PORT MACQUARIE-HASTINGS COUNCIL

PORT MACQUARIE HASTINGS

FLYNNS BEACH SEAWALL
STAGE 1

Cardno® Shaping the Future

Michilis Constructing the next Generation

PLEASE NOTE: ARTISTS IMPRESSION ONLY.

SEAWALL VIEW
Not To Scale

LIST OF DRAWINGS

DRAWING NUMBER	DRAWING TITLE
ST-1000	COVER SHEET & DRAWING INDEXCOVER SHEET AND DRAWING INDEX
ST-1001	STRUCTURAL NOTES
ST-1005	TYPICAL DETAILS - SHEET 1 OF 1
ST-1008	SITE LAYOUT PLAN
ST-1009	DEMOLITION PLAN
ST-1010	SEAWALL FOUNDATION LAYOUT PLAN
ST-1015	SEAWALL RAMP/ FOOTPATH LAYOUT PLAN
ST-1020	SEAWALL SECTIONS & DETAILS - SHEET 1 OF 2
ST-1021	SEAWALL SECTIONS & DETAILS - SHEET 2 OF 2
ST-1025	SEAWALL ELEVATIONS - SHEET 1 OF 1
ST-1030	SEAWALL HANDRAIL DETAILS - SHEET 1 OF 1

DIAL BEFORE YOU DIG® www.1100.com.au

Contact DIAL BEFORE YOU DIG prior to commencing any excavation works

For DA. Revision No. C Date: 14.11.2018

Drawing Number: 81018050-ST-1000

DATE PLOTTED: 14/11/2018 4:49:08 PM

GENERAL NOTES

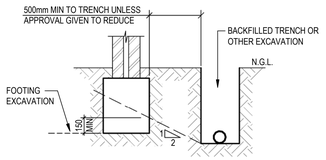
1. THESE DRAWINGS SHALL BE READ IN CONJUNCTION WITH ALL OTHER CONSULTANTS DRAWINGS, SPECIFICATIONS AND ADDITIONAL WRITTEN INSTRUCTIONS THAT MAY BE ISSUED DURING THE COURSE OF THE CONTRACT. THE INFORMATION CONTAINED ON THESE DRAWINGS IS FOR STRUCTURAL ENGINEERING PURPOSES ONLY. ALL DISCREPANCIES THAT COULD RESULT IN CHANGES TO THE STRUCTURAL DETAILS SHALL BE REFERRED TO THE STRUCTURAL ENGINEER PRIOR TO PROCEEDING WITH CONSTRUCTION.
   IF IN DOUBT, ASK.
2. THE CONTRACTOR SHALL CHECK AND BE RESPONSIBLE FOR THE CORRECTNESS OF ALL DIMENSIONS AND ANY DISCREPANCY SHALL BE REPORTED IMMEDIATELY TO THE SUPERINTENDENT. DIMENSIONS SHALL NOT BE OBTAINED BY SCALING FROM THE DRAWINGS.
3. IT IS THE BUILDER'S RESPONSIBILITY TO ENSURE THE SAFETY AND STABILITY OF NEW AND EXISTING STRUCTURES DURING CONSTRUCTION. TEMPORARY STRUCTURES, FORMWORK, FALSEWORK,TEMPORARY BRACING, SHORING AND THE LIKE SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR.
4. THE CONTRACTOR SHALL NOTIFY THE ENGINEER *FORTY-EIGHT (48) HOURS* BEFORE THE REINFORCEMENT IS COMPLETED. THE CONTRACTOR SHALL ALLOW *TWO (2) HOURS* AFTER THE COMPLETION OF THE REINFORCEMENT FOR THE ENGINEER'S INSPECTION.
5. ALL MATERIALS AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE RELEVANT AND CURRENT AUSTRALIAN STANDARDS AND WITH THE BY-LAWS AND ORDINANCES OF THE RELEVANT BUILDING AUTHORITIES EXCEPT WHERE VARIED BY THE PROJECT SPECIFICATION.
6. ALL WORK IS TO BE CARRIED OUT IN ACCORDANCE WITH ALL WORKCOVER REQUIREMENTS AND OCCUPATIONAL HEALTH AND SAFETY ACT REGULATIONS.
7. NO CHANGES SHALL BE MADE WITHOUT THE WRITTEN CONSENT OF THE ENGINEER.
8. CONSTRUCTION FROM THESE DRAWINGS AND ASSOCIATED CONSULTANTS' DRAWINGS SHALL NOT COMMENCE UNTIL APPROVED BY THE LOCAL AUTHORITIES AND PRINCIPAL CERTIFYING AUTHORITY.
9. *'U.N.O.' OR 'UNO'* DENOTES 'UNLESS NOTED OTHERWISE' ON THE DRAWINGS.
10. ALL LEVELS ARE IN METRES AND ALL DIMENSIONS ARE IN MILLIMETRES U.N.O.
11. DO NOT OBTAIN DIMENSIONS BY SCALING FROM DRAWINGS

GROUND PREPARATION

1. REFER TO PROJECT SPECIFIC CIVIL DOCUMENTATION AND SPECIFICATIONS FOR GROUND PREPARATION NOTES TYPICALLY. WHERE THIS IS NOT AVAILABLE REFER TO THE FOLLOWING AS A MINIMUM
2. IN THE ABSENCE OF SPECIFIC GEOTECHNICAL ADVICE REGARDING GROUND PREPARATION, THE SITE SHALL BE PREPARED AS FOLLOWS:
   a) FOOTING EXCAVATIONS SHALL BE CLEANED TO REMOVE ALL LOOSE OR SOFTENED MATERIAL AND DEBRIS PRIOR TO PLACING OF CONCRETE.
   b) REMOVE TOP SOIL, ROOT AFFECTED SOIL, FILL AND OTHER DELETERIOUS MATERIAL TO EXPOSE NATURAL SUBGRADE.
   c) THE EXPOSED SUBGRADE SHOULD THEN BE PROOF ROLLED WITH AT LEAST *EIGHT (8) PASSES OF A 10 TONNE MINIMUM* DEAD WEIGHT ROLLER. ANY SOFT OR HEAVING AREAS SHOULD BE REMOVED TO A MINIMUM DEPTH OF *300mm* AND REPLACED WITH CLEAN WELL GRADED MATERIAL SUCH AS *RIPPED OR CRUSHED SANDSTONE* COMPACTED TO *AT LEAST 98% OF STANDARD MAXIMUM DRY DENSITY (SMDD) AT ±2% OPTIMUM MOISTURE CONTENT* IN ACCORDANCE WITH *AS1289*.
   d) COMPACTED FILL SHOULD BE PLACED IN LAYERS NOT EXCEEDING *150mm THICK* AND COMPACTED TO *AT LEAST 98% SMDD*. FILL SHALL CONSIST OF CLEAN WELL GRADED MATERIAL SUCH AS *RIPPED OR CRUSHED SANDSTONE*.
3. DENSITY TESTING OF SUBGRADE AND FILLING COMPACTION TO BE IN ACCORDANCE WITH LEVEL 2 TESTING AS DESCRIBED IN *AS3798-2007*.
4. WHERE A VAPOUR PROOF MEMBRANE IS REQUIRED PROVIDE A SAND BLINDING LAYER TO *10mm MAXIMUM THICKNESS* TO PREVENT DAMAGE TO THE MEMBRANE.
5. THE LOCATION OF ANY UNDERGROUND SERVICES IS TO BE DETERMINED PRIOR TO ANY EXCAVATION USING A DIAL BEFORE YOU DIG (1100) ENQUIRY AND ANY SITE SURVEY INFORMATION AVAILABLE.

FOUNDATION NOTES

1. FOOTINGS HAVE BEEN DESIGNED FOR AN ALLOWABLE BEARING PRESSURE IN ACCORDANCE WITH THE GEOTECHNICAL REFERENCES TABLE ON THIS DRAWING. THIS FOUNDATION MATERIAL SHALL BE UNIFORM AND BE APPROVED BY THE ENGINEER FOR THIS PRESSURE BEFORE PLACING MEMBRANE, REINFORCEMENT OR CONCRETE.
2. FOOTING EXCAVATIONS SHALL BE CLEANED TO REMOVE ALL LOOSE OR SOFTENED MATERIAL AND DEBRIS PRIOR TO PLACING OF CONCRETE.
3. WHERE SKIN FRICTION IS REQUIRED TO BE DEVELOPED, CLEAN AND ROUGHEN THE SIDES OF THE EXCAVATION TO THE SATISFACTION OF THE ENGINEER.
4. CONCRETE SHOULD BE POURED AS SOON AS POSSIBLE AFTER EXCAVATION. IF EXCAVATIONS ARE LIKELY TO REMAIN OPEN FOR *MORE THAN 24 HOURS* A BLINDING LAYER OF CONCRETE SHALL BE PLACED TO PROTECT THE FOUNDATION BASE.
5. FOOTINGS SHALL BE CONCRETED ON THE DAY OF APPROVAL UNLESS PERMISSION IS GIVEN OTHERWISE.
6. FOOTINGS SHALL BE LOCATED CENTRALLY UNDER WALLS AND COLUMNS U.N.O.
7. DO NOT EXCEED NOMINATED *ANGLE OF REPOSE* BETWEEN ADJACENT FOOTINGS OR EXCAVATIONS.
8. RETAINING WALLS OTHER THAN CANTILEVER WALLS SHALL NOT BE BACKFILLED UNTIL FLOOR CONSTRUCTION AT TOP AND BOTTOM IS COMPLETED. COMPACTION OF BACKFILL, IF REQUIRED, SHALL BE COMPACTED AS SPECIFIED ON DRAWINGS. ENSURE FREE-DRAINING BACKFILL MATERIAL AND DRAINAGE IS IN PLACE AS SPECIFIED ON THE DRAWINGS.
9. FOOTING LEVELS, WHERE SHOWN ARE ESTIMATES ONLY AND WILL BE ESTABLISHED DURING SITE INSPECTION OF WORK IN PROGRESS.
10. PRIOR TO ANY EXCAVATION NEAR EXISTING FOOTINGS, THE BUILDER SHALL DETERMINE THE DEPTH OF FOUNDING OF EXISTING FOOTINGS BY LOCAL INVESTIGATORY EXCAVATION. GENERAL EXCAVATION SHALL NOT PROCEED BELOW A LEVEL 150mm ABOVE THE UNDERSIDE OF EXISTING FOOTINGS STRICTLY UNTIL APPROVAL HAS BEEN PROVIDED BY THE ENGINEER.
11. THE LIMITS OF EXCAVATIONS NEAR FOOTINGS SHALL BE AS SET OUT IN THE DETAIL BELOW UNLESS OTHERWISE APPROVED BY THE ENGINEER.



PROJECT GEOTECHNICAL REFERENCES	
REPORT No. & REVISION	81018050
DATED	21/05/2018
PREPARED BY	CARDNO
FOUNDATION DESIGN PARAMETERS: • ALLOWABLE BEARING PRESSURE (U.N.O.) = 150 kPa ON NATURAL STIFF CLAY MATERIAL • ALLOWABLE SKIN FRICTION = 25 kPa • ANGLE OF REPOSE FOR ALL TEMPORARY BATTERS = 1V:1H (ASSUMED IN CLAY)	

CONCRETE

1. ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH *AS3600* ,*AS3735, AS1379* & *AS3610* CURRENT EDITIONS WITH AMENDMENTS, EXCEPT WHERE VARIED BY THE CONTRACT DOCUMENTS.
2. FOR CONCRETE QUALITY REFER TO CONCRETE QUALITY & COVER SUMMARY TABLE ON THIS DRAWING. ALL CEMENT TO BE TYPE 'GP' GENERAL PURPOSE CEMENT IN ACCORDANCE WITH AS3972:2010, EXCEPT THAT THE MAXIMUM SHRINKAGE OF THE CEMENT IN THE MORTAR TEST SAMPLE IN ACCORDANCE WITH *AS2350* SHALL BE LESS THAN *600 MICROSTRAIN*.
3. PROJECT ASSESSMENT SHALL BE CARRIED OUT IN ACCORDANCE WITH AS 1379:2007 CLAUSE B7.
   a) CONCRETE IN SLABS AND BEAMS TO BE PROPORTIONED TO LIMIT DRYING SHRINKAGE TO *600 MICROSTRAIN AT 56 DAYS*.
   b) DETAILS OF THE PROPOSED MIX TO BE SUBMITTED & APPROVAL OBTAINED PRIOR TO POURING ANY CONCRETE.
   c) SHRINKAGE TESTS SHALL BE CARRIED OUT BY AN APPROVED NATA REGISTERED LABORATORY IN ACCORDANCE WITH *AS1012 PART 13*. TESTS SHALL BE CONDUCTED ON THE FIRST BATCH OF CONCRETE USED IN SUSPENDED SLABS AND SUBSEQUENTLY AT THE RATE OF *ONE TEST EVERY ADDITIONAL 100 CUBIC METRES OF CONCRETE SUPPLIED*. THREE SPECIMENS SHALL BE TAKEN FOR EACH TEST AND THE SHRINKAGE SHALL BE THE AVERAGE OF THE THREE RESULTS . THE COST OF TESTING SHALL BE BORNE BY THE CONTRACTOR AS SHALL ANY ADDITIONAL TESTS REQUIRED IF THE CONCRETE FAILS TO MEET THE SPECIFIED SHRINKAGE LIMITS.
4. NO ADMIXTURES OTHER THAN THOSE SPECIFIED IN THE CONCRETE QUALITY & COVER SUMMARY TABLE (OR APPROVED EQUIVALENTS) SHALL BE USED IN CONCRETE UNLESS APPROVED BY THE STRUCTURAL ENGINEER, WITH THE ONLY EXCEPTION BEING LOW RANGE WATER REDUCING ADMIXTURE.
5. CLEAR CONCRETE COVER TO REINFORCEMENT SHALL BE IN ACCORDANCE WITH CONCRETE QUALITY & COVER SUMMARY UNLESS NOTED OTHERWISE WHERE COVER MAY NEED TO BE INCREASED.
6. CONDUITS, PIPES, ETC. SHALL ONLY BE LOCATED *IN THE MIDDLE THIRD OF THE SLAB DEPTH* AND SHALL NOT BE PLACED IN THE CONCRETE COVER TO REINFORCEMENT. NO HOLES OR CHASES OTHER THAN THOSE SHOWN ON THE STRUCTURAL DRAWINGS SHALL BE ALLOWED WITHOUT THE PRIOR APPROVAL OF THE STRUCTURAL ENGINEER.
7. CONCRETE SIZES DO NOT INCLUDE THE THICKNESS OF APPLIED FINISHES.
8. THE DEPTH OF BEAMS IS GIVEN FIRST AND INCLUDES THE SLAB THICKNESS.
9. CONSTRUCTION JOINTS, WHERE NOT SHOWN, SHALL BE LOCATED TO THE APPROVAL OF THE STRUCTURAL ENGINEER.
10. CONSTRUCTION SUPPORT PROPPING IS TO REMAIN IN PLACE WHERE NEEDED TO AVOID OVERSTRESSING THE STRUCTURE DUE TO CONSTRUCTION LOADING. WHERE SLABS AND BEAMS ARE TO SUPPORT MASONRY OVER, FORMWORK AND PROPS MUST BE REMOVED PRIOR TO THE CONSTRUCTION OF MASONRY.
11. ALL CONCRETE SHALL BE MECHANICALLY VIBRATED TO ACHIEVE A DENSE HOMOGENEOUS MASS, COMPLETELY FILLING THE FORMWORK THOROUGHLY EMBEDDING THE REINFORCEMENT AND FREE OF STONE POCKETS. ALL CONCRETE INCLUDING SLABS ON GROUND AND FOOTINGS SHALL BE COMPACTED WITH MECHANICAL VIBRATORS.
12. CURING OF ALL CONCRETE IS TO BE ACHIEVED BY KEEPING SURFACES CONTINUOUSLY WET FOR A PERIOD OF *THREE (3) DAYS*, AND THE PREVENTION OF LOSS OF MOISTURE FOR A TOTAL OF *SEVEN (7) DAYS* FOLLOWED BY A GRADUAL DRYING OUT. APPROVED SPRAY ON CURING COMPOUNDS THAT COMPLY WITH AS370 MAY BE USED WHERE FLOOR FINISHES WILL NOT BE AFFECTED (REFER MANUFACTURERS SPECIFICATION). PVA BASED CURING COMPOUNDS ARE NO ACCEPTABLE . POLYTHENE SHEETING OR WET HESSIAN MAY BE USED IF PROTECTED FROM WIND AND TRAFFIC.
13. REPAIRS TO CONCRETE SHALL NOT BE ATTEMPTED WITHOUT THE PERMISSION OF THE ENGINEER.
14. CAST-IN FIXINGS, BOLTS ETC. SHALL NOT BE ALTERED WITHOUT THE PERMISSION OF THE ENGINEER.
15. SLABS AND BEAMS SHALL BE CONSTRUCTED TO BEAR ONLY ON THE BEAMS, WALLS, COLUMNS ETC. SHOWN ON THE DRAWINGS. ALL OTHER BUILDING ELEMENTS SHALL BE KEPT *12mm CLEAR* OF SOFFITS OF STRUCTURE .

CONCRETE QUALITY & COVER SUMMARY
NON LIQUID RETAINING STRUCTURES

• MIN. CEMENT CONTENT = 300 kg/m³
• MAX. PERMISSIBLE DRYING SHRINKAGE AT 56 DAYS = 600 MICROSTRAIN.

STRUCTURAL ELEMENT	SLUMP (MAX)	MAX. AGG. SIZE	CEMENT TYPE	STRENGTH GRADE	EXPOSURE CLASSIFICATION (AS3735)	COVER TO REINFORCEMENT (U.N.O.)
FOOTINGS						
CAST AGAINST GROUND (NON AGGRESSIVE SOILS)	80	Ø20mm	GP	40MPa	C1	70
PROTECTED BY DAMP-PROOF MEMBRANE	80	Ø20mm	GP	40MPa	C1	60
WALLS						
EXTERNAL	80	Ø20mm	GP	50MPa	C1	65
SLABS & RAMPS						
EXTERNAL	80	Ø20mm	GP	50MPa	B1	60

CONCRETE FINISHES

ELEMENT	FINISH
FOOTPATHS - TOP OF WALL & RAMP	COASTAL STONE
SEAWALL, RAMP WALLS & STAIRS	COPPER, ANTI-GRAFFITI COATING
BURIED ELEMENTS	STANDARD GREY

REINFORCEMENT

1. THE REBAR DEVELOPMENT AND LAP SPLICE TABLES ON THIS DRAWING HAVE BEEN CALCULATED IN ACCORDANCE WITH *SECTION 13 OF AS3600-2009* FOR DEFORMED BARS.
2. REINFORCEMENT IS REPRESENTED DIAGRAMMATICALLY, IT IS NOT NECESSARILY SHOWN IN TRUE PROJECTION.
3. WELDING OF REINFORCEMENT SHALL NOT BE PERMITTED UNLESS SHOWN ON THE STRUCTURAL DRAWINGS .
4. SPLICES IN THE MAIN REINFORCEMENT SHALL BE MADE ONLY IN THE POSITIONS SHOWN. SPLICES IN THE DISTRIBUTION REINFORCEMENT MAY BE POSITIONED AS NECESSARY WITH SPLICES OF SUFFICIENT LENGTH TO DEVELOP THE FULL STRENGTH OF THE BARS. MINIMUM LAPS TO FABRIC SHALL BE TO OVERLAP *TWO CROSS WIRES PLUS 50mm U.N.O.* REINFORCEMENT SHALL BE SECURELY TIED AT ALL LAPS AND INTERSECTIONS WITH *1.25mm BLACK ANNEALED WIRE*. THE WRITTEN APPROVAL OF THE ENGINEER SHALL BE OBTAINED FOR OTHER SPLICES . WHERE THE LAP LENGTH IS NOT SHOWN IT SHALL DEVELOP THE FULL STRENGTH OF THE REINFORCEMENT.
5. ALL UNSUPPORTED BARS SHALL BE TIED IN A TRANSVERSE DIRECTION WITH *N12-300 UNO*. REINFORCEMENT SHALL BE SUPPORTED ON APPROVED CHAIRS NOT MORE THAN *600mm CENTRES BOTH WAYS* IN SLABS AND AT *1000mm CENTRES IN BEAMS* IN EXPOSURE CONDITIONS B2 OR C USE ONLY PLASTIC OR CONCRETE CHAIRS.
6. ALL REINFORCEMENT SHALL BE FIRMLY SUPPORTED ON CHAIRS AT NOT MORE THAN *600mm CENTRES BOTH WAYS* IN SLABS, *800mm EACH WAY* FOR FABRIC, AND AT *1000mm CENTRES IN BEAMS* IN EXPOSURE CONDITIONS B2 OR C . WHEN POURED ON GROUND AS FORMWORK PROVIDE PLATES UNDER ALL BAR CHAIRS. PLASTIC TIPPED STEEL CHAIRS SHALL NOT BE USED ON EXPOSED FACES IN EXPOSURE CLASSIFICATION B1, B2 AND C, ONLY PLASTIC OR CONCRETE CHAIRS.
7. STEEL REINFORCEMENT MATERIAL QUALITY TO *AS4671:2001*, DENOTED AS FOLLOWS:
   SL = GRADE 500 DEFORMED WIRE REINFORCING SQUARE FABRIC OF DUCTILITY CLASS 'L'
   RL = GRADE 500 DEFORMED WIRE REINFORCING RECTANGULAR FABRIC OF DUCTILITY CLASS 'L'
   R = GRADE 250 ROUND BARS OF DUCTILITY CLASS 'N'
   N = GRADE 500 DEFORMED BARS OF DUCTILITY CLASS 'N'
   S = GRADE 250 DEFORMED BARS OF DUCTILITY CLASS 'N'
8. TEST CERTIFICATES CONFIRMING COMPLIANCE TO AS4671 SHALL BE SUPPLIED TO THE STRUCTURAL ENGINEER.
9. FABRIC SHALL BE SUPPLIED IN FLAT SHEETS, ROLLS WILL NOT BE ACCEPTED.
10. TYPICAL REINFORCEMENT NOTATION SHALL BE INTERPRETED AS FOLLOWS:
   'SN24-200' INDICATES
   'S' NUMBER OF BARS REQUIRED
   'N' DENOTES GRADE OF REINFORCEMENT
   '24' DENOTES BAR DIAMETER IN MILLIMETRES
   '200' DENOTES MAXIMUM BAR SPACING IN MILLIMETRES
11. TYPICAL BAR LAYING ABBREVIATIONS:
   BTM = BARS IN BOTTOM LAYER
   TOP = BARS IN TOP LAYER
   ALT = BARS ALTERNATING
   NF = BARS IN NEAR FACE
   FF = BARS IN FAR FACE
   EF = BARS IN EACH FACE
12. FOR SLAB FALLS, CHAMFERS, REGLETS, DRIP GROOVES, ETC., REFER TO THE ARCHITECT'S DRAWINGS. MAINTAIN CONCRETE COVER AT THESE DETAILS.
13. SITE BENDING OF REINFORCEMENT SHALL BE AVOIDED IF POSSIBLE. WHERE SITE BENDING IS UNAVOIDABLE IT SHALL BE CARRIED OUT COLD, WITHOUT THE APPLICATION OF HEAT, AND IN ACCORDANCE WITH THE *PRACTICE NOTE RPN1 OF THE STEEL REINFORCEMENT INSTITUTE OF AUSTRALIA*.
14. LAPPED SPLICES SHALL NOT BE USED FOR BARS WITH DIAMETER LARGER THAN 40mm. CONTRACTOR / DETAILER TO EITHER WORK OUT OR REQUEST THE INCREASED VALUES FROM THE ENGINEER FOR SITUATIONS THAT LIE OUTSIDE THE ASSUMPTIONS.
15. USE COMPRESSION LAP SPLICE LENGTH AT COLUMN AND WALL VERTICAL SPLICE LOCATIONS UNLESS INDICATED OTHERWISE ON PLANS, DETAILS OR SCHEDULES. USE TENSION SPLICE LENGTH FOR ALL OTHER SPLICES. WHERE SPLICING IS PERMITTED IN CODE.
16. WHERE VERTICAL BARS OF DIFFERENT DIAMETER ARE LAPPED OR SPLICED, THE LAP LENGTH SHALL BE BASED ON THE SMALLER DIAMETER BAR.
17. DEVELOPMENT LENGTHS AT SLAB FOLDS SHALL BE MEASURED IN ACCORDANCE WITH THE DIAGRAM ON THIS DRAWING.
18. LAPPED SPLICE LENGTHS FOR HORIZONTAL BARS WITH MORE THAN 300 mm CONCRETE CAST BELOW THE BAR AND SPACED AT ≥ 150 mm CENTRES TO COMPLY WITH THE FOLLOWING UNO:

COVER	f'c	N12	N16	N20	N24	N28	N32
≥25	≥20	770	1150	1570	-	-	-
≥30	≥25	600	980	1350	1740	-	-
≥40	≥32	510	770	1100	1440	1810	2220
≥50	≥40	460	630	890	1200	1030	1890

DO NOT INTERPOLATE INTERMEDIATE VALUES OF SPLICE LENGTHS.
LAPPED SPLICE LENGTHS FOR BARS IN COLUMNS REFER TO AS3600 OR SUPERINTENDENT.
EPOXY COATED BARS, BARS IN LIGHTWEIGHT CONCRETE AND SLIP FORMED CONCRETE WILL REQUIRE LONGER SPLICE LENGTHS. REFER TO AS3600 OR SUPERINTENDENT.

