Site Selection

A detailed assessment of the relative habitat value present within the Study Area was undertaken with a specific focus on shore bird and raptor species habitat. The assessment was undertaken via a three-stage process that included desktop appraisal, habitat validation surveys and a formal bird census.

The details of each stage, has been provide below.

Stage 1 Desktop Appraisal

Initial habitat assessment was undertaken at a desktop level using GIS analysis including - Aerial Photograph Interpretation (API) and consultation of topographic map (Scale 1:25,000) layers for the site and cadastre boundary info (Private and Public land). With acknowledgement of the target species ecology and habit, this process established the location of potential habitat in the form of Sandy beaches, mudflats, rocky outcrops and woodlands around the lakes foreshore and determined whether public access was available to nearby land.

Stage 2 Habitat validation Field Survey

The Stage 2 habitat validation field survey was undertaken to ground truth the potential habitat and survey locations identified during the Stage 1 desktop habitat appraisal. Habitat surveys were based on the specific habitat requirements of each threatened bird species in regard to home range, feeding, roosting, breeding, movement patterns and corridor requirements. The following attributes were recorded during the habitat validation field survey to provide an understanding of habitat quality at nominated sites:

- Presence of mudflats, salt marsh and lake margins with significant areas available for foraging;
- Presence/ absence of tree hollows and potential large nest trees;
- vegetation (estuarine) complexity, structure and quality;
- presence of freshwater or estuarine aquatic habitats, noting permanency;
- connectivity to adjacent areas of habitat;
- extent and types of disturbance;
- presence of foraging opportunities such as flowering eucalypts, fruits, seeds or other nectar bearing native plants;
- presence of human occupation or high pedestrian traffic; and
- presence and abundance of various potential prey species.

Stage 3 Formal Avifauna Census

At the completion of Stage 2 habitat validation field surveys, determination of the final site selection was carried out based on Stage 2 works. Stage 3 Formal Bird census surveys where then undertaken as outlined in **Section 2.3.3.**

In addition, tidal variations where assessed at each site to ensure high and low tides where surveyed at least once during the project. Tides were calculated using the NSW tidal chart (BOM 2017) and allowed for inside the lake time variation to ensure surveys where undertaken as close to the peak of each tide as possible. Inside Lake Macquarie variation are +2.30hrs for high tides and +30mins for low tides (BOM 2017)

2.3.3 Fauna Surveys

By way of the nature of the proposal, formal terrestrial fauna surveys for mammals and herpetofauna were not undertaken as part of this ecological assessment due to the proposal being situated over water. When crossing land at the northern or southern Study Area extent a helicopter will be close too or at the 1000 foot altitude, being study area upper height limit. Terrestrial environs immediately adjacent to the site have been subject to ecological assessment and approvals as part of state and

local approvals. The helipad operation does not require trimming, removal or management of terrestrial vegetation in the immediate area surrounding the site. On this basis no formal terrestrial flora surveys have been undertaken as part of this assessment.

Avifauna surveys were carried out as detailed below.

Avifauna

The observation of avifauna within the Study Area was undertaken via targeted diurnal census supplemented by opportunistic observations while travelling in the Study Area (Refer to **Figure 2**). The surveys were undertaken in early mornings, late afternoons, and evenings (being peak activity periods for birds), with consideration given to the tidal movements in the Lake, ensuring a cross-section of tides where surveyed over the project. Survey timing during summer and winter months accounted for seasonal species. Surveys consisted of 20-30-minute searches at several locations along the shoreline of Lake Macquarie within the Study Area. Search methods used are as follows:

Search area method: was used in areas where there was sufficient vegetation such as woodlands to undertaken 1ha 20-minute search.

Point survey method: was used along foreshores where birds were identified at pre-determined locations along a walking transect for a period of 30 minutes.

Secondary Indications and Incidental Observations

Opportunistic sightings of secondary indications of resident avifauna were noted. Such indicators included:

- Nests made by various guilds of birds;
- Whitewash, regurgitation pellets and prey remains from Owls; and
- Aural recognition of bird calls.

2.4 Limitations

Limitations associated with this Ecological Assessment report are presented herewith. The limitations have been taken into account specifically in relation to threatened species assessments, results and conclusions.

Seasonality & Conditions

Avifauna surveys spanned summer, autumn, and winter to improve the likelihood of recording migratory species or other species that may only be present on site on a seasonal basis. The primary survey time, coincided with the period during which many shorebirds and summer migrants can be found in the locality.

3 Results

3.1 Desktop Assessment

Using the NSW Wildlife Atlas database BioNet, and EPBC Act Protected Matters Search (13 September 2016 and 24 August 2017), a list of potentially occurring threatened species, populations and ecological communities from the locality (10 km radius) has been compiled (**Table 2**). A total of 169 entities have been recorded of which 21 threatened flora species, 99 fauna species, 2 ecological communities and 42 migratory species and 7 marine species have either been detected or have the potential to occur within the locality.

Note: Included in **Table 2** below are the numbers of records (not the number of individuals) for each species within the locality taken from the NSW Wildlife Atlas database. The EPBC Act Protected Matters Search does not provide number of records within the locality. Therefore, the record count related only to those TSC Act listed species that were detected within 10 km of the site. Threatened Flora & Fauna Database Search Results.

Table 2 Threatened Flora & Fauna Database Search Results.

Scientific Name	Common Name	TSC Act	FM Act	EPBC Act	No. of records	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	E		CE	27	Species or species habitat known to occur within area[1] Recorded within 10km of the site[2]
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V		E	13	Species or species habitat known to occur within area[1] Recorded within 10km of the site[2]
Botaurus poiciloptilus	Australasian Bittern	E		E	-	Species or species habitat known to occur within area[1]
Burhinus grallarius	Bush Stone-curlew	E			1	Recorded within 10km of the site[2]
Calidris carnutus	Red Knot			E (M, A)	1	Species or species habitat known to occur within area[1]
Calidris ferruginea	Curlew Sandpiper	E		CE (M, A)	1	Species or species habitat known to occur within area[1] Recorded within 10km of the site[2]
Calidris tenuirostris	Great Knot	V		CE (M, A)	-	Species or species habitat known to occur within area[1]

Scientific Name	Common Name	TSC Act	FM Act	EPBC Act	No. of records	Notes & Source
Charadrius mongolus	Lesser Sand Plover	V		E (M, A)	-	Species or species habitat known to occur within area[1]
Callocephalon fimbriatum	Gang-gang Cockatoo	V			3	Recorded within 10km of the site[2]
Calyptorhynchus lathami	Glossy Black-Cockatoo	V			40	Recorded within 10km of the site[2]
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V			2	Recorded within 10km of the site[2]
Chthonicola sagittata	Speckled Warbler	V			1	Recorded within 10km of the site[2]
Daphoenositta chrysoptera	Varied Sittella	V			25	Recorded within 10km of the site[2]
Dasyomis brachypterus	Eastern Bristlebird	E		E	-	Species or species habitat likely to occur within area[1]
Diomedea antipodensis	Antipodean Albatross	V		V (M, A)	-	Foraging, feeding or related behaviour likely to occur within area[1]
Diomedea antipodensis gibsoni	Gibson's Albatross	V		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	E		V (M, A)	-	Foraging, feeding or related behaviour likely to occur within area[1]
Diomedea sanfordi	Northern Royal Albatross			E (M, A)	-	Foraging, feeding or related behaviour likely to occur within area[1]
Ephippiorhynchus asiaticus	Black-necked Stork	E			11	Recorded within 10km of the site[2]
Epthianura albifrons	White-fronted Chat	V			2	Recorded within 10km of the site[2]
Falco subniger	Black Falcon	V			1	Recorded within 10km of the site[2]
Glossopsitta pusilla	Little Lorikeet	V			22	Recorded within 10km of the site[2]
Grantiella picta	Painted Honeyeater	V		V	-	Species or species habitat may occur within area[1]
Haliateetus leucogaster	White Bellied Sea-eagle	V		(A)	49	Species or species habitat known to occur within area[1] Recorded within 10km of the site[2]
Hieraaetus morphnoides	Little Eagle	V			2	Recorded within 10km of the site2

Scientific Name	Common Name	TSC Act	FM Act	EPBC Act	No. of records	Notes & Source
Haematopus fuliginosus	Sooty Oystercatcher	V			6	Recorded within 10km of the site[2]
Haematopus longirostris	Pied Oystercatcher	E			3	Recorded within 10km of the site[2]
Ixobrychus flavicollis	Black Bittern	V			6	Recorded within 10km of the site[2]
Lathamus discolor	Swift Parrot	E		CE (A)	27	Species or species habitat likely to occur within area[1] Recorded within 10km of the site[2]
Limosa lapponica baueri	Bar Tailed Godwit	V		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]
Lophoictinia isura	Square-tailed Kite	V			2	Recorded within 10km of the site[2]
Macronectes giganteus	Southern Giant Petrel	E		E (M, A)	-	Species or species habitat known to occur within area[1]
Macronectes halli	Northern Giant Petrel	V		V (M, A)	-	Species or species habitat may occur within area[1]
Neophema pulchella	Turquoise Parrot	V			1	Recorded within 10km of the site[2]
Ninox connivens	Barking Owl	V			1	Recorded within 10km of the site[2]
Ninox strenua	Powerful Owl	V			34	Recorded within 10km of the site[2]
Numenius madagascariensis	Eastern Curlew			CE(M, A)	1	Species or species habitat known to occur within area[1] Recorded within 10km of the site[2]
Oxyura australis	Blue-billed Duck	V			1	Recorded within 10km of the site[2]
Pandion haliaetus	Osprey	V		(A)	10	Breeding Known to occur within area[1] Recorded within 10km of the site[2]
Petroica boodang	Scarlet Robin	V			2	Recorded within 10km of the site[2]
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	V			1	Recorded within 10km of the site[2]
Ptilinopus regina	Rose-crowned Fruit-Dove	V			2	Recorded within 10km of the site[2]
Ptilinopus superbus	Superb Fruit-Dove	V			2	Recorded within 10km of the site[2]

Scientific Name	Common Name	TSC Act	FM Act	EPBC Act	No. of records	Notes & Source
Pachyptila turtur subantarctica	Fairy Prion (Southern)			V (A)	-	Species or species habitat known to occur within area[1]
Puffinus assimilis	Little Shearwater	V			1	Recorded within 10km of the site[2]
Rostratula australis	Australian Painted Snipe	E		E (A)	-	Species or species habitat likely to occur within area[1]
Stagonopleura guttata	Diamond Firetail	V			1	Recorded within 10km of the site[2]
Sternula albifrons	Little Tern	E		M (A)	1	Recorded within 10km of the site[2]
Stictonetta naevosa	Freckled Duck	V			1	Recorded within 10km of the site[2]
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 (M, A)	-	Species or species habitat may occur within area[1]
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		V (M, A)	1	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]
Turnix maculosus	Red-backed Button-quail	V			1	Recorded within 10km of the site[2]
Tyto novaehollandiae	Masked Owl	V			17	Recorded within 10km of the site[2]
Tyto tenebricosa	Sooty Owl	V			1	Recorded within 10km of the site[2]
Fish						
Epinephelus daemelii	Black Rockcod	V	V	V		MPR 2014[3].
Pristis zijsron	Green Sawfish	Presume EX	Presume EX			MPR 2014[3].

Scientific Name	Common Name	TSC Act	FM Act	EPBC Act	No. of records	Notes & Source
Syngnthiformes	Seahorses & pipefish		P			MPR 2014[3].
Frogs						
Crinia tinnula	Wallum Froglet	V			69	Recorded within 10km of the site[2]
Heleioporus australiacus	Giant Burrowing Frog			V	-	Species or species habitat likely to occur within area[1]
Litoria aurea	Green and Golden Bell Frog	E		V	2	Species or species habitat known to occur within area[1] Recorded within 10km of the site[2]
Litoria littlejohni	Littlejohn's Tree Frog, Heath Frog	V		V	-	Species or species habitat may occur within area[1]
Mixophyes balbus	Stuttering Frog	E		V	-	Species or species habitat likely to occur within area[1]
Mixophyes iteratus	Giant Barred Frog, Southern Barred Frog	E		E	-	Species or species habitat likely to occur within area[1]
Mammals						
Chalinolobus dwyeri	Large-eared Pied Bat, Large Pied Bat	V		V	1	Species or species habitat likely to occur within area[1]
Dasyurus maculatus maculatus (SE mainland population)	Spot-tailed Quoll, Spotted-tail Quoll	E		E	11	Species or species habitat known to occur within area[1] Recorded within 10km of the site[2]
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V			11	Recorded within 10km of the site[2]
Miniopterus australis	Little Bentwing-bat	V			72	Recorded within 10km of the site[2]
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V			40	Recorded within 10km of the site[2]
Mormopterus norfolkensis	Eastern Freetail-bat	V			53	Recorded within 10km of the site[2]
Myotis macropus	Southern Myotis	V			36	Recorded within 10km of the site[2]
Petaurus australis	Yellow-bellied Glider	V			2	Recorded within 10km of the site[2]
Petauroides volans	Greater Glider			V	-	Species or species habitat may occur within area[1]
Petaurus norfolcensis	Squirrel Glider	V		V	150	Species or species habitat likely to occur within area[1] Recorded within 10km of the site[2]

Scientific Name	Common Name	TSC Act	FM Act	EPBC Act	No. of records	Notes & Source
Petrogale penicillata	Brush-tailed Rock-wallaby	E		V	-	Species or species habitat may occur within area[1]
Phascolarctos cinereus	Koala	V		V	20	Species or species habitat known to occur within area[1] Recorded within 10km of the site[2]
Potorous tridactylus tridactylus	Long-nosed Potoroo (SE mainland)	V		V	-	Species or species habitat likely to occur within area[1]
Pseudomys gracilicaudatus	Eastern Chestnut Mouse	V			1	Recorded within a 10km of the site[2]
Pseudomys novaehollandiae	New Holland Mouse			V	27	Species or species habitat known to occur within area[1] Recorded within a 10km of the site[2]
Pteropus poliocephalus	Grey-headed Flying-fox	V		V	45	Foraging, feeding or related behaviour known to occur within area[1] Recorded within a 10km of the site[2]
Scoteanax rueppellii	Greater Broad-nosed Bat	V			35	Recorded within 10km of the site[2]
Vespadelus troughtoni	Eastern Cave Bat	V			2	Recorded within 10km of the site[2]
Plants						
Acacia bynoeana	Bynoe's Wattle	E		V	60	Species or species habitat known to occur within area Recorded within 10km of the site[2]
Angophora inopina	Charmhaven Apple	V		V	471	Species or species habitat likely to occur within area[1] Recorded within 10km of the site[2]
Caladenia tessellata	Thick-lipped Spider-orchid	V		V	-	Species or species habitat likely to occur within area[1]
Callistemon linearifolius	Netted Bottle Brush	V			6	Recorded within 10km of the site[2]
Corunastylis insignis	Wyong Orchid	CE		CE	-	Species or species habitat known to occur within area[1]
Corybas dowlingii	Red Helmet Orchid	E			2	Recorded within 10km of the site[2]
Cryptostylis hunteriana	Leafless Tongue-orchid	V		V	28	Species or species habitat known to occur within area[1] Recorded within 10km of the site[2]

Scientific Name	Common Name	TSC Act	FM Act	EPBC Act	No. of records	Notes & Source
Diuris praecox	Newcastle Doubletail	V		V	19	Species or species habitat known to occur within area[1] Recorded within 10km of the site[2]
Eucalyptus camfieldii	Camfield's Stringybark	V		V	3	Species or species habitat likely to occur within area[1]
Eucalyptus parramattensis subsp. *parramattensis*	Earp's Gum	E			5	Species or species habitat known to occur within area[1]
Genoplesium insigne	Variable Midge Orchid	E		CE	9	
Grevillea parviflora subsp. *parviflora*	Small-flower Grevillea	V		V	24	Species or species habitat known to occur within area[1] Recorded within 10km of the site[2]
Melaleuca biconvexa	Biconvex Paperbark	V		V	41	Species or species habitat known to occur within area[1]
Microtis angusii	Angus's Onion Orchid	V		E	1	Species or species habitat known to occur within area[1]
Pelargonium sp. *striatellum*	Omeo Stork's-bill	V		E	-	Species or species habitat may occur within area[1]
Pterostylis gibbosa	Illawarra Greenhood	V		E	-	Species or species habitat may occur within area[1]
Rutidosis heterogama	Heath Wrinklewort	V		V	94	Species or species habitat likely to occur within area[1]
Syzygium paniculatum	Magenta Lilly Pilly	V		V	6	Species or species habitat likely to occur within area[1]
Tetratheca juncea	Black-eyed Susan	V		V	919	Species or species habitat known to occur within area[1] Recorded within 10km of the site[2]
Thelymitra adorata	Wyong Orchid	CE		CE	-	Species or species habitat likely to occur within area[1]
Thesium australe	Austral Toadflax	V		V	-	Species or species habitat may occur within area[1]
Reptiles						
Caretta caretta	Loggerhead Turtle	E		E (M, A)	3	Recorded within 10km of the site[2] MPR 2014[3].
Chelonia mydas	Green Turtle	V		V (M, A)	89	Recorded within 10km of the site[2] MPR 2014[3].
Dermochelys coriacea	Leatherback Turtle	E		E (M, A)	-	Species or species habitat known to occur within area[1]

Scientific Name	Common Name	TSC Act	FM Act	EPBC Act	No. of records	Notes & Source
Eretmochelys imbricata	Hawksbill Turtle			V (M, A)	-	Foraging, feeding or related behaviour likely to occur within area[1]
Hoplocephalus stephensii	Stephens' Banded Snake			V (M, A)	1	Recorded within 10km of the site[2]
Natator depressus	Flatback Turtle			V	-	Foraging, feeding or related behaviour likely to occur within area[1]
Sharks						
Carcharias taurus (East coast population)	Grey Nurse Shark	CE	CE	CE		MPR 2014[3].
Carcharodon carcharias	Great White Shark			V (M, A)		MPR 2014[3].
Rhincodon typus	Whale Shark			V (M,A)		MPR 2014[3].
Migratory Species						
Migratory Marine Birds						
Anous stolidus	Common Noddy			(A)	-	Species or species habitat likely to occur within area[1]
Apus pacificus	Fork-tailed Swift			(A)	-	Species or species habitat likely to occur within area[1]
Puffinus carneipes	Flesh-footed Shearwater	V		(A)	-	Species or species habitat likely to occur within area[1]
Calonectris leucomelas	Streaked Shearwater			M	-	Species or species habitat known to occur within area[1]
Balaenoptera edeni	Bryde's Whale			M		MPR 2014[3]
Dugong dugong	Dugong			M		MPR 2014[3]
Eubalaena australis	Southern Right Whale	E1		E (M)		MPR 2014[3]
Fregata ariel	Lesser Frigatebird			M	-	Species or species habitat likely to occur within area[1]
Fregata minor	Great Frigatebird			M	-	Species or species habitat likely to occur within area[1]
Lagenorhynchus obscurus	Dusky Dolphin			M		MPR 2014[3]
Lamna nasus	Mackeral Shark			M		MPR 2014[3]
Manta alfredi	Reef Manta Ray			M		MPR 2014[3]

Scientific Name	Common Name	TSC Act	FM Act	EPBC Act	No. of records	Notes & Source
Manta birostris	Giant Manta Ray			M		MPR 2014[3]
Orcinus orca	Killer Whale			M		MPR 2014[3]
Sousa chinensis	Indo-Pacific Humpback Dolphin			M		MPR 2014[3]
Migratory Terrestrial Species						
Cuculus optatus	Oriental Cuckoo			(A)	-	Species or species habitat may occur within area[1]
Hirundapus caudacutus	White-throated Needletail			(A)	-	Species or species habitat known to occur within area[1]
Monarcha melanopsis	Black-faced Monarch			(A)	-	Species or species habitat known to occur within area[1]
Monarcha trivirgatus	Spectacled Monarch			(A)	-	Species or species habitat known to occur within area[1]
Motacilla flava	Yellow Wagtail			(A)	-	Species or species habitat likely to occur within area[1]
Myiagra cyanoleuca	Satin Flycatcher			(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]

Scientific Name	Common Name	TSC Act	FM Act	EPBC Act	No. of records	Notes & Source
Gallinago stenura	Pin-tailed Snipe			(A)	-	Roosting likely to occur within area[1]
Limosa lapponica	Bar-tailed Godwit			(A)	-	Species or species habitat known to occur within area
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]
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]
Himantopus himantopus	Black-winged stilt			(A)	-	Species or species habitat known to occur within area[1]
Rostratla benghalensis (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]

Key:

V = Vulnerable M = Migratory A = Marine
E = Endangered CE = Critically Endangered

1 - *Atlas of NSW Wildlife*, Office of Environment and Heritage (Accessed 24-8-2017).
2 - Commonwealth Protected Matters Search Tool, Department of the Environment (Accessed 24-8-2017)
3. MPR (2014) and MPR (2016)

3.2 Habitat Survey and Site Selection Results

3.2.1 Stage 1 Desktop Habitat Appraisal

The Stage 1 desktop habitat appraisal identified a total of 45 survey sites that were considered to contain potential habitat for target avifauna groups. The Stage 1 Desktop survey site locations are shown on **Figure 3**.

3.2.2 Stage 2 Habitat Validation Field Survey

The Stage 2 habitat validation field survey was undertaken to ground truth the potential habitat and survey locations identified during the Stage 1 desktop habitat appraisal. The habitat validation survey was undertaken over a two-day period, where information collected was used to refine the selection of formal avifauna census survey sites within the Study Area (to be conducted as Stage 3 works).

The following section provides a description of all sites identified during the Stage 1 desktop habitat appraisal based on the results of the Stage 2 habitat validation field survey works. With due consideration of the Stage 2 results, Stage 3 formal avifauna census sites have been summarised in **Table 3**.

Trinity Point & Barden's Bay

The Trinity Point Development site is primarily bordered by foreshore environments to the north, south and east. The foreshore environments and associated vegetation consist of sandy/ rocky shorelines, minor Saltmarsh occurrences, Mangrove Forest, Swamp Oak Forest and Coastal Woodlands that provide a number of areas of potential habitat for bird species within or adjacent to the Trinity Point development.

Site selection at Trinity Point was primarily focused within the shorelines to assessed habitat and foraging in waters adjacent to these sites. Additionally, Sites at this location included the small bay in the south of Barden's Bay. Each area has been described below.

Trinity Point Foreshore

The Trinity Point Foreshore includes all vegetated areas from west of the newly constructed marina to the southern facing cliff edges in the south-western corner of the development site. It also includes the small unnamed bay and surrounding vegetation in the south of Barden's Bay.

The terrestrial vegetation adjacent to the foreshores within Trinity Point is primarily open forest with *Eucalyptus tereticornis, Casuarina glauca* and *Angophora floribunda* dominant in the canopy along the eastern foreshore. The understorey is an exotic grassy understorey that transitions to include a mixed exotic and native midstorey and understorey as you continue in southerly direction towards the top of Bluff Point. The shoreline often drops off from the grassy understorey to the water's edge limiting tidal inundation along the lower flats of the site. The small step up in elevation increases with the gradual rise to Bluff Point in which the rocky cliff is present. The current conditions along the eastern foreshore allow continued access to the water's edge for recreational activities.

The South facing foreshore is partially managed understorey (mown grass to Lake edge), beneath several large old *Araucaria heterophylla* (Norfolk Island Pine) and scattered native canopy species. As the topography changes with the flat grassy edge replaced by steep hill sides and cliff edges the vegetation changes from the managed understorey to a mid-storey vegetation dominated by the noxious weed *Olea europaea* subsp*. cuspidata*, with a native canopy. The African olive is persistent throughout the remaining southern portion of the site except for a small patches of good quality Coastal Scribbly Gum woodland (top of hill) and Swamp Oak Forest (south-western limit of site) with a dense understorey of *Lantana camara* (Lantana).

Habitat value throughout the terrestrial vegetation is limited to perch/ roosting trees that could be used by large raptors during foraging in Barden's Bay or adjacent waters of Lake Macquarie.

Figure 3 Stage 1 Desktop Survey Locations

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Although trees are large and capable to support nesting structures made by large birds, the lack of isolation, potential disturbance from human interactions, exposure to weather events from the south and generally managed understoreys of the vegetation would limit the use of these trees by large raptors for breeding events. The open forest is narrow and would not support significant woodland bird habitat. Large *Eucalyptus haemastoma* (Scribbly Gum) and *E. tereticornis,* located in the south western portion of the site do provide habitat in the form of hollows and foraging opportunity. This area is limited in coverage and it was observed that many of the hollows are currently occupied by common bird species such as Rainbow Lorikeets, Sulphur crested cockatoos and Corellas.