19. LAPPED SPLICE LENGTHS FOR VERTICAL BARS (AND HORIZONTAL BARS WITH LESS THAN 300 mm CONCRETE CAST BELOW THE BAR) SPACED AT ≥ 150 mm CENTRES TO COMPLY WITH THE FOLLOWING UNO:

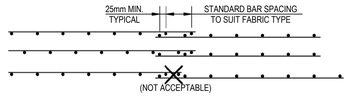
COVER	f'c	N12	N16	N20	N24	N28	N32
≥25	≥20	590	890	1210	-	-	-
≥30	≥25	490	750	1040	1340	-	-
≥40	≥32	390	660	840	1110	1400	1710
≥50	≥40	350	480	690	920	1180	1450

NOT APPLICABLE FOR BARS IN COLUMNS.
DO NOT INTERPOLATE INTERMEDIATE VALUES OF SPLICE LENGTHS.
LAPPED SPLICE LENGTHS FOR BARS IN COLUMNS REFER TO AS3600 OR SUPERINTENDENT.
EPOXY COATED BARS, BARS IN LIGHTWEIGHT CONCRETE AND SLIP FORMED CONCRETE WILL REQUIRE LONGER SPLICE LENGTHS. REFER TO as3600 OR SUPERINTENDENT.

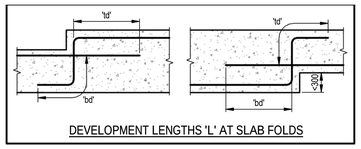
20. LAPPED SPLICE LENGTHS FOR VERTICAL BARS (AND HORIZONTAL BARS WITH LESS THAN 300 mm CONCRETE CAST BELOW THE BAR) FOR NARROW MEMBERS SUCH AS BEAMS AND COLUMNS SPACED AT ≤ 150 mm CENTRES TO COMPLY WITH THE FOLLOWING UNO

COVER	f'c	N12	N16	N20	N24	N28	N32
≥25	≥20	700	940	1190	-	-	-
≥30	≥25	620	830	1060	1300	-	-
≥40	≥32	540	700	900	1110	1340	1590
≥50	≥40	510	610	970	970	1170	1390

DO NOT INTERPOLATE INTERMEDIATE VALUES OF SPLICE LENGTHS.
LAPPED SPLICE LENGTHS FOR BARS IN COLUMNS REFER TO AS3600 OR SUPERINTENDENT.
EPOXY COATED BARS, BARS IN LIGHTWEIGHT CONCRETE AND SLIP FORMED CONCRETE WILL REQUIRE LONGER SPLICE LENGTHS. REFER TO as3600 OR SUPERINTENDENT.



REINFORCEMENT MESH LAP



DEVELOPMENT LENGTHS 'L' AT SLAB FOLDS

PROJECT-SPECIFIC DESIGN PARAMETERS:

1. REFER TO CARDNO BASIS OF DESIGN REPORT. REFERENCE No. 81018050.001

Michilis
Constructing the next Generation

Rev.	Date	Description	Approval
C	14.11.2018	RE-ISSUED FOR DA	
B	26.10.2018	ISSUED FOR DA	
A	04.09.2018	ISSUED FOR CONSTRUCTION	DS

Approved
HW — Design Manager — Date
GR — Group Manager Infrastructure Delivery — Date

Certified
TD — Structural Engineer — 18-05-2018
DS — Verifier — 04-09-2018

PORT MACQUARIE HASTINGS
Cardno® Shaping the Future

FLYNNS BEACH SEAWALL

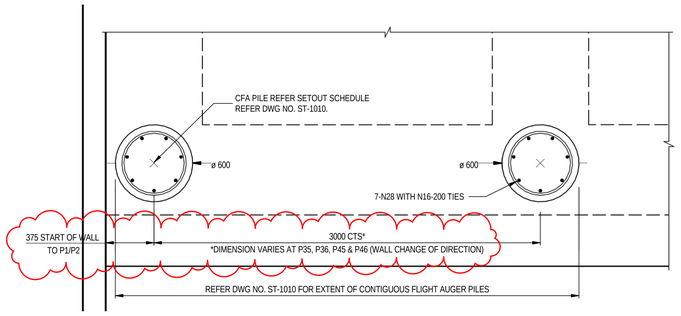
Scale

Drawn: JJ
Surveyed:
Coordinate System: MGA
Origin of Levels: PMSSM10521 RL 15.772 AHD71
File Path Name: C:\Temp\Revit\81018050_Flynns Beach Seawall_ST_v2018_JessJordan.rvt

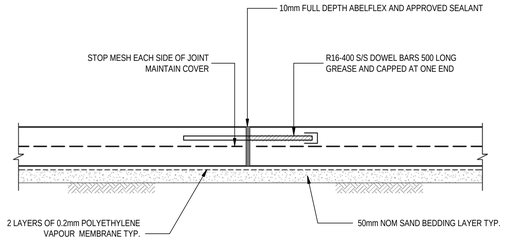
STRUCTURAL NOTES

Date Created: 24-04-2018 | Drawing Number: 81018050-ST-1001 | Sheet 2 of 10 | Revision: C | Sheet Size: B1

DATE PLOTTED: 14/11/2018 4:49:30 PM



DETAIL A
SCALE 1 : 20 ST-1010

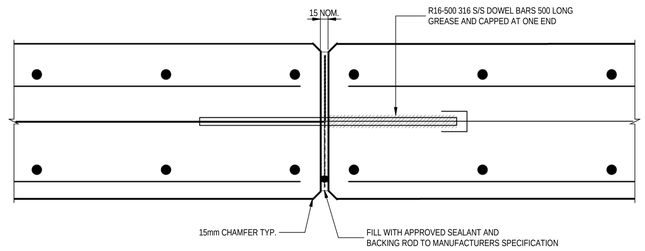


TYPICAL DOWELLED EXPANSION JOINT (DEJ)
SCALE 1:10

GENERAL NOTES:

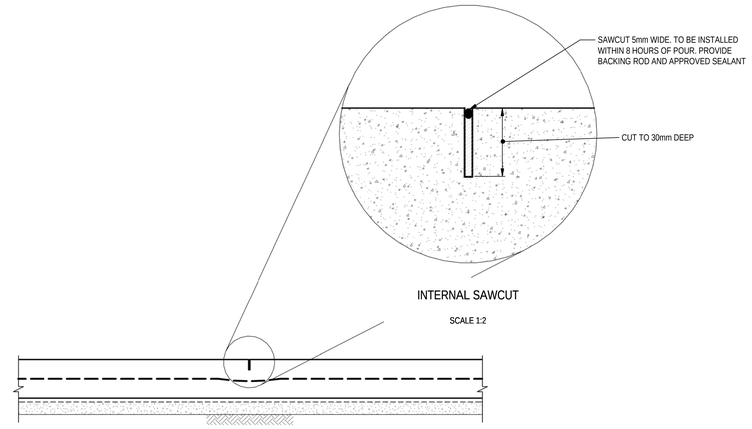
1. FOR STRUCTURAL NOTES REFER TO DWG No. ST-1001
2. FOR PILE SETOUT REFER TO DWG No ST-1010.

REAR FACE



FRONT FACE

TYPICAL WALL DOWEL JOINT (WDJ)
SCALE 1 : 5



TYPICAL SAWN JOINT (SJ)
SCALE 1:10

NOTES:
1. SAWCUT TO BE MADE WITHIN 8 HOURS OF CASTING SLAB

Michilis
Constructing the next Generation

Rev.	Date	Description	Approval
B	26.10.2018	ISSUED FOR DA	
A	04.09.2018	ISSUED FOR CONSTRUCTION	DS

Approved
HW — Design Manager — Date
GR — Group Manager Infrastructure Delivery — Date

Certified
TD 08-05-2018 — Structural Engineer — Date
DS 04-09-2018 — Verifier — Date

PORT MACQUARIE HASTINGS
Cardno® Shaping the Future

FLYNNS BEACH SEAWALL

Scale
0 400 800 1200 1600 2000

Drawn: JJ
Surveyed:
Coordinate System: MGA

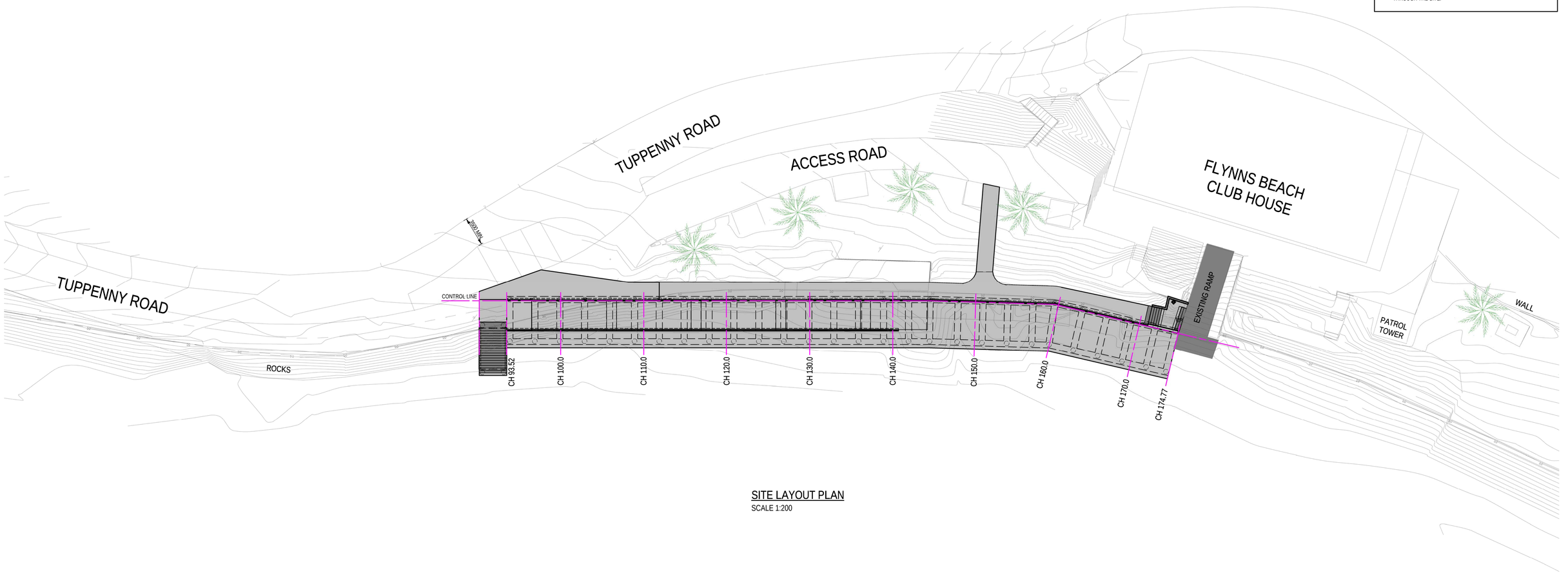
TYPICAL DETAILS - SHEET 1 OF 1

Date Created: 08-05-2018 | Drawing Number: 81018050-ST-1005 | Sheet Size: B1
Origin of Levels: PMSSM10521 RL 15.772 AHD71 | Sheet 3 of 10 | Revision: B
File Path/Name: C:\Temp\Revit\81018050_Flynns Beach Seawall_ST_v2018_JessJordan.rvt

DATE PLOTTED: 14/11/2018 4:49:53 PM

NOTES:

1. FOR STRUCTURAL NOTES REFER TO DWG No. ST-1001
2. FOR PILE SETOUT REFER TO DWG No ST-1010.
3. PRIOR TO COMMENCEMENT OF ANY WORKS THE CONTRACTOR SHALL ESTABLISH AND MAINTAIN TREE PROTECTION ZONES (TPZ) AROUND THE EXISTING NORFOLK PINES IN ACCORDANCE WITH AS4970-2009 PROTECTION OF TREES ON DEVELOPMENT SITES.
4. THE CONTRACTOR SHALL PROVIDE DOCUMENTATION OF THE PLANNED TPZ TO THE PRINCIPAL PRIOR TO THE COMMENCEMENT OF ANY WORKS, SITE ESTABLISHMENT OR VEHICLE MOVEMENT THROUGH THE SITE.



SITE LAYOUT PLAN
SCALE 1:200

Michilis
Constructing the next Generation

Rev.	Date	Description	Approval
C	14.11.2018	RE-ISSUED FOR DA	
B	26.10.2018	ISSUED FOR DA	
A	04.09.2018	ISSUED FOR CONSTRUCTION	DS

Approved
HW
Design Manager Date

GR
Group Manager Infrastructure Delivery Date

Certified
TD 18-05-2018
Structural Engineer Date

DS 04-09-2018
Verifier Date

PORT MACQUARIE HASTINGS

Cardno®
Shaping the Future

FLYNNS BEACH SEAWALL

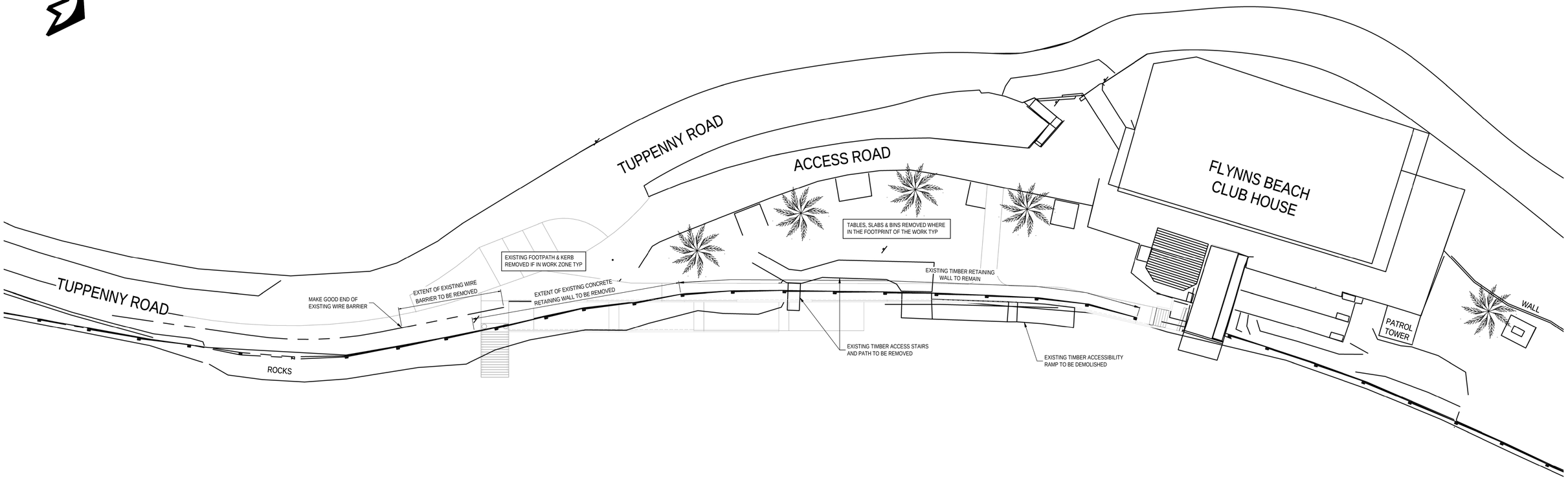
Scale
0 4000 8000 12000 16000 20000

Drawn: JJ
Surveyed:
Coordinate System: MGA
Origin of Levels: PMSSM10521 RL 15.772 AHD71
File Path/Name: C:\Temp\Revit\81018050_Flynns Beach Seawall_ST_v2018_JessJordan.rvt

SITE LAYOUT PLAN

Date Created:
Drawing Number: 81018050-ST-1008
Sheet 4 of 10
Revision: C
Sheet Size: B1

DATE PLOTTED: 14/11/2018 4:50:40 PM



Michilis
Constructing the next Generation

Rev.	Date	Description	Approval
A	14.11.2018	ISSUED FOR DA	

Approved

HW — Design Manager — Date

GR — Group Manager Infrastructure Delivery — Date

Certified

DS — Structural Engineer — 13-11-2018 — Date

DS — Verifier — 14-11-2018 — Date

PORT MACQUARIE HASTINGS

Cardno® Shaping the Future

FLYNNS BEACH SEAWALL

Scale

Drawn: JJ

Surveyed:

Coordinate System: MGA

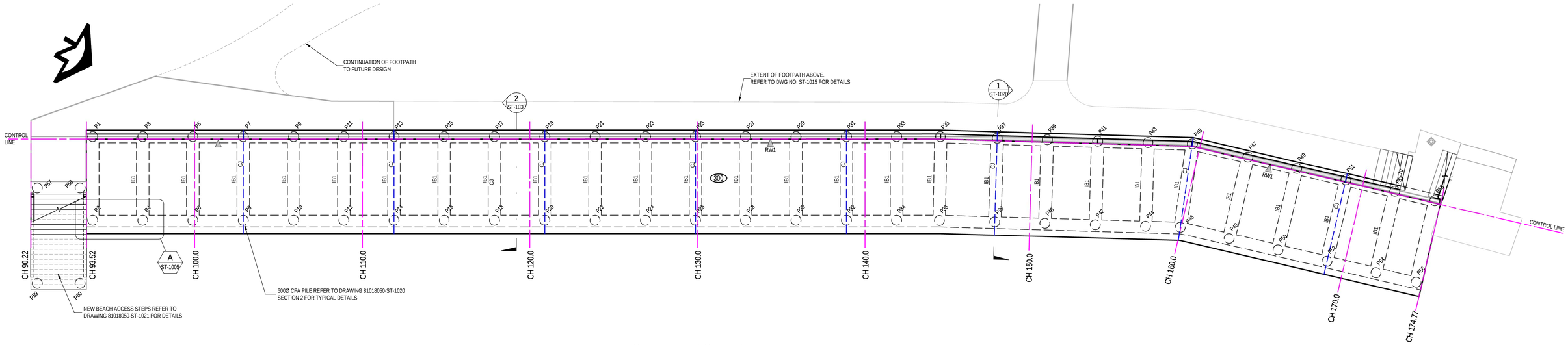
DEMOLITION PLAN

Date Created: 13-11-2018 | Drawing Number: 81018050-ST-1009 | Sheet Size: B1

Origin of Levels: PMSSM10521 RL 15.772 AHD71 | Sheet of | Revision: A

File Path/Name: C:\Temp\Revit\81018050_Flynns Beach Seawall_ST_v2018_JessJordan.rvt

DATE PLOTTED: 14/12/2018 4:51:10 PM

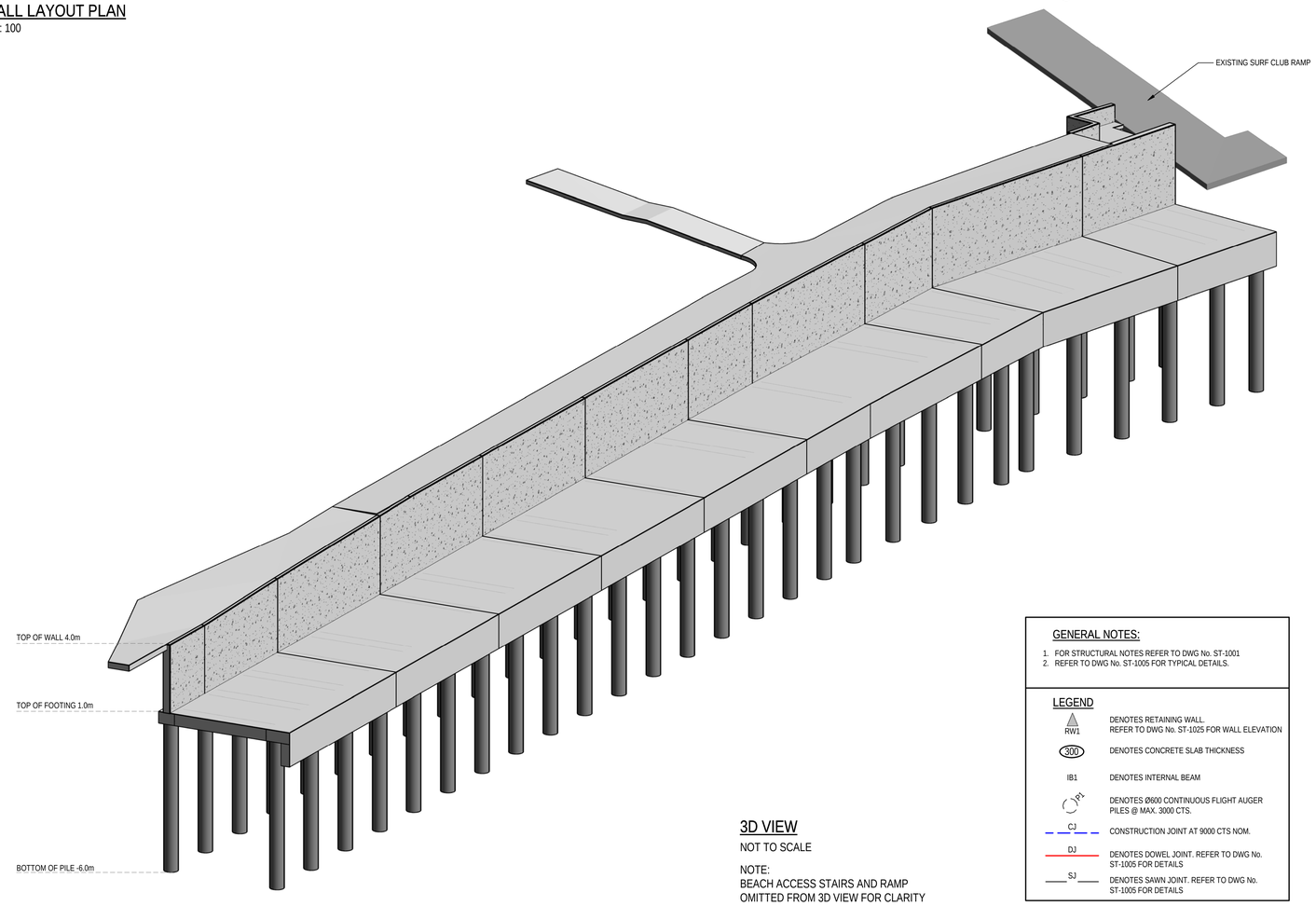


SEAWALL LAYOUT PLAN

SCALE 1 : 100

PILE SETOUT SCHEDULE

PILE NO.	EASTING	NORTHING	APPROX. PILE LENGTH	TOP OF PILE RL
P1	493007.324	6521271.804	6500	0.5
P2	493011.299	6521274.838	6500	0.5
P3	493005.504	6521274.189	6500	0.5
P4	493009.479	6521277.222	6500	0.5
P5	493003.684	6521276.574	6500	0.5
P6	493007.658	6521279.607	6500	0.5
P7	493001.864	6521278.959	6500	0.5
P8	493005.839	6521281.992	6500	0.5
P9	493000.044	6521281.343	6500	0.5
P10	493004.019	6521284.377	6500	0.5
P11	492998.223	6521283.728	6500	0.5
P12	493002.198	6521286.762	6500	0.5
P13	492996.404	6521286.113	6500	0.5
P14	493000.378	6521289.147	6500	0.5
P15	492994.583	6521288.497	6500	0.5
P16	492998.557	6521291.531	6500	0.5
P17	492992.763	6521290.882	6500	0.5
P18	492996.737	6521293.916	6500	0.5
P19	492990.943	6521293.267	6500	0.5
P20	492994.917	6521296.300	6500	0.5
P21	492989.122	6521295.651	6500	0.5
P22	492993.097	6521298.685	6500	0.5
P23	492987.302	6521298.036	6500	0.5
P24	492991.277	6521301.070	6500	0.5
P25	492985.482	6521300.421	6500	0.5
P26	492989.457	6521303.454	6500	0.5
P27	492983.662	6521302.806	6500	0.5
P28	492987.636	6521305.839	6500	0.5
P29	492981.842	6521305.190	6500	0.5
P30	492985.816	6521308.224	6500	0.5
P31	492980.021	6521307.575	6500	0.5
P32	492983.996	6521310.609	6500	0.5
P33	492978.201	6521309.960	6500	0.5
P34	492982.176	6521312.993	6500	0.5
P35	492976.614	6521312.039	6500	0.5
P36	492980.636	6521315.032	6500	0.5
P37	492974.633	6521314.796	6500	0.5
P38	492978.694	6521317.713	6500	0.5
P39	492972.883	6521317.233	6500	0.5
P40	492976.943	6521320.149	6500	0.5
P41	492971.133	6521319.669	6500	0.5
P42	492975.193	6521322.585	6500	0.5
P43	492969.382	6521322.105	6500	0.5
P44	492973.442	6521325.022	6500	0.5
P45	492967.836	6521324.258	6500	0.5
P46	492972.231	6521326.708	6500	0.5
P47	492966.447	6521327.378	6500	0.5
P48	492971.000	6521329.444	6500	0.5
P49	492965.217	6521330.115	6500	0.5
P50	492969.770	6521332.180	6500	0.5
P51	492963.986	6521332.851	6500	0.5
P52	492968.540	6521334.916	6500	0.5
P53	492962.756	6521335.587	6500	0.5
P54	492967.310	6521337.652	6500	0.5
P55	492961.749	6521337.828	6500	0.5
P56	492966.303	6521339.893	6500	0.5
P57	493011.771	6521271.047	9500	3.5
P58	493010.224	6521273.074	9500	3.5
P59	493015.586	6521273.959	6800	0.8
P60	493014.039	6521275.986	6800	0.8



3D VIEW

NOT TO SCALE

NOTE:
BEACH ACCESS STAIRS AND RAMP OMITTED FROM 3D VIEW FOR CLARITY

GENERAL NOTES:

1. FOR STRUCTURAL NOTES REFER TO DWG No. ST-1001
2. REFER TO DWG No. ST-1005 FOR TYPICAL DETAILS.

LEGEND

- RW1 — DENOTES RETAINING WALL. REFER TO DWG No. ST-1025 FOR WALL ELEVATION
- 300 — DENOTES CONCRETE SLAB THICKNESS
- IB1 — DENOTES INTERNAL BEAM
- P1 — DENOTES Ø600 CONTINUOUS FLIGHT AUGER PILES @ MAX. 3000 CTS.
- CJ — CONSTRUCTION JOINT AT 9000 CTS NOM.
- DJ — DENOTES DOWEL JOINT. REFER TO DWG No. ST-1005 FOR DETAILS
- SJ — DENOTES SAWN JOINT. REFER TO DWG No. ST-1005 FOR DETAILS

Michilis
Constructing the next Generation

Rev.	Date	Description	Approval
B	26.10.2018	ISSUED FOR DA	
A	04.09.2018	ISSUED FOR CONSTRUCTION	DS

Approved
HW — Design Manager — Date
GR — Group Manager Infrastructure Delivery — Date

Certified
TD 18-05-2018 — Structural Engineer — Date
DS 04-09-2018 — Verifier — Date

PORT MACQUARIE HASTINGS
Cardno® Shaping the Future

FLYNNS BEACH SEAWALL

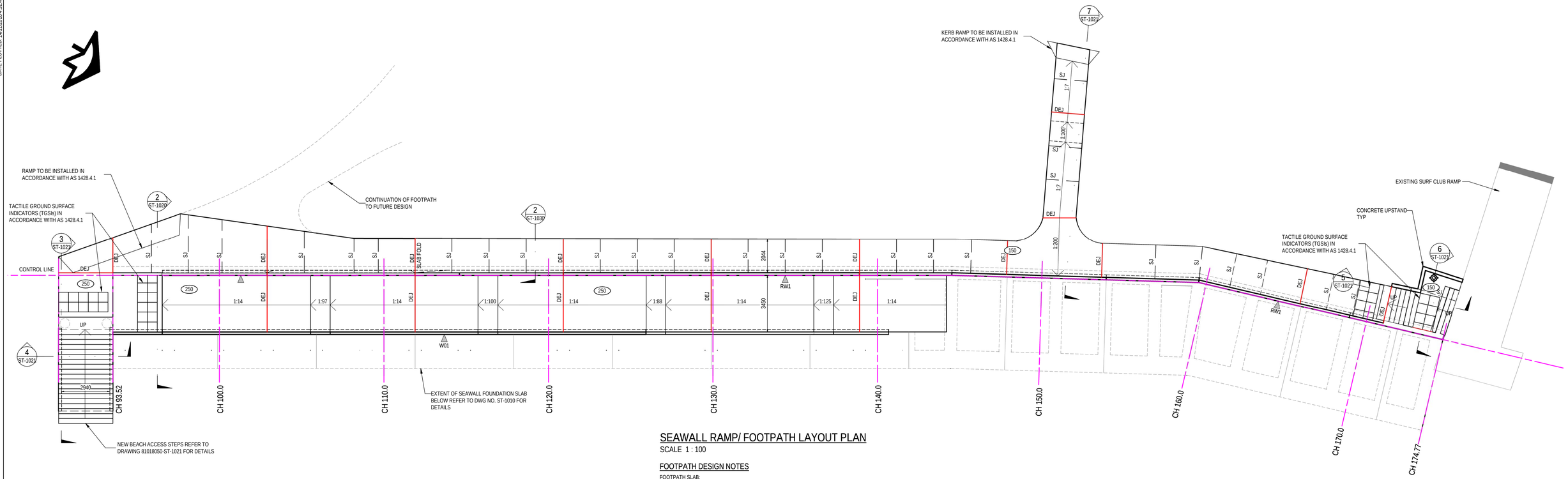
Scale
0 2000 4000 6000 8000 10000

Drawn: JJ
Surveyed:
Coordinate System: MGA
Origin of Levels: PMSSM10521 RL 15.772 AHD71
File Path/Name: C:\Temp\Revit\81018050_Flynns Beach Seawall_ST_v2018_JessJordan.rvt

SEAWALL FOUNDATION LAYOUT PLAN

Date Created: 18-05-2018 | Drawing Number: 81018050-ST-1010 | Sheet 5 of 10 | Revision: B | Sheet Size: B1

DATE PLOTTED: 14/12/2018 4:51:49 PM

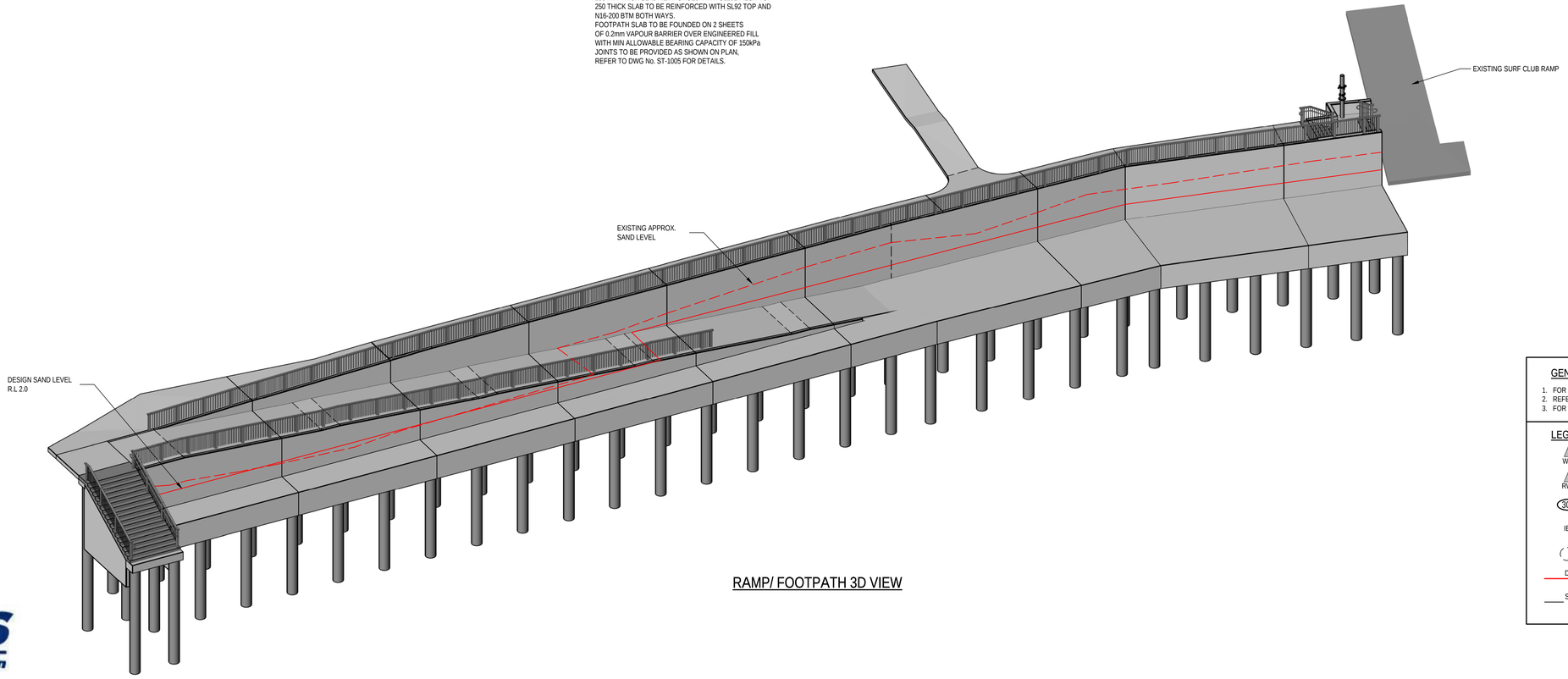


SEAWALL RAMP/ FOOTPATH LAYOUT PLAN

SCALE 1 : 100

FOOTPATH DESIGN NOTES

FOOTPATH SLAB:
150 MIN THICK SLAB REINFORCED WITH SL102 MESH TOP
250 THICK SLAB TO BE REINFORCED WITH SL92 TOP AND N16-200 BTM BOTH WAYS.
FOOTPATH SLAB TO BE FOUNDED ON 2 SHEETS OF 0.2mm VAPOUR BARRIER OVER ENGINEERED FILL WITH MIN ALLOWABLE BEARING CAPACITY OF 150kPa
JOINTS TO BE PROVIDED AS SHOWN ON PLAN, REFER TO DWG No. ST-1005 FOR DETAILS.



RAMP/ FOOTPATH 3D VIEW

GENERAL NOTES:

1. FOR STRUCTURAL NOTES REFER TO DWG No. ST-1001
2. REFER TO DWG No. ST-1005 FOR TYPICAL DETAILS.
3. FOR PILE SETOUT REFER TO DWG No. ST-1010.

LEGEND

- W01 — DENOTES RAMP SUPPORT WALL REFER TO DWG No. ST-1025 FOR WALL ELEVATION
- RW1 — DENOTES RETAINING WALL. REFER TO DWG No. ST-1025 FOR WALL ELEVATION
- 300 — DENOTES CONCRETE SLAB THICKNESS
- IB1 — DENOTES INTERNAL BEAM
- P1 — DENOTES Ø600 CONTINUOUS FLIGHT AUGER PILES @ MAX. 3000 CTS.
- DJ — DENOTES DOWEL JOINT. REFER TO DWG No. ST-1005 FOR DETAILS
- SJ — DENOTES SAWN JOINT. REFER TO DWG No. ST-1005 FOR DETAILS

Michilis Constructing the next Generation

Rev.	Date	Description	Approval
B	26.10.2018	ISSUED FOR DA	
A	04.09.2018	ISSUED FOR CONSTRUCTION	DS

Approved
HW — Design Manager — Date
GR — Group Manager Infrastructure Delivery — Date

Certified
TD — Structural Engineer — 18-05-2018
DS — Verifier — 04-09-2018

PORT MACQUARIE HASTINGS

Cardno® Shaping the Future

FLYNNS BEACH SEAWALL

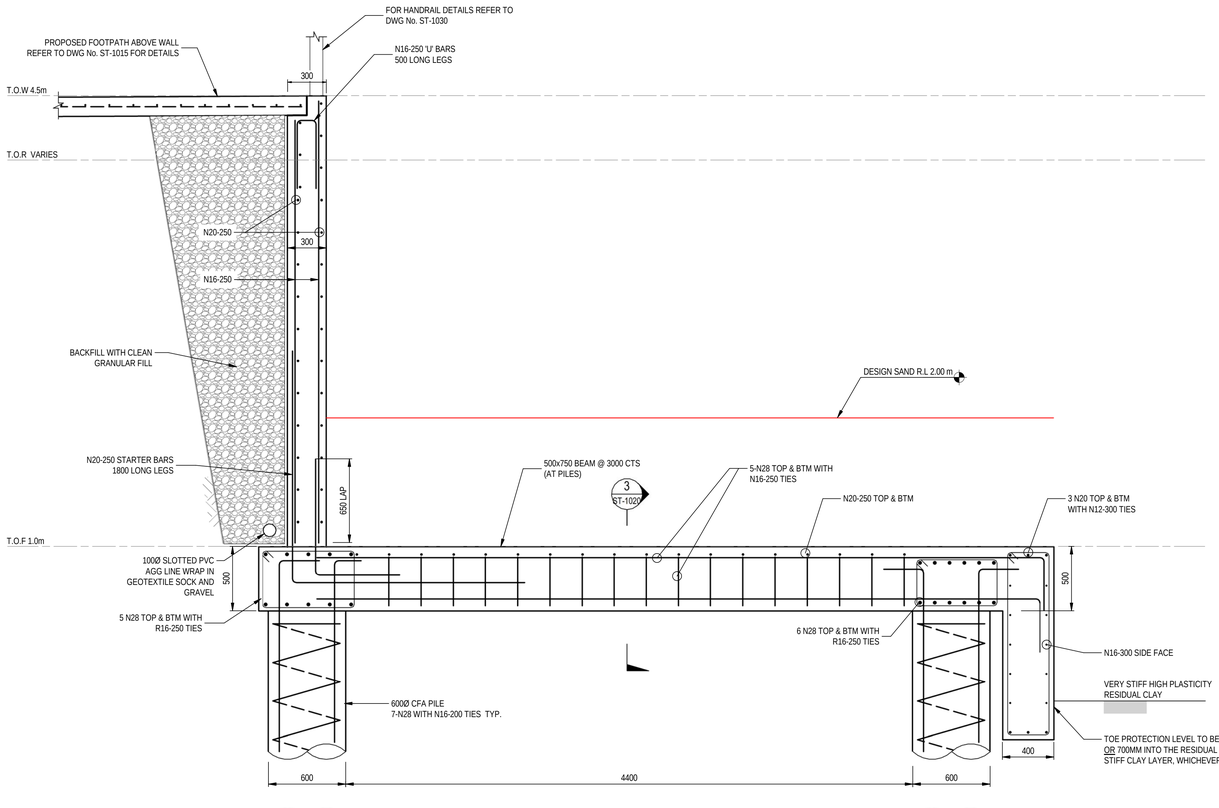
Scale 0 2000 4000 6000 8000 10000

Drawn: JJ
Surveyed:
Coordinate System: MGA

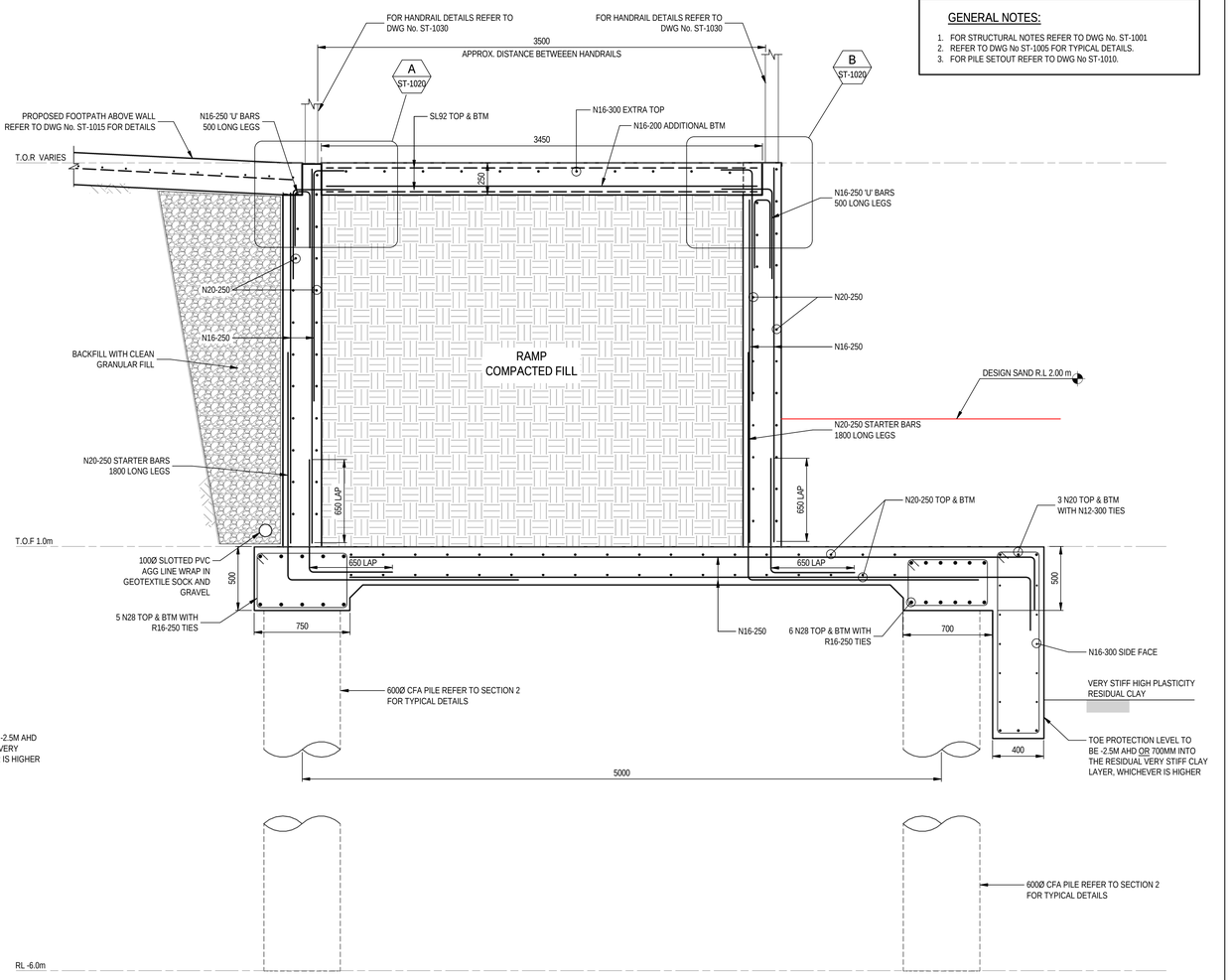
SEAWALL RAMP/ FOOTPATH LAYOUT PLAN

Date Created: 08-05-2018 | Drawing Number: 81018050-ST-1015 | Sheet Size: B1
Origin of Levels: PMSSM10521 RL 15.772 AHD71 | Sheet 6 of 10 | Revision: B
File Path/Name: C:\Temp\Revit\81018050_Flynns Beach Seawall_ST_v2018_JessJordan.rvt

DATE PLOTTED: 14/11/2018 4:52:22 PM



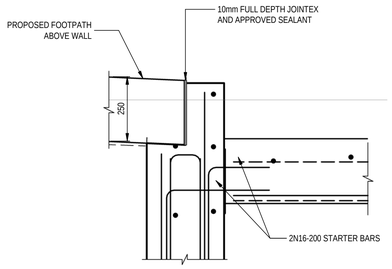
SECTION 1
SCALE 1 : 20 ST-1010



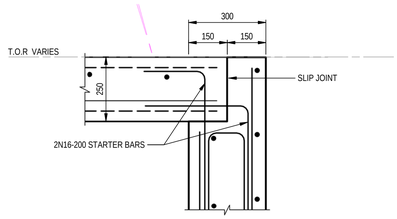
SECTION 2
SCALE 1 : 20 ST-1015

GENERAL NOTES:

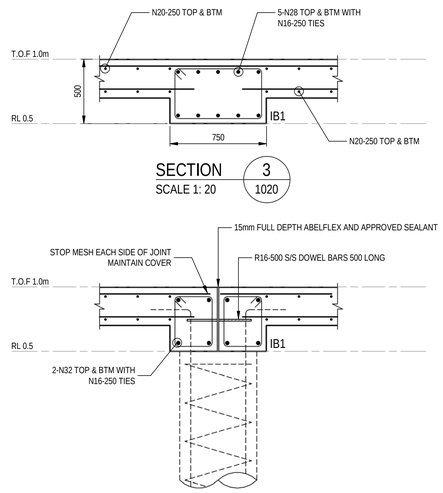
1. FOR STRUCTURAL NOTES REFER TO DWG No. ST-1001
2. REFER TO DWG No ST-1005 FOR TYPICAL DETAILS.
3. FOR PILE SETOUT REFER TO DWG No ST-1010.



DETAIL A
SCALE 1 : 10 ST-1020

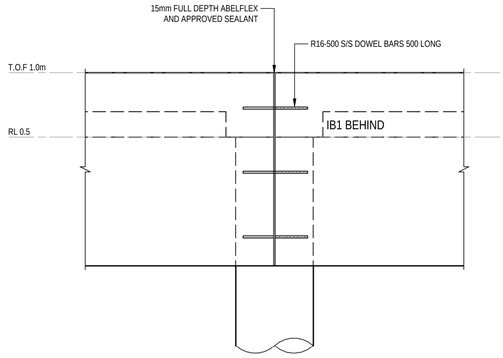


DETAIL B
SCALE 1 : 10 ST-1020

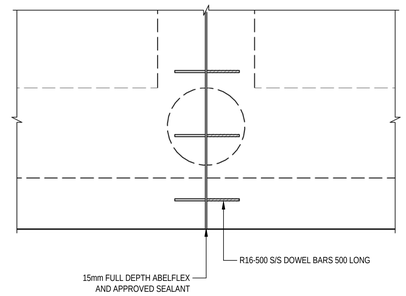


SECTION 3
SCALE 1: 20 1020

IB1 AT CONSTRUCTION JOINT DETAIL
SCALE 1 : 20



CONCRETE DOWNTURN AT CONSTRUCTION JOINT DETAIL
SCALE 1 : 20



PLAN OF CONCRETE DOWNTURN AT CONSTRUCTION JOINT
SCALE 1 : 20

Michilis
Constructing the next Generation

Rev.	Date	Description	Approval
B	26.10.2018	ISSUED FOR DA	
A	04.09.2018	ISSUED FOR CONSTRUCTION	DS

Approved
HW — Design Manager — Date
GR — 08-05-2018 — Group Manager Infrastructure Delivery — Date

Certified
TD — 08-05-2018 — Structural Engineer — Date
DS — 04-09-2018 — Verifier — Date

PORT MACQUARIE HASTINGS
Cardno® Shaping the Future

FLYNNS BEACH SEAWALL

Scale
0 400 800 1200 1600 2000

Drawn: JJ
Surveyed:
Coordinate System: MGA

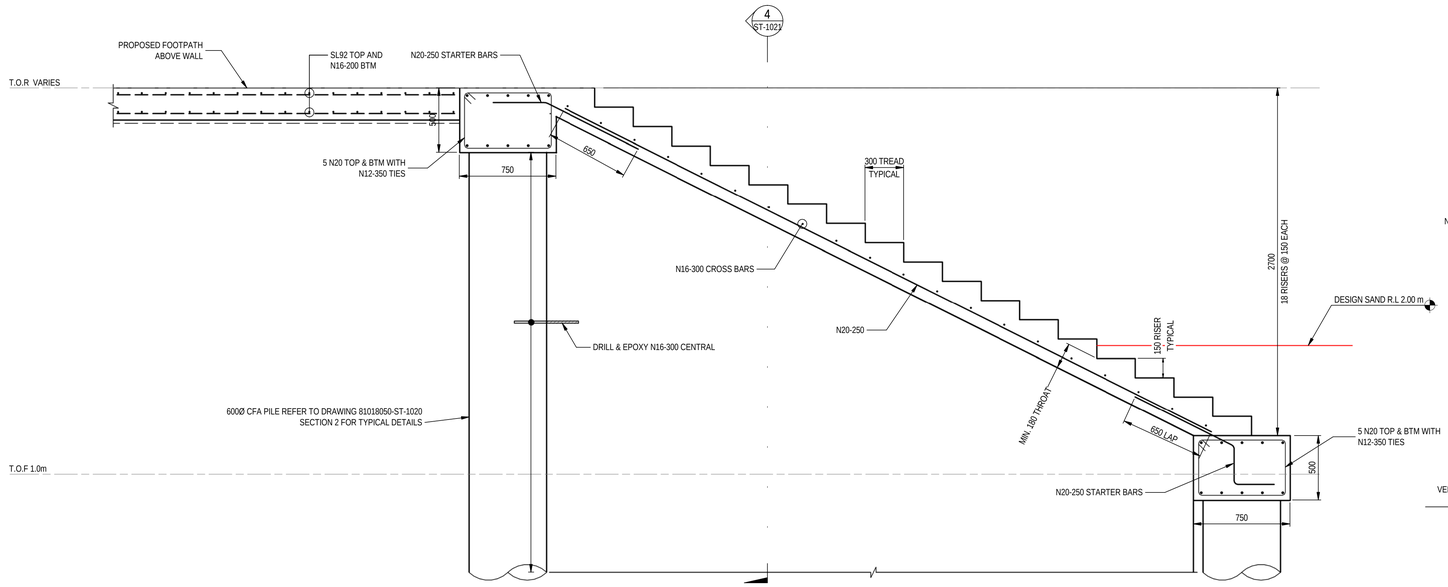
SEAWALL SECTIONS & DETAILS - SHEET 1 OF 2

Date Created: 08-05-2018 | Drawing Number: 81018050-ST-1020 | Sheet Size: B1
Origin of Levels: PMSSM10521 RL 15.772 AHD71 | Sheet 7 of 10 | Revision: B
File Path/Name: C:\Temp\Revit\81018050_Flynns Beach Seawall_ST_v2018_JessJordan.rvt

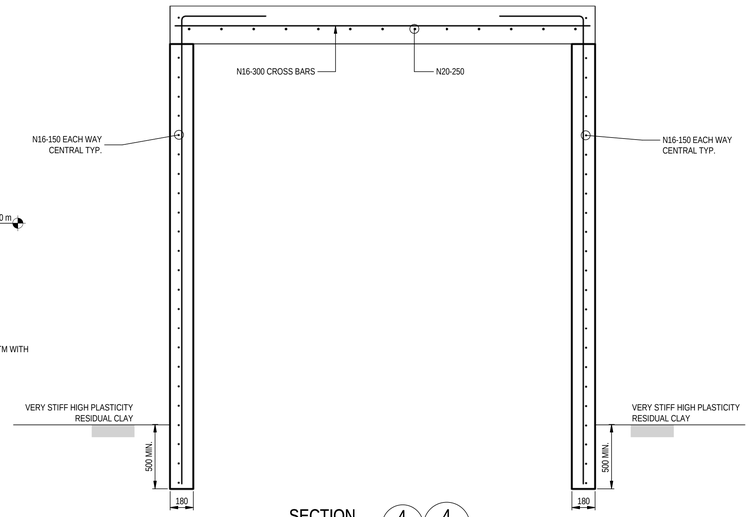
DATE PLOTTED: 14/11/2018 5:08:36 PM

GENERAL NOTES:

1. FOR STRUCTURAL NOTES REFER TO DWG No. ST-1001
2. REFER TO DWG No ST-1005 FOR TYPICAL DETAILS.
3. FOR PILE SETOUT REFER TO DWG No ST-1010.