The foreshores intertidal zone of Trinity Point has very limited foraging and roosting habitat suitable for wader and shorebirds. The foreshore was initially assessed for tidal variations that may provide foraging and roosting habitat for various shore birds. During the assessment, it was observed that the tidal variation that would allow exposure of mud and/or sandy flats is limited with a very narrow (1-1.5m from grassy bank) pebbly/sandy area exposed on low tides. The narrow sandy flats are predominantly bordered by seagrass beds reducing the available area for sandy or mud flat establishment. The seagrass *Zostera* sp. is present around the shores and is known to inhabit gentle sloping coastlines and does not generally favour extended exposure to air and hot conditions associated with low tides. During habitat assessments in the area the seagrass beds were not observed to be exposed during low tide events.

The suitability of habitat within the intertidal areas around the eastern section of Trinity Point, is also limited due to the high traffic (Humans and Pets) that would reduce the opportunity for shore birds to utilise the area in and around Trinity Point. Notwithstanding, the approved mix-use development and marina (stage one complete) on the shores of Trinity Point will increase human activities which in turn will limited the use of this narrow band of sandy shoreline by shore birds and also limit the use of the larger canopy trees as potential roosting and foraging opportunity for large raptors.

The rocky outcrop known as Bluff Point has very narrow (1-2m) rocky shoreline and platform located at the base of the cliff edge. The exposed rock platform in this area is limited to very small high points that are often exposed to winds from the south and east creating wave action over the rocks. The rocks that were observed exposed on an average low tide are unlikely to support a population of shore birds due to low exposure of the rock platform.

Additionally, the southern shores of Trinity Point have limited rock outcrops that are exposed on the lowest of low tides. The shore line is often lined by steep vegetated banks or rocky cliff edges which may provide protection for Shore birds, but the lack of significant rock outcrops or sandy areas would reduce any activity within these areas.

A total of two formal bird census sites were identified within the Trinity Point foreshore area.

Unnamed Small Bay

The small unnamed bay in the south-western corner of Barden's Bay provides a protected cove with three distinct vegetation communities present that may provide limited habitat for birds such as shorebirds and raptors.

- Tall Swamp Oak forest is present on the outer edge of the remnant vegetation that consists of a dense understorey of native sedges and rushes, with an exotic herbaceous and grassy weed cover, scattered throughout. The forest is currently providing little habitat value for shorebirds due to the dense vegetation within the understorey. It may provide some refuge for woodland birds as they move across the landscape although foraging resources in this area are limited. There are no large Eucalypt trees within the patch of forest that may provide nesting habitat for large raptors.
- The edge of the Swamp Oak Forest is delineated (water side) by a narrow band of salt marsh which is no more than 5 metres in width at its widest point. The saltmarsh continues along the edge of the forest and around the point that leads out to Barden's Bay. Saltmarsh vegetation is primarily *Sarcocornia quinqueflora* and *Sporobolus virginicus* (Salt Couch) with dense patches of *Juncus kraussii* that are bordered by the Mangrove and Swamp Oak forests. The Saltmarsh may

provide limited roosting habitat for small shorebirds although with limited foraging in proximity to the roost site may limit the usage of the saltmarsh by these species.

- Mangrove forest is present on the water side of the saltmarsh and Swamp Oak Forest. This is a very narrow band of *Avicennia marina* (Grey Mangrove) which is 10m wide at its widest point. The mangroves may provide limited foraging habitat (on low tide) for shorebirds.
- The unnamed bay does provide protection from prevailing weather to the south and east, thus may provide shelter for shorebirds. In general, the marginal habitat that is present for these species is limited and would not sustain a large population.

A single formal bird census survey site was identified at this location using.

Plate 1: Shoreline Trinity Point (North Shore- Barden's Bay)

Plate 2: Shoreline Trinity Point (North Shore)

Plate 3: Shoreline Trinity Point (South Shore)

Plate 4: Narrow Salt marsh and Mangorve forest (Unnamed Bay)

Plate 5: Unnamed bay habitat

Barden's Bay

The Foreshores of Barden's Bay were assessed for habitat along the north, north-east and western foreshores where public assess is available. This assessment included vegetation at Frying Pan Point and within Lake Petite. Areas in which access was restricted (private property to the lakes edge), an assessment was undertaken using Binoculars to identify any variations in the foreshore habitat from publicly accessible areas around the bay.

The Foreshore assessed in the north and north-east provides little habitat for shorebirds due to development that has occurred along the shores of Lake Macquarie. All vegetation has been removed, with the exception of some tall native canopy species from the Bays foreshore and has been replaced with managed lawns. In areas where private property extends to the water's edge primarily in the north and western section of the bay, the foreshore habitat has generally been replaced with jetties, boat moorings, constructed retaining walls and sheds built on the foreshore edge.

Habitat value throughout the terrestrial vegetation is limited to perch/ roosting trees that could be used by large raptors during foraging in Barden's Bay or adjacent waters of Lake Macquarie.

The south-eastern point of Brightwaters does provide a small outcrop of rocks that is exposed during low tides and was observed to be used by common water birds. Although this rock platform provides roosting habitat for shorebirds the limited exposure of the rock platform on low tide is considered to reduce the available surface areas for shorebirds to utilise.

Plate 7: Northern side of Barden's Bay

Plate 6:Northern side of Barden's Bay

Plate 8: Barden's Bay - Frying Pan Point

Plate 9: Barden's Bay - Frying Pan Point (Looking toward Trinity Point)

Lake Petite was assessed for exposed mudflats and shorelines suitable for shorebirds as well as for woodland bird habitat at Frying Pan Point and the unnamed reserve in the north west of the Lake. The habitat within Lake Petite is limited with private property's bordering the lake along the southern shoreline and including the north east corner. The establishment of private property to the shore line has resulted in structures being built at the lakes edge and management of understorey vegetation (Mown grass). It was noted that the tidal variation is limited within the lake and as such did not expose mudflats, with only a small narrow band of foreshore exposed in the south-eastern corner of the lake where Mangrove pneumatophores where exposed. It was also evident in these area that dumping of building rubbish had occurred over time.

Plate 10: Lake Petite habitat

The woodland habitat in Frying Pan Point Reserve and the unnamed reserve was very limited. Frying Pan Point is primarily a degraded Swamp Oak Forest that has a dense understorey of *Lantana camara*. The Lantana does allow for small birds to find refuge, but larger birds movement is restricted to the weed species presences. The Unnamed reserve has a very sparse mid storey and appears to be mown by neighbouring landholders. Both patches of woodland provide very little forage or roosting habitat and are both isolated from larger patches of bushland.

A total of three formal avifauna census survey sites were identified in Barden's Bay. Two sites are situated on the north side of the bay and a single site within Lake Petite.

Mannering Point

The Study Area includes Mannering Park foreshore within the northern and eastern sections of the suburb.

The site assessment around Mannering Park revealed the following:

- Shoreline habitat for shorebirds is low to non-existent along the northern banks of Vales Point.
- The vegetated park at the north-western extent of the point is a high traffic managed landscape with sandstone rock wall armouring.
- Shoreline habit is limited to a very narrow band (1-2m) of rocky sand at low tide. There is no vegetation buffer between the park/foreshore and the water's edge, that provides little protection from human activities in this area.
- The inter-tidal areas at low tides where observed to have limited movement in water height around this area of the Lake.
- General tidal limits (at the time of survey) were more clearly defined by seagrass beds observed all along the shoreline and deposits of seagrass biomass at the upper tide line.

- The remaining northern shoreline is in-accessible to the public (private ownership). Landholdings in this area are generally landscaped to the shoreline with infrastructure such as jetties and some bank stability works (rock walls and concrete).
- The eastern shorelines are in accessible to the intersection with Waverly Street. All shorelines have been modified with the construction of jetties, and stabilisation works such as rock and concrete batters. There are also a number of parcels with structures such as sheds or small boat sheds at the water's edge.
- The foreshore from Waverly St to the end of the Study Area contains a section of council managed parkland with a bike/footpath adjacent to the water's edge. The shoreline is stabilised by a retaining wall, limiting habitat as per the park in the north west.

All foreshore areas in the Mannering Park Area are limited to very small narrow parcels of rocky/sandy shoreline that are exposed at low tide. These areas were considered to be used on a low frequency basis at best by shorebirds due to the lack of foraging or roosting habitat coupled with the exposure to human activity and likely increased risk to predation by domestic animals and possibly feral animals in the area.

The foreshore is also lacking large old trees that may be potentially used by large raptors. Any trees that are available in the narrow foreshore corridor are native canopy trees over managed parklands or managed private landholdings.

With the lack of potential habitat for threatened shorebirds and raptors (except foraging in open water), no formal surveys where undertaken in this area.

Plate 11: Mannering Point habitat

Plate 12: Mannering Point habitat

Summerland Point

A site assessment of habitat value at Summerland was limited to the north-western foreshore including the northern point which was located just outside the Study Area.

The vegetation within the northern section of the Foreshore, is generally a managed understorey with large canopy trees such as *Casuarina glauca* and *Eucalyptus tereticornis*. The shoreline has the typical characteristics of a very narrow rocky outcrops and sandy bands along the shore at low tide. These areas of minor potential habitat are adjacent to areas that are managed (regularly mowing), and have high pedestrian traffic often with domestic dogs, along this foreshore from Sandy Point Reserve to the north of the Study Area.

Sandy Point Reserve – Woodland

The Woodland within the southern corner of the Study Area is a contiguous patch of woodland that consists of private and public landholdings. The woodland in the north of the woodland has recently been impacted by fire. The vegetation is a mix of Coastal Plains Smooth-bark Apple Forest that transition into Riparian Melaleuca Swamp Woodland in the lower depression areas particularly towards the southern point of the site.

The vegetation in the north is recovering with a mid-storey of native shrubs re-establishing creating dense thickets throughout. Additionally, the impacts of fire have resulted in the establishment of woody weed species. The vegetation has also been impacted by human disturbance such as bike tracks, trees being cut down for fire wood, and various walking tracks are found intertwined through the vegetation in which local residents appear to use whilst walking pets. Hollow habitat is sporadic with only a small number of hollows observed all less then 10cm in diameter.

The woodland within the private lots was not inspected as part of the habitat assessment. The woodland in the south is predominantly Riparian Melaleuca Woodlands. This woodland provides faunal habitat in the form of small hollows, roosting and foraging habitat for woodland birds and large trees that may be utilised by raptor species. The large Eucalypt and Casuarina species on the edge of the woodland and the Lake provide potential roosting or perch habitat for large birds. A White-bellied Sea-eagle was spotted in the trees at the point early morning and was observed being flushed by pedestrian use of the walking tracks.

The woodland provides ideal habitat for the invasive Noisy Miner, this species was observed in high numbers throughout the site during surveys.

A single formal avifauna census survey site was located in the Woodland at Sandy Point Reserve.

Plate 13: Summerland Point North eastern point

Plate 14: Woodland Summerland Point

Sandy Point Reserve - Foreshore

The vegetation within the northern section of the foreshore, is generally a managed understorey with large canopy trees such as *Casuarina glauca* and *Eucalyptus tereticornis*. The shoreline has the typical characteristics of a very narrow rocky outcrops and sandy bands along the shore at low tide. These areas of minor potential habitat are adjacent to areas that are managed (regularly mowing), and have high pedestrian traffic often with domestic dogs, along this foreshore from Sandy Point Reserve to the northern point at Summerland Point.

The southern foreshore exhibits similar low value habitat as the north, with a scattered managed understorey (mown lawn) and a greater number of canopy species that often include patchy mid-storey creating a small filtered natural barrier between the managed lawns and the water's edge.

There is a well-worn walking trail along the entire foreshore that was observed to have a high pedestrian usage during survey works

Habitat characteristics of the foreshore include perch/ roosting trees that could be used by large raptors during foraging in adjacent waters of Lake Macquarie.

The Tidal variations observed on this side of the lake were limited, which results in a very narrow sandy shore exposure during low tides. The foreshore intertidal area is also dominated by seagrass beds indicating limiting exposure to low tides in this area.

A total of two formal avifauna census survey sites were located within the shoreline at Summerland Point.

Plate 15: Summerland Point shoreline

Plate 16: Summerland Point shoreline

Lake Macquarie State Conservation Area – Morisset

The Lake Macquarie State Conservation Area (LM-SCA) is known to provide suitable habitat for shore, wader and fishing birds. The Reserve is outside the Study Area and is located south-west of the Trinity Point Development. The Morisset Hospital is also located adjacent to the SCA and borders the lake edge.

The LM-SCA was selected due to its close proximity to the Study Area and is known to provide suitable foraging and roosting habitat for shore, wader and fishing birds. Importantly the LM-SCA area is situated greater than a 1km buffer from the helicopter flight path at approx. 3 km.

The foreshore areas assessed for habitat value where the western side of Woods Point and the banks of Pourmalong Creek including the wetland between the creek and Hospital grounds and the eastern shoreline of the hospital. In addition, the sheltered cove at the very southern boundary of the reserve was also assessed.

The foreshore of Woods Point and Pourmalong Creek share similar characteristics with patches of Mangrove lined foreshore between woodland and shallow mudflats and scattered seagrass beds

throughout. During assessments it was observed that during low tide there were small to medium sized areas of exposed mudflats or very shallow waters that would provide moderate suitable habitat for shore and wading birds.

The protected cove in the south of the park is similar to Pourmalong creek with a mangrove lined bay and limited exposed mudflats present. This area is primarily isolated from human disturbance apart from the residential development across the water at Wyee Point.

Woodland Habitat at Woods Point and surrounding the hospital grounds provides a diverse Scribbly Gum and Smooth Bark Apple Woodland with Swamp Sclerophyll forest (*Eucalyptus robusta*) present in the damper wetter drainage lines.

Foreshore habitat within the Hospital grounds is largely mown lawns with scattered remnants of open forest in the form of large canopy trees present. There are small areas of denser native vegetation that provides some level of protection at the foreshore. There is a significant number of large canopy trees throughout the hospital grounds and that would support large raptors as roost and nesting trees. Anecdotal observations provided by local bird watchers to the authors included that an Osprey nest was present in the grounds of the hospital, this nest was not observed during the habitat assessment.

Plate 17: Morisset Hospital eastern shore

Plate 18: Pourmalong Creek Habitat

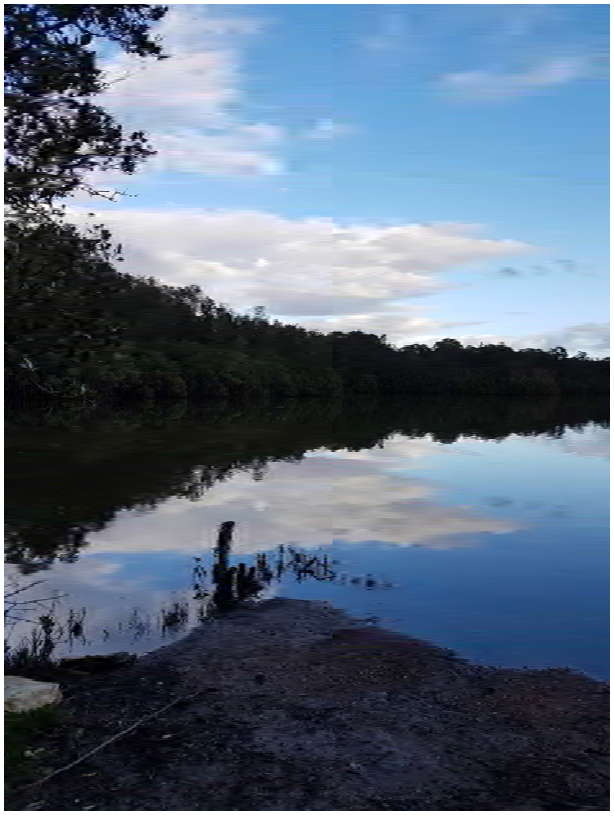

Plate 19: Southern cove - Lake Macquarie SCA

Plate 20: Pourmalong Creek Habitat

Plate 21: Woodland habitat Lake Macquarie SCA

Plate 22: Wetland Morisset Hospital

Lake Macquarie Airport

The public reserve to the north of Lake Macquarie Airport and the foreshore between the end of the runway and the lake, were assessed to compare bird utilisation in an area adjacent to the small scale working airport. The habitat at the end of the run way is primarily water with a rock wall installed to limit erosion potential in the area. Just north is a public car park and boat ramp. There is very limited bird roosting habitat in this area but foraging habitat for fishing birds is significant with sand bars (100m from shoreline) observed in the lakes occupied by various fishing bird species.

The Swamp Forest adjacent to the airport is a dense canopied forest that has a good native midstorey intertwined with exotic species such as Bitou Bush and Lantana. The patch provides potential foraging and roosting habitat for woodland birds.

A single formal avifauna census survey site was identified in this location targeting raptor birds and water birds.

Summary

The available habitat to support shore birds is very limited with no significant areas observed in the Study Area that provided roosting Foraging habit such as large mudflats, Sand flats and rocky outcrops. The limited occurrences of these habitat types was observed to be generally adjacent to high pedestrian usage areas, that in turn reduce protection and security for shore bird habitat. The following **Table 3** provides a summary of the formal avifauna census survey sites based on the Stage 2 habitat validation field survey. Refer to **Figure 4** showing the location of formal avifauna survey sites.

Table 3 Stage 3 Formal Avifauna Survey Site Locations

Study location	Site	Site Selection justification	Surevy Type	No. surveys
Trinity/ Barden's Bays	TP1	Proximity to proposed Helipad, marginal shoreline habitat (Sandy shore <1m), perch/roosting/nesting trees available	Point Survey Method	8
	TP2	Proximity to proposed Helipad, marginal shoreline habitat (Sandy shore <1m and small rocky outcrop), perch/roosting/nesting trees available	Point Survey Method	8
	TP3	Proximity to proposed Helipad, marginal shoreline habitat (Sandy spit) and shallow foraging waters	Point Survey Method	3
	BB1	North side of bay opposite helipad, very limited shoreline habitat (Sandy shore with rocky sections. 1-1.5m), perch/roosting/nesting trees available	Point Survey Method	3
	BB2	Rocky out crop east of proposed Helipad (exposed at Low tide)	Point Survey Method	3
	BB3	Woodland vegetation north of Barden's Bay	Search Area Method	2
	LP1	Proximity to proposed Helipad, marginal shoreline habitat - shallow foraging waters, perch/roosting/nesting trees available	Point Survey Method	3
Summerland Point	SLP1	Low quality Shoreline Vegetation (Sandy Shoreline), perch/roosting/nesting trees available	Point Survey Method	3
	SLP2	Remnant woodland vegetation, perch/roosting/nesting trees available	Search Area Method	3
	SLP3	Low quality Shoreline Vegetation (Sandy Shoreline), adjacent woodland vegetation, perch/roosting/nesting trees available	Point Survey Method	3
Lake Macquarie SCA	LMSCA1	Marginal shoreline habitat (mudflats and Mangrove forest), perch/roosting/nesting trees available	Point Survey Method	3
	LMSCA2	Remnant woodland vegetation, perch/roosting/nesting trees available	Search Area Method	3
	LMSCA3	Mangrove lined, protected bay, perch/roosting/nesting trees available	Point Survey Method	3
	MH1	Marginal shoreline habitat (Sandy shore <1m and small rocky outcrop), perch/roosting/nesting trees available	Point Survey Method	3
	MH2	Closed estuarine wetland with shallow waters	Point Survey Method	3
Belmont Hospital	BH1	open water near operational airport	Point Survey Method	2

Table 4 Tides during field survey period

Date	Site	Tide	Tide Time*	Survey Commencement
16/02/2017	TP1, TP2, TP3, LP1, BW1, BW2, BW3	Low	7:15	6:00
28/02/2017	TP1, TP2, TP3, LP1, BW1, BW3	Low	4:33	6:00
1/03/2017	TP1, TP2, TP3, LP1, BW1, BW2	Low	5:21	6:00
2/03/2017	SLP1, SLP2, SLP3, LMSCA1, LMSCA2, LMSCA3	Low	6:03	6:00
20/03/2017	SLP1, SLP2, SLP3	Low	2:38	6:00
22/03/2017	SLP1, SLP2, SLP3	Low	4:37	6:00
29/03/2017	LMSCA1, LMSCA2, LMSCA3	Low	16:45	16:00
31/03/2017	LMSCA1, LMSCA2, LMSCA3	Low	6:03	6:00
18/05/2017	TP1, TP2, TP3, LP1, BW1, BW2	Low	8:10	6:00
19/05/2017	TP1, TP2, TP3, LP1, BW1	High	17:38	16:00
15/08/2017	TP1, TP2, BW1	High	16:50	16:00
17/08/2017	TP1, TP2	Low	19:05	16:00

*Tide times include within lake variation; High +2.30hrs, Low+30min

Figure 4 Stage 3 Formal Avifauna Census Locations

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3.3 Avifauna Survey

The following provides the Stage 3 formal avifauna census survey results. A full list of the avifauna species recorded within the study area is provided as **Appendix 2**.

Formal avifauna surveys were undertaken over a total of 25 person hours across the Study Area. Census took place across the Summer, Autumn and Winter period and during a range of weather (e.g. during / after rain and wind or under fine conditions) and tidal events (Refer to **Table 2**, **Table 3** and **Table 4**). While it is noted this provides a 'snap shot' in time, the spread of seasonality, weather conditions and tide is intended to provide a representative sample of avifauna utilisation across the Study Area. The avifauna census results coupled with habitat assessment carried out in Stage 2 works has been used to inform the impact assessment presented in **Chapter 4**.

Bird utilisation across the Study Area was varied depending on the condition of habitat and its proximity to human activities. The birds observed throughout the study are were primarily common bird species seen more broadly within Lake Macquarie and foreshores. Woodland birds such as Rainbow Lorikeets and Eastern Rosellas were present throughout the study area in large numbers, as where Corella, and Sulphur Crested Cockatoos. Woodland bird diversity was observed to be greater within sites that where adjacent to or part of the LM-SCA.

With the acceptation of the LM-SCA, the Shorelines of the lake within the Study Area were generally low in potential habitat or refuge habitat. Often water birds were observed to be sitting on the Lake or in flight traversing the open waters. The only location where birds were observed to be present during each survey census, was the small rock outcrop off the point of Brightwaters north of Trinity Point. This rock outcrop at low tide was always occupied by a mix of water birds that included Crested Terns, Black Swan, and Pied Cormorant. All other shore areas were generally absent of birds roosting or foraging, with only the odd occurrence of Silver gull and Pelican.

There were very few shore or fishing birds observed in the Study Area with most observed on the rock platform at the end of Brightwaters Point, and within the LM-SCA.

A total of 51 bird species where observed within the Study Area.

A summary of the formal avifauna census survey results has been provided below. Threatened (State and Commonwealth) species results have been shown on **Figure 5**.

Trinity Point & Barden's Bay

- The listed threatened White-bellied Sea-eagle (Haliaeetus leucogaster) was observed flying along the southern boundary of Trinity Point on two occasions during targeted raptor surveys (Winter).
- No threatened shorebirds were observed roosting or foraging at any site within this site.
- Common terrestrial bird species observed within Trinity Point and Barden's Bay survey sites included the Australian Magpie (*Cracticus tibicen*), Eastern Rosella (*Platycercus eximius*), Laughing Kookaburra (*Dacelo* novaeguineae),Grey fan-tail (*Rhipidura albiscapa*),Common Myna (*Acridotheres* tristis) (Noisy Miner (*Manorina melanocephala*), Pied Butcher Bird (*Cracticus nigrogularis*), Pied Currawong (*Strepera graculina*), Rainbow Lorikeet (*Trichoglossus haematodus)*, Long-billed Corella (*Cacatua tenuirostris*), Sulphur Crested Cockatoo (*Cacatua galerita*) and Superb Fairy Wren (*Malurus cyaneus*).
- Common waterbirds observed included the Black Swan (*Cygnus atratus*), White-faced Heron (*Egretta novaehollandiae*), Wood Ducks (*Chenonetta jubata*), Australian Pelican (*Pelecanus conspicillatus*), Pied Cormorant (*Phalacrocorax varius*), Silver Gull (*Chroicocephalus novaehollandiae*), Crested Tern (*Thalasseus bergii*) and Chestnut Teal (*Anas castanea*).

Summerland Point

- The White-bellied Sea-eagle was observed perched within *Eucalyptus tereticornis* on the edge of the lake at the southern end of Sandy Point Reserve Summerland Point (Autumn 2017).

- The Sooty Oyster Catcher (*Haematopus fuliginosus*) was observed flying past Sandy Point Reserve in a north-south direction. This species was not observed roosting anywhere in the Study Area (Summer 2017).
- No threatened shorebirds were observed roosting or foraging at any site within this site.
- Common terrestrial bird species observed within Trinity Point and Barden's Bay survey sites included the Australian Magpie (*Cracticus tibicen*), Common Koel (*Eudynamys scolopacea*), Dollarbird (*Eurystomus orientalis*), Eastern Rosella (*Platycercus eximius*), Eastern Whipbird (*Psophodes olivaceus*) Laughing Kookaburra (*Dacelo* novaeguineae),Grey fan-tail (*Rhipidura albiscapa*),Common Myna (*Acridotheres* tristis) (Noisy Miner (*Manorina melanocephala*), Pied Butcher Bird (*Cracticus nigrogularis*), Pied Currawong (*Strepera graculina*), Rainbow Lorikeet (*Trichoglossus haematodus)*, Silver eye (*Zosterops lateralis*), Long-billed Corella (*Cacatua tenuirostris*), Sulphur Crested Cockatoo (*Cacatua galerita*) and Superb Fairy Wren (*Malurus cyaneus*).
- Common waterbirds such as Black Swan (*Cygnus atratus*), White-faced Heron (*Egretta novaehollandiae*), Wood Ducks (*Chenonetta jubata*), Australian Pelican (*Pelecanus conspicillatus*), Pied Cormorant (*Phalacrocorax varius*) and Chestnut Teal (*Anas castanea*) were observed at a number of sites within the Study Area.