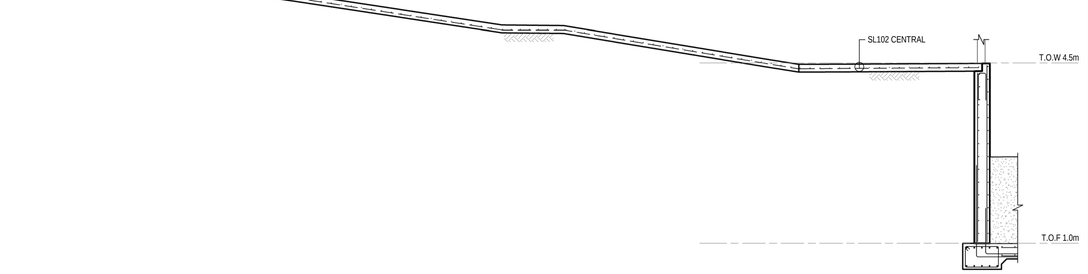


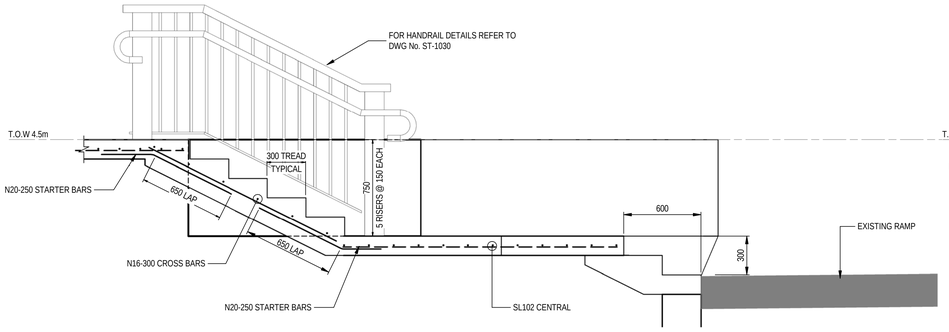
SECTION 4 ST-1015 ST-1021
SCALE 1 : 20



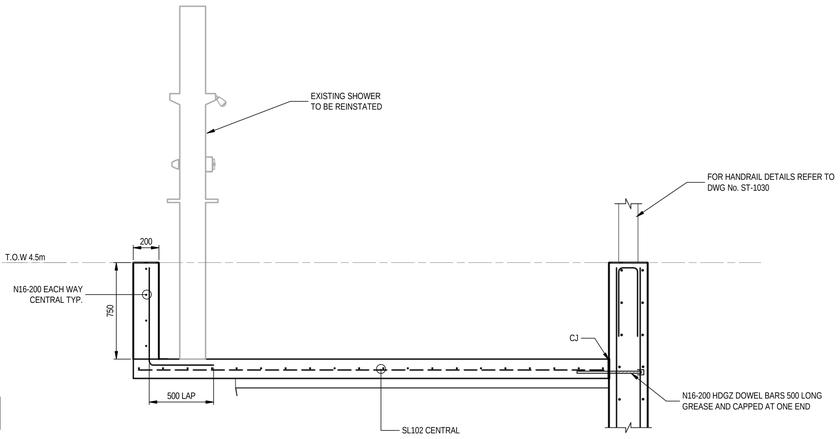
SECTION 7
SCALE 1 : 50 ST-1015

SECTION 3
SCALE 1 : 20 ST-1015





SECTION 5
SCALE 1 : 20 ST-1015



SECTION 6
SCALE 1 : 20 ST-1015

Michilis
Constructing the next Generation

Rev.	Date	Description	Approval
B	26.10.2018	ISSUED FOR DA	
A	04.09.2018	ISSUED FOR CONSTRUCTION	DS

Approved
HW — Design Manager — Date
GR — Group Manager Infrastructure Delivery — Date

Certified
TD 08-05-2018 — Structural Engineer — Date
DS 04-09-2018 — Verifier — Date

PORT MACQUARIE HASTINGS
Cardno® Shaping the Future

FLYNNS BEACH SEAWALL

Scale
0 2000 4000 6000 8000 10000

Drawn: JJ
Surveyed:
Coordinate System: MGA

SEAWALL SECTIONS & DETAILS - SHEET 2 OF 2

Date Created: 18-05-2018 | Drawing Number: 81018050-ST-ST-1021 | Sheet Size: B1
Origin of Levels: PMSSM10521 RL 15.772 AHD71 | Sheet 8 of 10 | Revision: B
File Path/Name: C:\Temp\Revit\81018050_Flynns Beach Seawall_ST_v2018_JessJordan.rvt

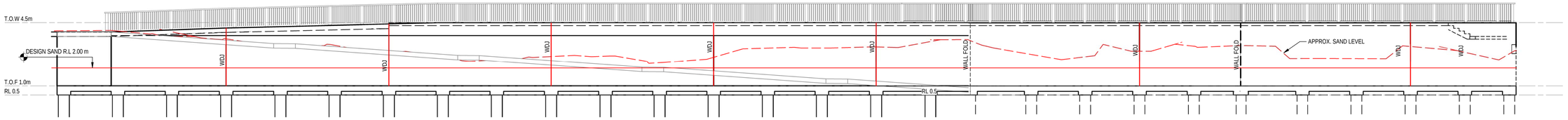
DATE PLOTTED: 14/11/2018 5:08:58 PM

GENERAL NOTES:

1. FOR STRUCTURAL NOTES REFER TO DWG NO. ST-1001
2. REFER TO DWG NO. ST-1005 FOR TYPICAL DETAILS.
3. FOR PILE SETOUT REFER TO DWG NO. ST-1010.

LEGEND

W01	DENOTES RAMP SUPPORT WALL
RW1	DENOTES RETAINING WALL
WDJ	DENOTES WALL DOWEL JOINT. REFER TO DWG NO. ST-1005 FOR DETAILS



RETAINING WALL ELEVATION - RW1 (LOOKING NORTH)
SCALE 1 : 100

RAMP SUPPORT WALL ELEVATION - W01 (LOOKING NORTH)
SCALE 1 : 100

Michilis
Constructing the next Generation

Rev.	Date	Description	Approval
B	26.10.2018	ISSUED FOR DA	
A	04.09.2018	ISSUED FOR CONSTRUCTION	DS

Approved
HW — Design Manager — Date
GR — Group Manager Infrastructure Delivery — Date

Certified
TD 08-05-2018 — Structural Engineer — Date
DS 04-09-2018 — Verifier — Date

PORT MACQUARIE HASTINGS
Cardno® Shaping the Future

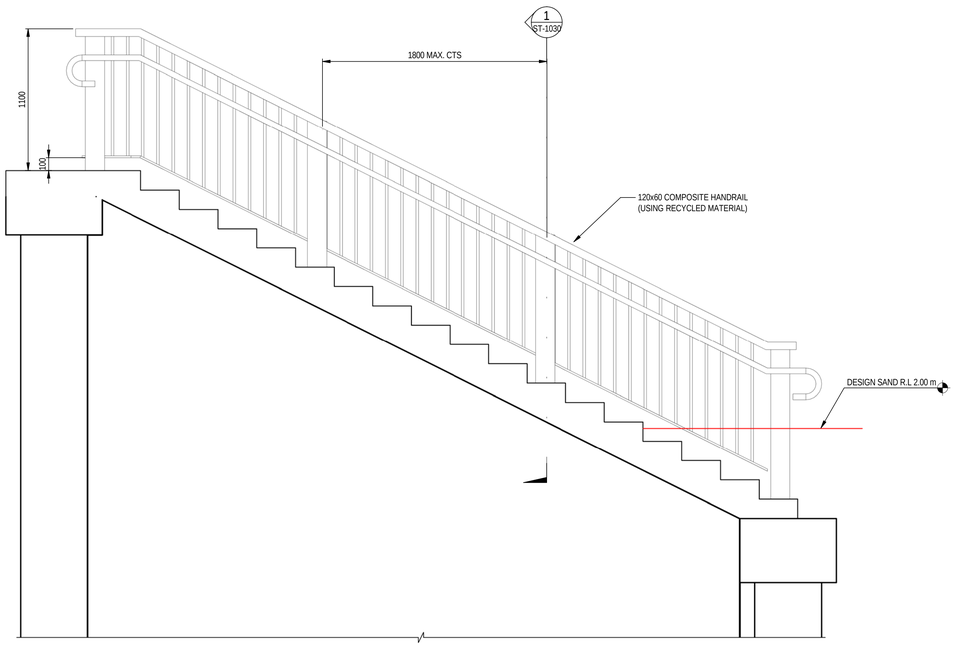
FLYNNS BEACH SEAWALL

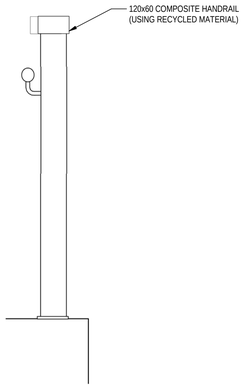
Scale
0 2000 4000 6000 8000 10000

Drawn: JJ
Surveyed:
Coordinate System: MGA
Origin of Levels: PMSSM10521 RL 15.772 AHD71
File Path/Name: C:\Temp\Revit\81018050_Flynns Beach Seawall_ST_v2018_JessJordan.rvt

SEAWALL ELEVATIONS - SHEET 1 OF 1

Date Created: 18-05-2018 | Drawing Number: 81018050-ST-1025 | Sheet 9 of 10 | Revision: B | Sheet Size: B1

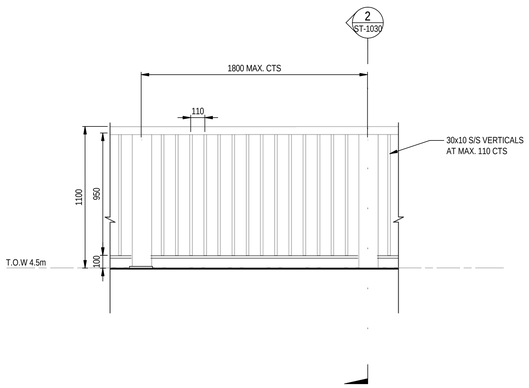


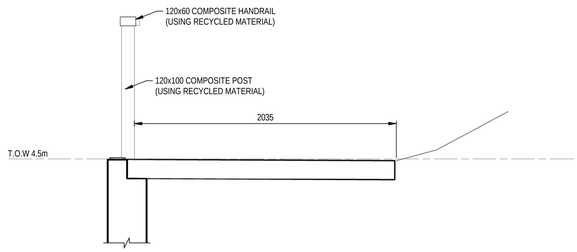


SECTION 1
SCALE 1 : 10 ST-1030

STAIRS FENCING DETAIL

FENCING TO PMHC STADNARDS
SCALE 1 : 20





SEAWALL AND RAMP FENCING DETAIL

SCALE 1 : 20

SECTION 2
SCALE 1 : 20 ST-1010

Michilis
Constructing the next Generation

Rev.	Date	Description	Approval
B	26.10.2018	ISSUED FOR DA	
A	04.09.2018	ISSUED FOR CONSTRUCTION	DS

Approved
HW — Design Manager — Date

GR — Group Manager Infrastructure Delivery — Date

Certified
TD 18-05-2018 — Structural Engineer — Date

DS 04-09-2018 — Verifier — Date

PORT MACQUARIE HASTINGS

Cardno® Shaping the Future

FLYNNS BEACH SEAWALL

Scale
0 400 800 1200 1600 2000

Drawn: JJ
Surveyed:
Coordinate System: MGA

SEAWALL HANDRAIL DETAILS - SHEET 1 OF 1

Date Created: 05-07-2018 | Drawing Number: 81018050-ST-1030 | Sheet Size: B1
Origin of Levels: PMSSM10521 RL 15.772 AHD71 | Sheet 10 of 10 | Revision: B
File Path/Name: C:\Temp\Revit\81018050_Flynns Beach Seawall_ST_v2018_JessJordan.rvt

Flynns Beach Seawall

Statement of Environmental Effects

81018050

Prepared for

Michilis Pty Ltd/ Port Macquarie Hastings Council

October 2018

Cardno

Contact Information

Cardno (NSW/ACT) Pty Ltd
ABN 95 001 145 035

Unit 1
10 Denney Street
Broadmeadow 2292
Australia

Phone +61 2 4965 4555
Fax +61 2 4965 4666

Document Information

Prepared for	Michilis Pty Ltd/ Port Macquarie Hastings Council
Project Name	Statement of Environmental Effects
File Reference	20180821_Flynns Beach Seawall SoEE Final.docx
Job Reference	81018050
Date	26 October 2018
Version Number	V3

Author(s):

Sally Law
Snr Environmental Scientist

Effective Date 26/10/2018

Approved By:

Daniel Sutcliffe
Business Unit Manager – Northern NSW

Date Approved 26/10/2018

Document History

Version	Effective Date	Description of Revision	Prepared by	Reviewed by
V1	June 2018	Draft for Review	SL	DS
V2	August 2018	Final Draft	SL	DS
V3	October 2018	Final Draft	SL	DS

Executive Summary

Cardno have been engaged by Michilis Pty Ltd to prepare a Statement of Environmental Effects (SEE) to support the preparation and lodgement of a Development Application on behalf of Port Macquarie-Hastings Council (PMHC). Development Consent is sought for Coastal Protection Works comprising Stage 1 of a seawall and associated infrastructure at Flynns Beach, Port Macquarie (The Project).

The existing retaining wall, which supports the foreshore embankment providing protection to the landward foreshore of Flynns Beach from coastal erosion, is failing in sections. The existing retaining wall constructed in the late 1970's, is in poor condition with concrete cancer taking over in some panels and posts. Undermining from ocean storms, groundwater and stormwater flows is also occurring in sections.

The Project involves the construction of an approximately 80m section of seawall (Stage 1) along Flynns Beach, with associated sustainable stormwater management and landscaping works. The seawall would be located immediately seaward of the existing retaining wall.

Flynns Beach is located approximately 3 km to the south-east of the centre of Port Macquarie on the mid-north coast of NSW, approximately 380 km north of Sydney. The beach is accessed via Tuppenny Lane off Pacific Drive and is located between Rocky Beach and Nobbys Beach and fronts the Pacific Ocean.

A Review of Environmental Factors (REF) was prepared by NSW Public Works Office of Finance and Services in 2006 following extensive engineering investigations and community consultation. Since the preparation of the Flynns Beach Seawall REF, the NSW Government has established a new Coastal Management Framework for coastal management in NSW. As a result, the *Coastal Protection Act 1979* has been replaced with the *Coastal Management Act 2016 (*CM Act*).* In addition, the *State Environmental Planning Policy (Coastal Management) 2018* (Coastal Management SEPP) has commenced identifying development controls for consent authorities to apply to each coastal management area to achieve the objectives of the CM Act.

As a result of changes in legislation 'Coastal Protection works' are no longer subject to the provisions of State *Environmental Planning Policy (Infrastructure) 2007* (ISEPP) altering the planning pathway for the Project. Clause 19 (2, b) of the Coastal Management SEPP declares 'Coastal Protection Works' by a public authority for the purpose of a seawall, if not covered in a certified coastal management program requires development consent.

This SEE is provided in accordance with Schedule 1, Part 1, s2(4) of the *Environmental Planning and Assessment Regulation 2000*. It is provided to facilitate the assessment of the relevant issues in accordance with Section 4.15 (previously s79c) of the *Environmental Planning and Assessment Act, 1979*.

The SEE utilises much of the information contained within the NSW Public Works Office of Finance and Services, Flynns Beach Seawall REF prepared in 2016 and associated documents as advised by PMHC.

The proposal would require the following approvals, licences or permits under NSW legislation:

- Landowner's consent and License Application from Trade & Investment Crown Lands prior to determination of REF (s155 of the *Crown Lands Act 1989*).
- Development Consent of the proposed activity under Part 4 of the EP&A Act.
- Permit for dredging work and reclamation works and water land (s200 of the *Fisheries Management Act 1994*).
- Permit for constructing a bore under Part 5 of the *Water Act 1912* should dewatering be required during construction.

Summary of Impacts and Mitigation

The construction impacts would be temporary and are not considered to be significant. The implementation of a Soil and Water Management Plan is particularly important to prevent potential water quality impacts. Impacts on coastal processes are negligible and no works will be undertaken in the sea or intertidal zone.

Short term construction impacts are predicted for recreation users. However, works are planned to be undertaken outside peak beach usage time periods of summer and the Easter holidays. Although specific areas of the beach and foreshore would be cordoned off for public safety reasons, and protective fencing

would be provided around the existing Norfolk Pine trees, access to the beach, clubhouse and café would remain at all times during the project. Notices would be provided at the beach to describe the works and any special restrictions.

The proposed new seawall is not considered to have a significant impact on any terrestrial or aquatic species, populations or communities that are of state and/or federal conservation significance. It is not considered that any threatened fauna would be reliant upon the habitat of Flynns Beach.

There are no known Aboriginal significant places or items identified and therefore a section 90 Aboriginal Heritage Impact Permit (AHIP) under the *National Parks and Wildlife Act 1974* (NPW Act) would not be required. No items of historic heritage would be impacted by the works.

The majority of the construction issues identified can be adequately managed through the development by the contractor of a Construction Environmental Management Plan consisting of:

- Traffic and Pedestrian Management Plan
- Waste Management Plan
- Soil and Water Management Plan

It is considered that the construction of a new seawall would have a positive long term impact. Stabilising the foreshore landward of the seawall would protect the amenity of the beach against future coastal storms, rainfall events and sea level changes if they occur. In addition, the adaptive strategy built into the design of the seawall would result in long term protection of this important beach for the people of Port Macquarie and the wider community.

On the basis of the information presented in this SEE, it is concluded that by adopting the safeguards identified in this assessment there would be no significant adverse environmental impacts associated with the proposed works.

Table of Contents

Appendices

Tables

Figures

List of Abbreviations

AHD	Australian Height Datum
AHIP	Aboriginal Heritage Impact Permit
AOBV	Areas of Outstanding Biodiversity Value
CEMP	Construction Environmental Management Plan
Council	Port Macquarie-Hastings Council
DA	Development Application
DECCW	Department of Environment, Climate Change and Water, now OEH
DPI	Department of Primary Industries
DP&I	Department of Planning and Infrastructure
EP&A Act	*Environmental Planning and Assessment Act 1979*
EP&A Regulation	*Environmental Planning and Assessment Regulation 2000*
EPA	Environment Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation 1999*
FM Act	*Fisheries Management Act 1994*
KTPs	Key Threatening Processes
LEP	Local Environmental Plan
LGA	Local government area
NOW	NSW Office of Water
NPW Act	*National Parks and Wildlife Act 1974*
OEH	Office of Environment and Heritage (formerly DECCW)
OEMP	Operation Environmental Management Plan
POEO Act	*Protection of the Environment Operations Act 1997*
REF	Review of Environmental Factors
SEE	Statement of Environmental Effects
SEPP	State Environmental Planning Policy
ISEPP	State Environmental Planning Policy Infrastructure 2007
SWMP	Soil and Water Management Plan
TMP	Traffic Management Plan
TSC Act	*Threatened Species Conservation Act 1995*
WHS	Work Health and Safety
WM Act	*Water Management Act 2000*
WMP	Waste Management Plan

1 Introduction

This Statement of Effects for the Flynns Beach Seawall (Stage 1) is provided in accordance with Schedule 1, Part 1, s2(4) of the *Environmental Planning and Assessment Regulation 2000*. It is provided to facilitate the assessment of the relevant issues in accordance with Section 4.15 (previously s79c) of the *Environmental Planning and Assessment Act, 1979*.

1.1 Engagement

Cardno (NSW/ACT) Pty Ltd (Cardno) has been engaged by Michilis Pty Limited (Michilis) to prepare this Statement of Environmental Effects (SEE) on behalf of Port Macquarie Hastings Council (PMHC) to accompany a Development Application (DA) for the Project.

1.2 Purpose of Statement

This report provides the consent authority with the relevant information necessary to assess the proposal and to determine the DA in accordance with Section 4.16 of the *Environmental Planning and Assessment Act 1979* (the **Act**). The SEE has been prepared to identify and assess the impacts of the proposed development against the relevant planning controls and policies relating to the site and type of development, having regard to Section 4.15 of the EP&A Act.

A description of the site is provided in **Section 3** and details of the proposed development are provided in **Section 4**. An assessment against the relevant Environmental Planning Instruments is provided in **Section 6**.

The proposed Coastal Protection Works are permitted with consent under Clause 19 (2, b) of *State Environmental Planning Policy (Coastal Management) 2018.*

1.3 Land Owner and Applicant

The seawall is located on Crown land identified as Lot 7052, DP 1121282 which forms part of Crown reserve R619924 for public recreation. The reserve is under trust management by PMHC.

The beach area and all surrounding land between the beach and the road (Pacific Drive) are identified as the following cadastral lots:

- Lot 7052 of DP1121282 (Stage 1)
- Lot 7053 of DP1074173
- Lot 7075 of DP1070992
- Lots 9,10,11,12,14 and 15 of DP32244

The extent of the Crown Land is shown in **Figure 1-1** below.

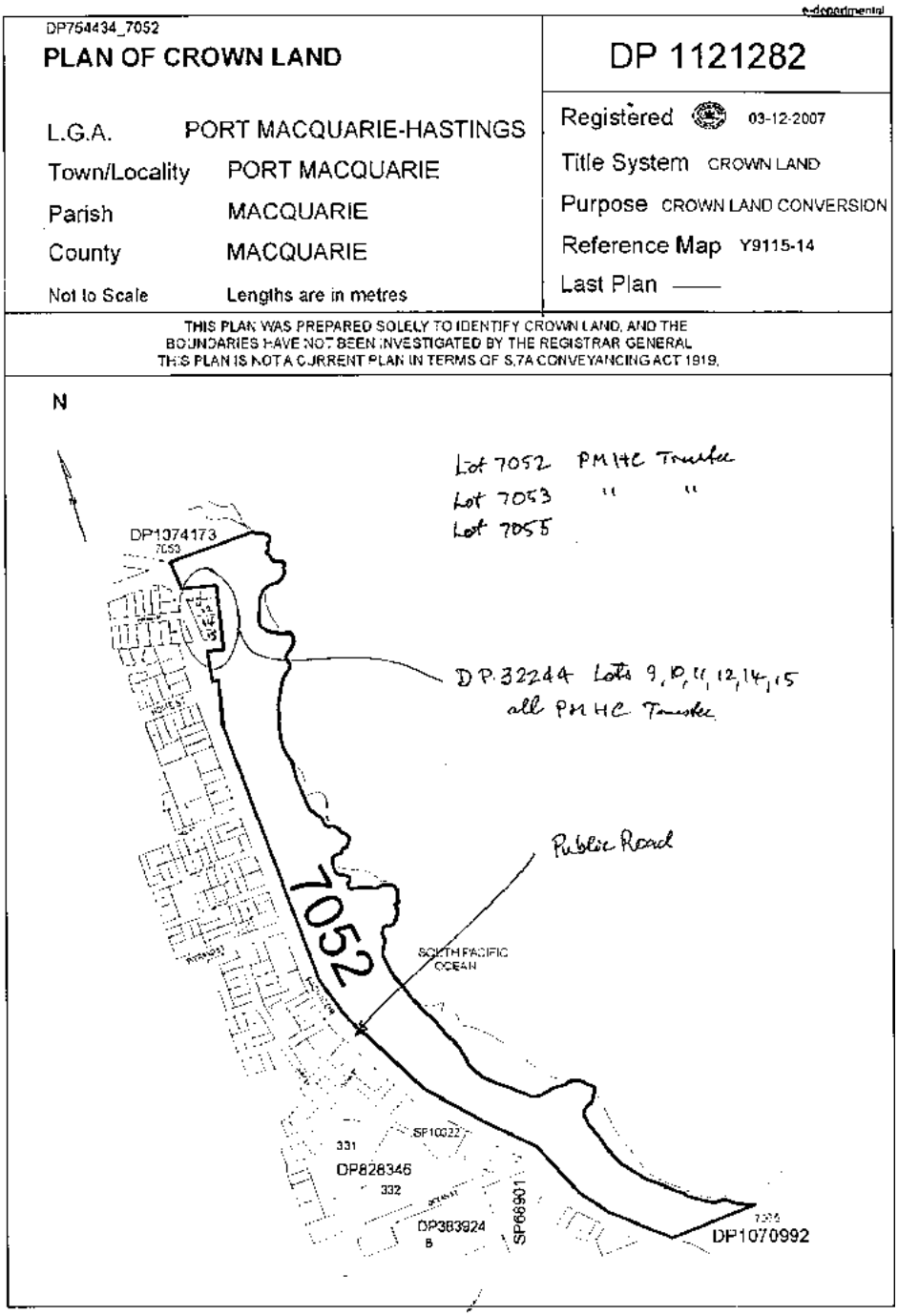


Figure 1-1 Flynns Beach Deposited Plan

1.4 Consent Authority

The subject site is in the Port Macquarie Hastings Local Government Area (LGA). The Northern Joint Regional Planning Panel (JRPP) is the consent authority for the proposed Coastal Protection Works as Regionally Significant Development.

Consent for the works is also required from Crown Lands as the owner of the land.

The proposed works are also considered integrated development under s4.46 of the EP&A Act requiring a permit under the *Fisheries Management Act* (s200) from Department of Primary Industry - Fisheries.

The applicable environmental planning instrument for the works is the Coastal Management SEPP (refer to **Section 6.2.3**).

1.5 Supporting Documentation

This SEE has been prepared based upon:

- Site visit 13th February 2018
- Council Pre DA meeting 24/05/17; and
- The following technical investigations

Document	Author	Reference	Date
Review of Environmental Factors	Manly Hydraulics Laboratory	Flynns Beach Seawall Review of Environmental Factors, NSW Public Works, DC13220	02/2016
Engineering Design Report	Manly Hydraulics Laboratory	Final Report MHL2244	02/2016
Geotechnical Report	Cardno	Flynns Beach Seawall Replacement – Stage 1, Geotechnical Interpretive Report	21/05/2018
Ecological Impact Assessment	Cardno	Flynns Beach Seawall Design and Construction, Ecological Impact Assessment	28/06/2018
Stage 1 Basis of Design Report	Cardno	Flynns Beach Seawall – Stage 1 Basis of Design Report	02/05/2018

2 Background

In 1995, a master plan for the future development of Flynns Beach was prepared by The Geolink Group. A key feature of the master plan was the provision of a walk way along the seawall providing a continuous link at both ends of the beach to the coastal walk.

In 1998, Council obtained a structural engineer's report on the pre-stressed concrete retaining wall at Flynns Beach. The report stated that the wall was structurally unstable, with concrete cancer, cracking of precast concrete panels, displacement of posts, and undermining of the wall by groundwater. The structural engineer recommended that the wall be reconstructed.

In 2009, several panels of the retaining wall failed due to stormwater impacts that occurred during a declared natural disaster event. These panels were repaired later that year following receipt of Natural Disaster funding from the state government.

In 2010, temporary repairs were carried out with rock placed along the retaining wall at the southern end following further storm surge impacts. (It is understood that Council placed the rocks in front of the sea wall to try to slow down the wave velocity and try to hold the wall in position until the natural sand replenishment occurred over time).

In 2012, PMHC engaged three engineering consultancies to prepare concept design options for the seawall. The NSW Public Works Manly Hydraulics Laboratory (MHL) concept plan for the sea wall was chosen, and various amendments to the concept plan were required as a result of the community consultation process undertaken by Council, state agency consultation, and new geological data.

Storm surges in February and March 2013 resulted in further undermining of the retaining wall with collapse of parts of the wall at the northern end of the beach.

Council has undertaken extensive community consultation in relation to the proposed Flynns Beach Seawall, developing a detailed community participation plan and publicly exhibiting three concept designs. A report on the consultation is provided in Council Agenda Papers dated 15 May 2013.

In 2016, NSW Public Works, Office of Finance and Services prepared a Review of Environmental Factors (REF) on behalf of Council to assess the potential environmental impacts that may result from activities associated with the proposed construction and other associated works of the Flynns Beach Seawall.

Since that time a staged construction program that is considerate of higher beach usage seasons, and can match Council's budget over two financial years, has been determined. This has resulted in the project being divided into two stages designed and constructed independently of each other.

This recommended staging was determined giving consideration to a range of factors including the condition of the current retaining wall, coinciding construction of like sections of the new seawall, and minimising disruption to usage of the beach.

In 2018, Cardno were appointed by Michilis to undertake an alternate seawall design for the Stage 1 component of works in response to an advertised tender released by PMHC. Cardo prepared the alternate concept design with reference to the design criteria and previously prepared documentation that was released as part of the RFT. Michilis were successful in winning the project on the basis of the alternate concept design prepared by Cardno and Cardno were subsequently commissioned to finalise the detailed design and documentation in line with the proposed alternate Stage 1 concept.

The Stage 1 section of seawall is to be constructed first as the current retaining wall is failing. It is anticipated that the construction of the Stage 1 section of the proposed works would occur during the winter/early spring season where beach use is at a minimum. With work being undertaken in front of the surf club this time period was considered to be the least disruptive to the public and allow for the completion of this feature of the wall before the busy summer period.

3 Site Location and Setting

Flynns Beach is located within the Port Macquarie-Hastings Local Government Area (LGA) on the mid-north coast of New South Wales, between Rocky Beach and Nobbys Beach. Port Macquarie is approximately 380 km north of Sydney (refer to **Figure 3-1**).

Port Macquarie is a growing regional business centre. Tourists and holiday makers visit the LGA due to its many beaches fronting the Pacific Ocean, lush hinterland and moderate climate. Flynns Beach is a significant asset for local residents and the Port Macquarie-Hastings region, particularly during holiday periods when it receives high visitation rates from tourists and local residents. The beach, which is accessed via Tuppenny Lane off Pacific Drive, is 3 km from the centre of town, relatively safe and protected from prevailing winds.

Flynns Beach Reserve consists of the beach landward of low water mark, landward area behind the existing retaining wall including the Surf Life Saving Club building and cafe, grassed area including picnic tables and BBQs, adjacent areas to the north and south of the existing retaining wall, carpark and Tuppenny Lane.

The stage 1 section of the seawall extends for a length of 81.25m from between chainages 93.52 to 174.77 as shown in **Appendix A**.

As the proposal does not directly impact on the area seaward of low water mark, that area is not included in the study area, however indirect impacts are included in the assessment where relevant.

A location map and aerial photos of the beach and surrounds are shown in **Figures 3-1 to 3-4**.

Figure 3-1 Location Map of Port Macquarie (Source: Google Maps, Accessed 2014)

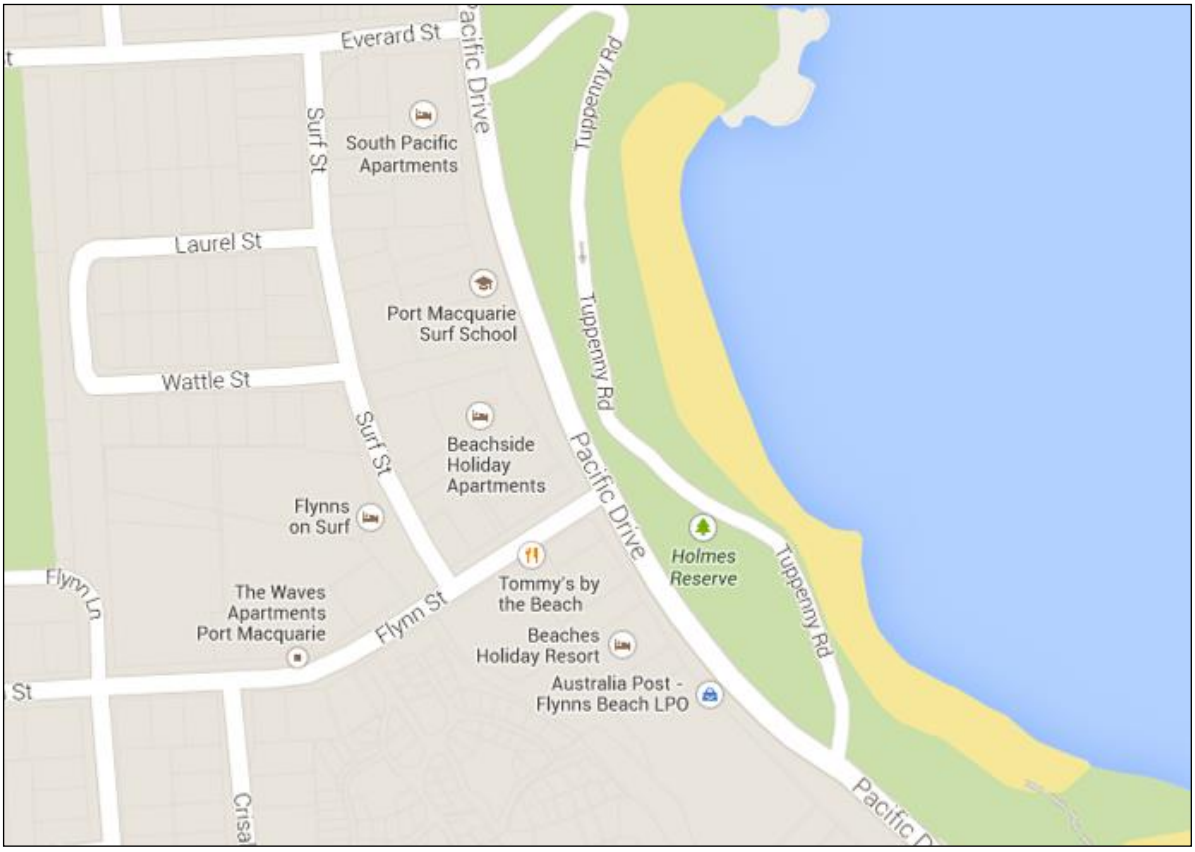


Figure 3-2 Location Map of Flynns Beach (*Source: Google Maps, Accessed 2014)*

Figure 3-3 Aerial view of Flynns Beach (*Source: Google Maps, Accessed 2014)*

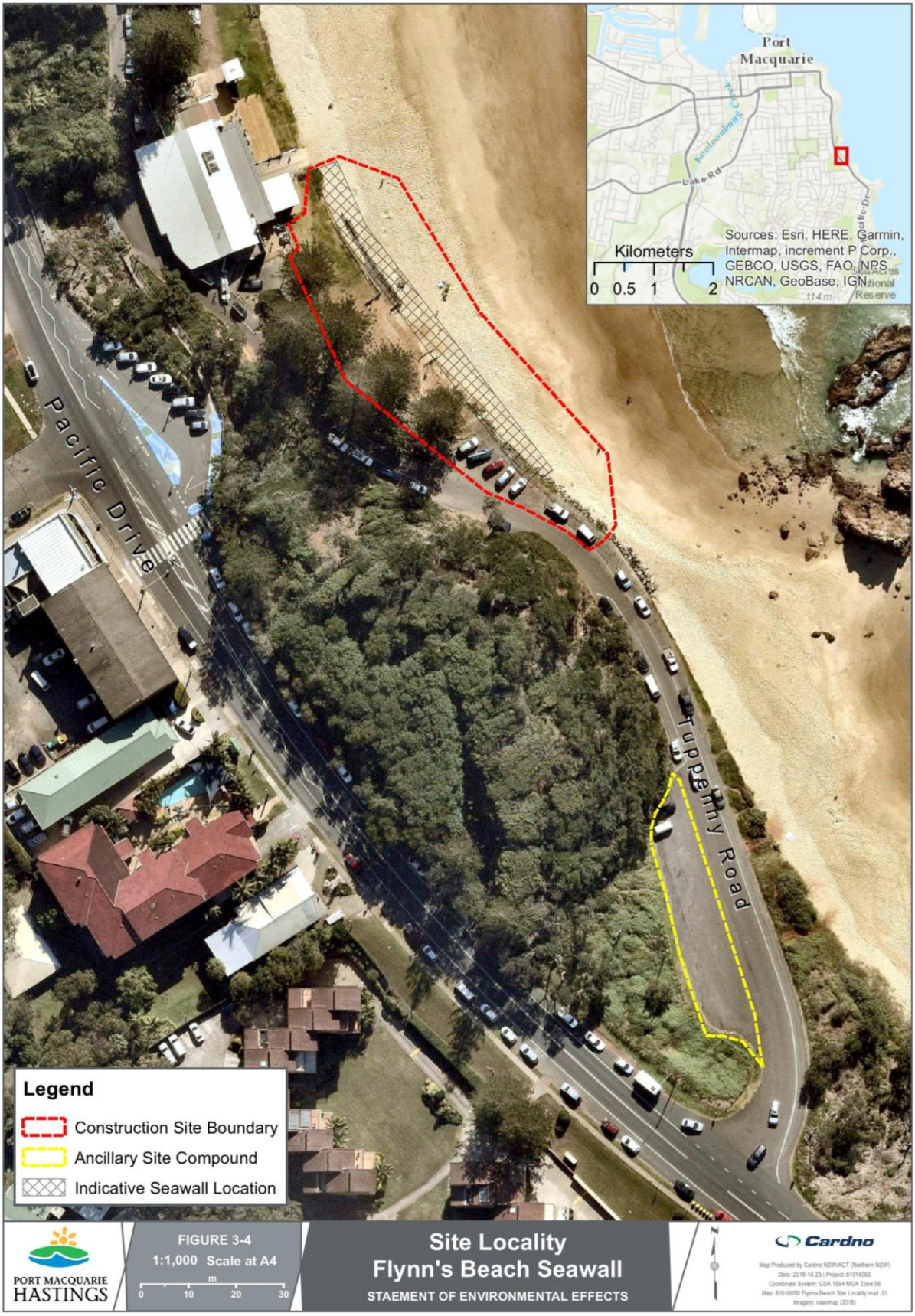


Figure 3-4 Proposed Seawall and Construction Site locality

3.2 Existing Environment

The existing Flynns Beach retaining wall is approximately 260m in length and was constructed in the late 1970s as a retaining wall to support the foreshore embankment and provide protection to the landward foreshore of Flynns Beach from coastal erosion.

The retaining wall is in poor condition, with concrete cancer taking over in some panels and posts, plus undermining from groundwater and overland stormwater flows causing significant erosion of fill.

The structure at the northern end of the beach is unstable with cracking of the precast panels, displacement of the supporting posts, and more recently parts of the wall have collapsed following storm surges in February and March 2013.

Rocks have been placed along the southern end of the existing retaining wall to protect the toe from coastal erosion where the wall alignment protrudes seaward in the salient created by the rocky outcrop.

Council provides various facilities for the public at the reserve including carparking, picnic tables, electric BBQ, café, showers, water drinking station, amenities. A Surf Life Saving Club, vehicle and pedestrian access, beachfront park and car parking along Tuppenny Lane and in Pacific Drive above.

The vegetation within the Study Area is predominantly exotic grasses and planted trees with Norfolk Island Pines lining the foreshore adjacent to the Stage 1 works.

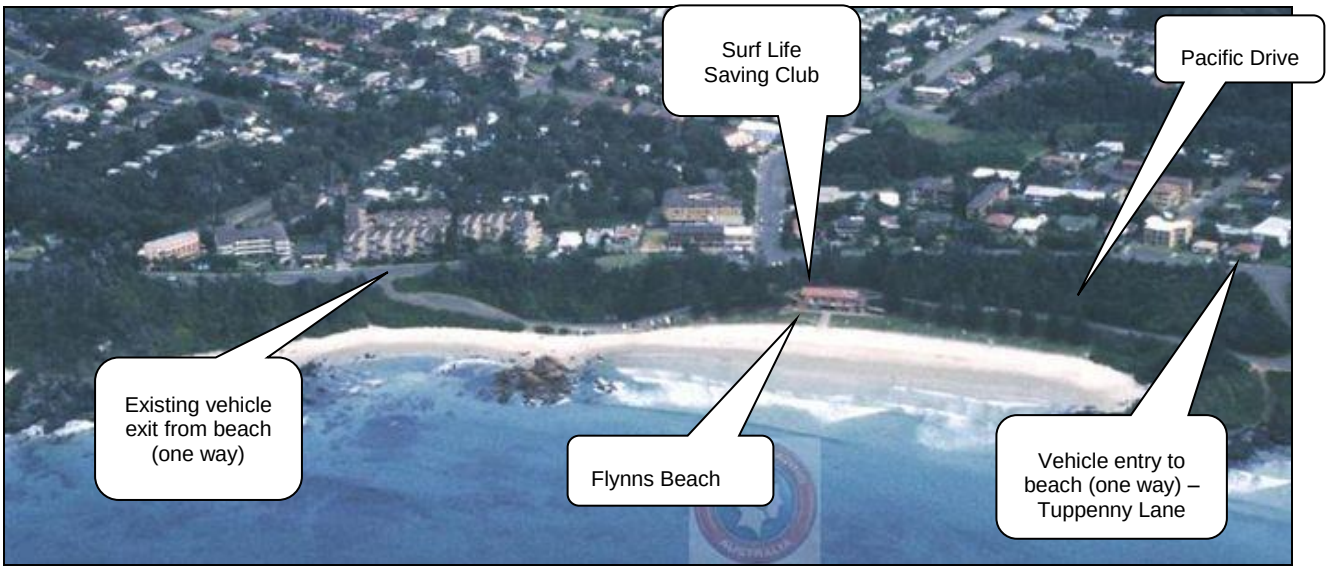


Figure 3-5 Aerial View of Flynns Beach (*Source: Surf Life Saving Association website, Accessed 2014)*

Figure 3-6 Movement of the precast panels and erosion behind the retaining wall at the northern end and Rocks placed along the southern end of the existing retaining wall

Figure 3-7 Existing environment at Flynns beach showing access ramp, stairs and foreshore area.

4 Proposed Development

4.1 Project Description

Port-Macquarie-Hastings Council is proposing to build a 336m seawall along Flynns Beach, the seawall would be located immediately seaward of the existing retaining wall.

The function of the proposed seawall is to replace the existing retaining wall in order to protect the valuable public asset of Flynns Beach and the foreshore behind against coastal erosion.

For this DA only Stage 1 of the proposed seawall is subject to the application. The remaining Stage 2/3 works will be subject to a separate DA in the future. Stage 1 consists of an approximate length of 80 metres of seawall between chainages 93.52 to 174.77.

The new seawall design comprises:

- a reinforced cantilever concrete seawall structure with integral wheelchair accessibility ramp adjoining the existing boat ramp;
- reinforced concrete beach access stairs adjacent to the proposed seawall;
- a new footpath slab at the top of the proposed wall for more suitable beach access; and
- associated minor landscaping works including footpath and grassed areas.

The proposed seawall design has an allowance for Sea Level Rise (SLR) of 450mm to the year 2050.

The design drawings for the Flynns Beach Seawall are provided in **Appendix A**.

The detailed design and construction methodology is described further in **Section 4.2** of this SEE and the Cardno Basis of Design Report (Cardno, 2018*a*). The works would be in stages based on the need to construct particular parts of the seawall in a sequential manner.

The works would be undertaken out of the peak beach usage time periods of summer and the Easter holidays. It is anticipated the completion date would be dependent on funding.

The beach, foreshore grassed area, surf lifesaving club, café and car parking areas would remain open for the duration of the works. However, access would be restricted to certain routes depending on the stage of work being undertaken.

In addition, specific areas, including parts of the foreshore, would be cordoned off for public safety reasons, and protective fencing would be provided around the existing Norfolk Pine trees. Notices would be provided at the beach to describe the works and any special restrictions.

4.1.1 Seawall Design Objectives

The following design objectives for the proposed seawall were developed through community consultation and relevant coastal engineering practice:

- The new seawall should be in keeping with current seawall design practices and offer appropriate scour protection.
- The design shall be in accordance with ‘Environmentally Friendly Seawalls – A Guide to Improving the Environmental Value of Seawalls and Seawall-Lined Foreshores in Estuaries’ (DECC, 1990). The design will also comply with ‘Engineering Standards and Guidelines for Maritime Structures’ code (NSW Maritime 2005) and AS 4997-2005 Guideline for the Design of Maritime Structures.
- The design should aim to protect the grassed terrace and buildings from potential coastal erosion and projected sea level rises of up to 450mm until the year 2050.
- The design should be sensitive to the maintenance of the pristine beach area as well as the protection of the grassed terrace, picnic facilities and buildings including the surf club and cafe which overlook the beach.
- The proposed solution should not unnecessarily reduce the limited beach area, or threaten the Norfolk Island pines or the facilities which have been constructed on the grassed area.

- The design should include both traditional and innovative (composite) approaches.
- The design should allow matching of all existing infrastructure such as footpaths, lighting, kerbs, gutters, car parking, picnic areas and access ways.
- The new seawall design also gives consideration to:
- minimising any trip hazards on top of the seawall;
- dissipating wave action to prevent scouring and loss of sand at the toe of the seawall;
- preventing ponding of water on the park in close proximity to the seawall;
- making allowance for stormwater outlets to the seawall; and
- not being visually intrusive or unnecessarily limit public access to the foreshore.

4.1.2 Seawall Makeup, Crest Levels and Alignment

The new seawall will be located seaward and adjacent to the existing retaining wall to maximise the beach amenity while maintaining highly valued parkland areas. The proposed new seawall crest levels have been determined to meet serviceability requirements (wave overtopping) and to fit in with existing ground and landscape levels. The new seawall also includes features that further improve the foreshore amenity which is highly valued by the community. The overall design philosophy adopted caters for 35 years ARI design conditions excluding allowance for sea level rise with an assessment of seawall performance for 50 years and 100 years ARI conditions and adaptation strategies developed where necessary to cater for upper bound sea level rise projections

The existing retaining wall crest level south of the clubhouse is too low for coastal protection purposes. A slightly raised vertical seawall is proposed with a minimum crest level of 4.1m AHD (at ramp location) and up to 4.5m AHD. The 4.1m crest is assessed to be adequate to tolerate minor wave overtopping as expected under present and future sea level conditions.

4.2 Construction Methodology

4.2.1 Construction Staging and Timing

The proposed Stage 1 seawall comprises an approximate 80m length of reinforced concrete cantilever wall with reinforced concrete continuous flight auger (CFA) piles, footing slab, wall, ramp and concrete stairway.

It is anticipated that the construction works staging would be as follows:

- Install CFA piles in accordance with the engineering drawings;
- Locally excavate and trim back top of piles as required;
- Construct the reinforced concrete foundations / base slab in 9m panel lengths;
- Construct the main reinforced concrete vertical retaining wall in approximate 9m panel lengths, with joint locations to match base slab joints;
- Construct the front wall to support the access ramp;
- Install subsoil drainage and backfill the construction area (i.e. behind the retaining wall, under the access ramp, on top of the foundation slab)
- Construct stairs, footpaths and ramp
- Install handrails.

The staging outlined above was selected on the basis of limiting exposed large excavation areas for extended periods of time to prevent the potential effects of storm surge impacts during the construction period.

It is anticipated that the construction of the seawall section would occur during the winter/early spring season where beach use is at a minimum. This time period was considered to be the least disruptive to the public and allow for the completion of this feature of the wall before the busy summer period.

The works would be undertaken out of the peak beach usage time periods of summer and the Easter holidays. The completion date would be dependent on funding and other constraints.

All activities or project works, including the arrival and departure of vehicles delivering or removing materials from or to the site, would be carried out between the hours of:

- 7:00 am to 5:00 pm Monday to Saturdays
- At no time on Sunday and public holidays.

Work could be undertaken outside these hours only with prior written approval from the Principals Authorised Person after consultation with Council.

4.2.2 Construction Activities

It is envisaged that the construction of the seawall would involve the following:

4.2.2.1 Preliminaries

Site establishment and implementation of the Construction Environmental Management Plan.

4.2.2.2 Type C1 vertical concrete panel and steel pile seawall

- Create a truck/plant access over the existing southern rock wall to the beach to enable work vehicles to access the beach.
- Beach preparations including relocation of sand from the base of the retaining wall with an excavator and stockpiling on the beach within the area fenced off from the public (stockpiles lineally along the beach to create a bund to protect the plant from normal ocean conditions during daytime works may be considered).
- Undertaking stormwater drainage works related to the existing retaining wall and foreshore area landward of the existing retaining wall. This would necessitate the identification of existing stormwater pits and pipes. It is understood that Council would be undertaking the stormwater works that would include extension of the existing drainage lines/pits to the new seawall with access pits along the seawall and/or appropriately distributed stormwater outlet pipes along the seawall structure.
- Where possible the existing retaining wall will be left in place. Depending on the stormwater pipe size, where the alignment of the proposed wall or slumping of the existing wall results in a gap of a nominated size, the existing retaining wall will be straightened (or removed) and where necessary additional fill placed to the landward side of that wall where slumping has occurred.
- Placement of CFA piling rig on the beach and with a 600mm diameter auger drill through beach sand/clay and construct CFA piles to an approximate depth of RL -6.0m. The piling rig will install the reinforcing cage into the augured grouted holes.
- Form and pour reinforced concrete footing slab and beams in 9m long segments
- Form and pour reinforced concrete walls in 9m long segments
- Backfill excavation area and continue with next segment of wall/footing length
- Form and pour reinforced concrete ramp and reinforced concrete stairs adjacent to the proposed seawall
- Construct handrails at top of wall and top of ramp
- Excavation and shoring of beach material, including dewatering will be required during the cast in-situ concrete works for the reinforced concrete footing slabs.
- Placement of geotechnical fabric between the old retaining wall and the new seawall, and filling with gravel. Prior to the gravel fill, stormwater management would have been provided for.
- Site cleanup

4.2.2.3 Foreshore Works

- Making good the landward surface. This will involve returfing, construction of a reinforced concrete footpath and planting of new plants etc.