Lake Macquarie State Conservation Area – Morisset

Formal survey undertaken within surrounding vegetation in Lake Macquarie State Conservation Area and Morrissett Hospital results included:

- No threatened shorebirds were observed roosting or foraging at any site within this site.
- Common woodland birds where observed include Australian Magpie (*Cracticus tibicen*), Common Koel (*Eudynamys scolopacea*), Dollarbird (*Eurystomus orientalis*), Noisy Friar Bird (*Philemon corniculatus*), Eastern Rosella (*Platycercus eximius*), Laughing Kookaburra (*Dacelo* novaeguineae), Noisy Miner (*Manorina melanocephala*), Pied Butcher Bird (*Cracticus nigrogularis*), Pied Currawong (*Strepera graculina*), Rainbow Lorikeet (*Trichoglossus haematodus)* White Browed Scrub Wren (*Sericornis frontalis*), Sulphur Crested Cockatoo (*Cacatua galerita*),Yellow-faced Honeyeater (*Lichenostomus chrysops)* and Superb Fairy Wren (*Malurus cyaneus*).
- Common waterbirds such as Black Swan (*Cygnus atratus*), White-faced Heron (*Egretta novaehollandiae*), Wood Ducks (*Chenonetta jubata*), Australian Pelican (*Pelecanus conspicillatus*), Pied Cormorant (*Phalacrocorax varius*), Royal Spoonbill (*Platalea regia*) and Chestnut Teal (*Anas castanea*) were observed at a number of sites within the Study Area.
- The White-bellied Sea-eagle was observed roosting in the distance (form Survey siteLMSCA3) in undisturbed vegetation at Wyee Point.
- The Threatened Eastern Osprey (*Pandion haliaetus*) was observed roosting in trees in the enclosed bay south of the hospital within the National Park.

Lake Macquarie Airport

- Common woodland birds where observed around the edges of the adjacent forest these included Eastern Rosella (*Platycercus eximius*), Laughing Kookaburra (*Dacelo* novaeguineae), Noisy Miner (*Manorina melanocephala*), Pied Currawong (*Strepera graculina*), Rainbow Lorikeet (*Trichoglossus haematodus)* White Browed Scrub Wren (*Sericornis frontalis*).
- During one of the formal avifauna census survey events, a small private plane was taking off from the site in a westerly direction toward the lake and during this event a White-bellied Sea-eagle was flying in the immediate area. The individual was not startled or showed signs of being disturbed by the presences of this aircrafts and continue to circle above the water.
- Common water birds observed included the Black Swan (*Cygnus atratus*), Australian Pelican (*Pelecanus conspicillatus*). These birds were observed on sand bars in line with the airport run way. During light aircraft take off, these birds were closely observed and no sign of startling (eg flushing) was recorded.

Figure 5 Threatened Avifauna Records

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4 Impact Assessment

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 table of likelihood of occurrence and potential for impacts to occur to threatened species, populations and ecological communities. In such instances, this has determined the need for further assessment of significance (7-part test).

4.1 Potential Impacts

Based on the ecological survey results over the Study Area, the following direct and indirect impacts have been generated to inform impact assessment over the Study Area.

Direct Impacts

Direct impacts within the Study Area are limited to:

- The loss of 436m2 of potential foraging area on the lake surface due to the installation of the helipad (20m x 20m) on a floating pontoon and gangway connecting to the existing marina. The helipad pontoon will be secured to the lake bed by four piles. The gangway will be supported by an additional pile;
- Note:
  - The aquatic impacts of the piles driven into the lake bed have already been assessed by Marine Pollution Research (2014 & 2016); and
  - The proposal will have no direct impacts on aquatic or terrestrial flora within the Study Area.

Indirect Impacts

The proposal may have the following indirect impacts associated with the proposed helipad:

Noise impacts to local fauna in particularly Shore birds, resulting from helicopter operations in the Study Area along entry and exit flight paths and at the helipad

A comprehensive acoustic assessment was completed by The Acoustic Group (2016). The Acoustic Assessment included the follow key elements:

- Assessment of existing noise context;
- discussion and decision making, regarding appropriate noise criteria. It was determined that the Air Services Australia Aircraft Noise Exposure Forecast System (ANEF) was the appropriate evaluation methodology, supplemented by a range of other measures, in particular AS 2363;
- Consideration of preferred flight paths;
- Rather than relying on a standard practice of only using a theoretical model, testing of flight paths was undertaken for noise impact at different locations for a base helicopter type (not chosen to be either the quietest or the noisiest) via a tailored helicopter survey. The survey is only one part of the acoustic assessment methodology and is used to inform assessment, including other helicopter types;
- Consideration of varying wind directions and speed; and
- Analysis and modelling of results, as directed by relevant standards or measurement and analysis of helicopter noise. This includes an accepted weighting method to provide assessment for all helicopter types.

The assessment confirmed that the proposal will comply with noise targets, including consideration of the existing noise environment and that the helipad can be introduced without unreasonable or

unacceptable acoustic impact to surrounding residential areas, on the basis that definitive management measures are introduced.

In addition, the background noise within the area was noted during Avifauna surveys. The development of the staged subdivision and construction of housing at Trinity was a continuing source of background noise in the area along with boats on the water, and traffic movements from various roads in the Study Area. The noises varied from consistent droning (vehicles) to loud power tools and earthmoving machinery. These noises did not appear to impact the movement of birds across the Study Area during the survey period.

As a comparison site, it is known that shorebirds can co-exists in locations with excessive noise and large operations. An example is Penrhyn Estuary Port Botany. This area is a location in which migratory shore birds forage and roost regularly. This estuary is within 1.5km of Sydney International Airport runways. In 2016 there was 348,904 flight movements in and out of the airport (Sydney Airport 2018), that would contribute to significant noise impacts in the area, this is coupled with the noise from the commercial operation of the Port Botany container terminal directly adjacent to the estuary.

Bird mortality as a result of striking helicopters while in flight or on the helipad

The proposal will see the commence of helicopter flights in and out of the Trinity Point Helipad. This will see up to 8 flights per day to a maximum of 38 flights per week. The introduction of a helicopter to the immediate environment at Trinity Point and causing bird mortality from a helicopter strike cannot be discounted. As part of the proposal a risk management protocol has been development to minimise bird strikes, during the operation of the helipad.

A review of current statistics relating to bird strikes, the Australia Transports Safety Bureau's released *Australian Aviation wildlife strike statistics* (ATSB 2017) that provide a snapshot of bird strikes between 2006-2015. In summary it notes that there were 16,069 bird strikes between 2006-2015. Bird strike occurrence data is a reportable matter under provisions of the Transportation Safety Regulations 2003 and therefore data is expected to be comprehensive and reliable.

The report found that in 2014- 2015 the four most struck bird species at Australian Airports were identified as Kites, Flying Foxes, Lapwings/Plovers and Galahs. Whilst NSW specifically the Magpies, Flying Foxes, Lapwings/Plovers and Galahs, where the most frequently struck birds.

The Report provides a detailed breakdown of bird strikes into categories such as bird type, aircraft types and a breakdown of the movement type in which bird strike was most common.

Out of the 16,069 bird strikes occurring in Australia during 2006+-2015, helicopters account for 275 bird strikes. The vast majority of bird strikes involve large commercial aircraft, but within the General Aviation category of which helicopters operating within the Study Area would belong, the strike rate is 0.419 strikes per 10,000 aircraft movements (General Aviation statistics include fixed-wing aircraft which account for a significantly higher proportion of bird strikes, therefore the strike rate possible from helicopters within the Study Area would likely fall well below this number).

Moreover, bird strike statistics indicate that, by contrast with fixed wing aircraft where most bird strikes occur during take-off and landing, helicopter bird strikes occur significantly less often during the movement types that will occur within the Study Area, with approximately 10% of strikes occurring during take-off, 5% during landing, and 18% occurring on approach

4.2 Threatened Species & Communities Likelihood of Occurrence Assessment

Threatened flora and fauna species (listed under the TSC Act and/or EPBC Act) that have been gazetted and recorded within a 10 kilometres radius of the Study Area have been considered within the assessment contained in **Table 5**. Each species / community is considered for its likelihood to occur in the Study Area and potential for impact arising from the proposal. Where a potential for impact is considered the entity has been nominated for further assessment under an Assessment of Significance (AoS) in **Appendix 4**.

'**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.

Database searches were conducted of the NSW Wildlife Atlas (13-09-16 & 24-08-2017) and Commonwealth Protected Matters Tool (13-09-16 & 24-08-2017).

Note: marine species (reptile, fish, mammal) recorded on the Protected Matters have not been listed or assessed herewith due to these species being address in MPR (2016) report.

Table 5 Likelihood of Occurrence and Impact Assessment

Common Name	Scientific Name	TSC Act	EPBC Act	No. of records	Likelihood of Occurrence / Likely Level of Impact
Birds					
Anthochaera phrygia	Regent Honeyeater	E	CE	27	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. Noise produced from helicopters that will fly over forest or woodland that may provide habitat for this species would be minor due to the height (approx. 1000 foot altitude) at which the helicopter would be above terrestrial vegetation. On this basis, it is **unlikely** the species will be impacted by the proposal
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V		13	The proposal does not seek to modify or alter terrestrial habitats that this species may utilise for foraging or for nesting. The proposed helicopter flight entry and exit paths from the helipad are over open water and once above land will be generally above 1000ft, greatly reducing the potential for interactions within the flight path. Noise produced by helicopters flying over woodland habitat would be minor due to the altitude at which the helicopter will fly above vegetation. On this basis, it is **unlikely** the species will be impacted by the proposal.
Botaurus poiciloptilus	Australasian Bittern	E	E	-	Targeted habitat surveys within the Study Area, did not detect suitable habitat (Permanent freshwater wetland with tall sedges and rushes), for this species to utilise. The proposed helicopter flight entry and exit paths will be over open water and once above land will be generally greater than 1,000ft. Due to the lack of suitable habitat this species is unlikely to occur in the Study Area. On this basis, it is **unlikely** the species will be impacted by the proposal.
Burhinus grallarius	Bush Stone-curlew	E		1	The proposal does not seek to modify or alter habitats this species could utilise for foraging or refuge. Noise produced from helicopters that will fly over terrestrial habitats for this species would be minor due to the height at which helicopters will fly above terrestrial vegetation. This species is largely nocturnal and unlikely to be flying within the area of flight entry and exit paths during hours of operation of the helipad.

Common Name	Scientific Name	TSC Act	EPBC Act	No. of records	Likelihood of Occurrence / Likely Level of Impact
					On this basis, it is **unlikely** the species will be impacted by the proposal.
Calidris carnutus	Red Knot		E, M, A	1	Targeted habitat surveys within the Study Area, did not detect this species or significant suitable habitat for this species to utilise. Intertidal zones of Barden's Bay and surrounds are generally no greater than 1-1.5m in width at low tides, often significantly less due to slope at the interface with water. The potential foraging habitat is marginal at best, therefore this species is unlikely to be present within the Study Area. In addition, the lack of protection and security in this narrow band of habitat, due to the close proximity of human occupation to much of the lakes edge and high pedestrian usage along the foreshore would severely limit the utilisation of this area by this species. The proposed helicopter flight entry and exit paths will be over open water outside intertidal zones and once above land will be generally greater than 1,000ft reducing the impacts of noise on fauna species. Due to the lack of suitable habitat this species is **unlikely** to occur in the Study Area. On this basis, it is **unlikely** the species will be impacted by the proposal.
Calidris ferruginea	Curlew Sandpiper	E	CE, M, A	1	Targeted habitat surveys within the Study Area, did not detect significant suitable habitat for this species to utilise. Intertidal zones of Bardens Bay and surrounds are generally less than 1m in width, often significantly less due to slope at interface with water. Therefore, foraging habitat is unlikely to be present within the Study Area during all but the most significant low tide events. In addition, the lack of protection and security in this narrow bands of habitat, due to the close proximity of urbanisation to much of the lakes edge and high pedestrian usage along the foreshore would severely limit the utilisation of this area by this species. The proposed helicopter flight entry and exit paths will be over open water outside intertidal zones and once above land will be generally greater than 1,000ft reducing the impacts of noise on fauna species. Due to the lack of suitable habitat this species is **unlikely** to occur in the Study Area. On this basis, it is **unlikely** the species will be impacted by the proposal.

Common Name	Scientific Name	TSC Act	EPBC Act	No. of records	Likelihood of Occurrence / Likely Level of Impact
Calidris tenuirostris	Great Knot	V	CE, M, A	-	Targeted habitat surveys within the Study Area, did not detect significant suitable habitat for this species to utilise. Intertidal zones of Bardens Bay and surrounds are generally less than 1m in width, often significantly less due to slope at interface with water. Therefore, foraging habitat is unlikely to be present within the Study Area during all but the most significant low tide events. In addition, the lack of protection and security in this narrow bands of habitat, due to the close proximity of urbanisation to much of the lakes edge and high pedestrian usage along the foreshore would severely limit the utilisation of this area by this species. The proposed helicopter flight entry and exit paths will be over open water outside intertidal zones and once above land will be generally greater than 1,000ft reducing the impacts of noise on fauna species. Due to the lack of suitable habitat this species is **unlikely** to occur in the Study Area. On this basis, it is **unlikely** the species will be impacted by the proposal.
Callocephalon fimbriatum	Gang-gang Cockatoo	V		3	The proposal does not seek to modify or alter terrestrial habitats that this species may utilise for foraging or for nesting. The proposed helicopter flight entry and exit paths from the helipad are over open water and once above land will be generally above 1000ft, greatly reducing the potential for interactions within the flight path. Noise produced by helicopters flying over woodland habitat would be minor due to the altitude at which the helicopter will fly above terrestrial vegetation. On this basis, it is **unlikely** the species will be impacted by the proposal.
Calyptorhynchus lathami	Glossy Black-Cockatoo	V		40	The proposal does not seek to modify or alter terrestrial habitats that this species may utilise for foraging or for nesting. The proposed helicopter flight entry and exit paths from the helipad are over open water and once above land will be generally above 1000ft, greatly reducing the potential for interactions within the flight path. Noise produced by helicopters flying over woodland habitat would be minor due to the altitude at which the helicopter will fly above terrestrial vegetation. On this basis, it is **unlikely** the species will be impacted by the proposal.

Common Name	Scientific Name	TSC Act	EPBC Act	No. of records	Likelihood of Occurrence / Likely Level of Impact
Charadrius mongolus	Lesser Sand Plover	V	E, M, A	-	Targeted habitat surveys within the Study Area, did not detect significant suitable habitat for this species to utilise. Intertidal zones of Bardens Bay and surrounds are generally less than 1m in width, often significantly less due to slope at interface with water. Therefore, foraging habitat is unlikely to be present within the Study Area during all but the most significant low tide events. In addition, the lack of protection and security in this narrow bands of habitat, due to the close proximity of urbanisation to much of the lakes edge and high pedestrian usage along the foreshore would severely limit the utilisation of this area by this species. The proposed helicopter flight entry and exit paths will be over open water outside intertidal zones and once above land will be generally greater than 1,000ft reducing the impacts of noise on fauna species. Due to the lack of suitable habitat this species is **unlikely** to occur in the Study Area. On this basis, it is **unlikely** the species will be impacted by the proposal.
Chthonicola sagittata	Speckled Warbler	V		1	The proposal does not seek to modify or alter terrestrial habitat that this species may utilise for foraging or for nesting. The proposed helicopter flight entry and exit paths from the helipad are over open water and once above land will be generally above 1000ft, greatly reducing the potential for interactions within the flight path. Noise produced by helicopters flying over woodland habitat would be minor due to the altitude at which the helicopter will fly above vegetation. On this basis, it is **unlikely** the species will be impacted by the proposal.
Climacteris picumnus victoriae	Brown Treecreeper	V		2	The proposal does not seek to modify or alter terrestrial habitats that this species may utilise for foraging or for nesting. The proposed helicopter flight entry and exit paths from the helipad are over open water and once above land will be generally above 1000ft, greatly reducing the potential for interactions within the flight path. Noise produced by helicopters flying over woodland habitat would be minor due to the altitude at which the helicopter will fly above vegetation. On this basis, it is **unlikely** the species will be impacted by the proposal.

Common Name	Scientific Name	TSC Act	EPBC Act	No. of records	Likelihood of Occurrence / Likely Level of Impact
Daphoenositta chrysoptera	Varied Sittella	V		25	The proposal does not seek to modify or alter terrestrial habitats that this species may utilise for foraging or for nesting. The proposed helicopter flight entry and exit paths from the helipad are over open water and once above land will be generally above 1000ft, greatly reducing the potential for interactions within the flight path. Noise produced by helicopters flying over woodland habitat would be minor due to the altitude at which the helicopter will fly above vegetation. On this basis, it is **unlikely** the species will be impacted by the proposal.
Dasyomis brachypterus	Eastern Bristlebird	E	E	-	There is no suitable habitat (dense heathy understorey) for this species to utilise within the project Study Area. This species rarely flies at altitude and coupled with the lack of habitat, the helicopter flight paths would not impact this species. Due to the lack of suitable habitat this species is **unlikely** to occur in the Study Area. On this basis, it is **unlikely** the proposal will impact this species.
Diomedea antipodensis	Antipodean Albatross	V	V, A	-	There is no suitable habitat for this species to utilise within the Study Area. This species is known to spend significant portions of its life on the open ocean and only ventures to land (subantarctic Islands) to breed. Due to the lack of suitable habitat this species is **unlikely** to occur in the Study Area. On this basis, it is **unlikely** the proposal will impact this species.
Diomedea antipodensis gibsoni	Gibson's Albatross	V	V, A	-	There is no suitable habitat for this species to utilise within the Study Area. This species is known to spend significant portions of its life on the open ocean and only ventures to land (subantarctic Islands) to breed. Due to the lack of suitable habitat this species is **unlikely** to occur in the Study Area. On this basis, it is **unlikely** the proposal will impact this species.
Diomedea epomophora (senso stricto)	Southern Royal Albatross		V, M, A	-	There is no suitable habitat for this species to utilise within the Study Area. This species is known to spend significant portions of its life on the open ocean and only ventures to land (subantarctic Islands) to breed. Due to the lack of suitable habitat this species is **unlikely** to occur in the Study Area.

Common Name	Scientific Name	TSC Act	EPBC Act	No. of records	Likelihood of Occurrence / Likely Level of Impact
					On this basis, it is **unlikely** the proposal will impact this species.
Diomedea exulans (Sensu lato)	Wandering Albatross	E	V, M, A	-	There is no suitable habitat for this species to utilise within the Study Area. This species is known to spend significant portions of its life on the open ocean and only ventures to land (subantarctic Islands) to breed. Due to the lack of suitable habitat this species is **unlikely** to occur in the Study Area. On this basis, it is **unlikely** the proposal will impact this species.
Diomedea sanfordi	Northern Royal Albatross		E, A	-	There is no suitable habitat for this species to utilise within the proposed project Study Area. This species is known to spend significant portions of its life on the open ocean and only ventures to land (Chatham Islands) to breed. Due to the lack of suitable habitat this species is **unlikely** to occur in the Study Area. On this basis, it is **unlikely** the proposal will impact this species.
Ephippiorhynchus asiaticus	Black-necked Stork	E		11	Targeted habitat surveys within the Study Area, did not detect significant suitable habitat for this species to utilise. The shorelines of Barden's Bay to a depth of about 0.5m potentially provide foraging habitat for this species. In addition, the lack of protection and security along the shoreline, due to the close proximity of urbanisation to much of the lakes edge and high pedestrian usage along the foreshore would severely limit the utilisation of this area by this species. The proposed helicopter flight entry and exit paths will be over open water well beyond the shoreline and once above land will be generally greater than 1,000ft reducing the impacts of noise on fauna species. On this basis, it is **unlikely** the species will be impacted by the proposal.
Epthianura albifrons	White-fronted Chat	V		2	Targeted habitat surveys within the Study Area, did not detect significant suitable habitat for this species to utilise. Grassy wetland margins around Bardens Bay potentially provide foraging habitat for this species. The proposed helicopter flight entry and exit paths will be over open water well beyond the shoreline and once above land will be generally greater than 1,000ft reducing the impacts of noise on fauna species.

Common Name	Scientific Name	TSC Act	EPBC Act	No. of records	Likelihood of Occurrence / Likely Level of Impact
					On this basis, it is **unlikely** the species will be impacted by the proposal.
Falco subniger	Black Falcon	V		1	Black Falcons are uncommon in the Lake Macquarie area and the Study Area lacks the preferred habitats (open woodlands, tree lined watercourses) of this widespread species. Prey in the form of wetland birds is present within the Study Area, however this species is unlikely to forage over open water therefore unlikely to spend significant time foraging within the proposed entry and exit paths of helicopters. Noise produced by helicopters flying over woodland habitat would be minor due to the altitude (generally >1000ft) at which the helicopter will fly above vegetation. On this basis, it is **unlikely** the species will be impacted by the proposal.
Glossopsitta pusilla	Little Lorikeet	V		22	The proposal does not seek to modify or alter terrestrial habitats that this species may utilise for foraging or for nesting. The proposed helicopter flight entry and exit paths from the helipad are over open water and once above land will be generally above 1000ft, greatly reducing the potential for interactions within the flight path. Noise produced by helicopters flying over woodland habitat would be minor due to the altitude at which the helicopter will fly above vegetation. On this basis, it is **unlikely** the species will be impacted by the proposal.
Grantiella picta	Painted Honeyeater	V	V	-	There is no suitable habitat for this species to utilise within the Study Area. This species habitat is predominantly Box-gum Woodlands of which no known occurrences of this community is present proposed project Study Area. Due to the lack of suitable habitat this species is **unlikely** to occur in the Study Area. On this basis it is **unlikely** the species will be impacted by the proposal.
Haematopus fuliginosus	Sooty Oystercatcher	V		6	There is limited suitable habitat for this species to utilise within the Study Area. Intertidal zones within the Study Area were observed to be quite restricted in size, and therefore the potential for this species to forage along the water's edge within the Study Area is limited. Nesting occurs almost exclusively on islands or isolated promontories which do not occur within the Study Area.

Common Name	Scientific Name	TSC Act	EPBC Act	No. of records	Likelihood of Occurrence / Likely Level of Impact
					This species was **recorded** flying across the southern portion of the Study Area, but was not observed roosting and forging within the Study Area. As such this species has **potential** to occur in the project Study Area but low interaction shall occur due to the very limited available habitat within the project Study Area. On this basis it is **unlikely** the species will be impacted by the proposal.
Haematopus longirostris	Pied Oystercatcher	E		3	There is limited suitable habitat for this species to utilise within the proposed project Study Area. As per the Sooty Oyster Catcher, this species has **potential** to occur in the project Study Area, but low interaction shall occur due to the lack of available habitat within the project Study Area. On this basis it is **unlikely** the species will be impacted by the proposal.
Haliaeetus leucogaster	White Bellied Sea-eagle	V	A	49	This species was **recorded** during field surveys This species foraging 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 directly impacted as there is no shoreline vegetation to be removed, trimmed or managed as part of the helipad proposal. The foraging behaviour (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. The wide foraging range of this species across the Lake Macquarie water mass coupled with the rapid ascent / descent from cruising altitude (1000ft altitude), is considered to limit interactions between the species and proposed helicopter movements within the flight path. Nevertheless, given the recorded observations during the census period, known presence of this species across Lake Macquarie and foraging habitat within the entry and exit flight paths of helicopters in the Study Area, an assessment of impacts is considered in **Appendix 3.**

Common Name	Scientific Name	TSC Act	EPBC Act	No. of records	Likelihood of Occurrence / Likely Level of Impact
Hieraaetus morphnoides	Little Eagle	V		2	This species is widespread occurring across many habitat types, however the Study Area has limited preferred habitat (forests, woodlands, or open woodlands) present. Prey in the form of wetland birds is present within the Study Area, however this species is unlikely to forage over open water therefore unlikely to spend significant time foraging within the proposed entry and exit paths of helicopters. Noise produced by helicopters flying over woodland habitat would be minor due to the altitude (generally at or greater than 1000ft) at which the helicopter will fly above vegetation. On this basis, it is **unlikely** the species will be impacted by the proposal.
Ixobrychus flavicollis	Black Bittern	V		6	Targeted habitat surveys within the Study Area, did not detect suitable habitat for this species to utilise. The proposed helicopter flight entry and exit paths will be over open water and once above land will be generally greater than 1,000ft. Due to the lack of suitable habitat this species is unlikely to occur in the Study Area. On this basis, it is **unlikely** the species will be impacted by the proposal.
Lathamus discolor	Swift Parrot	E	CE, A	27	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. Noise produced from helicopters that will fly over forest or woodland that may provide habitat for this species would be minor due to the height at which the helicopter would be above the vegetation. On this basis, it is **unlikely** the species will be impacted by the proposal.
Limosa lapponica baueri	Bar Tailed Godwit	V	V	-	Targeted habitat surveys within the Study Area, did not detect significant suitable habitat for this species to utilise. Intertidal zones with sand and mudflats in Barden's Bay and surrounds are generally 1 -1.5m in width, often significantly less due to slope at interface with water. Therefore, foraging habitat is unlikely to be present within the Study Area during all but the most significant low tide events. In addition, the lack of protection and security in this narrow bands of habitat, due to the close proximity of urbanisation to much of the lakes edge and high pedestrian usage along the foreshore would severely limit the utilisation of this area by this species.