4.2.3 Construction Vehicle Movements

The number of vehicle (including truck movements) required for the works is estimated to be as follows:

Table 4-1 Anticipated Construction Traffic Volumes – Entry & Exit is counted as separate traffic volume movements

Programme Task	Vehicle Type	Traffic Volume
Site establishment & disestablishment	Light Vehicles	[20] movements per day
	Heavy Vehicles	[10] movements per day
General Construction of Walls	Light Vehicles	[10] movements per day
	Heavy Vehicles	[4] movements per day
Installation of Piles	Light Vehicles	[10] movements per day
	Heavy Vehicles	[4 - 8] movements per day *(concentrated vehicle movements during concrete pours)*
Pouring Concrete Retaining Walls	Light Vehicles	[14] movements per day
	Heavy Vehicles	[4 - 12] movements per day *(concentrated vehicle movements during concrete pours)*
Importing / Exporting Fill Materials	Light Vehicles	[10] movements per day
	Heavy Vehicles	[6 - 8] movements per day

4.2.4 Construction Equipment

The types of machinery to be used are as follows:

The construction machinery/equipment to be used during the works would be determined by the construction contractor. For the purposes of this assessment, it has been assumed that the works would likely use the following machinery:

- Bulldozer
- Jack Hammers
- Vibrator Roller
- Water Cart
- Dump Trucks
- Excavator
- Rockbreaker
- Truck
- Crane
- Compressors
- Backhoe
- Compactor
- Tip truck
- Generator
- Mechanical broom
- Piling Hammer
- Concrete truck and pump
- Concrete vibrators
- Drill

- Concrete saws
- Welders
- Concrete leveller
- Cherry picker, truck mounted

4.2.5 Construction Site Facilities

A works depot/compound area to accommodate construction facilities for workers would be established for the duration of the construction period. The compound area would contain ablution facilities, storage and material lay down areas, and rubbish bins. Due to space and access restrictions workers and contractors will not be able to park on the construction site without making prior arrangements with the Project Manager. Parking is available on Pacific Drive as per local parking restrictions.

At completion of the works, the work areas would be left in a clean, tidy and attractive state. The compound site would be restored to its original condition.

Site Facility Locations are shown in **Figures 4-1 and 4-2**.

Figure 4-1 Site Plan for Project Set up and Site Amenities Location

Figure 4-2 Site Amenities and Materials Lay down Area Location

4.3 Construction Management

4.3.1 Construction Environmental Management Plan

The proposed works would be undertaken in accordance with the Construction Environmental Management Plan (CEMP) and associated sub plans prepared by the construction contractor and approved by Council prior to the commencement of works. The CEMP incorporates the following relevant sub-plans:

- Community Consultation Plan
- Public Safety Plan
- Public Signage Plan
- Traffic Management Plan including Pedestrian Management
- Dilapidation Report (including condition of existing Norfolk Pines)
- Waste Management Plan
- Soil and Water Management Plan (including Emergency Oil and Fuel Spillage and storm contingency management)

The CEMP would be made available to residents upon request and where considered appropriate.

4.4 Operational Maintenance Program

A seawall maintenance program would be initiated comprising inspections and repair as necessary. This program would include analysis of any storms and the impact on the seawall and overtopping occurrence.

It is anticipated that sand nourishment may be required at Flynns Beach to maintain a suitable beach amenity in response to seal level rise and this activity would be part of the operational maintenance program.

5 Option Evaluation and Project Justification

This section reviews the option evaluation process and provides the context and justification for the proposal.

5.1 Need for the Proposal

The existing retaining wall was constructed from prestressed concrete panels in the 1970s extending approximately 260m along the foreshore of Flynns Beach. Despite serving an effective function retaining 600mm to 1800mm of fill for over 30 years, it was not designed as a seawall and is now in a poor condition.

One of the causes for sections of the existing retaining wall to fail is the nearshore stormwater runoff. It is creating instability of the soils immediately landward of the wall and undermining parts of the vertical sections of the wall.

A number of tie back repairs and rock toe stabilisation works (comprising rocks of 2–3 tonnes) have been undertaken to the existing retaining wall by PMHC following instability caused by scour from rainfall runoff and/or beach erosion undermining the retaining wall foundations. Prestressed concrete panels and supporting concrete piles have reached their design life and are suffering from weathering (concrete cancer) with further failures evident.

The existing retaining wall at the southern end of the beach has concrete cancer in the posts and panels, and following undermining of the wall, temporary repairs were carried out with rock placed to arrest coastal erosion. The retaining wall at the northern end of the beach is structurally unstable with bowing and cracking of the precast panels and displacement of the supporting posts.

Without any form of repair or maintenance, the seawall will continue to deteriorate. Further panels and posts will crack and be displaced as a result of concrete cancer, ground water and overland stormwater flows will continue to undermine the seawall and cause significant erosion of fill. Future storm surges, similar to those that occurred in February and March 2013 will cause further collapsing of the supporting posts and wall, and the need for further placement of rocks on the beach. This option means that the foreshore of Flynns Beach will be eroded and the amenity of the beach reduced.

5.2 Option Evaluation

In August 2012, Council advertised publically for quotations from consultants with a high level of expertise and experience in design of sea walls to prepare a concept plan and estimate of construction cost for a new sea wall at Flynns Beach to replace the failing seawall.

The brief was to prepare a concept plan suitable for public exhibition and an estimate of construction cost. The brief stated that *"...the new structure will need to protect the grassed terrace and buildings from potential coastal erosion for predicted sea level rises of up to 450mm over the next 35 years. The design must be sensitive to the maintenance of the pristine beach area as well as the protection of the grassed terrace, picnic facilities and buildings including a surf club and cafe which overlook the beach, and any proposed solutions should not unnecessarily reduce the limited beach area, or threaten the Norfolk Island pines or the facilities which have been constructed on the grassed area."*

Submissions were received from six consulting firms, and after evaluation of the submissions, three firms were engaged to prepare concept plans. A summary of the options considered for the combined stages of the Project is provided in the REF prepared by NSW Public works (2016) and associated documents.

The preferred option was the concept plan proposed by Manly Hydraulics Laboratory.

Since that time, a staged construction program that is considerate of higher beach usage seasons and can match Council's budget over two financial years has been determined resulting in the project being divided into two stages being designed and constructed independently of each other.

This recommended staging was determined giving consideration to a range of factors including the condition of the current retaining wall, coinciding construction of like sections of the new seawall, and minimising disruption to usage of the beach.

In 2018, Cardno developed an alternate design for the Stage 1 section of the seawall. Cardno's Option was developed to:

- Respond to the site specific geotechnical conditions by minimising the depth of disturbance into the in-situ clay materials;
- Further minimise the affected footprint by eliminating the use of ground anchors; and
- Provide a durable and relatively maintenance free structure suitable for the location and exposure conditions.

6 Statutory Planning Framework

6.1 Application of Part 4 of the EP&A Act

6.1.1 Environmental Planning and Assessment Act 1979 *(EP&A Act) and* Regulation 2000 (*EP&A Reg*)

The EP&A Act is the primary legislation controlling development activity in NSW and is administered by the Department of Planning and Environment (DP&E), local government and other consent or determining authorities.

Section 4.15 (previously s79c) of the *Environmental Planning and Assessment Act 1979* requires the following heads of consideration to be assessed as part of a DA. This SEE has been prepared to address the heads of consideration (where relevant) which are as follows:

a) the provisions of:

(i) any environmental planning instrument, and

(ii) any proposed instrument that is or has been the subject of public consultation under this Act and that has been notified to the consent authority (unless the Secretary has notified the consent authority that the making of the proposed instrument has been deferred indefinitely or has not been approved), and

(iii) any development control plan, and

(iiia) any planning agreement that has been entered into under section 7.4, or any draft planning agreement that a developer has offered to enter into under section 7.4, and

(iv) the regulations (to the extent that they prescribe matters for the purposes of this paragraph),

(v) (Repealed)

that apply to the land to which the development application relates,

b) the likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality,

c) the suitability of the site for the development,

d) any submissions made in accordance with this Act or the regulations,

e) the public interest.

This SEE has also been prepared to comply with Part 4 of Schedule 1 of the EP&A Regulation and indicates the following matters:

a) the environmental impacts of the development,

b) how the environmental impacts of the development have been identified,

c) the steps to be taken to protect the environment or to lessen the expected harm to the environment,

d) any matters required to be indicated by any guidelines issued by the Secretary for the purposes of this clause.

The environmental impacts of the development and associated management and mitigation measures are discussed in **Section 8**.

Part 4, Division 4.2, Section 4.5 of the EP&A Act designates the consent authority for the purposes of the Act. As the development is of a kind that is declared by an environmental planning instrument as regionally significant development, the consent authority is the regional planning panel for the area. In this case the Northern regional planning panel.

The development proposal requires development consent and approvals from DPI Fisheries therefore is deemed to be integrated development under s4.46 of the EP&A Act.

The applicable environmental planning instrument for the works is the Coastal Management SEPP (refer to **Section 6.2.3**), which provides the permissibility for the proposed coastal protection works with development consent.

6.2 Environmental Planning Instruments

6.2.1 Port Macquarie-Hastings Local Environmental Plan 2011

Flynns Beach is located within the Port Macquarie-Hastings LGA. The *Port Macquarie-Hastings Local Environmental Plan 2011* (PMH LEP) identifies the land use zones relevant to the site. The existing retaining wall is located within the RE1 (Public Recreation Zone) and the Surf Life Saving Club building being located within the RE2 (Private Recreation Zone) (**Figure 6-1**).

The proposed seawall is defined as coastal protection works which is prohibited in both zones. However, Clause 19.2b of the Coastal Management SEPP provides development for the purpose of coastal protection works may be carried out on land to which the Policy applies by or on behalf of a public authority may be carried out with development consent.

As the proposed coastal protection works would be permitted with consent under the Coastal Management SEPP (**refer to Section 6.2.3**) the development controls contained within the PMH LEP would not be applicable to the proposed development.

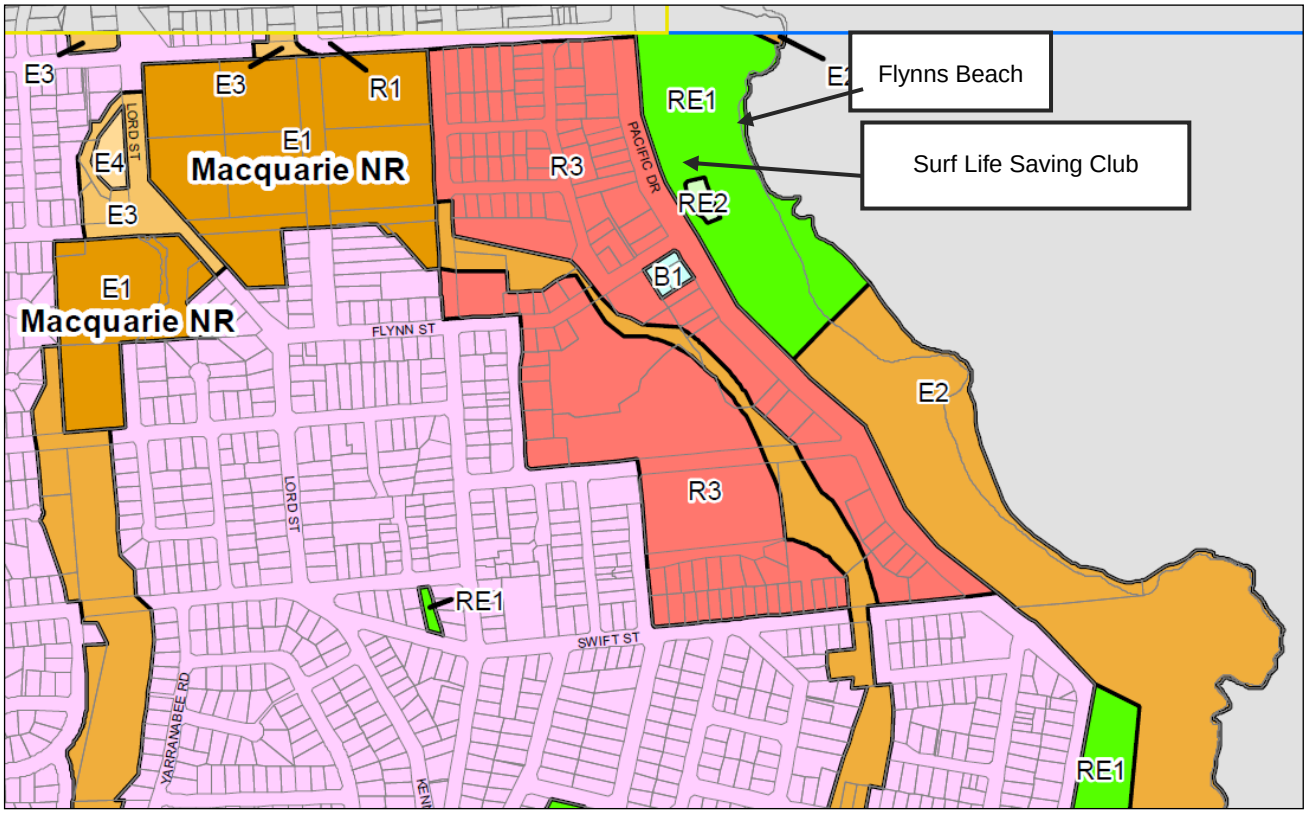


Figure 6-1 Zoning Extract Port Macquarie-Hastings LEP 2011

6.2.2 Port Macquarie-Hastings Development Control Plan

The *Port Macquarie-Hastings Development Control Plan 2013* (DCP) is applicable to development within the Port Macquarie-Hastings LGA. The DCP contains area based provisions for the Flynns Beach Precinct adopted from the *Port Macquarie-Hastings Development Control Plan 2011*. These provisions however relate to building development and not to development on the beach.

Chapter 2.3 of the DCP contains development provisions related to environmental management. Section 2.3.3.4 of the DCP identifies vegetated buffers that must be provided around endangered ecological communities (EECs), including:

a) For coastal floodplain endangered ecological communities a minimum, fully vegetated buffer of 35m must be provided.

b) For Freshwater Wetland on Coastal Floodplain endangered ecological community a fully vegetated buffer of 100m is to be provided.

c) For all other endangered ecological communities, a fully vegetated buffer of 50m must be provided.

The buffer provisions to ecologically endangered communities do not apply:

1. To land less than 1ha in area;
2. To land where the is a current and valid approval for urban purposes;
3. To any application to modify an existing valid approval under section 96 of the Environmental Planning and Assessment Act 1979.

The Proposal site is located within 50m of an EEC (refer **Section 8.12**), however the 50m buffer land surrounding this EEC is existing cleared land, including road infrastructure and development associated with Port Macquarie Surf Life Saving Club and Flynn's Beach. As such, the land likely has a current and valid approval for urban purposes and the DCP provision for the requirement of a 50 m buffer is not required.

6.2.3 State Environmental Planning Policy (Coastal Management) 2018

State Environmental Planning Policy (Coastal Management) 2018 updates and consolidates into one integrated policy *SEPP 14 (Coastal Wetlands)*, *SEPP 26 (Littoral Rainforests)* and *SEPP 71 (Coastal Protection)*, including clause 5.5. of the Standard Instrument – Principal Local Environmental Plan. These policies are now repealed.

The aim of this Policy is to promote an integrated and coordinated approach to land use planning in the coastal zone in a manner consistent with the objects of the *Coastal Management Act 2016*, including the management objectives for each coastal management area, by:

a) managing development in the coastal zone and protecting the environmental assets of the coast, and

b) establishing a framework for land use planning to guide decision-making in the coastal zone, and

c) mapping the 4 coastal management areas that comprise the NSW coastal zone for the purpose of the definitions in the *Coastal Management Act 2016*.

A review of the Coastal Management SEPP mapping indicated the Study Area occurs adjacent to three patches of areas that are mapped as Littoral Rainforest to the west and north (**Figure 6-2**) (DPE 2018). As such, the Study Are occurs within the 'proximity area for Littoral Rainforest'. The proposed project would avoid any direct and indirect impact to any area mapped as Littoral Rainforest.

In addition, the Study Area occurs within the following areas mapped under the Coastal Management SEPP (DPE 2018);

- Coastal Environment Area; and
- Coastal Use Area.

Under Part 2, Division 1, 3 and 4 of the Coastal Management SEPP, Development consent must not be granted to development on land that is in proximity to Littoral Rainforest, within the 'Coastal Environment Area' or 'Coastal Use Area' unless the consent authority has considered whether the proposed development is likely to cause an adverse impact on the matters set out in **Table 6.1** below. **Table 6.1** also indicates where the matters are considered in this SEE.

Part 3 Clause 19 (2) (Coastal protection works by public authority), states that "Development for the purpose of coastal protection works may be carried out on land to which this Policy applies by or on behalf of a public authority:

a) without development consent—if the coastal protection works are:

i. identified in the relevant certified coastal management program, or

ii. beach nourishment, or

iii. the placing of sandbags for a period of not more than 90 days, or

iv. routine maintenance works or repairs to any existing coastal protection works, or

(b) with development consent—in any other case.

The proposal does not meet the criteria for works permissible without consent and therefore development consent is required.

Figure 6-2 Ecological constraints mapping taken from Ecological Impact Assessment Report (Cardno, 2018b) showing location of Littoral Rainforest extent at Flynns Beach Port Macquarie.

Table 6-1 Coastal management SEPP considerations and Report Section

Coastal Management SEPP Considerations	Report Section
Clause 11 Development on land in proximity to coastal wetlands or littoral rainforest	
(1) Development consent must not be granted to development on land identified as "proximity area for coastal wetlands" or "proximity area for littoral rainforest" on the *Coastal Wetlands and Littoral Rainforests Area Map* unless the consent authority is satisfied that the proposed development will not significantly impact on:	
(a) the biophysical, hydrological or ecological integrity of the adjacent coastal wetland or littoral rainforest, or	**Section 8, 8.4 and 8.12**
(b) the quantity and quality of surface and ground water flows to and from the adjacent coastal wetland or littoral rainforest.	**Section 8.3**
Clause 13 Development on land within the coastal environment area	
(1) Development consent must not be granted to development on land that is within the coastal environment area unless the consent authority has considered whether the proposed development is likely to cause an adverse impact on the following:	
(a) the integrity and resilience of the biophysical, hydrological (surface and groundwater) and ecological environment	**Section 8, 8.4 and 8.12**
(b) coastal environmental values and natural coastal processes	**Section 8.5**
(c) the water quality of the marine estate (within the meaning of the *Marine Estate Management Act 2014*), in particular, the cumulative impacts of the proposed development on any of the sensitive coastal lakes identified in Schedule 1	**Section 8.3**
(d) marine vegetation, native vegetation and fauna and their habitats, undeveloped headlands and rock platforms,	**Section 8.12**
(e) existing public open space and safe access to and along the foreshore, beach, headland or rock platform for members of the public, including persons with a disability,	**Section 8.8**
(f) Aboriginal cultural heritage, practices and places,	**Section 8.10**
(g) the use of the surf zone.	**Section 8.7**
(2) Development consent must not be granted to development on land to which this clause applies unless the consent authority is satisfied that:	
(a) the development is designed, sited and will be managed to avoid an adverse impact referred to in subclause (1), or (b) if that impact cannot be reasonably avoided—the development is designed, sited and will be managed to minimise that impact, or (c) if that impact cannot be minimised—the development will be managed to mitigate that impact.	**Sections as identified above**
Clause 14 Development on land within the Coastal Use Area	

(1) Development consent must not be granted to development on land that is within the coastal use area unless the consent authority:	
(a) has considered whether the proposed development is likely to cause an adverse impact on the following:	
(i) existing, safe access to and along the foreshore, beach, headland or rock platform for members of the public, including persons with a disability,	**Section 8.8**
(ii) overshadowing, wind funnelling and the loss of views from public places to foreshores,	**Section 8.6**
(iii) the visual amenity and scenic qualities of the coast, including coastal headlands,	**Section 8.6**
(iv) Aboriginal cultural heritage, practices and places,	**Section 8.10**
(v) cultural and built environment heritage	**Section 8.11**
(b) is satisfied that:	
(i) the development is designed, sited and will be managed to avoid an adverse impact referred to in paragraph (a), or (ii) if that impact cannot be reasonably avoided—the development is designed, sited and will be managed to minimise that impact, or (iii) if that impact cannot be minimised—the development will be managed to mitigate that impact, and	**Sections as identified above**
(c) has taken into account the surrounding coastal and built environment, and the bulk, scale and size of the proposed development.	
Clause 15 Development in coastal zone generally—development not to increase risk of coastal hazards	
Development consent must not be granted to development on land within the coastal zone unless the consent authority is satisfied that the proposed development is not likely to cause increased risk of coastal hazards on that land or other land.	**The proposed Seawall is intended to protect the land from Coastal Hazards.**

6.2.4 State Environmental Planning Policy (State and Regional Development) 2011

Clause 8A of Schedule 7 of S*tate Environmental Planning Policy (State and Regional Development) 2011* declares certain development for the purpose of coastal protection works to be regionally significant development for which a Sydney district or regional planning panel is the consent authority including, 'development for the purpose of coastal protection works carried out by or on behalf of a public authority (other than development that may be carried out without development consent under clause 19 (2) (a) of *State Environmental Planning Policy (Coastal Management) 2018*)'.

The proposal is regionally significant development. The consent authority is the Northern Joint Regional Planning Panel.

6.2.5 State Environmental Planning Policy No. 55 – Remediation of Land

This Policy specifies that a consent authority must not consent to the carrying out of development on land unless it has considered whether the land is, or is likely to be contaminated, and if the land is, or is likely to be contaminated, whether the land requires remediation before the land is developed for the proposed use.

Based on the information available of the previous and existing uses on the site, it is unlikely that any contaminated soil (or other contaminating agents) would be encountered in the construction of the proposal.

Excavated material would be classified in accordance with Department of Environment, Climate Change and Water guidelines prior to disposal at an appropriately licensed facility.

6.2.6 State Environmental Planning Policy No. 44 – Koala Habitat Protection

This Policy aims to encourage the proper conservation and management of areas of natural vegetation that provide habitat for koalas to ensure a permanent free-living population over their present range and reverse the current trend of koala population decline:

(a) by requiring the preparation of plans of management before development consent can be granted in relation to areas of core koala habitat, and

(b) by encouraging the identification of areas of core koala habitat, and

(c) by encouraging the inclusion of areas of core koala habitat in environment protection zones.

Port Macquarie Hastings LGA is listed as an area to which this policy applies.

A review of the PMHC Koala habitat mapping indicated that no areas within the Study Area or the adjacent vegetation is mapped as either 'Secondary' or 'Primary' Koala Habitat (Port Macquarie, 2014). Therefore, no Koala Habitat would be directly or indirectly impacted from the proposed project.

6.3 Other Relevant Legislation

There is a range of other State legislation that is relevant to the works. These instruments have been considered, and the need for any additional permits, licenses or approvals for the works identified as applicable.

6.3.1 Coastal Management Act 2016

The objects of this Act are to manage the coastal environment of New South Wales in a manner consistent with the principles of ecologically sustainable development for the social, cultural and economic well-being of the people of the State.

The *Coastal Management Act 2016* replaces the *Coastal Protection Act 1979* and establishes a new strategic framework and objectives for managing coastal issues in NSW.

The Act defines the coastal zone as comprising four coastal management areas:

1. Coastal wetlands and littoral rainforests area; areas which display the characteristics of coastal wetlands or littoral rainforests that were previously protected by SEPP 14 and SEPP 26
2. Coastal vulnerability area; areas subject to coastal hazards such as coastal erosion and tidal inundation
3. Coastal environment area; areas that are characterised by natural coastal features such as beaches, rock platforms, coastal lakes and lagoons and undeveloped headlands. Marine and estuarine waters are also included
4. Coastal use area; land adjacent to coastal waters, estuaries and coastal lakes and lagoons.

Each coastal management area has differentiated objectives under the Act, which respond to their social and environmental values and key threats. Detailed maps defining Coastal Management Areas accompany the Coastal Management SEPP.

The *Coastal Management Act 2016* defines coastal protection works to mean:

a) beach nourishment activities or works, and

b) activities or works to reduce the impact of coastal hazards on land adjacent to tidal waters, including (but not limited to) seawalls, revetments and groynes.

Section 27 of the *Coastal Management Act 2016* contains provisions dealing with the granting of development consent to development for the purpose of coastal protection works.

The section provides, Development consent must not be granted under the *Environmental Planning and Assessment Act 1979* to development for the purpose of coastal protection works, unless the consent authority is satisfied that:

a) the works will not, over the life of the works:

i. unreasonably limit or be likely to unreasonably limit public access to or the use of a beach or headland, or

ii. pose or be likely to pose a threat to public safety, and

(b) satisfactory arrangements have been made (by conditions imposed on the consent) for the following for the life of the works:

i. the restoration of a beach, or land adjacent to the beach, if any increased erosion of the beach or adjacent land is caused by the presence of the works,

ii. the maintenance of the works.

The works would not unreasonably limit or be likely to unreasonably limit public access to or the use of a beach or headland, or pose or be likely to pose a threat to public safety (Refer **Sections 8.6** and **8.7**).

PMHC would be the owner of the asset and would be responsible for any restoration or/and maintenance associated with the works.

6.3.2 Environment Protection and Biodiversity Conservation Act 1999

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) provides for Commonwealth involvement in development assessment and approval in circumstances where there exist 'matters of national environmental significance'. Matters of national environmental significance include:

- World Heritage properties;
- National Heritage places;
- Wetlands of International Importance;
- Great Barrier Reef Marine Park
- Commonwealth marine areas;
- Listed threatened species and ecological communities;
- Listed Migratory species;

Under this Act an action would require approval from the Minister if the action has, will have, or is likely to have, a significant impact on a matter of national environmental significance.

The potential for occurrence of the matters of national environmental significance (MNES) protected under the EPBC Act within 10km of the proposal was searched via the EPBC Act database (Protected Matters Search Tool) on the 18 May 2018. Results are provided in Ecological Impacts Assessment in **Appendix C.**

Based on the outcomes of the environmental impact assessment the proposed works are unlikely to have a significant impact on a MNES, and is therefore not considered to be a controlled action. The environmental impact assessment has concluded that no referral under the EPBC Act is required.