Common Name	Scientific Name	TSC Act	EPBC Act	No. of records	Likelihood of Occurrence / Likely Level of Impact
					The proposed helicopter flight entry and exit paths will be over open water outside intertidal zones and once above land will be generally greater than 1,000ft reducing the impacts of noise on fauna species. Due to the lack of suitable habitat this species is **unlikely** to occur in the Study Area. On this basis, it is **unlikely** the species will be impacted by the proposal.
Limosa lapponica menzbieri	Northern Siberian Bar-tailed Godwit		CE	-	Targeted habitat surveys within the Study Area, did not detect significant suitable habitat for this species to utilise. Intertidal zones with sand and mudflats in Barden's Bay and surrounds are generally 1 -1.5m in width, often significantly less due to slope at interface with water. Therefore, foraging habitat is unlikely to be present within the Study Area during all but the most significant low tide events. In addition, the lack of protection and security in this narrow bands of habitat, due to the close proximity of urbanisation to much of the lakes edge and high pedestrian usage along the foreshore would severely limit the utilisation of this area by this species. The proposed helicopter flight entry and exit paths will be over open water outside intertidal zones and once above land will be generally greater than 1,000ft reducing the impacts of noise on fauna species. Due to the lack of suitable habitat this species is **unlikely** to occur in the Study Area. On this basis, it is **unlikely** the species will be impacted by the proposal.
Lophoictinia isura	Square-tailed Kite	V		2	This species is widespread occurring across many habitat types, however the Study Area lacks the preferred habitats (timbered habitats, dry woodlands and open forest). This species preys on passerines in the forest canopy and is unlikely to forage over open water and therefore unlikely to spend significant time foraging within the proposed entry and exit paths of helicopters. Noise produced by helicopters flying over woodland habitat would be minor due to the altitude (generally at or greater than 1000ft) at which the helicopter will fly above vegetation. On this basis, it is **unlikely** the species will be impacted by the proposal.

Common Name	Scientific Name	TSC Act	EPBC Act	No. of records	Likelihood of Occurrence / Likely Level of Impact
Macronectes giganteus	Southern Giant Petrel	E	E, M, A	-	There is no suitable habitat for this species to utilise within the proposed project Study Area. 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. Due to the lack of suitable habitat this species is **unlikely** to occur in the Study Area. On this basis it is **unlikely** the species will be impacted by the proposal.
Macronectes halli	Northern Giant Petrel	V	V, M, A	-	There is no suitable habitat for this species to utilise within the proposed project Study Area. 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. Due to the lack of suitable habitat this species is **unlikely** to occur in the Study Area. On this basis it is **unlikely** the species will be impacted by the proposal.
Neophema pulchella	Turquoise Parrot	V		1	The proposal does not seek to modify or alter terrestrial habitats that this species may utilise for foraging or for nesting. The proposed helicopter flight entry and exit paths from the helipad are over open water and once above land will be generally above 1000ft, greatly reducing the potential for interactions within the flight path. Noise produced by helicopters flying over woodland habitat would be minor due to the altitude at which the helicopter will fly above vegetation. On this basis, it is **unlikely** the species will be impacted by the proposal
Ninox connivens	Barking Owl	V		1	The proposal does not seek to modify or alter terrestrial habitats that this species may utilise for foraging or for nesting. This nocturnal woodland species is unlikely to occur within the Study Area during the hours of operation (daylight hours) of helicopters within the entry and exit flight paths. Noise produced by helicopters flying over woodland habitat would be minor due to the altitude at which the helicopter will fly above vegetation (generally at or greater than 1000ft) and would therefore be unlikely to cause disturbance to roosting owls. On this basis it is **unlikely** the species will be impacted by the proposal.

Common Name	Scientific Name	TSC Act	EPBC Act	No. of records	Likelihood of Occurrence / Likely Level of Impact
Ninox strenua	Powerful Owl	V		34	The proposal does not seek to modify or alter terrestrial habitats that this species may utilise for foraging or for nesting. This nocturnal woodland species is unlikely to occur within the Study Area during the hours of operation (daylight hours) of helicopters within the entry and exit flight paths. Noise produced by helicopters flying over woodland habitat would be minor due to the altitude at which the helicopter will fly above vegetation (generally at or greater than 1000ft) and would therefore be unlikely to cause disturbance to roosting owls. On this basis it is **unlikely** the species will be impacted by the proposal.
Numenius madagascariensis	Eastern Curlew		CE, M, A	1	Targeted habitat surveys within the proposed project Study Area didn't identify habitat in the form of inter -tidal flats. Small patches of Saltmarsh (with encroaching Mangroves and She Oaks) were detected within the Study Area but do not provide adequate area for this species to inhabit. The lack of records in the area and during targeted surveys coupled within the limited habitat available in the proposed project Study Area, it is **unlikely** this species is to occur in the locality. On this basis it is **unlikely** the species will be impacted by the proposal.
Oxyura australis	Blue-billed Duck	V		1	This species prefers deep water in areas with dense aquatic vegetation. It is unlikely to forage in the open saline water of the Study Area. When disturbed, it prefers to dive and is therefore unlikely to startle and fly within the flight path of helicopters in the Study Area. Due to the low number of records within 10km of the Study Area, lack of preferred habitat, and behaviour of this species, it is **unlikely** to be impacted by the proposal.
Pachyptila turtur subantarctica	Fairy Prion (Southern)		V	-	There is no suitable habitat for this species to utilise within the proposed project Study Area. 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. Due to the lack of suitable habitat this species is **unlikely** to occur in the Study Area. On this basis it is **unlikely** the species will be impacted by the proposal.

Common Name	Scientific Name	TSC Act	EPBC Act	No. of records	Likelihood of Occurrence / Likely Level of Impact
Pandion haliaetus	Osprey	V		10	This species was not observed within the Study Area during field surveys, although it was detected roosting in the south west of the Study Area. This species foraging 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 directly impacted as there is no shoreline vegetation to be removed, trimmed or managed as part of the helipad proposal. The foraging behaviour (in aquatic environments) 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). The wide foraging range of this species across the Lake Macquarie water mass coupled with the rapid ascent / descent from cruising altitude (1000ft altitude), is considered to limit interactions between the species and proposed helicopter movements within the flight path. Nevertheless, given the potential presence of this species foraging within the helicopter flightpaths within the Study Area, an assessment of impacts is considered in **Appendix 3.**
Petroica boodang	Scarlet Robin	V		2	The proposal does not seek to modify or alter terrestrial habitats that this species may utilise for foraging or for nesting. The proposed helicopter flight entry and exit paths from the helipad are over open water and once above land will be generally above 1000ft, greatly reducing the potential for interactions within the flight path. Noise produced by helicopters flying over woodland habitat would be minor due to the altitude at which the helicopter will fly above vegetation. On this basis, it is **unlikely** the species will be impacted by the proposal
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	V		1	The proposal does not seek to modify or alter terrestrial habitats that this species may utilise for foraging or for nesting. The proposed helicopter flight entry and exit paths from the helipad are over open water and once above land will be generally above 1000ft, greatly reducing the potential for interactions within the flight path. Noise produced by

Common Name	Scientific Name	TSC Act	EPBC Act	No. of records	Likelihood of Occurrence / Likely Level of Impact
					helicopters flying over woodland habitat would be minor due to the altitude at which the helicopter will fly above vegetation. On this basis, it is **unlikely** the species will be impacted by the proposal
Ptilinopus regina	Rose-crowned Fruite-Dove	V		2	The proposal does not seek to modify or alter terrestrial habitats that this species may utilise for foraging or for nesting. The proposed helicopter flight entry and exit paths from the helipad are over open water and once above land will be generally above 1000ft, greatly reducing the potential for interactions within the flight path. Noise produced by helicopters flying over woodland habitat would be minor due to the altitude at which the helicopter will fly above vegetation. On this basis, it is **unlikely** the species will be impacted by the proposal
Ptilinopus superbus	Superb Fruit-Dove	V		2	The proposal does not seek to modify or alter terrestrial habitats that this species may utilise for foraging or for nesting. The proposed helicopter flight entry and exit paths from the helipad are over open water and once above land will be generally above 1000ft, greatly reducing the potential for interactions within the flight path. Noise produced by helicopters flying over woodland habitat would be minor due to the altitude at which the helicopter will fly above vegetation. On this basis, it is **unlikely** the species will be impacted by the proposal
Puffinus assimilis	Little Shearwater	V		1	The proposal does not seek to modify or alter terrestrial habitats that this species may utilise for foraging or for nesting. The proposed helicopter flight entry and exit paths from the helipad are over open water and once above land will be generally above 1000ft, greatly reducing the potential for interactions within the flight path. Noise produced by helicopters flying over woodland habitat would be minor due to the altitude at which the helicopter will fly above vegetation. On this basis, it is **unlikely** the species will be impacted by the proposal
Rostratula australis	Australian Painted Snipe	E	E, A	-	Targeted habitat surveys within the project Study Area, did not detect suitable habitat for this species to utilise. The proposed helicopter flight entry and exit paths will be over open water lacking swamps, grassy lagoons and mudflats required by this species. Due to the lack of suitable habitat this species is **unlikely** to occur in the Study Area.

Common Name	Scientific Name	TSC Act	EPBC Act	No. of records	Likelihood of Occurrence / Likely Level of Impact
					On this basis, it is **unlikely** the proposal will impact this species.
Stagonopleura guttata	Diamond Firetail	V		1	The proposal does not seek to modify or alter terrestrial habitats that this species may utilise for foraging or for nesting. The proposed helicopter flight entry and exit paths from the helipad are over open water and once above land will be generally above 1000ft, greatly reducing the potential for interactions within the flight path. Noise produced by helicopters flying over woodland habitat would be minor due to the altitude at which the helicopter will fly above vegetation. On this basis, it is **unlikely** the species will be impacted by the proposal
Sternula albifrons	Little Tern	E	M, K	1	Little Terns have potential to forage from the wing for fish in the open waters of Lake Macquarie, including within the Study Area. The proposal seeks to modify a small area of potential foraging habitat for this species for the construction of the helipad. Little Terns are an infrequent visitor to the inland Lake Macquarie area with only 1 record inside a 10km search. The primary threats to this species relate to its high rate of breeding failure and developments which either remove or degrade estuarine habitats in which it feeds. Given the low level of occurrence around the Study Area and the rarity of breeding events in the Lake Macquarie area, the potential for interactions within the flight entry and exit paths are quite low, and therefore the potential for mortality of individuals is quite low. Broad sandy beaches and dunes in which this species might nest do not occur in the Study Area. Given that disruptions affecting breeding success and quality of foraging habitat are the primary causes of this species decline, and the proposal will neither disrupt breeding sites nor degrade the aquatic environment in which this species forages, the proposal is unlikely to significantly impact local populations or transient individuals. On this basis, it is **unlikely** the species will be significantly impacted by the proposal.
Stictonetta naevosa	Freckled Duck	V		1	The Freckled Ducks prefer wetlands such as swamps and creeks with heavy growth of emergent vegetation, typically in inland environments. During dispersal events to the NSW coast at times of inland drought, this species may occur in wetlands in the Lake Macquarie area. However, foraging generally occurs at dawn and dusk and at night, with Freckled Ducks seeking refuge in dense vegetation during the day. The Study Area has very limited

Common Name	Scientific Name	TSC Act	EPBC Act	No. of records	Likelihood of Occurrence / Likely Level of Impact
					vegetation suitable for cover for this species, and it is unlikely to forage in the open saline waters of the Study Area, particularly during daylight hours when helicopters are likely to be operating. Therefore, it is unlikely that interactions will occur. On this basis, it is **unlikely** that this species will be impacted by the proposal.
Thalassarche bulleri	Buller's Albatross		V, M, A	-	There is no suitable habitat for this species to utilise within the proposed within the project Study Area. 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. Due to the lack of suitable habitat this species is **unlikely** to occur in the Study Area. On this basis it is **unlikely** the species will be impacted by the proposal.
Thalassarche bulleri platei	Northern Buller's Albatross, Pacific Albatross		V, A	-	There is no suitable habitat for this species to utilise within the proposed project Study Area. 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. Due to the lack of suitable habitat this species is **unlikely** to occur in the Study Area. On this basis it is **unlikely** the species will be impacted by the proposal.
Thalassarche cauta cauta	Shy Albatross, Tasmanian Shy Albatross		V, M, A	-	There is no suitable habitat for this species to utilise within the proposed project Study Area. 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. Due to the lack of suitable habitat this species is **unlikely** to occur in the Study Area. On this basis it is **unlikely** the species will be impacted by the proposal.
Thalassarche cauta steadi	White-capped Albatross		V, A	-	There is no suitable habitat for this species to utilise within the proposed project Study Area. 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. Due to the lack of suitable habitat this species is **unlikely** to occur in the Study Area. On this basis it is **unlikely** the species will be impacted by the proposal.

Common Name	Scientific Name	TSC Act	EPBC Act	No. of records	Likelihood of Occurrence / Likely Level of Impact
Thalassarche eremita	Chatham Albatross		E, A	-	There is no suitable habitat for this species to utilise within the proposed project Study Area. 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). Due to the lack of suitable habitat this species is **unlikely** to occur in the Study Area. On this basis it is **unlikely** the species will be impacted by the proposal.
Thalassarche impavida	Campbell Albatross, Campbell Black-browed Albatross		V, A	-	There is no suitable habitat for this species to utilise within the proposed project Study Area. This species is known to spend significant portions of its life on the open ocean and only breed on Campbell Islands (NZ). Due to the lack of suitable habitat this species is **unlikely** to occur in the Study Area. On this basis it is **unlikely** the species will be impacted by the proposal.
Thalassarche melanophris	Black-browed Albatross	V	V, A	1	There is no suitable habitat for this species to utilise within the proposed project Study Area. This species is known to spend significant portions of its life on the open ocean and only ventures to land (subantarctic Islands) to breed. Due to the lack of suitable habitat this species is **unlikely** to occur in the Study Area. On this basis it is **unlikely** the species will be impacted by the proposal.
Thalassarche salvini	Salvin's Albatross		V, K	-	There is no suitable habitat for this species to utilise within the proposed project Study Area. This species is known to spend significant portions of its life on the open ocean and only ventures to land (subantarctic Islands) to breed. Due to the lack of suitable habitat this species is **unlikely** to occur in the Study Area. On this basis it is **unlikely** the species will be impacted by the proposal.
Turnix maculosus	Red-backed Button-quail	V		1	The proposal does not seek to modify or alter terrestrial habitats that this species may utilise for foraging or for nesting. The proposed helicopter flight entry and exit paths from the helipad are over open water and once above land will be generally above 1000ft, greatly reducing the potential for interactions within the flight path. Noise produced by helicopters flying over woodland habitat would be minor due to the altitude at which the helicopter will fly above vegetation.

Common Name	Scientific Name	TSC Act	EPBC Act	No. of records	Likelihood of Occurrence / Likely Level of Impact
					On this basis, it is **unlikely** the species will be impacted by the proposal
Tyto novaehollandiae	Masked Owl	V		17	The proposal does not seek to modify or alter terrestrial habitats that this species may utilise for foraging or for nesting. This nocturnal woodland species is unlikely to occur within the Study Area during the hours of operation (daylight hours) of helicopters within the entry and exit flight paths. Noise produced by helicopters flying over woodland habitat would be minor due to the altitude at which the helicopter will fly above vegetation (generally >1000ft) and would therefore be unlikely to cause disturbance to roosting owls. On this basis it is **unlikely** the species will be impacted by the proposal.
Tyto tenebricosa	Sooty Owl	V		1	The proposal does not seek to modify or alter terrestrial habitats that this species may utilise for foraging or for nesting. This nocturnal woodland species is unlikely to occur within the Study Area during the hours of operation (daylight hours) of helicopters within the entry and exit flight paths. Noise produced by helicopters flying over woodland habitat would be minor due to the altitude at which the helicopter will fly above vegetation (generally >1000ft) and would therefore be unlikely to cause disturbance to roosting owls. On this basis it is **unlikely** the species will be impacted by the proposal.
Frogs					
Crinia tinnula	Wallum Froglet	V		69	There is no suitable habitat for this species to utilise within the proposed project Study Area. There is no potential habitat in the saline environment of the Lake Macquarie water body beneath the proposed flight path. 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. Due to the lack of suitable habitat this species is **unlikely** to occur in the Study Area. On this basis it is **unlikely** the species will be impacted by the proposal.
Heleioporus australiacus	Giant Burrowing Frog		V		There is no suitable habitat for this species to utilise within the proposed project Study Area. There is no potential habitat in the saline environment of the Lake Macquarie water body beneath the proposed flight path. 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

Common Name	Scientific Name	TSC Act	EPBC Act	No. of records	Likelihood of Occurrence / Likely Level of Impact
					interaction shall occur with this species terrestrial habitat where present. Due to the lack of suitable habitat this species is **unlikely** to occur in the Study Area. On this basis it is **unlikely** the species will be impacted by the proposal.
Litoria aurea	Green and Golden Bell Frog	E	V	2	There is no suitable habitat for this species to utilise within the proposed project Study Area. There is no potential habitat in the saline environment of the Lake Macquarie water body beneath the proposed flight path. 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. Due to the lack of suitable habitat this species is **unlikely** to occur in the Study Area. On this basis it is **unlikely** the species will be impacted by the proposal.
Litoria littlejohni	Littlejohn's Tree Frog, Heath Frog	V	V	-	There is no suitable habitat for this species to utilise within the proposed project Study Area. There is no potential habitat in the saline environment of the Lake Macquarie water body beneath the proposed flight path. 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. Due to the lack of suitable habitat this species is **unlikely** to occur in the Study Area. On this basis it is **unlikely** the species will be impacted by the proposal.
Mixophyes balbus	Stuttering Frog	E	V	-	There is no suitable habitat for this species to utilise within the proposed project Study Area. There is no potential habitat in the saline environment of the Lake Macquarie water body beneath the proposed flight path. 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. Due to the lack of suitable habitat this species is **unlikely** to occur in the Study Area. On this basis it is **unlikely** the species will be impacted by the proposal.
Mixophyes iteratus	Giant Barred Frog, Southern Barred Frog	E	E	-	There is no suitable habitat for this species to utilise within the proposed project Study Area. There is no potential habitat in the saline environment of the Lake Macquarie water body beneath the proposed flight path. 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

Common Name	Scientific Name	TSC Act	EPBC Act	No. of records	Likelihood of Occurrence / Likely Level of Impact
					interaction shall occur with this species terrestrial habitat where present. Due to the lack of suitable habitat this species is **unlikely** to occur in the Study Area. On this basis it is **unlikely** the species will be impacted by the proposal.
Mammals					
Chalinolobus dwyeri	Large-eared Pied Bat, Large Pied Bat	V	V	1	There is potential suitable habitat for this species to utilise within the proposed project Study 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 species has the **potential** to occur in small forest remnants at the northern and southern portions of the proposed project Study Area. 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	V	E	11	There is no suitable habitat for this species to utilise within the Study Area. 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.
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V		11	This species has potential to occur in small forest remnants at the northern and southern portions of the Study Area. Within entry and exit flight paths, helicopters will generally be above 1,000ft when they reach land. As such no interaction with this species terrestrial habitat will occur, and noise impacts over land will be minimal. This is a nocturnal species and no helicopter flights will occur when this species is active, therefore strikes are highly unlikely to occur. On this basis, it is **unlikely** this species will be impacted by the proposal.

Common Name	Scientific Name	TSC Act	EPBC Act	No. of records	Likelihood of Occurrence / Likely Level of Impact
Miniopterus australis	Little Bentwing-bat	V		72	This species has potential to occur in small forest remnants at the northern and southern portions of the Study Area. Within entry and exit flight paths, helicopters will generally be above 1,000ft when they reach land. As such no interaction with this species terrestrial habitat will occur, and noise impacts over land will be minimal. This is a nocturnal species and no helicopter flights will occur when this species is active, therefore strikes are highly unlikely to occur. On this basis, it is **unlikely** this species will be impacted by the proposal.
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V		40	This species has potential to occur in small forest remnants at the northern and southern portions of the Study Area. Within entry and exit flight paths, helicopters will generally be above 1,000ft when they reach land. As such no interaction with this species terrestrial habitat will occur, and noise impacts over land will be minimal. This is a nocturnal species and no helicopter flights will occur when this species is active, therefore strikes are highly unlikely to occur. On this basis, it is **unlikely** this species will be impacted by the proposal.
Mormopterus norfolkensis	Eastern Freetail-bat	V		53	This species has potential to occur in small forest remnants at the northern and southern portions of the proposed project Study Area. Within entry and exit flight paths, helicopters will generally be above 1,000ft when they reach land. As such no interaction with this species terrestrial habitat will occur, and noise impacts over land will be minimal. This is a nocturnal species and no helicopter flights will occur when this species is active, therefore strikes are highly unlikely to occur. On this basis, it is **unlikely** this species will be impacted by the proposal.
Myotis macropus	Southern Myotis	V		36	This species has potential to occur in small forest remnants at the northern and southern portions of the proposed project Study Area. Within entry and exit flight paths, helicopters will generally be above 1,000ft when they reach land. As such no interaction with this species terrestrial habitat will occur, and noise impacts over land will be minimal. This is a nocturnal species and no helicopter flights will occur when this species is active, therefore strikes are highly unlikely to occur. On this basis, it is **unlikely** this species will be impacted by the proposal.

Common Name	Scientific Name	TSC Act	EPBC Act	No. of records	Likelihood of Occurrence / Likely Level of Impact
Petaurus australis	Yellow-bellied Glider	V		2	There is no suitable habitat for this species to utilise within the Study Area. When the helicopter reaches land on the proposed flight paths it will be at an elevation of generally greater than 1,000ft limiting noise. 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.
Petauroides volans	Greater Glider		V	-	There is no suitable habitat for this species to utilise within the Study Area. When the helicopter reaches land on the proposed flight paths it will be at an elevation of generally greater than 1,000ft limiting noise. 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.
Petaurus norfolcensis	Squirrel Glider	V		150	There is no suitable habitat for this species to utilise within the Study Area. 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.
Petrogale penicillata	Brush-tailed Rock-wallaby	E	V	-	There is no suitable habitat for this species to utilise within the Study Area. On this basis it is **unlikely** the species will be impacted by the proposal.
Phascolarctos cinereus	Koala	V	V	20	There is no suitable habitat for this species to utilise within the Study Area. 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.

Common Name	Scientific Name	TSC Act	EPBC Act	No. of records	Likelihood of Occurrence / Likely Level of Impact
					On this basis it is **unlikely** the species will be impacted by the proposal.
Potorous tridactylus tridactylus	Long-nosed Potoroo (SE mainland)	V	V	-	There is no suitable habitat for this species to utilise within the Study Area. 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 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 gracilicaudatus	Eastern Chestnut Mouse	V		1	There is no suitable habitat for this species to utilise within the Study Area. 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.
Pseudomys novaehollandiae	New Holland Mouse, Pookila		V	27	There is no suitable habitat for this species to utilise within the proposed project Study Area. 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	TSC Act	EPBC Act	No. of records	Likelihood of Occurrence / Likely Level of Impact
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	45	Targeted habitat surveys detected potential suitable foraging or roosting habitat for this species to utilise within the proposed project Study 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 helicopter flights will occur in daylight hours, therefore rotor strike is highly unlikely to occur at any time during the helicopter flight to and from including decent/ ascent to the helipad. On this basis it is **unlikely** the species will be impacted by the proposal.
Scoteanax rueppellii	Greater Broad-nosed Bat	V		35	This species has potential to occur in small forest remnants at the northern and southern portions of the proposed project Study Area. Within entry and exit flight paths, helicopters will generally be above 1,000ft when they reach land. As such no interaction with this species terrestrial habitat will occur, and noise impacts over land will be minimal. This is a nocturnal species and no helicopter flights will occur when this species is active, therefore strikes are highly unlikely to occur. On this basis, it is **unlikely** this species will be impacted by the proposal.
Vespadelus troughtoni	Eastern Cave Bat	V		2	This species has potential to occur in small forest remnants at the northern and southern portions of the proposed project Study Area. Within entry and exit flight paths, helicopters will generally be above 1,000ft when they reach land. As such no interaction with this species terrestrial habitat will occur, and noise impacts over land will be minimal. This is a nocturnal species and no helicopter flights will occur when this species is active, therefore strikes are highly unlikely to occur. On this basis, it is **unlikely** this species will be impacted by the proposal.
Reptiles					
Caretta caretta	Loggerhead Turtle	E	E	3	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 Study Area as they require sandy beaches.

Common Name	Scientific Name	TSC Act	EPBC Act	No. of records	Likelihood of Occurrence / Likely Level of Impact
					On this basis it is **unlikely** the species will be impacted by the proposal.
Chelonia mydas	Green Turtle	V	V	89	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(DA1503/2014) - 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.
Dermochelys coriacea	Leatherback Turtle	E	E	-	This 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. There are no known breeding / nesting locations proximate to the Study 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		V	-	This 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

Common Name	Scientific Name	TSC Act	EPBC Act	No. of records	Likelihood of Occurrence / Likely Level of Impact
					their large home range and food availability. Feed species includes sponges, gastropods, jellyfish and seagrass. Suitable habitat does not occur in the Study Area. On this basis it is **unlikely** the species will be impacted by the proposal. 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 seagrass beds proximate to the Study 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		V	-	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 stephensii	Stephens' Banded Snake			1	There is limited suitable habitat for this species to utilise within the proposed Study Area. When in flight there is no potential habitat in the aquatic 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 during 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.
Threatened Ecological Communities					
Posidonia australis seagrass meadows of the Manning-			E	-	This ecological community does occur within the proposal area.

Common Name	Scientific Name	TSC Act	EPBC Act	No. of records	Likelihood of Occurrence / Likely Level of Impact
Hawkesbury ecoregion					Aquatic ecology assessments of the larger approved Marina development, have indicated that the structures to be built as part of the helipad sit 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			V	-	This ecological community does not occur within the proposal area.
Flora					
Acacia bynoeana	Bynoe's Watle	E	V	60	The proposal will be within an aquatic environment; therefore, this terrestrial species will not be impacted by the proposal.
Angophora inopina	Charmhaven Apple	V	V	471	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	V	V	-	The proposal will be within an aquatic environment; therefore, this terrestrial species will not be impacted by the proposal.
Callistemon linearifolius	Netted Bottle Brush	V		6	The proposal will be within an aquatic environment; therefore, this terrestrial species will not be impacted by the proposal.
Corunastylis insignis	Wyong Midge Orchid, Variable Midge Orchid	CE	CE	-	The proposal will be within an aquatic environment; therefore, this terrestrial species will not be impacted by the proposal.
Corybas dowlingii	Red Helmet Orchid	E		2	The proposal will be within an aquatic environment; therefore, this terrestrial species will not be impacted by the proposal.
Cryptostylis hunteriana	Leafless Tongue-orchid	V	V	28	The proposal will be within an aquatic environment; therefore, this terrestrial species will not be impacted by the proposal.

Common Name	Scientific Name	TSC Act	EPBC Act	No. of records	Likelihood of Occurrence / Likely Level of Impact
Diuris praecox	Newcastle Double-tail	V	V	19	The proposal will be within an aquatic environment; therefore, this terrestrial species will not be impacted by the proposal.
Eucalyptus camfieldii	Camfield's Stringybark	V	V	3	The proposal will be within an aquatic environment; therefore, this terrestrial species will not be impacted by the proposal.
Eucalyptus parramattensis subsp. parramattensis	Earp's Gum, Earp's Dirty Gum	E		5	The proposal will be within an aquatic environment; therefore, this terrestrial species will not be impacted by the proposal.
Genoplesium insigne	Variable Midge Orchid	E	CE	9	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	V	V	24	The proposal will be within an aquatic environment; therefore, this terrestrial species will not be impacted by the proposal.
Melaleuca biconvexa	Biconvex Paperbark	V	V	41	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	E	E	1	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	E	E	-	The proposal will be within an aquatic environment; therefore, this terrestrial species will not be impacted by the proposal.
Pterostylis gibbosa	Illawarra Greenhood	E	E	-	The proposal will be within an aquatic environment; therefore, this terrestrial species will not be impacted by the proposal.
Rutidosis heterogama	Heath Wrinklewort	V	V	94	The proposal will be within an aquatic environment; therefore, this terrestrial species will not be impacted by the proposal.

Common Name	Scientific Name	TSC Act	EPBC Act	No. of records	Likelihood of Occurrence / Likely Level of Impact
Syzygium paniculatum	Magenta Lilly Pilly	E	V	6	The proposal will be within an aquatic environment; therefore, this terrestrial species will not be impacted by the proposal.
Tetratheca juncea	Black-eyed Susan	V	V	919	The proposal will be within an aquatic environment; therefore, this terrestrial species will not be impacted by the proposal.
Thelymitra adorata	Wyong Sun Orchid	CE	CE	-	The proposal will be within an aquatic environment; therefore, this terrestrial species will not be impacted by the proposal.
Thesium australe	Austral Toadflax	V	V	-	The proposal will be within an aquatic environment; therefore, this terrestrial species will not be impacted by the proposal.
Listed Migratory Species					
Migratory Marine Birds					
Anous stolidus	Common Noddy		M	-	There is no suitable habitat for this species to utilise within the proposed Study Area (helipad and flight paths). This species is known to spend significant portions of its life on the open ocean and there is no suitable nesting habitat in the Study Area. On this basis it is **unlikely** the species will be impacted by the proposal.
Apus pacificus	Fork-tailed Swift		M	-	Suitable habitat is present within the Study Area, however this species is thought to be almost entirely aerial throughout its range in Australia, and is likely to forage across all terrestrial habitat types, with suitability of a particular area influenced more by weather events (low pressure systems) and seasonal abundances of prey (insects) than by terrestrial habitat conditions. Thus, while study area provides habitat, it is not likely to a focus of foraging activity compared to the rest of this species range. As this species forages at high altitudes (up to and exceeding 300m), foraging activity would likely outside the entry and exit flight path elevations, altitudes above which aircraft flight patterns are less restricted. On this basis it is **unlikely** the species will be impacted by the proposal.

Common Name	Scientific Name	TSC Act	EPBC Act	No. of records	Likelihood of Occurrence / Likely Level of Impact
Puffinus carneipes	Flesh-footed Shearwater				There is no suitable habitat for this species to utilise within the proposed Study 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.
Calonectris leucomelas	Streaked Shearwater		M	-	There is no suitable habitat for this species to utilise within the proposed Study Area (helipad and flight paths). This species is known to spend significant portions of its life on the open ocean and there is no suitable nesting habitat in the Study Area. On this basis it is **unlikely** the species will be impacted by the proposal.
Fregata ariel	Lesser Frigatebird		M	-	This species very rarely occurs in the locality and is unlikely to utilise habitat within the Study Area for foraging. This species is known to spend a significant portion of its life on the open ocean and it is unlikely to forage in inshore habitat. On this basis it is **unlikely** the species will be impacted by the proposal.
Fregata minor	Great Frigatebird		M	-	This species very rarely occurs in the locality and is unlikely to utilise habitat within the Study Area for foraging. This species is known to spend a significant portion of its life on the open ocean and it is unlikely to forage in inshore habitat. On this basis it is **unlikely** the species will be impacted by the proposal.
Migratory Terrestrial Species					
Cuculus optatus	Oriental Cuckoo		M	-	There is no suitable habitat for this species to utilise within the proposed Study Area. 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	TSC Act	EPBC Act	No. of records	Likelihood of Occurrence / Likely Level of Impact
Hirundapus caudacutus	White-throated Needletail		M	-	Suitable habitat is present within the study area, however this species is thought to be almost entirely aerial throughout its range in Australia, and is likely to forage across all terrestrial habitat types, with suitability of a particular area influenced more by weather events (low pressure systems) and seasonal abundances of prey (insects) than by terrestrial habitat conditions. Thus, while study area provides habitat, it is not likely to a focus of foraging activity compared to the rest of this species range. As this species forages at high altitudes (up to and exceeding 300m), foraging activity would likely to be outside the entry and exit flight path elevations, altitudes above which aircraft flight patterns are less restricted. On this basis it is **unlikely** the species will be impacted by the proposal.
Monarcha melanopsis	Black-faced Monarch		M	-	There is no suitable habitat for this species to utilise within the proposed Study Area. 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		M	-	There is no suitable habitat for this species to utilise within the proposed Study Area. 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		M	-	There is no suitable habitat for this species to utilise within the proposed Study Area. 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	TSC Act	EPBC Act	No. of records	Likelihood of Occurrence / Likely Level of Impact
Myiagra cyanoleuca	Satin Flycatcher		M	-	There is no suitable habitat for this species to utilise within the proposed Study Area. 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		M	-	There is no suitable habitat for this species to utilise within the proposed Study Area. 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 Wetland Species					
Actitis hypoleucos	Common Sandpiper		M	-	There is no suitable habitat for this species to utilise within the proposed Study Area. 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		M	-	Targeted habitat surveys within the Study Area, did not detect significant suitable habitat for this species to utilise. Intertidal zones with sand and mudflats in Barden's Bay and surrounds are generally 1 -1.5m in width, often significantly less due to slope at interface with water. Therefore, foraging habitat is unlikely to be present within the Study Area during all but the most significant low tide events. In addition, the lack of protection and security in this narrow bands of habitat, due to the close proximity of urbanisation to much of the lakes edge and high pedestrian usage along the foreshore would severely limit the utilisation of this area by this species. The proposed helicopter flight entry and exit paths will be over open water outside intertidal zones and once above land will be generally greater than 1,000ft reducing the impacts of

Common Name	Scientific Name	TSC Act	EPBC Act	No. of records	Likelihood of Occurrence / Likely Level of Impact
					noise on fauna species. Due to the lack of suitable habitat this species is **unlikely** to occur in the Study Area. On this basis, it is **unlikely** the species will be impacted by the proposal.
Calidris acuminata	Sharp-tailed Sandpiper		M	-	Targeted habitat surveys within the Study Area, did not detect significant suitable habitat for this species to utilise. Intertidal zones with sand and mudflats in Barden's Bay and surrounds are generally 1 -1.5m in width, often significantly less due to slope at interface with water. Therefore, foraging habitat is unlikely to be present within the Study Area during all but the most significant low tide events. In addition, the lack of protection and security in this narrow bands of habitat, due to the close proximity of urbanisation to much of the lakes edge and high pedestrian usage along the foreshore would severely limit the utilisation of this area by this species. The proposed helicopter flight entry and exit paths will be over open water outside intertidal zones and once above land will be generally greater than 1,000ft reducing the impacts of noise on fauna species. Due to the lack of suitable habitat this species is **unlikely** to occur in the Study Area. On this basis, it is **unlikely** the species will be impacted by the proposal.
Calidris alba	Sanderling		M	-	Targeted habitat surveys within the Study Area, did not detect significant suitable habitat for this species to utilise. Intertidal zones with sand and mudflats in Barden's Bay and surrounds are generally 1 -1.5m in width, often significantly less due to slope at interface with water. Therefore, foraging habitat is unlikely to be present within the Study Area during all but the most significant low tide events. In addition, the lack of protection and security in this narrow bands of habitat, due to the close proximity of urbanisation to much of the lakes edge and high pedestrian usage along the foreshore would severely limit the utilisation of this area by this species. The proposed helicopter flight entry and exit paths will be over open water outside intertidal zones and once above land will be generally greater than 1,000ft reducing the impacts of noise on fauna species. Due to the lack of suitable habitat this species is **unlikely** to occur in the Study Area. On this basis, it is **unlikely** the species will be impacted by the proposal.

Common Name	Scientific Name	TSC Act	EPBC Act	No. of records	Likelihood of Occurrence / Likely Level of Impact
Calidris melanotos	Pectoral Sandpiper		M	-	Targeted habitat surveys within the Study Area, did not detect significant suitable habitat for this species to utilise. Intertidal zones with sand and mudflats in Barden's Bay and surrounds are generally 1 -1.5m in width, often significantly less due to slope at interface with water. Therefore, foraging habitat is unlikely to be present within the Study Area during all but the most significant low tide events. In addition, the lack of protection and security in this narrow bands of habitat, due to the close proximity of urbanisation to much of the lakes edge and high pedestrian usage along the foreshore would severely limit the utilisation of this area by this species. The proposed helicopter flight entry and exit paths will be over open water outside intertidal zones and once above land will be generally greater than 1,000ft reducing the impacts of noise on fauna species. Due to the lack of suitable habitat this species is **unlikely** to occur in the Study Area. On this basis, it is **unlikely** the species will be impacted by the proposal.
Calidris ruficollis	Red-necked Stint		M	-	Targeted habitat surveys within the Study Area, did not detect significant suitable habitat for this species to utilise. Intertidal zones with sand and mudflats in Barden's Bay and surrounds are generally 1 -1.5m in width, often significantly less due to slope at interface with water. Therefore, foraging habitat is unlikely to be present within the Study Area during all but the most significant low tide events. In addition, the lack of protection and security in this narrow bands of habitat, due to the close proximity of urbanisation to much of the lakes edge and high pedestrian usage along the foreshore would limit the utilisation of this area by this species. The proposed helicopter flight entry and exit paths will be over open water outside intertidal zones and once above land will be generally greater than 1,000ft reducing the impacts of noise on fauna species. Due to the lack of suitable habitat this species is **unlikely** to occur in the Study Area. On this basis, it is **unlikely** the species will be impacted by the proposal.

Common Name	Scientific Name	TSC Act	EPBC Act	No. of records	Likelihood of Occurrence / Likely Level of Impact
Charadrius bicinctus	Double-banded Plover		M	-	Targeted habitat surveys within the Study Area, did not detect significant suitable habitat for this species to utilise. Intertidal zones with sand and mudflats in Barden's Bay and surrounds are generally 1 -1.5m in width, often significantly less due to slope at interface with water. Therefore, foraging habitat is unlikely to be present within the Study Area during all but the most significant low tide events. In addition, the lack of protection and security in this narrow bands of habitat, due to the close proximity of urbanisation to much of the lakes edge and high pedestrian usage along the foreshore would limit the utilisation of this area by this species. The proposed helicopter flight entry and exit paths will be over open water outside intertidal zones and once above land will be generally greater than 1,000ft reducing the impacts of noise on fauna species. Due to the lack of suitable habitat this species is **unlikely** to occur in the Study Area. On this basis, it is **unlikely** the species will be impacted by the proposal.
Gallinago hardwickii	Latham's Snipe		M	-	There is no suitable habitat for this species to utilise within the proposed Study Area. 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		M	-	There is no suitable habitat for this species to utilise within the Study Area. 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 stenura	Pin-tailed Snipe		M	-	There is no suitable habitat for this species to utilise within the Study Area. 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

Common Name	Scientific Name	TSC Act	EPBC Act	No. of records	Likelihood of Occurrence / Likely Level of Impact
					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		M	-	Targeted habitat surveys within the Study Area, did not detect significant suitable habitat for this species to utilise. Intertidal zones with sand and mudflats in Barden's Bay and surrounds are generally 1 -1.5m in width, often significantly less due to slope at interface with water. Therefore, foraging habitat is unlikely to be present within the Study Area during all but the most significant low tide events. In addition, the lack of protection and security in this narrow bands of habitat, due to the close proximity of urbanisation to much of the lakes edge and high pedestrian usage along the foreshore would limit the utilisation of this area by this species. The proposed helicopter flight entry and exit paths will be over open water outside intertidal zones and once above land will be generally greater than 1,000ft reducing the impacts of noise on fauna species. Due to the lack of suitable habitat this species is **unlikely** to occur in the Study Area. On this basis, it is **unlikely** the species will be impacted by the proposal.
Limosa limosa	Black-tailed Godwit		M	-	Targeted habitat surveys within the Study Area, did not detect significant suitable habitat for this species to utilise. Intertidal zones with sand and mudflats in Barden's Bay and surrounds are generally 1 -1.5m in width, often significantly less due to slope at interface with water. Therefore, foraging habitat is unlikely to be present within the Study Area during all but the most significant low tide events. In addition, the lack of protection and security in this narrow bands of habitat, due to the close proximity of urbanisation to much of the lakes edge and high pedestrian usage along the foreshore would limit the utilisation of this area by this species. The proposed helicopter flight entry and exit paths will be over open water outside intertidal zones and once above land will be generally greater than 1,000ft reducing the impacts of noise on fauna species. Due to the lack of suitable habitat this species is **unlikely** to occur in the Study Area. On this basis, it is **unlikely** the species will be impacted by the proposal.

Common Name	Scientific Name	TSC Act	EPBC Act	No. of records	Likelihood of Occurrence / Likely Level of Impact
Numenius minutus	Little Curlew		M	-	Targeted habitat surveys within the Study Area, did not detect significant suitable habitat for this species to utilise. Intertidal zones with sand and mudflats in Barden's Bay and surrounds are generally 1 -1.5m in width, often significantly less due to slope at interface with water. Therefore, foraging habitat is unlikely to be present within the Study Area during all but the most significant low tide events. In addition, the lack of protection and security in this narrow bands of habitat, due to the close proximity of urbanisation to much of the lakes edge and high pedestrian usage along the foreshore would limit the utilisation of this area by this species. The proposed helicopter flight entry and exit paths will be over open water outside intertidal zones and once above land will be generally greater than 1,000ft reducing the impacts of noise on fauna species. Due to the lack of suitable habitat this species is **unlikely** to occur in the Study Area. On this basis, it is **unlikely** the species will be impacted by the proposal.
Numenius phaeopus	Whimbrel		M	-	There is no suitable habitat for this species to utilise within the Study Area. 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 fulva	Pacific Golden Plover		M	-	Targeted habitat surveys within the Study Area, did not detect significant suitable habitat for this species to utilise. Intertidal zones with sand and mudflats in Barden's Bay and surrounds are generally 1 -1.5m in width, often significantly less due to slope at interface with water. Therefore, foraging habitat is unlikely to be present within the Study Area during all but the most significant low tide events. In addition, the lack of protection and security in this narrow bands of habitat, due to the close proximity of urbanisation to much of the lakes edge and high pedestrian usage along the foreshore would limit the utilisation of this area by this species. The proposed helicopter flight entry and exit paths will be over open water outside intertidal zones and once above land will be generally greater than 1,000ft reducing the impacts of

Common Name	Scientific Name	TSC Act	EPBC Act	No. of records	Likelihood of Occurrence / Likely Level of Impact
					noise on fauna species. Due to the lack of suitable habitat this species is **unlikely** to occur in the Study Area. On this basis, it is **unlikely** the species will be impacted by the proposal.
Pluvialis squatarola	Grey Plover		M	-	Targeted habitat surveys within the Study Area, did not detect significant suitable habitat for this species to utilise. Intertidal zones with sand and mudflats in Barden's Bay and surrounds are generally 1 -1.5m in width, often significantly less due to slope at interface with water. Therefore, foraging habitat is unlikely to be present within the Study Area during all but the most significant low tide events. In addition, the lack of protection and security in this narrow bands of habitat, due to the close proximity of urbanisation to much of the lakes edge and high pedestrian usage along the foreshore would limit the utilisation of this area by this species. The proposed helicopter flight entry and exit paths will be over open water outside intertidal zones and once above land will be generally greater than 1,000ft reducing the impacts of noise on fauna species. Due to the lack of suitable habitat this species is **unlikely** to occur in the Study Area. On this basis, it is **unlikely** the species will be impacted by the proposal.
Tringa nebularia	Common Greenshank		M	-	Targeted habitat surveys within the Study Area, detected minor suitable habitat for this species to utilise. Intertidal zones with sand and mudflats in Barden's Bay and surrounds are generally 1 -1.5m in width, often significantly less due to slope at interface with water. The unnamed bay may provide minor forging opportunity Therefore, foraging habitat is marginal at best within the Study Area. In addition, the lack of protection and security in this narrow bands of habitat, due to the close proximity of urbanisation to much of the lakes edge and high pedestrian usage along the foreshore would limit the utilisation of this area by this species. The proposed helicopter flight entry and exit paths will be over open water outside intertidal zones and once above land will be generally greater than 1,000ft reducing the impacts of noise on fauna species. Due to the lack of suitable habitat this species is **unlikely** to occur in the Study Area.

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					On this basis it is **unlikely** the species will be impacted by the proposal.
Tringa stagnatilis	Marsh Sandpiper		M	-	Targeted habitat surveys within the Study Area, did not detect significant suitable habitat for this species to utilise. Intertidal zones with sand and mudflats in Barden's Bay and surrounds are generally 1 -1.5m in width, often significantly less due to slope at interface with water. Therefore, foraging habitat is unlikely to be present within the Study Area during all but the most significant low tide events. In addition, the lack of protection and security in this narrow bands of habitat, due to the close proximity of urbanisation to much of the lakes edge and high pedestrian usage along the foreshore would limit the utilisation of this area by this species. The proposed helicopter flight entry and exit paths will be over open water outside intertidal zones and once above land will be generally greater than 1,000ft reducing the impacts of noise on fauna species. Due to the lack of suitable habitat this species is **unlikely** to occur in the Study Area. On this basis, it is **unlikely** the species will be impacted by the proposal.
Xenus cinereus	Terek Sandpiper		M	-	Targeted habitat surveys within the Study Area, did not detect significant suitable habitat for this species to utilise. Intertidal zones with sand and mudflats in Barden's Bay and surrounds are generally 1 -1.5m in width, often significantly less due to slope at interface with water. Therefore, foraging habitat is unlikely to be present within the Study Area during all but the most significant low tide events. In addition, the lack of protection and security in this narrow bands of habitat, due to the close proximity of urbanisation to much of the lakes edge and high pedestrian usage along the foreshore would limit the utilisation of this area by this species. The proposed helicopter flight entry and exit paths will be over open water outside intertidal zones and once above land will be generally greater than 1,000ft reducing the impacts of noise on fauna species. Due to the lack of suitable habitat this species is **unlikely** to occur in the Study Area.

Common Name	Scientific Name	TSC Act	EPBC Act	No. of records	Likelihood of Occurrence / Likely Level of Impact
					On this basis, it is **unlikely** the species will be impacted by the proposal.
Listed Marine Species					
Birds					
Ardea alba	Great Egret, White Egret		A	-	Targeted habitat surveys within the Study Area, detected limited habitat for this species to utilise. Intertidal zones with sand and mudflats in Barden's Bay and surrounds are generally 1 -1.5m in width, often significantly less due to slope at interface with water. Therefore, foraging habitat is marginal within the Study Area during. In addition, the lack of protection and security in this narrow bands of habitat, due to the close proximity of urbanisation to much of the lakes edge and high pedestrian usage along the foreshore would limit the utilisation of this area by this species. The proposed helicopter flight entry and exit paths will be over open water outside intertidal zones and once above land will be generally greater than 1,000ft reducing the impacts of noise on fauna species. Due to the lack of suitable habitat this species is **unlikely** to occur in the Study Area. On this basis, it is **unlikely** the species will be impacted by the proposal.
Ardea ibis	Cattle Egret		A	-	There is no suitable habitat for this species to utilise within the proposed Study Area. 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 habitat along the lake shores where present. On this basis, it is **unlikely** the species will be impacted by the proposal.

Common Name	Scientific Name	TSC Act	EPBC Act	No. of records	Likelihood of Occurrence / Likely Level of Impact
Charadrius ruficapillus	Red-capped Plover		A	-	Targeted habitat surveys within the Study Area, did not detect significant suitable habitat for this species to utilise. Intertidal zones with sand and mudflats in Barden's Bay and surrounds are generally 1 -1.5m in width, often significantly less due to slope at interface with water. Therefore, foraging habitat is unlikely to be present within the Study Area during all but the most significant low tide events. In addition, the lack of protection and security in this narrow bands of habitat, due to the close proximity of urbanisation to much of the lakes edge and high pedestrian usage along the foreshore would limit the utilisation of this area by this species. The proposed helicopter flight entry and exit paths will be over open water outside intertidal zones and once above land will be generally greater than 1,000ft reducing the impacts of noise on fauna species. Due to the lack of suitable habitat this species is **unlikely** to occur in the Study Area. On this basis it is **unlikely** the species will be impacted by the proposal.
Himantopus himantopus	Black-winged stilt		A	-	Targeted habitat surveys within the Study Area, did not detect significant suitable habitat for this species to utilise. Intertidal zones with sand and mudflats in Barden's Bay and surrounds are generally 1 -1.5m in width, often significantly less due to slope at interface with water. Therefore, foraging habitat is unlikely to be present within the Study Area during all but the most significant low tide events. In addition, the lack of protection and security in this narrow bands of habitat, due to the close proximity of urbanisation to much of the lakes edge and high pedestrian usage along the foreshore would limit the utilisation of this area by this species. The proposed helicopter flight entry and exit paths will be over open water outside intertidal zones and once above land will be generally greater than 1,000ft reducing the impacts of noise on fauna species. Due to the lack of suitable habitat this species is **unlikely** to occur in the Study Area. On this basis it is **unlikely** the species will be impacted by the proposal.