6.3.3 Heritage Act 1977

The *Heritage Act 1977* (Heritage Act) relates to non-Aboriginal historic artefacts and/or sites (older than 50 years) if uncovered during the works. The proposed development does not involve an item or place listed on the NSW State Heritage Register. Approval of works on the site is therefore not required under s57 of the Heritage Act.

6.3.4 Crown Lands Act 1989

Under the *Crown Lands Act* 1989 "public lands" refers to "Crown land or land within a reserve as defined in Part 5 or any other land granted, dedicated or reserved for a public purpose" (s153). The existing retaining wall is located on Crown Land (public land) as shown in **Figure 1-1**.

Any development on Crown Land must be in accordance with any adopted Plan of Management. As there is no adopted Plan of Management for the subject site the proposal needs to satisfy the requirements of the Crown Lands Act 1989 and approval needs to be obtained from NSW Department of Industry (Crown Lands Division).

Under s155 of the *Crown Lands Act 1989* it is an offence to erect a structure, clear or dig up public land without a lawful authority. As such, the proposal would require authorisation by a lease, licence or other permit from NSW Department of Industry to allow the use of Public Land.

Land owner's consent from Trade & Investment Crown Lands is also required prior to determination of the DA.

Following determination of the DA, Council is to make application to Crown Lands for issue of a temporary licence (Public Works Licence) for the Council and its contractors to occupy the Crown Land to carry out the approved works.

6.3.5 Fisheries Management Act 1994

The objects of the *Fisheries Management Act 1994* (FM Act) are to conserve, develop and share the fishery resources of the State for the benefit of present and future generations.

A permit is required for any proposed dredging and reclamation works in 'waterland' undertaken by a local authority (in this case Port Macquarie-Hastings Council), in accordance with Section 200 of the FM Act. This proposal involves excavation of existing foundations of the retaining wall and the construction of the new seawall immediately in front of the existing seawall which may meet the following definition for "reclamation":

> "reclamation work" means any work that involves:
>
> *(a) Using any material (such as sand, soil, silt, gravel, concrete, oyster shells, tyres, timber or rocks) to fill in or reclaim land, or*
>
> *(b) Depositing any such material on water land for the purpose of constructing anything over water land (such as a bridge), or*
>
> *(c) Draining water from water land for the purpose of its reclamation.*
>
> "water land" means land submerged by water:
>
> *(a) Whether permanently or intermittently, or*
>
> *(b) Whether forming an artificial or natural body of water,*

As such, the proposal would require a permit from DPI under Section 200 of the FM Act.

The proposal would not trigger the requirement for additional permits under the FM Act.

The Act also includes schedules of endangered aquatic species, populations and ecological communities, which must be considered in the same manner as species listed under the *Threatened Species Conservation Act 1995.* As the proposed works are unlikely to harm any aquatic species, marine vegetation or intertidal habitats, permits related to species and marine vegetation are not required.

6.3.6 National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* (NPW Act) provides for the statutory protection of Aboriginal cultural heritage places, objects and features and removal of identified native species, populations and ecological communities.

The Proposal does not fall within a designated National Park, nor would it affect any National Parks or other areas of National Park Estate.

Part 6 of the NPW Act provides specific protection for Aboriginal objects and declared Aboriginal places by establishing offences of harm.

It is a defence against prosecution for unintentionally harming Aboriginal Objects if due diligence had been exercised to determine that no Aboriginal object would be harmed, or the harm or desecration was authorised by an Aboriginal heritage impact permit (AHIP).

In accordance with the provisions of the NPW Act, the Proposal site has been assessed.

Impacts on Aboriginal cultural heritage are not anticipated. Should any Aboriginal objects be uncovered during the works, the works should cease in the vicinity of the find and OEH notified immediately (refer **Section 8.10**).

6.3.7 Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) regulates air, noise, land and water pollution, and is administered by Environment Protection Authority (EPA).

The objectives of the POEO Act are to:

- Protect, restore and enhance the quality of the environment in New South Wales, having regard to the need to maintain ecologically sustainable development,
- Provide increased opportunities for public involvement and participation in environment protection,
- Ensure that the community has access to relevant and meaningful information about pollution,
- Reduce risks to human health and prevent the degradation of the environment,
- Rationalise, simplify and strengthen the regulatory framework for environment protection,
- Improve the efficiency of administration of the environment protection legislation,
- Assist in the achievement of the objectives of the *Waste Avoidance and Resource Recovery Act 2001*.

Activities listed under Schedule 1 of the POEO Act are scheduled activities which require an Environmental Protection Licence to be issued by the Environment Protection Authority. The proposed works are not a scheduled activity and therefore an Environmental Protection Licence would not be required for this proposal.

Although the proposed works associated with the construction of the new seawall may not be a scheduled activity, under Section 120 of the POEO Act it is an offence to pollute water unless an Environmental Protection Licence is obtained.

Assuming that the safeguards identified in this SEE and the contractors CEMP are implemented, it is anticipated that no pollution of the waters would occur as a result of the proposal, and that the resources are protected and conserved. As such, an Environmental Protection Licence for the proposed works is not anticipated to be required.

6.3.8 Protection of the Environment Operations (Waste) Regulation 2005

The *Protection of the Environment Operations (Waste) Regulation 2005* sets out the provisions with regards to non-licensed waste activities and non-licensed waste transporting, in relation to the way in which waste must be stored, transported, and the reporting and record-keeping requirements. The disposal of construction waste would be required to comply with this regulation.

6.3.9 Biodiversity Conservation Act 2016

The *Biodiversity Conservation Act 2016* (BC Act) protects threatened species, populations and ecological communities and their habitat in NSW. If threatened species, populations, ecological communities or their habitat could be impacted by the proposal, an assessment of significance must be completed to determine the significance of the impact, in accordance with Section 7 of the BC Act.

Ecological investigations have considered the requirements of Section 7 of the BC Act and concluded that the proposal would be unlikely to result in a significant impact on threatened species, populations, ecological communities or their habitat. Potential biodiversity impacts of the proposal are discussed further in **Section 8.12**.

The proposed project does not occur within an area mapped as having high biodiversity value and will not results in the removal of native vegetation. As such, the preparation of a Biodiversity Development Assessment Report (BDAR) in accordance with the Biodiversity Assessment Method (BAM) is not required and has not been included in this report.

6.3.10 Water Act 1912

The *Water Act 1912* governs the issue of water licences for water sources in other areas. A licence is required to extract water from either a surface or groundwater source under Part 5 of the *Water Act 1912* if you want to construct a 'bore' in an area where a water sharing plan has not commenced. Note that the term 'bore' is used here to mean any bore or well, or any excavation or other work, connected or proposed to be connected with sub-surface water sources to access it either by natural flows or by a pump or other artificial means (refer to s. 105 *Water Act 1912*).

The proposed works is likely to require minor dewatering during construction and therefore a license under Part 5 of the Water Act would be required to be obtained prior to dewatering being undertaken.

6.4 Relevant Policies and Guidelines

6.4.1 DECCW Draft Guideline for Assessing the Impacts of the Seawall

The DECCW Draft Guideline for Assessing the Impacts of Seawalls was developed to assist in assessing any impact on coastal processes and coastal hazards, including those under projected climate change conditions.

The guidelines were developed to be used by or on behalf of landowners proposing to construct seawalls under the provisions of *State Environmental Planning Policy (Infrastructure) 2007* (Infrastructure SEPP) and the now repealed *Coastal Protection Act 1979* and *State Environmental Planning Policy No 71 – Coastal Protection.*

As a result of the recent changes to Coastal Management legislation and assessment processes in NSW the proposed coastal protection works (seawall) is now to be assessed under current legislation including the *Coastal Management Act 2016* and associated SEPP as discussed in **Section 6.3.1** and **6.2.3** respectively.

6.4.2 Policy and Guidelines for Fish Habitat Conservation and Management

Copies of development applications that are integrated development will be forwarded to NSW DPI for assessment. When considering integrated development applications, NSW DPI will make a decision as to whether the proposal should be permitted to proceed on the basis of compatibility with the adopted Policies and guidelines for fish habitat conservation and management (Update 2013).

A review of the Fisheries NSW's Policy and Guidelines for Fish Habitat Conservation and Management (2013 Update) was undertaken as suggested by the Department of Primary Industries, Fisheries Conservation (DPI) during consultation as part of the preparation of the original REF for the entire seawall design. DPI takes the policy into account when assessing and either approving or refusing proposals for developments or other activities affecting fish habitats.

The new seawall is considered not to be inconsistent to the guidelines. The new seawall is to replace the existing failing retaining wall along the same alignment above the typical high tide level.

The biodiversity values of the project area are considered to be low.

6.4.3 Mid North Coast Regional Strategy

In March 2009 the Minister for Planning released the Mid North Coast Regional Strategy. The Mid North Coast Regional Strategy is applicable to the Port Macquarie-Hastings LGA.

The purpose of the Strategy is to provide planning policy guidance for the sustainable development of the Mid North Coast region over the next 25 years. The majority of the matters in the Strategy do not relate to the proposed seawall. The strategy mainly links existing and future population growth and methods to minimise risks through land use planning.

The strategy recognises that some areas in the region, including Port Macquarie Hasting LGA may be subject to the effects of natural hazards such as flooding, coastal inundation and shoreline recession. It also states that the risk and severity of many hazards may be higher under climate change. Where a coastal zone management plan is not yet in place, the Regional Strategy requires that councils consider the higher levels of risk associated with climate change on or from potential new land releases, rezoning or existing development in areas subjected to hazards.

6.4.4 Northern Rivers Catchment Management Plan

The Northern Rivers Catchment Action Plan applies to the site. The Action Plan's priority is to guide natural resource management outcomes by identifying long term directions to address issues that could adversely impact on the catchment and establish directions for rehabilitation and environmental repair of natural resources that are under stress. It is considered that the proposal is not inconsistent with the Plan and in particular Goal No 2 and Strategy No 2.

It is noted that Strategy No SD 2.4 states: "Ensure adaptation strategies and management options for climatic variation and extreme climatic events are incorporated within landscape and seascape plan development and delivery." The adaptive design of the seawall to manage projected sea level rise conditions complies with this strategy in this regard.

6.4.5 NSW Coastal Policy 1997

Clause 92 of the EP&A Regulation states that the consent authority shall take into account the Government Coastal Policy for lands within the Coastal Zone.

As a result of the recent changes to Coastal Management legislation and assessment processes in NSW the proposed coastal protection works (seawall) is now to be assessed under current legislation which includes the *Coastal Management Act 2016* and associated SEPP as discussed in **Section 6.3.1** and **6.2.3** respectively

6.4.6 NSW Maritime Engineering Standards and Guidelines for Maritime Structures

The design complies with 'Engineering Standards and Guidelines for Maritime Structures' code (NSW Maritime 2005) and AS 4997 – Guideline for the Design of Maritime Structures.

6.5 Summary of Approvals and Consents

Table 6-2 provides a summary of the approvals or consents required in relation to the Flynns Beach Seawall Stage 1 works.

Table 6-2 Summary of Approvals and Consents

Agency/ Owner	Requirements	Reference
Northern Joint Regional Planning Panel	Development Consent of the proposed activity under Part 4 of the EP&A Act.	Part 4 of EP&A Act
Department of Industry Crown Lands	Land owner's consent from Crown Lands is required prior to determination of the DA. The Reserve Trust Manager (namely Council) is required to submit a Licence Application.	s155 of the *Crown Lands Act 1989*
Department of Primary Industries	Permit for dredging work and reclamation works and water land.	Section 200 of the FM Act

7 Consultation

7.1 Community Consultation

PMHC developed a community participation plan for the Flynns Beach Sea Wall project and undertook a series of community engagement strategies in 2013. The extensive Community participation and engagement process included;

- Public exhibition of concept plans at various locations in the Port Macquarie Hastings LGA;
- Media promotions inviting submissions, via newspaper, Council matters, and Mayoral column, as well as on-line and other social media including facebook and twitter;
- A community survey via Council's web site and Council's Community Forum "PMHC Listening"
- A presentation was made to invited key stakeholders (i.e. members of the surf club, the club-house caretaker and the kiosk owner) at a meeting held at the Surf Club on Wed 30 January 2013;
- 2 public forums held at the Surf Club; and
- A presentation to the Port Macquarie Hastings Council Access Committee

7.2 Agency Consultation

As part of the preparation of the original REF prepared by NSW Public Works (2016), the following agencies were consulted regarding the proposal:

- Office of Environment & Heritage (OEH) – Marine Parks Assessment, Coast Unit, Parks & Wildlife Unit and Planning Unit;
- Environment Protection Authority (EPA)
- NSW Coastal Council;
- Port Macquarie-Hastings Council;
- Trade & Investment - Crown Lands – Coastal Infrastructure and Taree Office;
- Department of Primary Industries – Fisheries, Crown lands, Marine parks
- NSW Coastal Panel

No additional stakeholder or community consultation has been undertaken during development of the Stage 1 works. Full details relating to stakeholder and community consultation that was undertaken during development of the proposal is provided in the Flynns Beach Seawall REF (NSW PW, 2016).

8 Environmental Assessment

This section identifies and characterises the likely potential impacts associated with the construction of the proposal. Where considered necessary, mitigation measures are identified.

8.1 Assessment Methodology

This SEE has been prepared to comply with Part 4 of Schedule 1 of the EP&A Regulation and indicates the following matters:

e) the environmental impacts of the development,

f) how the environmental impacts of the development have been identified,

g) the steps to be taken to protect the environment or to lessen the expected harm to the environment,

h) any matters required to be indicated by any guidelines issued by the Secretary for the purposes of this clause.

8.2 Air Quality

8.2.1 Existing Environment

The air quality at Flynns Beach is considered to be good due the coastal location. Possible sources of air pollution would consist mostly of intermittent due to exhaust fumes generated by vehicular traffic on Tuppeny Lane.

8.2.2 Potential Impacts

Local air quality may be affected by emissions from construction traffic including trucks transporting materials to and around the site.

Vehicles, plant and equipment to be used on site would be required to be serviced prior to use at the works site and be monitored to ensure they do not emit unacceptable levels of smoke and fumes. They would be required to meet emission levels set by the EPA.

Airborne dust may also occur. Methods to suppress potential dust would be included in the CEMP to minimise dust formation and maintain a suitable level of air quality. However, it would be unlikely that airborne dust would contribute to a permanent detectable reduction in local air quality.

8.2.3 Mitigation Measures

- The contactor would ensure are undertaken to minimise dust, cement dust and other objectionable matter into the atmosphere.
- The contractor would take all proper precautions to minimise any nuisance arising from dust caused by the construction activities. Such precautions may include but not limited to covering loads on trucks with tarpaulins and to spraying the roads with water or other suitable liquids. Methods to suppress potential dust would be included in the CEMP to minimise dust formation and maintain a suitable level of air quality.
- No burning of materials on site.

8.3 Water Quality

8.3.1 Existing environment

The Regional State of the Environment Report includes a section on marine water quality. The Beachwatch program results are provided in the 2012 report with results indicating water quality at ocean sites is good to very good across all monitored locations. The results for Flynns beach are available only for 2010 and are recorded as “very good”.

8.3.2 Potential Impacts

8.3.2.1 Construction Impacts

The Proposed works has the potential to result in minor impacts to surface water quality if left unmitigated as a result of construction works including excavation, stockpiling and accidental spills. A significant component of surface infiltration would be expected given the site is comprised mainly of beach sand and a lack of existing drainage infrastructure within the immediate site disturbance area.

On the Land

In the short term, excavation and vegetation removal during construction could result in slight increases in sediment transport associated with wind and rain. In addition, run-off from stockpiled areas could potentially be transported downstream which could degrade water quality by increasing turbidity and alter the chemical properties of the water during periods of rainfall. Appropriate storm water Best Management Practices (BMPs) and engineering controls shall be implemented during design and construction in association with the Blue Book (Landcom, 2004).

The work depot including any fuel storage are to be specifically included in the Soil and Water Management Plan for measures to prevent leakage from any spills or in the event of rain from leaving those areas. Bunding may be required.

The works landward of the existing retaining wall would also have the potential to be impacted on by overtopping waves. Therefore, any temporary works such as stockpiles, depots, equipment and the like would be located outside the area that has the potential to be overtopped by waves in a storm event.

Provided the safeguards listed below are implemented the risks of impacts are considered low.

On the Beach

The construction methodology includes construction vehicles located on the beach to undertake the construction work. These would be removed from the beach after work each day, and no works would occur on the beach during storm events.

Vehicles are also required on the beach to remove the sand at the base of the existing retaining wall. This sand is to be temporarily stockpiled on the beach.

A vehicle shakedown area would be established on land to ensure that soil and sediment from the land is not racked onto the access to the beach and onto the beach itself. This shakedown area would also prevent sand from vehicles exiting the beach from being tracked onto the foreshore areas.

Care is required to maintain these beach vehicles to ensure fuel and oils are not deposited on the beach. Where this does occur, work is to stop, and the spill response plan is to be enacted to remove any spill from the beach immediately. Work would commence upon satisfactory removal of the spill. The contractor is to report how the incident occurred and what measures are to be taken to prevent such a spillage in the future from occurring.

It should also be noted that it is an offence under Section 120 of the *Protection of the Environment Operations Act 1997* to pollute water by allowing the release of pollution into the sea.

Groundwater

Based on the results of the geotechnical investigation, groundwater was encountered at an elevation range of approximately -1.2 - 0.7 m AHD in BH01, BH02 & BH04 (Cardno, 2018b). Bulk excavations are expected to extend to 0.0-1.0 m AHD and as such minor dewatering would be required. Where excavations extend to depths greater than 0.0 m AHD, seepage from the sidewalls of the excavation may be encountered due to tidal fluctuations and large swell conditions during the construction.

Groundwater levels encountered during the site investigations were measured during low tide and as such are expected to be lower bound limits. The extent of dewatering during construction would likely depend of the shoring / excavation strategy adopted.

8.3.2.2 Water Quality (operational impacts)

In addition to the stress caused by high energy oceanic events, one of the causes for sections of the existing retaining wall to fail is the nearshore stormwater runoff. It is creating instability of the soils immediately landward of the wall and undermining parts of the vertical sections of the retaining wall.

In addition, overtopping by storm waves onto the landward sections of the foreshore causes ponding and cannot be sufficiently drained and managed, and therefore has the potential to cause further instability to the wall.

It is understood from the design of the proposed seawall that a drainage medium would be included immediately behind the proposed seawall.

As the seawall is located within a marine environment, and subjected to stress from the oceanic environment, periodic maintenance of the seawall would be required.

8.3.3 Mitigation Measures

8.3.3.1 Construction Period

- The contractor would develop a storm and rain event contingency plan in the event of high water levels on the beach, overtopping of the works area and foreshore by waves, and rain events during the construction stages of the seawall.
- Methods to prevent the discharge onto the foreshore, beach or ocean of any oils or similar materials or of any foaming or non-biodegradable detergents.
- Washing out of concrete trucks and pumps on site will be undertaken at designated areas/wash out bays away from the beach environment.
- Methods to reduce the likelihood or impact of any fuel or petro-chemicals spills at the site related to refuelling of all light vehicles. Such refuelling will occur off site. Refuelling of any other vehicles will be via a designated refuelling area away from beach environment with an appropriate spill kit available.
- Regularly servicing all vehicles and equipment used at the site off site.
- An Emergency Oil and Fuel Spillage Plan would be prepared. Such a plan would include keeping spill kits at the works site for the event of a fuel spillage, and all machinery would be suitably maintained to minimise the risk of any fuel leakage measures in the event of a pollution spill or the like on the foreshore or beach. Measures would include, but are not limited to:
    - Immediately cleaning up any oil or fuel spill or leaking from plant, equipment or vehicles.
    - Excavate any sand or impregnated soil if necessary and remove to approved disposal area.
    - Repair or maintain the equipment, plant or vehicle that caused the pollution.
- In the event of pollution to the ocean the Contractor is to undertake notification in accordance with the pollution notification requirements under the *Protection of the Environment Operations Act 1997*. This may include immediately contacting the Council or EPA and follow all directions given to clean up the contamination and prevent any further pollution.
- Reporting by the contractor how the incident occurred and what measures are to be taken to prevent such a spillage in the future from occurring.
- In areas where equipment might drip oil or cause other damage to surfaces, a protective cover of heavy gauge, flame resistant, oil proof sheeting would be provided so that no oil or grease contacts the surface under.
- Designing any temporary access tracks to the beach or on the foreshore so as to provide adequate drainage and stormwater control.

8.3.3.2 During Operation

- Monitoring by Council of the stormwater runoff and water quality would be undertaken to ensure the integrity of the works is maintained.
- Council to include the new seawall in its infrastructure maintenance plan and for periodic inspections.
- During and/or after a storm event inspections of the seawall would be undertaken to ensure structural stability of the seawall.

8.4 Landform, Geology and Soils

8.4.1 Existing environment

Flynns beach faces east towards the Pacific Ocean. The local topography is characterised by relatively flat deposits of Marine Aeolian sands on the foreshore. The beach is located at the base of a steep east facing hill comprising of weathered sedimentary rock and residual clays with grades in the order of 40-60 degrees approaching near vertical in some locations.

The beach is approximately 450m in length and is bound to the north by a large steep rocky headland and several smaller low rocky headlands to the south.

A geotechnical report by Coffey Geotechnics Pty Ltd (Coffey) was prepared for the Flynns Beach Seawall Project in 2013. The lack of suitable intrusive investigations such as drilling or test pitting during these previous investigations were identified during additional geotechnical investigations carried out by Cardno in 2018. Discrepancies between estimated depths to rock were identified with rock depths encountered significantly shallower throughout recent investigation works performed by Cardno. Rock type was also misidentified (Cardno, 2018c). The results of the Cardno geotechnical investigations for Stage 1 of the Project are therefore described in this report.

The key findings of this investigation are as follows:

Subsurface material present within the depth of the bulk excavations is expected to comprise:

- Marine sands (Unit M1); and
- Stiff residual clays of medium to high plasticity (Unit R1).

If deep foundations are utilised during design where applicable, it is expected that excavations may extend further into the underlying hard residual clays (R2).

The Acid Sulfate Soil Risk Map – Edition Two for Wauchope-Port Macquarie was reviewed during geotechnical investigations to identify potential areas where acid sulfate soil material is present. The map indicates that the site is situated in an area of no known occurrence of acid sulfate soils.

Naturally Occurring Asbestos

Naturally occurring asbestos (NOA) including chrysotile commonly occurs in the serpentine rock group, which is found in the Port Macquarie area.

A visual inspection study was undertaken by a Licenced Asbestos Assessor at NSW Public Works in 2015 to ascertain the risk associated with naturally occurring asbestos at Flynns Beach during the preparation of the NSW Public Works REF. The inspection did not identify any naturally occurring asbestos along the surface of the proposed Flynns Beach sea wall (MHL,2016).

Additional testing undertaken by Cardno of one representative sample of serpentine rock taken from outside of the stage 1 works impact area found no Asbestos to be present (Cardno, 2018b).

Further to this, it is not expected that the depth of bulk excavations would extend into the underlying hard residual clays within the Stage 1 works area.

In the unlikely event that excavations encounter serpentine rock additional investigations should be undertaken to determine the presence or otherwise of NOA.

8.4.2 Potential Impacts

Construction of the project would result in ground, sand and soil disturbance associated with clearing, earthworks and excavation works.

Construction works could potentially have the following impacts:

- soil erosion;
- dust from excavation work and vehicle movements;

- soil contamination caused by oil, chemical, grease or fuel spills or leaks from machinery; and
- sediment laden run-off from disturbed areas into stormwater and/or waterways.

The construction work will involve stockpiling materials. There is the potential for stockpiled loose material and sediment to be washed away during rain if not properly contained.

Due to the location of the works there is a potential that the work site may be affected by coastal storms. Under severe storm conditions the entire sandy beach area may be, at least temporarily, lost due to erosion. As such, the construction area would require appropriate protection and contingency measures for such an event.

Provided the areas of disturbance have been suitably stabilised following and monitored during construction works, the potential impacts to soils are predicted to be low.

8.4.3 Mitigation Measures

Soil and Water Management

- A Soil and Water Management Plan (SWMP) has been prepared by the Contractor.

The following management and mitigation measures are to be adhered to to ensure impacts to the environment are avoided:

Soil

- Methods to minimise the discharge of water containing soil to the beach or ocean.
- Site specific measures to be implemented in accordance with the standards outlined in the 2004 Landcom publication Managing Urban Stormwater: Soils and Construction, 4th edition (“The Blue Book”).
- Installation of erosion sediment control devices, where required, before commencement of the works.
- A designated clean down area for construction vehicles exiting the beach will be established.
- Trucks shall be cleaned to the extent necessary to ensure that wheels and all surfaces are free of mud before they enter public roads. Water from such wheel clean down activities is not to enter the beach. The Contractor shall be responsible for the removal of mud spilt by construction equipment/vehicles on public roads and paved areas on the foreshore.

Sand

- Methods to control water from the sea during normal tides from entering the beach works site on the beach whilst vehicles/equipment are located on the beach or a contingency plan to remove the construction vehicles/equipment from the beach
- Measures to protect the stockpiles of sand on the beach
- Minimising any stockpiling of fill if required for the works and to transport to site as required.
- Protection of any stockpiled bore material from scour and erosion, including coverings or bunding as relevant.
- Locating any stockpiled bore materials and all other materials and works depots and areas landward of any potential overtopping wave area.
- Ensuring vehicles leaving each works site are to be cleaned to ensure sediment is not tracked onto the public roads.
- Timing works, if practicable, to be timed to fall outside of high rainfall or coastal storms.
- Returning stockpiled sand on the beach to the base of the new seawall once the seawall works have been completed.