Common Name	Scientific Name	TSC Act	EPBC Act	No. of records	Likelihood of Occurrence / Likely Level of Impact
Rostratla benghalaensis (sensu lato)	Painted Snipe		A	-	There is no suitable habitat for this species to utilise within the Study Area. 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.
Thalassarche sp.*nov.*	Pacific Albatross		A	-	There is no suitable habitat for this species to utilise within the Study Area 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

Key:

V = Vulnerable
E = Endangered
M = Migratory
CE = Critically Endangered
A = Marine

The following species are being assessed in **Appendix 3** under the 7 Part Test of Significance (TSC Act) based on the likelihood of occurrence results contained in **Table 5**.

- *Haliaeetus leucogaster* (White-bellied Sea-eagle)
- *Pandion haliaetus* (Eastern Osprey)

Assessment of Significant under the 7-part test determined that the proposal is unlikely to have a significant impact on threatened species assessed herewith such that a local extinction would occur.

4.3 Other Legislative Considerations

4.3.1 Key Threatening Processes

A Key Threatening Process (KTP) is defined in the TSC Act as a process that "threatens, or could threaten, the survival or evolutionary development of species, populations or ecological communities". They are listed under Schedule 3 of the TSC Act and may adversely affect threatened species, populations or ecological communities or could cause species, populations or ecological communities that are not threatened to become threatened.

One KTP has the potential to operate in the Study Area and requires consideration under proposal:

Anthropogenic Climate Change

Modification of the environment by humans is considered to contribute to Climate Change and as a result has been listed as a Key Threatening Process. The construction and operational processes which will occur as a result of the proposed Helipad, are actions that can contribute to greenhouse gas emissions. The proposal involves up to 38 helicopter movements per week. Helicopters have a relatively high burn rate of fossil fuels compared to other vehicles. The operation of a helicopter in the Study Area will result in a marginal increase in the operation of this KTP in the locality. Therefore, may indirectly impact upon known or potentially occurring threatened species as most species depend on climate for their distribution.

4.3.2 SEPP 44 – Koala Habitat Protection

Assessment of potential koala habitat under SEPP 44 requires the following steps be undertaken:

(a) Identification of 'potential Koala habitat' within the site area to be impacted; if the total tree cover contains 15% or more of the Koala food tree species listed in Schedule 2 of SEPP 44 then it is deemed to be 'potential Koala habitat'. Identification of 'potential Koala habitat requires the determination of the presence of 'core Koala habitat';

(b) Identification of 'core Koala habitat' within the area to be impacted. 'Core Koala habitat' is defined as an area of land with a resident population of Koalas, evidenced by attributes such as breeding females (females with young), recent sightings and historical records of a Koala population;

(c) Identification of 'core Koala habitat' will require that a plan of management must accompany the DA application;

(d) If the rezoning of lands, other than to environmental protection, involves potential or core Koala habitat then the Director of planning may require a local environmental study be carried out.

No Koala feed trees will be impacted by the proposal. Only very limited terrestrial habitat occurs within the Study Area beneath proposed flight paths. The proposal will not impact Potential or Core Koala Habitat. On this basis, no further considerations of the SEPP apply.

4.3.3 Commonwealth EPBC Act

An EPBC Act Protected Matters Search (accessed 13-09-2016 & 24-08-17) was undertaken to generate a list of those Matters of National Environmental Significance (MNES) from within 10 km of the Site. 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 66 threatened species and 2 threatened ecological communities listed under the EPBC Act have been recorded on the protected matters search. A likelihood of occurrence assessment for these MNES has been completed in **Section 4.2**.

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

One Threatened Ecological Communities listed under the EPBC Act has been recorded within the Study Area, being

- Subtropical and Temperate Coastal Saltmarsh.

No impacts are proposed to occur or have been identified within any areas that have potential to be affected by indirect impacts.

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

Listed Migratory Species

The protected matters search nominated 57 migratory species or species habitat that may occur with the 10km site buffer search area. The assessment contained in **Section 4.2** concluded that although migratory species may occupy and utilise various habitats throughout the Study Area and locality, no habitat on site is critical to their survival. Therefore, it is unlikely that the proposal over the site will impact migratory species.

Wetlands of International Significance (declared Ramsar wetlands):

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

Commonwealth Marine Areas:

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

World Heritage Properties:

The Study Area is not a World Heritage area and is not in close proximity to any such area.

National Heritage Places:

The Study Area is not a National Heritage area and is not in close proximity to any such area.

Great Barrier Reef Marine Parks:

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

Nuclear Actions:

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

Water Resources in relation to Coal Mining and CSG:

The proposal over the Study Area 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.

5 Conclusion

MJD Environmental has been engaged by Johnson Property Group (JPG), to prepare an Ecological Assessment associated with, a proposed 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.

This Ecological Assessment has been prepared to:

- Accompany the Part 3A Concept Plan Section 75W Modification Application known as MOD 3 currently being assessed by the NSW Department of Planning & Environmental (DPE). The modification application proposes the addition of a helipad to the Part 3A Concept Plan;
- to address the Secretary's Environmental Assessment Requirements (SEARs) for the proposed, Modification (SEARS MP06_0309 MOD3); and
- accompany an Environmental Impact Statement (EIS) that will form part of DA 1176/2014 (Lodged with Lake Macquarie City Council (LMCC)) for the construction and operation of the proposed helipad, which this application is a designated development. Requirements for the EIS are in the SEARs issued by the NSW DPE (SEAR 846) in July 2016.

The assessment aims to examine the likelihood of the proposed helipad having a significant effect on any threatened species, populations or ecological communities listed under the *NSW Threatened Species Conservation Act 1995* (TSC Act). This assessment recognises the relevant requirements of the EP&A Act 1979 as amended by the *NSW Environmental Planning and Assessment Amendment Act 1997*. Preliminary assessment was also made with regard to those threatened entities listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)

This ecological assessment specifically focused on threatened Avifauna species and their habitat, due to the fact the proposed development is situated entirely over water. No terrestrial flora and fauna surveys where undertaken as part of this assessment.

To assess the impacts of the proposal the Study Area selected for the project was based around the proposed flight paths and the air space between landing and take-off, to the cruising altitude of 1000ft. A 1km buffer surrounding the flight paths was set to provide a conservative separation from the flight paths that included all shoreline and woodland vegetation areas within Barden's Bay (location of Helipad). It was assumed that this area would provide an understanding of avifauna utilisation in the locality and provide a range of potential habitat for threatened bird species. Included in the Study was areas south west of the Helipad outside the1km buffer within higher quality vegetation found in the Lake Macquarie State Conservation Area (LM SCA).

A detailed assessment of the relative habitat value present within the Study Area was undertaken with a specific focus on shore bird and raptor species habitat. The assessment was undertaken via a three-stage process that included desktop appraisal, habitat validation surveys and a formal bird census.

- Stage 1: Desktop appraisal of potential habitat within the Study Area using GIS analysis including - Aerial Photograph Interpretation (API) and consultation of topographic map (Scale 1:25,000) layers for the site and cadastre boundary info (Private and Public land);
- Stage 2 habitat validation field survey was undertaken to ground truth the potential habitat and survey locations identified during the Stage 1 desktop habitat appraisal. Habitat surveys were based on the specific habitat requirements of each threatened bird species in regard to home range, feeding, roosting, breeding, movement patterns and corridor requirements; and
- Stage 3 Formal Bird census surveys where then undertaken at selected sites. Determination of the final site selection was carried out based on Stage 2 works.

Formal survey methods employed included:

Search area method: was used in areas where there was sufficient vegetation such as woodlands to undertaken 1ha 20-minute search.

Point survey method: was used along foreshores where birds were identified at pre-determined locations along a walking transect for a period of 30 minutes.

Additionally, secondary indications and incidental observations such as nests, whitewash, aural recognition of calls, where recorded in the Study Area.

During the habitat validation assessment, it was observed, habitat to support shore birds is very limited with no significant areas observed in the Study Area that provided roosting Foraging habit such as large mudflats, Sand flats and rocky outcrops. The limited occurrences of these habitat types were observed to be generally adjacent to high pedestrian usage areas, that in turn reduce protection and security for shore bird habitat. A total of 16 sites where selected from the 45 identified during desktop assessments.

Avifauna field survey results are as follows:

- A total of 51 bird species where observed within the Study Area;
- No threatened shorebirds were observed roosting or foraging at any site within this Study Area;
- The threatened White-bellied Sea-eagle (*Haliaeetus leucogaster*), was observed at Trinity Point (two occasions), Sandy Point Reserve, Belmont Airport and Lake Macquarie SCA during site surveys;
- The Threatened Eastern Osprey (*Pandion haliaeetus*) was observed roosting in trees in the enclosed bay south of the hospital within the National Park; and
- The Sooty Oyster Catcher (*Haematopus fuliginosus*) was observed flying past Sandy Point Reserve in a north-south direction. This species was not observed roosting anywhere in the Study Area (Summer 2017).

Proposed direct Impacts of the development include:

- The loss of 436m^2 of potential foraging area on the lake surface due to the installation of the helipad (20m x 20m) on a floating pontoon and gangway connecting to the existing marina. The helipad pontoon will be secured to the lake bed by four piles. The gangway will be supported by an additional pile;

In additional, indirect impacts relating to bird strike by helicopter movements within the flight path, and noise impacts on threatened species during ascent and decent from cruising altitude (1000ft) were assessed as part of this proposal.

The ecological impact assessment and Seven-Part Test considered whether the proposed helipad to be included as part of the concept approved marina and mixed-use development at Trinity Point, would have the potential to constitute a significant impact on known threatened species (particularly Avifauna), and populations from the locality such that a local extinction may occur.

The assessment concluded that the proposal was unlikely to have a significant impact on the threatened entities assessed.

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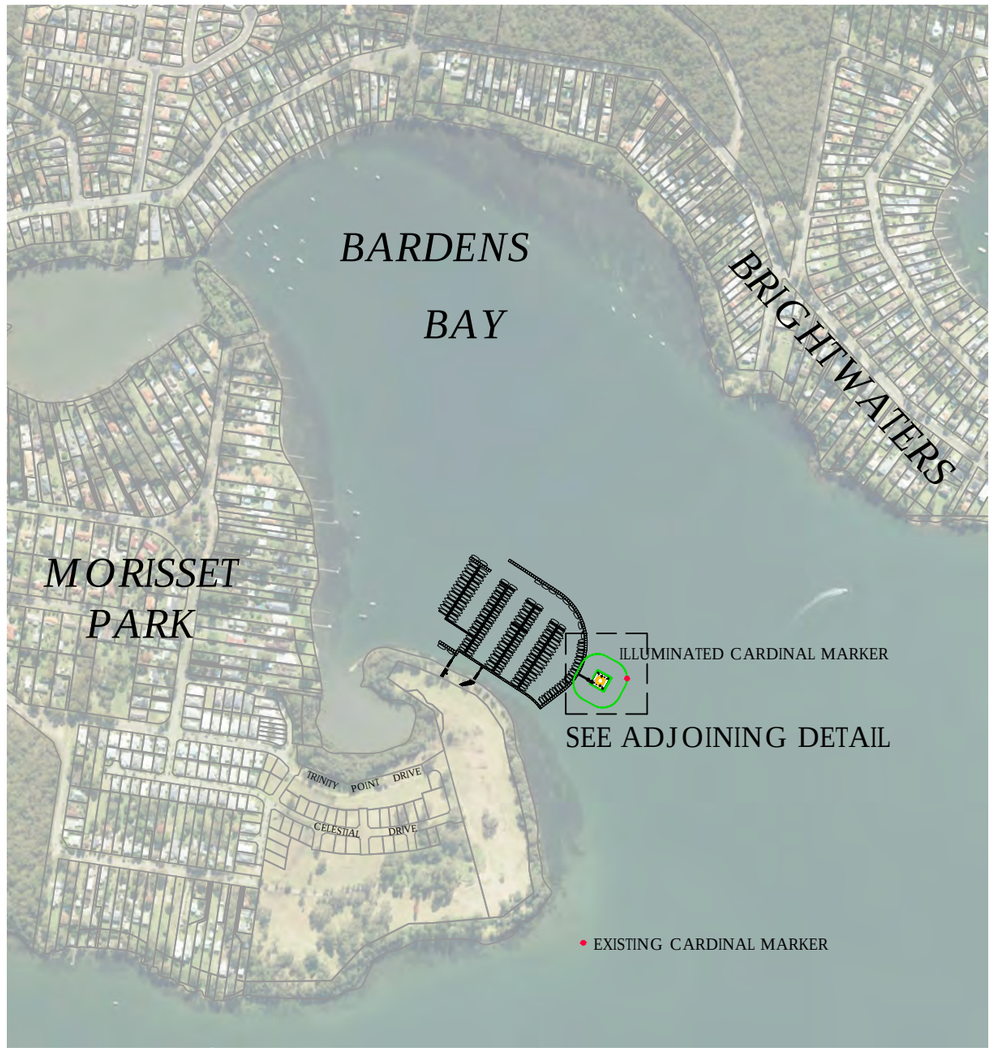
Appendix 1 Plan of Proposal



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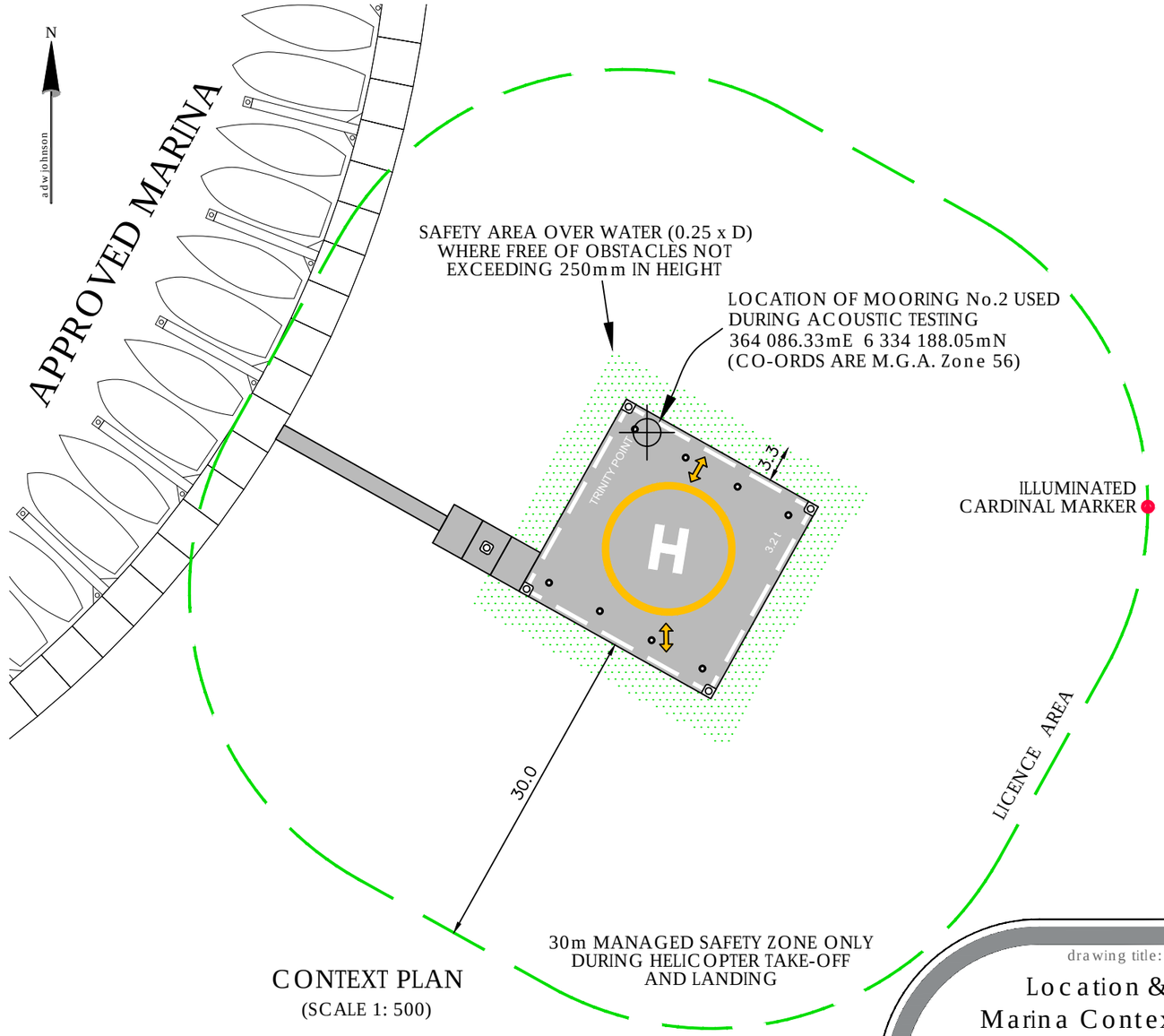

CONTEXT PLAN
(SCALE 1: 500)

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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.
H	14.03.18	MINOR AMENDMENTS	-	Z.J.	M.R.	S.H.

co-ordinate & level information:
CO-ORDINATE SYSTEM: M.G.A. 56
ORIGIN OF CO-ORDINATES: P.M.58712
DATUM: N/A
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-H

client:
JOHNSON PROPERTY GROUP
adw johnson

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

N

adwjohnson

LEGEND

- F.A.T.O. (1.5 x D)
- SAFETY AREA (0.25 x D)
- T.L.O.F. (0.83 x D)
- 3.2 t STATIC LOAD
- APPROACH / DEPARTURE MARKINGS

BOLLARD & CHAIN TO PREVENT ACCESS DURING TAKEOFF & LANDING

FLASHING LIGHT ON APPROVED PEDESTAL DEFINING CLEAR ZONE DURING TAKEOFF & LANDING

CLEAR ZONE DURING TAKEOFF & LANDING

APPROVED 4.0m WIDE ATTENUATOR PONTOON

1.5m WIDE HINGED ALUMINIUM GANGWAY

17.0

9.0

4m

3m

BOLLARD & CHAIN TO PREVENT ACCESS DURING TAKEOFF & LANDING

FLASHING LIGHT ON APPROVED PEDESTAL DEFINING CLEAR ZONE DURING TAKEOFF & LANDING

BOLLARD & CHAIN TO PREVENT ACCESS DURING TAKEOFF & LANDING

4m WIDE PONTOONS

30.0

WIND INDICATOR POLE HEIGHT TO BE CONFIRMED

TELESCOPIC PILES (APPROX. ø600mm) REFER TO ELEVATION

INDICATIVE TIE DOWN POINTS TO BE FLUSH WITH SURFACE

SAFETY AREA OVER WATER

TRINITY POINT

H

3.2 t

3.3

20.0

20.0

BUNDING & FIRST FLUSH TREATMENT TO BE PROVIDED TO PROTECT AGAINST FUEL SPILLS. DETAILS TO BE PROVIDED AT CONSTRUCTION CERTIFICATE STAGE.

ver.	date	comment	surveyed	drawn	checked	pm
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.
H	14.03.18	MINOR AMENDMENTS	-	Z.J.	M.R.	S.H.

co-ordinate & level information

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ORIGIN OF CO-ORDINATES: P.M.58712
DATUM: N/A
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:

Plan of Proposed Helipad

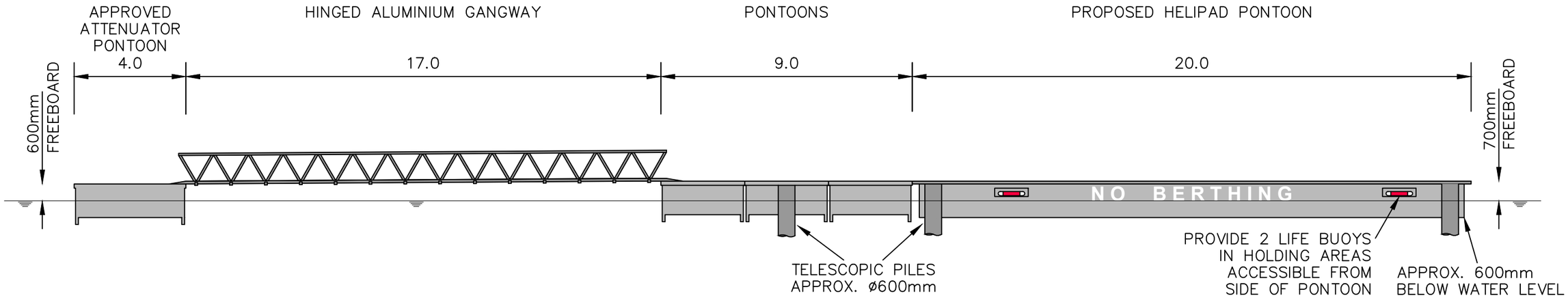
location: Trinity Point Marina

council: LAKE MACQUARIE

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

client: JOHNSON PROPERTY GROUP

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



ver.	date	comment	surveyed	drawn	checked	pm
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.
H	14.03.18	MINOR AMENDMENTS	-	Z.J.	M.R.	S.H.

co-ordinate & level information:
CO-ORDINATE SYSTEM: M.G.A. 56
ORIGIN OF CO-ORDINATES: P.M.58712
DATUM: N/A
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 Elevation of Proposed Helipad

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

client: JOHNSON PROPERTY GROUP

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

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.

Appendix 2 Fauna Species List

Bird List		Trinity/ Barden's Bay	Summerland Point	Lake Macquarie SCA/ Morisset Hospital	Belmont Hospital
Yellow Thornbill	*Acanthiza chrysorrhoa*		X	X	
Azure Kingfisher	*Alcedo azurea*			X	
Chestnut Teal	*Anas castanea*	X		X	
Australasian Darter	*Anhinga novaehollandiae*	X		X	
Red Wattlebird	*Anthochaera carunculata*	X	X	X	X
Striated Heron	*Butorides striata*	X		X	
Sulphur Crested Cockatoo	*Cacatua galerita*	X	X	X	X
Little corella	*Cacatua sanguinea*	X			
Long billed Corella	*Cacatua tenuirostris*	X	X	X	
Wood Duck	*Chenonetta jubata*	X		X	
Silver Gull	*Chroicocephalus novaehollandiae*	X	X	X	X
White-browed Treecreeper	*Climacteris affinis*		X	X	
Australian Raven	*Corvus coronoides*	X	X		X
Australian Magpie	*Cracticus tibicen*	X	X	X	X
Black Swan	*Cygnus atratus*	X	X	X	X
Laughing Kookaburra	*Dacelo novaeguineae*	X	X	X	X
White-faced Heron	*Egretta novaehollandiae*	X	X	X	X
Galah	*Eolophus roseicapilla*	X			
Magpie Lark	*Grallina cyanoleuca*	X	X	X	X
Sooty Oystercatcher (V)	***Haematopus fuliginosus* (V)**		X		
White-bellied Sea-eagle (V)	***Haliaeetus leucogaster* (V)**	X	X	X	X
Welcome Swallow	*Hirundo neoxena*	X	X	X	X
Yellow-faced Honeyeater	*Lichenostomus chrysops*		X	X	
Superb Fairy Wren	*Malurus cyaneus*	X	X	X	
Noisy Miner	*Manorina melanocephala*	X	X	X	X
Bell Miner	*Manorina melanophrys*	X	X	X	
Lewins Honeyeater	*Meliphaga lewinii*		X	X	X
Little Pied Cormorant	*Microcarbo melanoleucos*	X			
Red-browed Finch	*Neocmia temporalis*		X		
Crested Pigeon	*Ocyphaps lophotes*	X	X		
Osprey (V)	***Pandion haliaetus* (V)**	X		X	
Spotted Pardalote	*Pardalotus punctatus*		X		
Australian Pelican	*Pelecanus conspicillatus*	X			X
Great Cormorant	*Phalacrocorax carbo*		X		
Pied Cormorant	*Phalacrocorax varius*	X		X	X
Common Bronzewing	*Phaps chalcoptera*		X		
Noisy Friar Bird	*Philemon corniculatus*	X		X	

Bird List		Trinity/ Barden's Bay	Summerland Point	Lake Macquarie SCA/ Morisset Hospital	Belmont Hospital
Royal Spoonbill	*Platalea regia*	X			
Eastern Rosella	*Platycercus eximius*	X	X	X	X
Eastern Whipbird	*Psophodes olivaceus*	X	X	X	
Grey Fantail	*Rhipidura albiscapa*	X	X	X	X
Willy Wagtail	*Rhipidura leucophrys*	X	X	X	X
White-browed Scrub-wren	*Sericornis frontalis*	X	X	X	X
Australasian Figbird	*Sphecothere vieilloti*	X			
Pied Currawong	*Strepera graculina*	X			
Crested Tern	*Thalasseus bergii*				X
Scaly-breasted Lorikeets	*Trichoglossus chlorolepidotus*	X			
Rainbow Lorikeet	*Trichoglossus moluccanus*	X	X	X	X
Masked Lapwing	*Vanellus miles*	X		X	X
Silvereye	*Zosterops lateralis*		X		

V = Vulnerable under the TSC Act
V* = Vulnerable under the EPBC Act

Appendix 3 Assessment of Significance

Assessment of Significance (7-Part Test)

Section 5A of the EP&A Act lists seven factors that must be taken into account in the determination of the significance of potential impacts of proposed activities on 'threatened species, populations or ecological communities or their habitats' (threatened biota) listed under the TSC Act. The '7-part test' is used to determine whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats and thus whether a Species Impact Statement (SIS) is required to be produced.

The significance of the impacts on those threatened species and EECs which have been recorded in the Site or are likely to occur and are likely to utilise habitat to be potentially impacted by the proposal (see **Table 3**) have been assessed. The following threatened species and ecological community have been considered:

- *Haliaeetus leucogaster* (White-bellied Sea-Eagle)
- *Pandion haliatus* (Eastern Osprey)

a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Fishing Eagles

- *Haliaeetus leucogaster* (White-bellied Sea-Eagle)
- *Pandion Haliaeetus* (Eastern Osprey)

The White Bellied Sea-eagle was detected on five occasions within the Study Area with two sightings at Morisset Park, one observation at Belmont Airport, a single observation at the Hospital site and a single at Summerland Point. The Eastern Osprey was only detected at one location being the Hospital site within the Study Area. Both species are noted to have large numbers of records existing in the surrounding region of Lake Macquarie. Habitat for these species is found within the Study Area in the form of foraging over the Lake Macquarie water body and perching, roosting habitat. These species are likely to soar over the waters of Barden's Bay and Lake Macquarie while foraging for fish, and the high number of large canopy trees along the lakes edge provide opportunity for perching or nesting for these large raptor species.

Threats to these species primarily relate to disturbance of breeding sites and degradation of the aquatic environment and subsequent reduction in fish stocks available for foraging. The proposal does not seek to alter the attributes of the habitat within the Study Area beyond the construction of a 20m by 20m helipad (436m^2) that will form part of the existing Trinity Point Marina. Within the Study Area beyond the helipad, the nature of the potential impact is not to alter the attributes of the habitat itself, but to affect the likelihood of this species to utilise that habitat, due to disturbance caused by noise and activity of aircraft.

The Study Area is currently subject to disturbance due to residential development and recreation activity on the lake. Existing disturbance in this area due to recreational boating creates noise and disruption to the waters (outboard motors, jet skis, etc) these actions alone will affect the foraging potential of within this habitat. The addition of noise from helicopter movements within their entry and exit flight paths to the helipad is not expected to be excessively disruptive to foraging over and above the noise and disturbance caused by existing recreational activity. The Acoustics report notes there will be an increase in noise in the locality but current estimates are compliant with AirServices Australia Environmental Principles, (Acoustic Group 2016). The source of the noise being from an aircraft is unlikely to be disruptive to birds, as recent studies undertake for the Western Sydney Airport noted that avifauna thrives in habitats (if habitat available) in the vicinity of the airport despite noise levels significantly higher than those likely from the proposal (Commonwealth of Australia (2016).

With regard to potential interactions between this species and helicopters while foraging, the likelihood of bird strike is assessed as extremely low. Australian Transportation Safety Bureau

statistics compiled between 2006 and 2015 support this assessment (ATSB 2017). Bird strike occurrence data is a reportable matter under provisions of the Transportation Safety Regulations 2003 and therefore data is expected to be comprehensive and reliable. Out of the 16,069 bird strikes occurring in Australia over the past 10 years, helicopters account for 275 bird strikes. The vast majority of bird strikes involve large commercial aircraft, but within the General Aviation category of which helicopters operating within the Study Area would belong, the strike rate is 0.419 strikes per 10,000 aircraft movements (General Aviation statistics include fixed-wing aircraft which account for a significantly higher proportion of bird strikes, therefore the strike rate possible from helicopters within the Study Area would likely fall well below this number). The proposal will result in a maximum of 38 aircraft movements occurring within the Study Area per week. Assuming every week involves the maximum number of movements and factoring in the General Aviation strike rate of 0.419 strikes per 10,000 aircraft movements, then the likelihood of a bird strike occurring within the Study Area is approximately 0.0827 strikes per year, or about 1 bird strike occurring every 13 years. Moreover, bird strike statistics indicate that, by contrast with fixed wing aircraft where most bird strikes occur during takeoff and landing, helicopter bird strikes occur significantly less often during the movement types that will occur within the Study Area, with approximately 10% of strikes occurring during takeoff, 5% during landing, and 18% occurring on approach. Eagles account for a very low number of bird strikes, with 87 eagles struck by all types of aircraft across Australia over a 10-year period. Sea eagles account for 12 of these strikes.

The greatest population impact on the White-Bellied Sea-Eagle or the Eastern Osprey would be potential disturbance of nest sites. Nests are built in large emergent trees or stags near water, with high nest site fidelity over several years for resident breeding pairs. Nests have been recorded in the wider locality outside the Study Area, however no existing nests were found within the Study Area during the survey. The helicopter flight entry and exit paths proposed would result in helicopters nearing 1,000 feet at the point that flight paths approach the shoreline. Once at cruising altitude, the noise impacts and visual disturbance of a helicopter is not expected to be greater than the levels of disturbance currently operating in the area from residential housing, vehicle traffic, and recreational boating.

On this basis, it is considered that the establishment and operation of the Trinity Point helipad, is not likely to lead to an adverse effect on the life cycle of these species such that a viable local population is likely to be placed at risk of extinction.

b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

No endangered populations were considered as having potential to occur on site. Therefore, the action proposed is not likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

No EEC or CEECs were considered as having potential to occur within the Study Area in the impact zone of works for construction of the helipad. Therefore, the action proposed is not likely to have an adverse effect on the life cycle of the community or substantially modify an ecological community composition such that a viable local population of the species is likely to be placed at risk of extinction.

d) In relation to the habitat of a threatened species, population or ecological community:

i. the extent to which habitat is likely to be removed or modified as a result of the action proposed,

The helipad will occupy 436m^2 over open water in Barden's Bay. Proposed helicopter flight paths for approach and departure to a height of 1000ft cruising altitude will extend for 1.2km to the northwest and 2.6km to the southeast of the helipad, occurring almost entirely over open water. At the extreme northwest of the Study Area, helicopters may briefly be below 1,000ft during their ascent / descent from cruising altitude. On this basis the area of permanent foraging habitat removal for these species is 436m^2. A linear alignment of the air column above Lake Macquarie will be modified on each occasion a helicopter approaches or departs the helipad below an altitude of 1000ft. It is acknowledged that aircraft including helicopters generate noise, thus on each occasion noise is considered to represent a modification to foraging habitat above Lake Macquarie for the period of helicopter travel on approach to or departure from the helipad where the helicopter is below a cruising altitude of 1000ft (or the period of noise generation). A conservative approach to impact assessment has been made in this report, where impacts or modification to habitat have been considered to an area of a 1km buffer from the flight path where it occurs below 1000ft.

ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

The proposal will not lead to fragmentation or isolation of habitat. The helipad (436m^2) is situated in an area of open water adjacent to the approved marina. The movement of a helicopter on approach or departure from the helipad below an altitude of 1000ft. will not lead to a permanent isolation or fragmentation of habitat on either side of the flight path.

iii. the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality

Threatened Fauna

Fishing Eagles

- *Haliaeetus leucogaster* (White-bellied Sea-Eagle)
- *Pandion haliatus* (Eastern Osprey)

The Study Area consists of a patch of open water that may be utilised periodically by these species for hunting prey. This habitat will not be degraded with respect to its potential to provide prey for White-bellied Sea-Eagles or Eastern Ospreys. The hunting potential of the open waters immediately within the flight path will be disrupted over brief periods of time (only during take-off and landing) and only with respect to noise and interaction with aircraft. Noise will increase in the area during these time, it is assumed noise is not likely to disrupt the hunting of visual predators foraging on aquatic prey as observations made at the nearby Lake Macquarie Airport indicated during take-off of aircraft raptor species such as the White-bellied Sea-eagle where observed to continue to hunt in close proximity to the aircraft. Interactions with aircraft are expected to occur only if raptors are compelled to move in avoidance of aircraft, limiting the foraging potential of the area over a brief time period. Mortality via bird strikes is unlikely (ATSB 2017).

On this basis the minor removal of foraging habitat on site is not considered to be significant for the long-term survival of the threatened species assessed herewith.

e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)

No critical habitat for any threatened species or ecological communities occurs on site, therefore the proposal is unlikely to impact upon such habitat.

f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

Threat abatement plan or recovery plans have not been prepared for White-bellied Sea-eagles or Ospreys at the time of report preparation.

More broadly the NSW OEH are in the early phases of implementing the 'Saving our Species' program, that aims to secure species in their natural settings for the next 100 years. The intent is to manage threatened species one of six streams being:

1) Site managed species
2) Iconic species
3) Data-deficient species
4) Landscape-managed species
5) Partnership species
6) Keep watch species

Based on management allocation each species will be prioritised by OEH. At the time of reporting, all fauna species assessed were nominated as 'Landscape-managed Species'.

g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Key Threatening Processes (KTPs) are listed under Schedule 3 of the TSC Act 1995. KTPs considered relevant to the proposal is described in **Section 4.3.1**. This assessment concluded that the proposal was unlikely to trigger KTPs currently not operating on site and/or not contribute to or increase the activity of a KTP potentially operating on the site.

Appendix 4 Trinity Point Helipad Overview of Potential MNES and Aquatic Ecological Impacts (MJD Environmental 2016)

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.

<u>Construction Impacts</u>

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;

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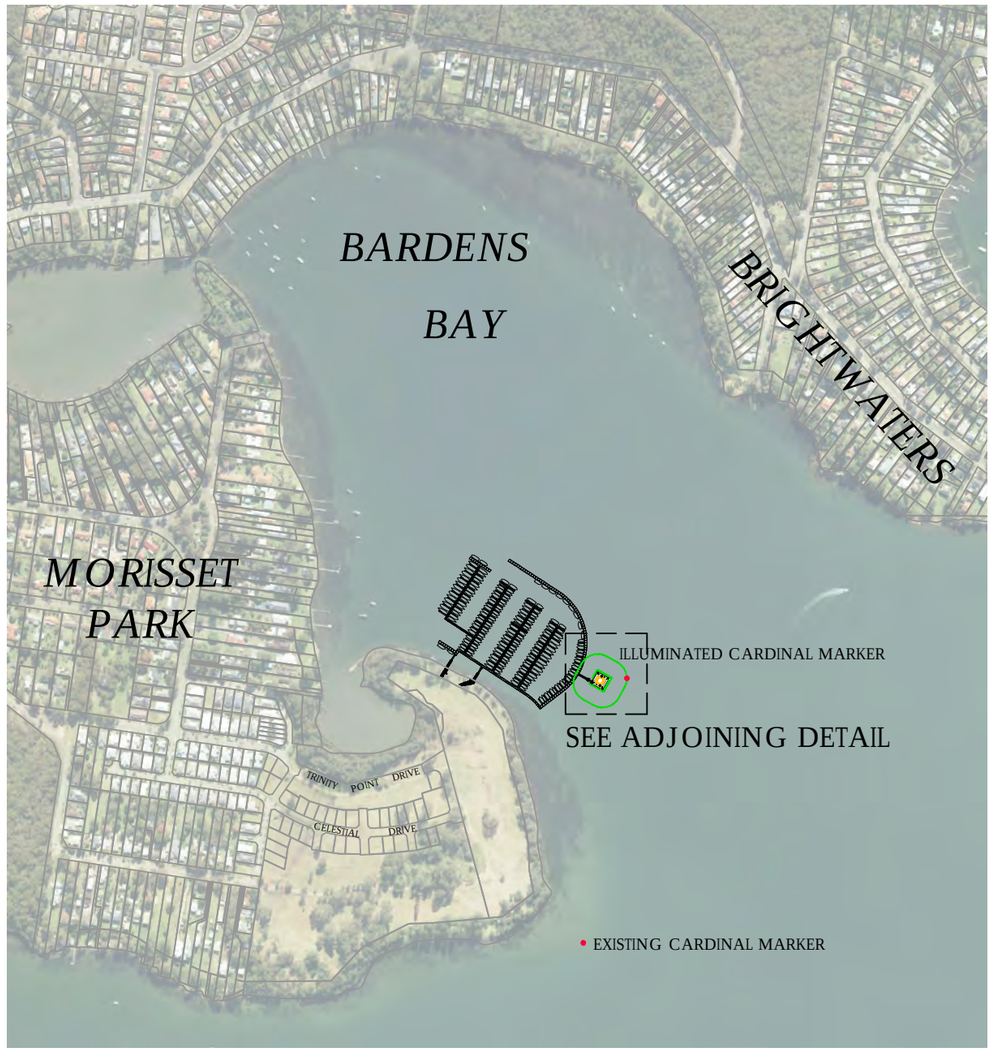
The Acoustic Group (2016). *Acoustic Assessment for a proposed Helipad- Trinity Point Development, Lake Macquarie.* ADW Johnson Acoustic Report 27th August

Attachment 1- Plans of the Proposal



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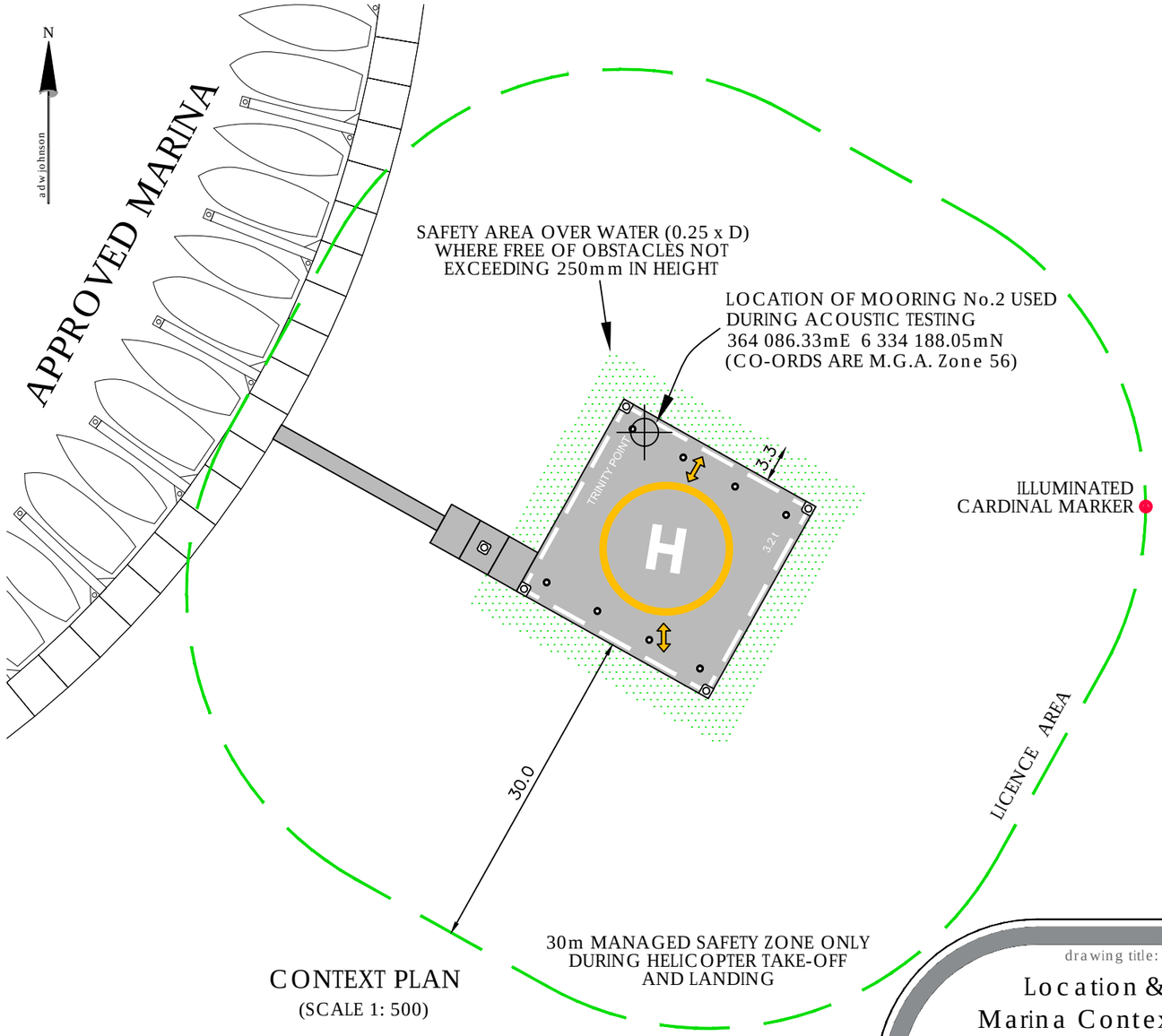


CONTEXT PLAN
(SCALE 1: 500)

ver.	date	comment	surveyed	drawn	checked	pm
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
DATUM: N/A
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

37429(4)-DA-001-G

N

adw johnson

LEGEND

- F.A.T.O. (1.5 x D)
- SAFETY AREA (0.25 x D)
- T.L.O.F. (0.83 x D)
- 3.2 t — STATIC LOAD
- APPROACH / DEPARTURE MARKINGS

BOLLARD & CHAIN TO PREVENT ACCESS DURING TAKEOFF & LANDING

FLASHING LIGHT ON APPROVED PEDESTAL DEFINING CLEAR ZONE DURING TAKEOFF & LANDING

CLEAR ZONE DURING TAKEOFF & LANDING

APPROVED 4.0m WIDE ATTENUATOR PONTOON

1.5m WIDE HINGED ALUMINIUM GANGWAY

17.0

9.0

4m

3m

4m WIDE PONTOONS

BOLLARD & CHAIN TO PREVENT ACCESS DURING TAKEOFF & LANDING

FLASHING LIGHT ON APPROVED PEDESTAL DEFINING CLEAR ZONE DURING TAKEOFF & LANDING

BOLLARD & CHAIN TO PREVENT ACCESS DURING TAKEOFF & LANDING

WIND INDICATOR POLE HEIGHT TO BE CONFIRMED

30.0

TELESCOPIC PILES (APPROX. ø600mm) REFER TO ELEVATION

INDICATIVE TIE DOWN POINTS TO BE FLUSH WITH SURFACE

SAFETY AREA OVER WATER

TRINITY POINT

H

3.2 t

3.3

20.0

20.0

BUNDING & FIRST FLUSH TREATMENT TO BE PROVIDED TO PROTECT AGAINST FUEL SPILLS. DETAILS TO BE PROVIDED AT CONSTRUCTION CERTIFICATE STAGE.

ver.	date	comment	surveyed	drawn	checked	pm
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
DATUM: N/A
ORIGIN OF LEVELS: N/A
CONTOUR INTERVAL: N/A

scale (A3 original size)

0 5.0 10.0 12.5m
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

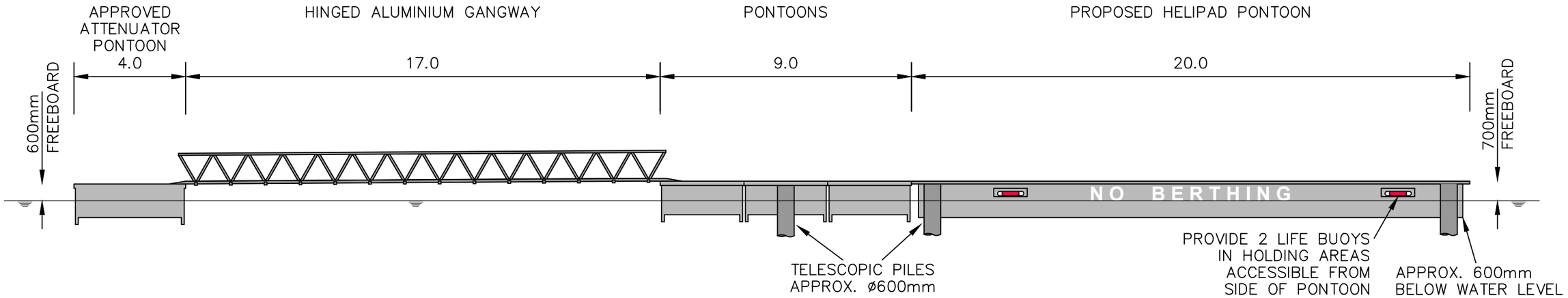
dwg ref: 37429(4)-DA-001-G

client: JOHNSON PROPERTY GROUP

adw johnson

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

Plotted By: Zachary Jarvie Plot Date: 12/09/16 11:04:58AM Cad File: N:\37429\37429(4)\DWG\PLANNING\DA\37429(4)-DA-001-G.DWG



ver.	date	comment	surveyed	drawn	checked	pm
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
DATUM:	N/A
ORIGIN OF LEVELS:	N/A
CONTOUR INTERVAL:	N/A

scale (A3 original size)

0 5.0 10.0m

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
hunter office ph: (02) 4978 5100

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

References

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The Acoustic Group (2016) – *Draft Proposed Helipad- Trinity Point Development, Lake Macquarie ADW Johnson Acoustic Report 27th August 2016*

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

Table of Contents

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).

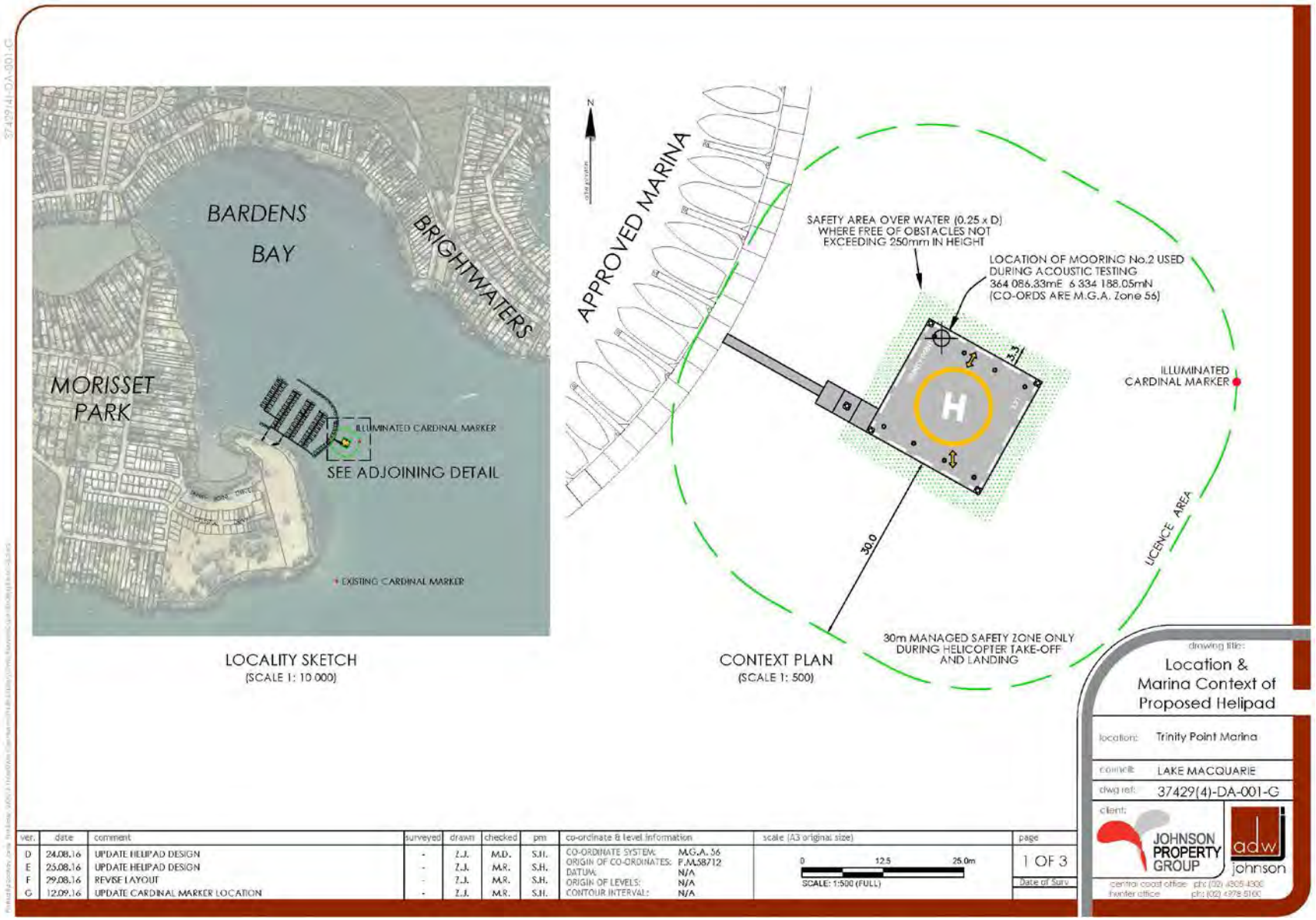

Figure 1 Trinity Point Marina showing location of proposed Helipad in relation to the marina.

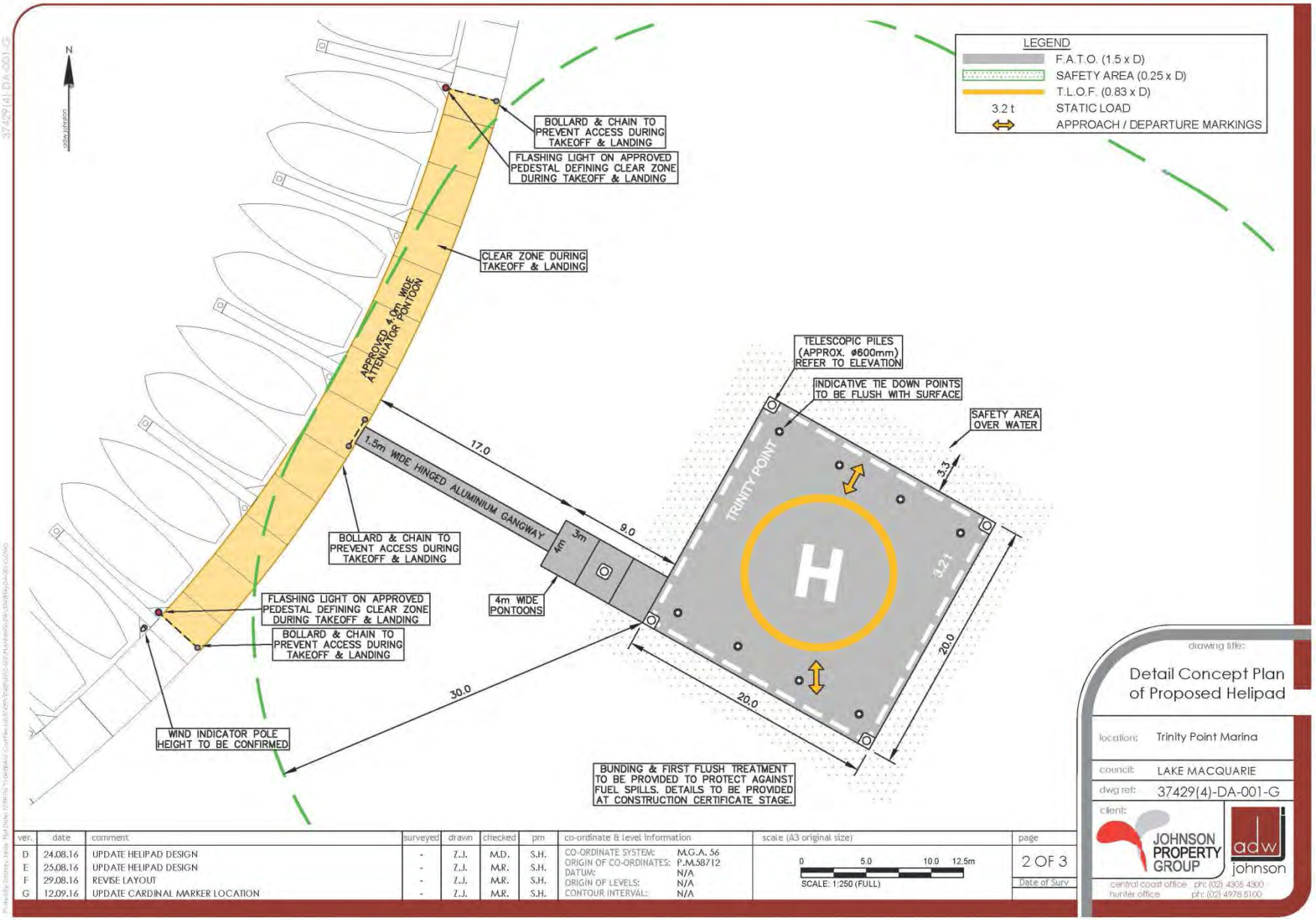

Figure 2 Detailed Concept Plan for Proposed Helipad

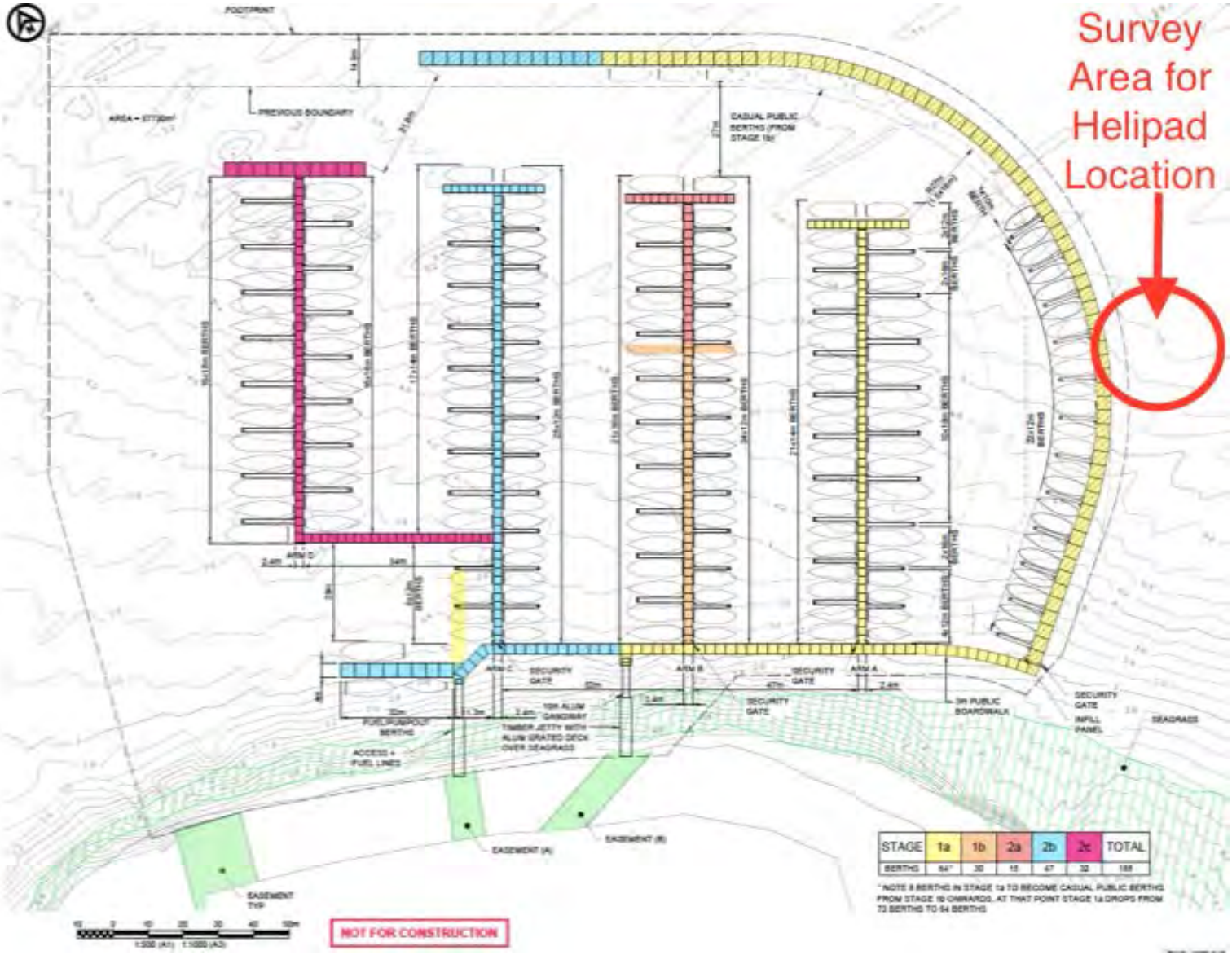

Figure 3 Location of Helipad Seabed Survey Area and relation of Helipad site to inshore *Zostera* Seagrass beds

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).

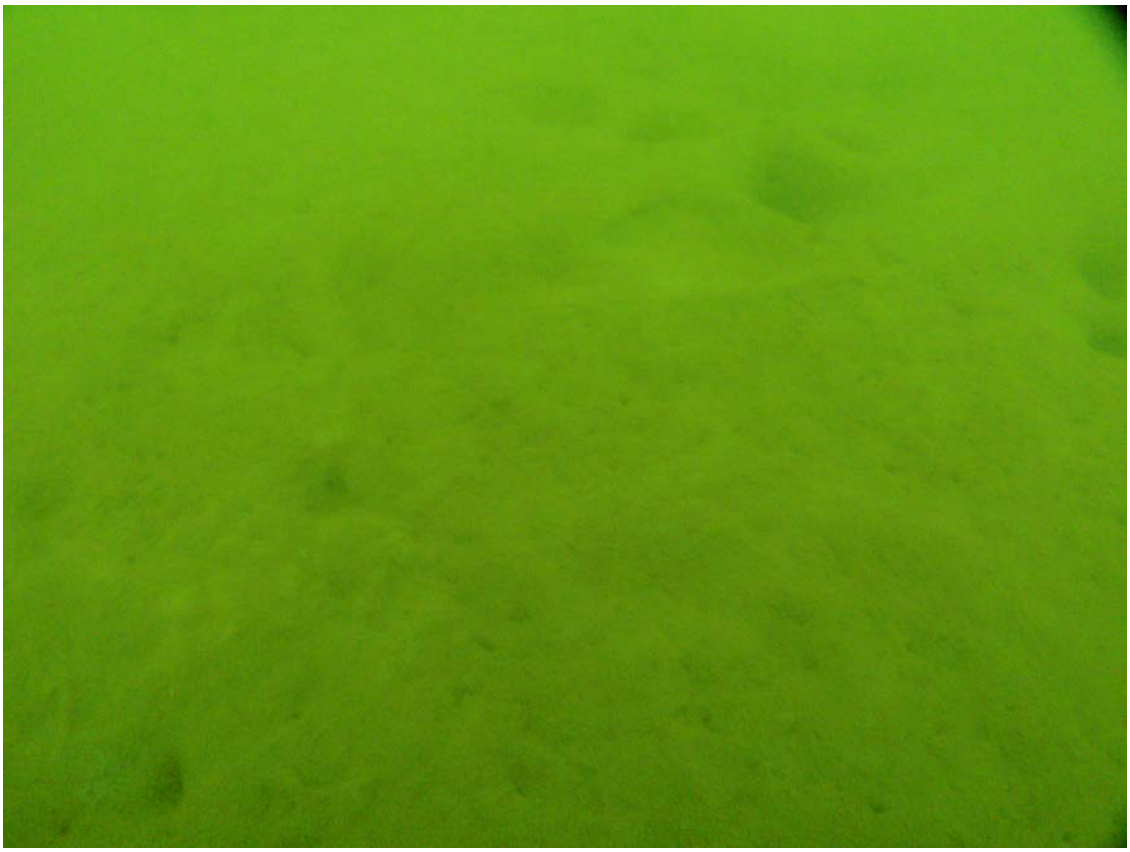

Figure 5 Silty-Sand Habitat under Helipad Footprint 8 May 2014.

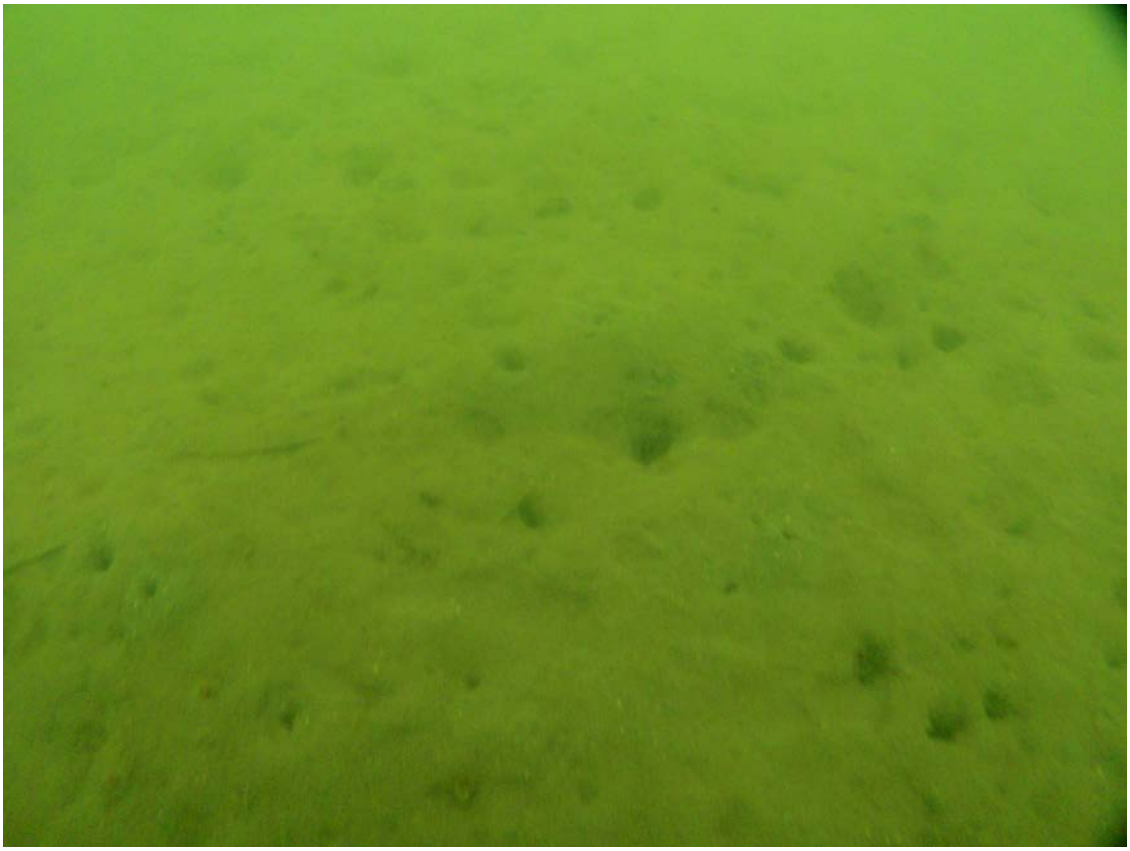

Figure 6 Silty-Sand Habitat under Helipad Footprint 8 May 2014. Note variety of small to large burrows.

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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Appendix 5 LMCC Referral Response Development: Flora and Fauna (2016)

Referral Response
Development – Flora/Fauna

Application Number:	PT/2/2008	**Date:**	29/11/16
Location:	LOT 31 DP 1117408, LOT 32 DP 1117408, LOT 33 DP 1117408, LOT 410 DP 1139690 LAKE MACQUARIE AND 41, 49, AND 71 TRINITY POINT DRIVE, MORISSET PARK, NSW		

I have inspected the site and reviewed the application, including:

- Environmental Assessment Report (ADW Johnson November 2016)
- Trinity Point helipad overview of potential MNES and aquatic ecological impacts (MJD Environmental 28/11/2016)
- Aquatic Ecology Impact Report (Marine Pollution Research October 2016)
- Coastal Processes and Hydrodynamics (Royal Haskoning DHV 25/10/2016)

Where required the application has been assessed for compliance with ecological requirements / recommendations detailed in the EP&A Act 1979, TSC Act 1995, NV Act 2003, FM Act 1994, EPBC Act 1999, SEPP 14, 19, 26 & 44, LMCC LEP (2014), LMCC DCP 1 (2014), and LMCC Guidelines for Flora and Fauna Survey (2012), Tetratheca juncea (2014), Grevillea parviflora subsp. Parviflora (2013), Squirrel Glider (2015), Large Forest Owls (2014) and Coastal Management.

The assessments examine potential impacts of the helipad to seagrass, benthic organisms and habitat, seagrass wrack, terrestrial species and habitat, fish and matters of national significance (MNES) under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999.* No impacts are anticipated on existing seagrass beds, benthic organisms, seagrass wrack, terrestrial vegetation, fish and MNES. There is a low risk of bird strike inherent to this activity.

There are no objections from a flora and fauna perspective to the helipad. The recommendations within the Ecological Assessment relating to the Construction Environmental Management Plan, pile and pontoon establishment, stormwater controls, water quality management and fauna clearance procedures are supported. Anti-roosting structures within the Managed Safety Zone may also help prevent bird strikes.

Should you require any information please contact me on extension ext 1334.

Vanessa Owen
Development Assessment and Compliance

Appendix 6 OEH Response to Environmental Assessment (2016)

NSW GOVERNMENT | Office of Environment & Heritage

DOC16/581518-2
MP06 0309 MOD 3

Ms Amy Robertson
Planner, Modification Assessments
Department of Planning and Environment
amy.robertson@planning.nsw.gov.au

Dear Ms Robertson

Request to modify the Concept Plan for a mixed use development at Trinity Point Drive, Morisset Park – MP06 0309 MOD 3

I refer to your email dated 16 November 2016, seeking comments on the proposed modification to the Concept Plan approval for a mixed use development (Trinity Point Marina) at Trinity Point Drive, Morisset Park within the Lake Macquarie local government area. The Office of Environment and Heritage (OEH) understands that Johnson Property Group are seeking approval to modify the Concept Plan to include the use of a helipad. OEH acknowledges that the proposal is a Section 75W modification to an existing approval (MP06 0309) issued under the *Environmental Planning and Assessment Act 1979* by Department of Planning and Environment; and that the proposal was initially on exhibition from 17 November to Friday 16 December 2016, however, this period has been extended to 20 January 2017 (as per email correspondence to OEH dated 13 December 2016).

OEH has undertaken a review of the Environmental Assessment (EA) report titled *Section 75 Modification (MP06 0309 MOD 3) Environmental Assessment Report - Proposed Trinity Point Helipad* (including relevant Appendices; prepared for Johnson Property Group by ADW Johnson Pty. Limited) in relation to threatened biodiversity, Aboriginal cultural heritage and flooding / floodplain matters. OEH is of the opinion that the EA has not adequately assessed threatened species with respect to impact assessment and survey requirements associated with threatened birds. As such OEH is unable to support the findings of the EA until this matter is adequately addressed. Matters relating to Aboriginal cultural heritage and flooding have either been adequately addressed or are not applicable. Further comments are provided in **Attachment A**.

If you require any further information regarding this matter please contact Steve Lewer, Regional Biodiversity Conservation Officer, on 4927 3158.

Yours sincerely

22 DEC 2016

RICHARD BATH
Senior Team Leader Planning, Hunter Central Coast Region
Regional Operations

Enclosure: Attachment A

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ATTACHMENT A: OEH REVIEW - ENVIRONMENTAL ASSESSMENT – REQUEST TO MODIFY CONCEPT APPROVAL FOR MIXED USE DEVELOPMENT (TRINITY POINT MARINA) – HELIPAD - MORISSET PARK (MP06 0309 MOD 3)

THREATENED BIODIVERSITY

OEH has undertaken a review of Appendix F (Aquatic and Terrestrial Ecology Assessment) of the EA, namely the report which appears to be authored by MJD Environmental Pty Limited. OEH is of the opinion the EA has not adequately assessed threatened species with respect to impact assessment and survey requirements associated with threatened birds.

OEH was not requested to provide input to the Department of Planning and Environment (DPE) SEARs for this Modification. However, OEH did provide input to SEARs for a previous Part 4 Designated Development proposal for a helipad at this site (EARs 846) in correspondence to DPE dated 16 June 2016 (DOC16/296712-1). OEH's input to these SEARs requested:

- that all direct and indirect impacts (offsite) must be considered in any environmental assessment of the proposal; it should include a detailed biodiversity assessment, including assessment of impacts on threatened biodiversity and their habitat.
- field surveys of the surrounding site should be conducted and documented in accordance with relevant guidelines, including:
  - the *NSW Guide to Surveying Threatened Plants* (OEH 2016)
  - the *Threatened Species Survey and Assessment Guidelines: Field Survey Methods for Fauna - Amphibians* (DECC 2009)
  - *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities - Working Draft* (DEC 2004), and
  - Threatened species survey and assessment guideline information on www.environment.nsw.gov.au/threatenedspecies/surveyassessmentgdlns.htm.
- if a proposed survey methodology is likely to vary significantly from the above methods, the proponent should discuss the proposed methodology with OEH prior to undertaking the assessment, to determine whether OEH considers that it is appropriate.
- recent (less than five years old) surveys and assessments may be used. However, these surveys should not be used if they have:
  - *been undertaken in seasons, weather conditions or following extensive disturbance events when the subject species are unlikely to be detected or present, or*
  - utilised methodologies, survey sampling intensities, timeframes or baits that are not the most appropriate for detecting the target subject species, unless these differences can be clearly demonstrated to have had an insignificant impact upon the outcomes of the surveys. If a previous survey is used, any additional species listed under the TSC Act since the previous survey took place, must be surveyed for.

OEH acknowledges that the EA states that extensive surveys were undertaken for the original Concept Plan and implies that additional survey work was not required and hence not undertaken. As such the assessment relies on these previous (older) surveys and recent desk-top analyses of relevant databases. Given this approach, OEH is of the opinion that the environmental assessment does not adequately meet OEH standards and survey requirements (as specified above and stated in the Designated Development SEARs). Furthermore, there is no indication whether or not previous surveys adequately targeted threatened species (such as shorebirds and seabirds), and if so how they negate the need for current surveys. OEH notes that Appendix F provides a list of likely candidate species, which includes a number of threated shorebirds and/or seas birds that have been recorded within 10 kilometres radius of the proposal (as per Attachment 2 of Appendix F). However, this attachment or the overall assessment report does not provide any links to previous survey work or explanation as to why additional targeted survey work was not undertaken. OEH would have expected appropriate survey work (in accordance with OEH guidelines) to have targeted the likely candidate species to determine whether or not the proposal would have a direct impact. Based on some of the recent public

submissions received through the current exhibition phase (as provided by DPE in December 2016), OEH understands that the Eastern Osprey and the White-bellied Sea Eagle (the latter subject to a Preliminary Determination under the *Threatened Species Conservation Act 1995*) have both been recorded within the vicinity of the site. Obviously, further details on the impacts to these species will be required and how the proposal may impact on local populations. OEH recommends to DPE that appropriate surveying of all known and likely candidate species be provided (i.e. to determine absence / presence) or appropriate justification why this is not required.

With respect to the assessment of likely impacts of the helipad proposal to threatened species, OEH's main concerns relate to impacts of potential bird strike and noise to locally occurring threatened shore/sea birds. OEH is of the opinion that the brief impact assessments provided in Attachment 3 of Appendix F do not adequately address whether or not the proposal will result in a significant impact to threatened species, including local populations. For example, with respect to the Eastern Osprey, the assessment fails to take into account the impact to a local population, particularly the viability of a local population if an individual(s) is adversely impacted upon by bird strike or other associated impact. OEH would expect that the assessment address the significance of the impact, including long-term implications to the viability of local populations of threatened species, where appropriate. As such OEH recommends that the proponent provide more detailed impact assessments in accordance with recognised guidelines (e.g. DEC 2014, DECC 2007) to likely candidate and/or known threatened species, particularly local threatened birds.

If the proposal does adversely impact a threatened species and this impact cannot be avoided, then an appropriate biodiversity offset package should be developed in consultation with OEH.

OEH acknowledges that the proposal is unlikely to impact on threatened reptiles (e.g. marine turtles) and marine mammals (e.g. dugong), including known foraging resources such as seagrass beds. With respect to the latter, OEH notes that the proposal is not located within the known seas grass beds that occur along the eastern shoreline of Trinity Point, nor will the proposed helipad present any shadowing impacts on these beds. As such OEH is of the opinion the EA and associated Appendices have adequately addressed issues that related to these threatened species.

References:

DEC (2004) *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities*. Draft, Department of Environment and Conservation, Hurstville; available at: www.environment.nsw.gov.au/resources/nature/TBSAGuidelinesDraft.pdf.

DECC (2007) *Threatened Species Assessment Guidelines: The Assessment of Significance*. August 2007. Department of Environment and Climate Change (NSW).

OEH (2014) *BioBanking Assessment Methodology*. Office of Environment and Heritage, detailed at: www.environment.nsw.gov.au/biobanking/bbreview.htm.

OEH (2016) *NSW Guide to Surveying Threatened Plants*. February 2016. Office of Environment and Heritage, Goulburn Street, Sydney.

DECC (2009) *Threatened Species Survey and Assessment Guidelines: Field Survey Methods for Fauna – Amphibians*. April 2009. Department of Environment and Climate Change (NSW), Goulburn Street, Sydney.

ABORIGINAL CULTURAL HERITAGE

OEH has reviewed the EA and is satisfied that the project will have no significant impact on Aboriginal cultural heritage in the vicinity.

FLOODING AND FLOODPLAIN MANAGEMENT

OEH has reviewed the EA and is satisfied that the project will have no significant impact on flooding in the vicinity.

OEH – DECEMBER 2016