Stormwater and Overtopping

- The contractor would develop a Storm Contingency Plan in the event of high water levels on the beach, overtopping of the works area and foreshore by waves, and rain events during the construction stages of the seawall. The plan would aim to protect unfinished works, minimise risk to the plant and equipment and

minimise the risk of pollution to the environment. The Storm Contingency Plan is to also provide for the safety of personnel.

- The Storm Contingency Plan would include a plan showing locations that may be overtopped by waves during a storm. Any construction works such as stockpiles, depots, equipment and the like would be located outside the area that has the potential to be overtopped by waves in a storm event.
- The contractor would monitor weather conditions throughout the construction phase and implement the Storm Contingency Plan when necessary.

8.5 Coastal Processes and Sea Level Rise

8.5.1 Existing Environment

Flynns Beach is approximately 500m in length and faces east-north-east. It is an embayed sandy beach located between two rocky headlands that faces east-north-east and hence it is somewhat protected from the dominant offshore wave direction from the south-south-east in comparison with open ocean beaches on the NSW mid-north coast. Rocky features are present throughout the foreshore area, with a rocky outcrop in the centre of the embayment creating a small salient feature towards the south of the beach.

More extensive and shallow rock reefs exist offshore of the beach further south. Flynns Beach is further protected by the offshore reef system that helps to dissipate incident storm waves (through breaking) and acts to perch the beach to create a relatively flat and further dissipative surf zone profile with slopes of 1:100 to 1:150.

The Surf Life Saving Association website indicates that waves average 1.4m and the beach maintains two permanent rips against the northern headland and southern rocks, with a third rip crossing the central bar and following higher waves. Seaward of the bar is a trough and outer bar also cut by rips at either end.

Usually the beach sand seaward of the retaining wall at Flynns Beach is effective enough in reducing wave energy. However during storms, the retaining wall provides the secondary line of protection behind the beach to protect the foreshore and amenities such as the Surf Life Saving Club.

Normally, as the beach recedes due to severe wave action, sand is shifted from the beach. This sand deposited off-shore is normally returned to the beach by flatter waves. However, if storm waves persist long enough, the potential is there for the shoreline at Flynns Beach to recede to the seawall, and the sea bottom seaward of the seawall may be lowered. If this occurs, or there is the potential for this to occur, then beach nourishment may be required. This is because sand may be taken out of the beach compartment and may be unable to return during flatter waves, although this has not occurred to any measurable extent in the past 30 to 40 years.

The MHL Design report (MHL, 2014) indicates that sediments on the shoreline are generally mobilised to align the shoreline with the approaching wavefronts. Longshore drift or alongshore transportation of sediments is generated when there is a misalignment between the approaching wave fronts and the shoreline. Offshore significant wave height and wave direction are shown in **Figure 8-1** below.

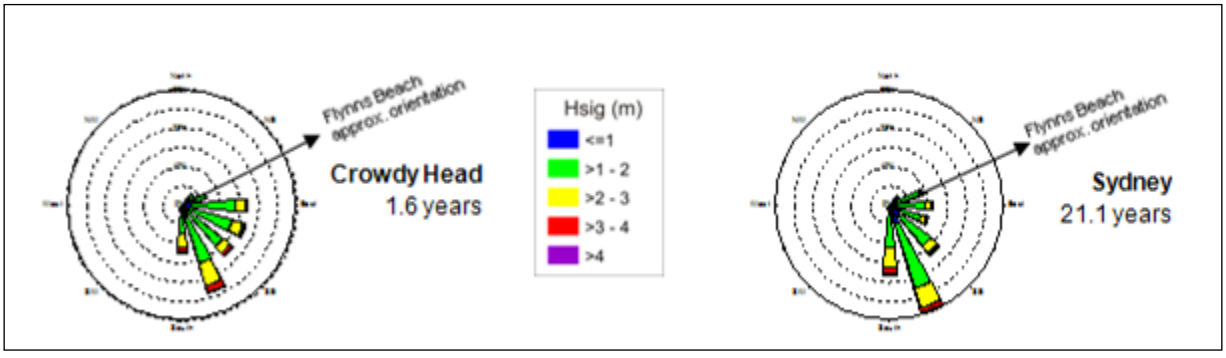


Figure 8-1 OEH/MHL Offshore Significant Wave Height and Wave Direction *Source: MHL Design Report, 2014*

As a consequence of the dominant incident wave energy direction from the south-south-east, the longshore sand transport within the Flynns Beach embayment is estimated to be between 20,000 cubic metres per year and 50,000 cubic metres per year towards the north (based on measured quantities at similar mid-north coast beaches), with the majority of longshore transport taking place episodically during major coastal storms. Little or no net loss of sand is evident within the embayment during the last 30 to 40 years, however, with incoming and outgoing sand volumes generally matching based on the shoreline position from historical aerial photogrammetry analysis (MHL, 2013) and anecdotal accounts.

Notwithstanding a generally balanced sediment budget indicated for Flynns Beach (with no evidence of long-term beach recession), changes to the subaerial beach width from north to south and vice versa are observed to occur in response to interdecadal variability in the dominant incident wave energy direction (due to ENSO) causing some rotation of the beach alignment. As with cross-shore sediment transport, future beach nourishment may be required to maintain an adequate beach amenity in response to any permanent longer-term change to the dominant incident wave energy direction resulting from Climate Change (CSIRO, 2007).

8.5.2 Potential Impacts

The proposed seawall has been designed taking into account the existing coastal environment and coastal processes and based on engineering principles as detailed in the Cardno Basis of Design Report (Cardno, 2018).

The scope of the MHL Report (2014) did not include sea level rise predictions within Council's local government area. As a result MHL's report adopted a risk based approach to deal with the inherent uncertainty of climate change and sea level rise projections. MHL has however tested the seawall design using the State Government's previous benchmarks comprising a sea level rise of 40cm by 2050 and 90cm by 2100. This level was selected by MHL to represent upper bound projections because trends since the year 2000 indicated global emissions would exceed the highest IPCC (2007) scenarios.

Cardno's design has taken into account the geology and the expected foundation conditions, including sub-surface layers and the weathered materials that are anticipated to be encountered. The adopted Stage 1 seawall design relies on both cantilever action of the "L" shaped wall profile and the capacity of reinforced concrete piles socketed into the insitu stiff clay strata for both local and global stability. Cardno has undertaken a detailed analysis of the proposed seawall design for both strength and serviceability limit states conditions.

The design parameters such as wave height, period and direction, tide levels and storm surge levels have been adopted from the MHL information and have included in the design parameters. The design life has been quantified and the acceptable risk of failure during this period estimated.

The design presented is based on the basic geometry of the previously adopted MHL design with respect to wall crest height. Cardno understand that the MHL design established a balance between the cost of the proposed seawall and the degree of protection required as it was considered not economical to build a sea wall to the height of the highest possible wave, and such a height would be detrimental to the amenity (visual) of the beach.

Therefore, as previously adopted, an adaptive strategy has been included in the revised design of the seawall for sea level rise as a consequence of climate change. To the south of the clubhouse the section of vertical concrete panel and steel pile seawall (Type C2) would have crest level of 4.1m AHD. The 4.1m crest is assessed to be adequate to tolerate minor wave overtopping as expected under present sea level conditions. However, the adaptive strategy provides that this section of seawall can be raised to 4.5m AHD (or higher) by construction of an extension to the existing vertical wall panel or by construction of a supplementary low-height wall at the crest of the existing seawall.

It is not anticipated that wave patterns will be changed as a result of the seawall. Therefore sand movements are not anticipated to change. The amenity of the beach should not be adversely affected, and together with beach nourishment, when required, will provide the community with an asset for many years to come.

8.5.3 Sea Level Rise

8.5.3.1 Mitigation Measures

- Observations would be undertaken by Council to ascertain changes in sea level conditions. In the event of sea level rise, Council would seek engineering expert advice as to whether the adaptive strategy should be implemented.
- Council will keep records of any seawall damage and repairs, including landscaped areas as this will form an important inventory for future assessment of trigger levels for sea level rise adaptation.

8.6 Visual Amenity

8.6.1 Existing environment

Flynns Beach is a picturesque beach (refer to **Figure 8-2**) and is one of the most popular beaches in Port Macquarie for families. It is an embayed sandy beach and is patrolled for 32 weeks of the year by the PMHC Professional Lifeguard Service and the Volunteer Surf Lifesavers from the Port Macquarie Lifesaving Club. Patrols start from the September-October school holidays and finish on ANZAC Day (or finish of the school holidays).

The beach is located below a vegetated bank approximately 100m in height and the height of the bank prevents direct overlooked from the road immediately above and from the residential and commercial development on the western side of that road.

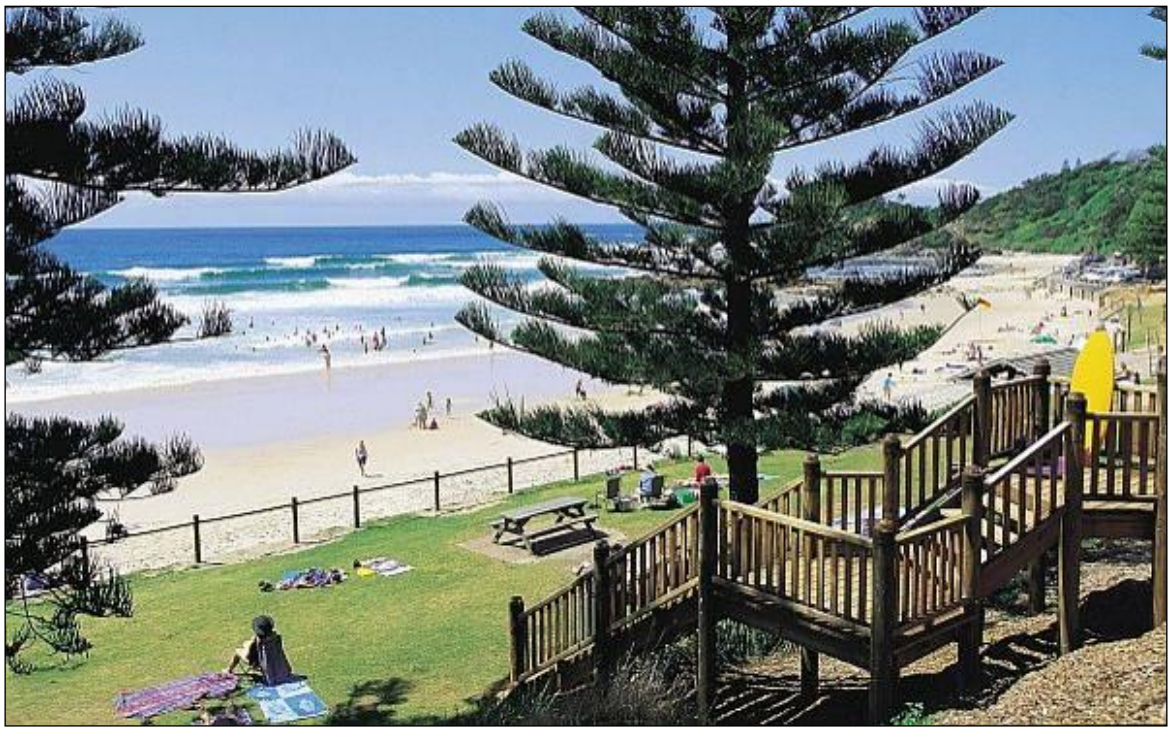


Figure 8-2 View of Flynns Beach (Source: Port Macquarie-Hastings Council website, Accessed 2014)

8.6.2 Potential Impacts

8.6.2.1 During Construction

During construction, visual impacts associated with the works would be associated with the day-to-day operation of the construction works. The works will be highly visible to users of the beach and the foreshore areas.

As the works will be to the seawall, the works will not be visible from Pacific Drive, however construction vehicles entering and exiting Tuppeny Lane will be visible.

8.6.2.2 During Operation

Post construction, Flynns Beach would be returned to a picturesque setting. Minimal change to its natural setting or natural features would be apparent and the foreshore area would be landscaped.

The proposed new seawall has been designed to current sea level conditions. Had the seawall been designed using an upper end projection of sea level rise, the new seawall would have appeared with a crest level 1.0m to 1.5m higher than the existing retaining wall. Such a height would have detracted from the existing character and serviceability of the beach and surrounding amenities and incur potentially unnecessary cost should these upper end projections not materialise.

The proposed design height therefore has not been designed for sea level rise, but includes an adaption strategy to raise the height in the event that sea level rise eventuates. Therefore, the design is considered to have minimal impact due to the height proposed.

The proposed seawall will appear as consisting of a number of elements but representing a unified form with its main purpose being a sea defence structure. The visual appearance is provided in the plans in **Appendix A**.

Sand nourishment comprising importation of suitable beach sand may be required to maintain the subaerial beach amenity if sea level rise projections eventuate. This sand nourishment will assist to retain the visual amenity of the sandy beach.

8.6.3 Mitigation Measures

8.6.3.1 During Construction

- Work areas and surrounding grounds would be kept clean and free from rubbish and debris.
- Materials and supplies will be stored in locations that will permit easy cleaning of the area and not block accessways.
- All materials used for construction such as hoses, cables, extension cords, and similar would be located, arranged and grouped to permit easy cleaning and maintenance and not block accessways. At the close of each work week and at the close of each day preceding a holiday, all such items would be removed from the construction area and stored in the site depot.
- On completion the site shall be left free from all scrap, rubbish, waste materials and debris resulting from work.
- On completion of the work the contractor would remove all temporary depots, facilities and reinstate the areas disturbed by their construction activities to their condition existing prior to the commencement of work unless otherwise agreed with Council. Disturbed areas shall be graded to uniform contours where required.

8.6.3.2 During operation

- Landscaping of the foreshore would be undertaken as soon as practicable after the completion of the seawall construction works.
- Sand nourishment comprising importation of suitable beach sand may be required to maintain the subaerial beach amenity if sea level rise projections eventuate. This sand nourishment will assist to retain the visual amenity of the sandy beach.

8.7 Community Recreation

8.7.1 Existing environment

Flynns Beach is one of the most popular beaches in Port Macquarie for families. It is an embayed sandy beach and is patrolled for 32 weeks of the year by the Port Macquarie HC Professional Lifeguard Service and the Volunteer Surf Lifesavers from the Port Macquarie Lifesaving Club. Patrols start from the September-October school holidays and finish on ANZAC Day (of finish of the school holidays).

The Council provides various facilities for the public at the reserve including carparking, picnic tables, electric BBQ, café, showers, water drinking station, amenities. The Surf Life Saving Club located at Flynns Beach was constructed in 1929 in preference to adjacent beaches because the beach provides generally safe surf

conditions, has less rock and more sand along its length and has good vehicle access, with a beachfront park and car parking along Tuppenny Lane and in Pacific Drive above.

8.7.2 Potential Impacts

8.7.2.1 During Construction

The proposed works would have some minor impact during construction on the land based passive and active recreational pursuits e.g. walking, Surf Club boat access, café, picnicking and use of the beach. The most noticeable will be in the areas cordoned off for the particular stage of the seawall construction. In additional noise and visual impacts will affect the amenity of users of Flynns Beach during the construction works. Access to the cordoned off areas will be prevented during the works to ensure public safety, however the remainder of the beach and foreshore areas will remain open to the public. Access to the clubhouse and café will remain at all times during the project.

Crown Lands have requested that the following lessees be notified by Council 2 weeks prior to commencement of the proposed works namely: Surf Life Saving Club, Tennis Club and RSL Youth Club (See correspondence in MHL REF, 2016)

Signage would be provided to inform the public of changes to beach and foreshore access and other important safety information. Security fencing would be kept to a minimum required for safety of the public and workers.

8.7.2.2 Operational Impacts

The addition of a dual function accessibility ramp and vehicle access will provide increased access to the beach for disabled persons, as well as improving access for Surf Lifesaving vehicles and boats, council vehicles for beach maintenance and cleaning, and for maintenance of the seawall. The new ramp will meet the guideline slopes for accessibility (AS1428.1-2009) providing direct access from the two disabled parking spaces to both the beach and clubhouse area.

8.7.3 Mitigation Measures

8.7.3.1 During Construction

- A Safety Management Plan would be prepared by the Contractor and the Contractor is to ensure that work is carried out at all times in a manner that is safe to both members of the public and the Contractor's work force. The Safety Management Plan would address public safety and construction work safety including occupational health and safety risk mitigation measures in relation to workers during construction. The contractor would be required to employ occupational health and safety risk mitigation measures in relation to workers during construction.
- Security and safety fencing as practicable for onsite conditions would be required to be in place prior to the commencement of any stage of the works.
- Construction works would be undertaken outside the summer period and in the main outside periods of high beach usage.
- The work site outside normal work hours will be made safe, kept tidy and equipment will be stowed in a secure state.
- Preparation of a dilapidation report that describes the state of the site at Flynns Beach including a detailed photographic record and reports of the condition of existing Norfolk Pine trees (including tree branches (in particular low lying branches) and the underlying root system), public areas to be used for access, roadways, any beach accessways, footpaths, utilities, existing conditions of buildings and structures including existing cracks, footings, plaster and the like. The report would be provided to, and approved by the Superintendent prior to the commencement of any works on the site.
- A Community Consultation Plan will be prepared by the Contractor to address public consultation during the construction works to facilitate recreation in the area during the construction period including alternative access routes to the foreshore, beach, Surf Life Saving Club and café.

- The Community Consultation Plan is to include liaison with Council to determine any dates that the beach or clubhouse may be required for special or specific public recreation events and the like. The construction program is to take into account any special or specific events.
- A Public Signage Plan would be prepared by the Contractor including which areas are closed and which routes are open.
- The following lessees are to be notified by Council 2 weeks prior to commencement of the proposed works – Surf Life Savings Club, Tennis Club and RSL Youth Club.

8.7.3.2 During Operation

- Signage would be provided alerting the public to any safety matters during storm events.

8.8 Public Access and Safety

8.8.1 Existing Environment

Parts of the existing retaining panels that are unstable pose a threat to public safety to people directly under the panels on the beach or walking in close proximity above. There is potential for individual panels to collapse or slump on the foreshore. If the existing retaining wall is left in its current condition and allowed to further collapse, the foreshore would continue to be eroded causing further safety issues.

8.8.2 Potential Impacts

The new seawall works will prevent the collapse of the existing retaining wall and undermining of the foreshore. The proposed stormwater works (by PMHC) are required to reduce the potential for undermining of the new works and slumping of the foreshore.

It is considered that the works will have a very similar alignment to the existing configuration of the retaining wall and therefore will not present any further hindrance to public access during operation. The actual design of the seawall incorporates improvements to public access and amenity.

To further provide for safety a handrail has been provided to the seawall. In addition, the design of the proposed seawall includes an emergency vehicle access ramp to allow access to the beach from Tuppenny Lane for emergencies.

Following the completion of the works, the longer-term safety impacts of the works would be favourable. In particular, the failing sections of the seawall would no longer pose a safety issue, and the seawall would improve the overall stability and safety of the seawall.

It is not anticipated that the seawall would cause detrimental public safety impacts during operation. However, during storm events wave overtopping may be hazardous to pedestrians and vehicles. Signposting may be provided to the public to alert the public during such an event.

The addition of a dual function accessibility ramp and vehicle access will provide increased access to the beach for disabled persons, as well as improving access for Surf Lifesaving vehicles and boats, council vehicles for beach maintenance and cleaning, and for maintenance of the seawall. The new ramp will meet the guideline slopes for accessibility (AS1428.1-2009) providing direct access from the two disabled parking spaces to both the beach and clubhouse area.

8.8.3 Mitigation Measures

- To minimise risks to public safety, it is planned that the construction works would be undertaken outside the summer period and in the main outside periods of high beach usage.
- Signage would be provided to inform the public of the construction works as per the Signage Plan prepared by the Contractor.
- Security and safety fencing would be required to be in place prior to the commencement of any stage of the works.

- The Contractor would be required to ensure that work is carried out at all times in a manner that is safe to both members of the public and the Contractor's work force, including implementation of work health and safety and traffic management measures. Traffic management measures are detailed further in **Section 8.9** and the Traffic and Pedestrian Management Plan associated with the CEMP.
- The work site outside normal work hours will be made safe, kept tidy and equipment will be stowed in a secure state.
- Contractors would be required to liaise closely with Council to determine any dates that the beach or clubhouse may be required for specific public access. Pedestrian access will be maintained at all times to the beach, the clubhouse and café. Car access and public access outside normal construction work times will be unrestricted except for the cordoned off areas, or as advised in a notice on the road above the beach.

8.9 Construction Traffic and Access

8.9.1 Existing Environment

Flynns Beach is accessed from Pacific Drive via Tuppenny Lane. Tuppeny Road is a two lane, one way road with parking along one lane on alternating sides depending on road bends. Entry to Tuppeny Road is from the northern end from Pacific Drive with exit to the South also onto Pacific Drive. Pedestrian access is via wooden stairs from Pacific Drive and via Tuppenny Lane.

8.9.2 Potential Impacts

A Traffic Management Plan has been prepared by the Contractor. The following information is taken directly from the Traffic Management Plan which is to be provided with the CEMP for the construction works.

During normal daily works it is expected that the average vehicle movements will be up to 2 trucks per day and 5 light vehicles.

Table 8-1 below details the anticipated number of vehicles that will be accessing the construction site from Tuppeny Road per day during peak construction periods.

These are average numbers based on construction experience and knowledge and which will increase and decline at specific times of the project.

Table 8-1 Table 4: Anticipated Construction Traffic Volumes – Entry & Exit is counted as separate traffic volume movements

Programme Task	Vehicle Type	Traffic Volume
Site establishment & disestablishment	Light Vehicles	[20] movements per day
	Heavy Vehicles	[10] movements per day
General Construction of Walls	Light Vehicles	[10] movements per day
	Heavy Vehicles	[4] movements per day
Installation of Piles	Light Vehicles	[10] movements per day
	Heavy Vehicles	[4 - 8] movements per day *(concentrated vehicle movements during concrete pours)*
Pouring Concrete Retaining Walls	Light Vehicles	[14] movements per day
	Heavy Vehicles	[4 - 12] movements per day *(concentrated vehicle movements during concrete pours)*
Importing / Exporting Fill Materials	Light Vehicles	[10] movements per day

Given the predicted volume of truck and vehicle movements, there is likely to be some inconvenience to the users of Flynns Beach and users of the local road system.

It is anticipated that the road may be closed for short periods when construction vehicles are accessing the site to deliver specific equipment or materials. Signage and appropriate traffic management will be implemented during these times as per the Traffic Management Plan.

The operation of the seawall will not impact traffic and access in the long term.

8.9.3 Mitigation Measures

- A Traffic Management Plan (TMP) has been prepared by the Contractor to address safety issues with regard to construction traffic and public access.
- The TMP covers all aspects of public access and traffic management at the site with the aim of minimising the impact of the construction work on the existing traffic flow and public access areas.
- Due to space and access restrictions workers and contractors will not be able to park on the construction site without making prior arrangements with the Project Manager. Parking is available on Pacific Drive as per local parking restrictions.
- Traffic management specifically related to the proposed use of the southern exit point of Tuppenny Lane as an entrance for trucks and constructing vehicles.
- A dilapidation report of Tuppenny Lane would be prepared prior to construction works.
- Post construction any roads impacted by the works would be returned to a condition equivalent to or better than its prior condition.
- All roads should be kept clean and free of dust and mud at all times. Where excavated material is tracked onto roads at any time, it would be removed immediately so that road pavements are kept safe and trafficable.
- Roads shall, where necessary, be swept with a vacuum sweeper to remove any material. Where hosing of the road surface is carried out, loose material should be trapped to prevent it from being discharged into drains and waterways.
- All construction traffic would comply with all applicable traffic laws and regulations including speed limits.
- The contractor to minimise traffic inconvenience to the Surf Lifesaving Club operations, the café and users of the beach

8.10 Aboriginal Heritage

8.10.1 Existing environment

The Birpai Aboriginal peoples are the original inhabitants of the region, and areas and sites of Aboriginal Cultural Significance must be respected.

The Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW (DECCW, 2010) has been considered in assessing the likelihood of encountering items of Aboriginal cultural heritage during the construction works. As part of the preparation of this REF, a search of the OEH NSW Atlas of Aboriginal Places indicated that there are no Aboriginal places at Flynns Beach or in the vicinity of the beach.

A search of OEH's Aboriginal Heritage Information Management System (AHIMS) database conducted on the 21th June 2018 indicated that no Aboriginal sites have been recorded and no Aboriginal places declared within 200m of the Flynns Beach foreshore (Lot 7052 on DP 1121282) (**Appendix B**). The site has been subjected to past disturbances and clearing. There is no known evidence of Aboriginal occupation or previously unidentified sites at the proposed site, or within the immediate vicinity.

It is considered that further archaeological investigations and/or an Aboriginal Heritage Impact Permit are not required and that the works can proceed with caution.

8.10.2 Potential Impacts

A search of the OEH NSW Atlas of Aboriginal Places indicated that there are no Aboriginal places at Flynns Beach or in the vicinity of the beach.

In addition, a search of OEH's Aboriginal Heritage Information Management System (AHIMS) database indicated that no Aboriginal sites have been recorded and no Aboriginal places declared within 200m of the Flynns Beach foreshore (Lot 7052 on DP1121282). The site has been subjected to past disturbances and clearing. There is no known evidence of Aboriginal occupation or previously unidentified sites at the proposed site, or within the immediate vicinity. A copy of the search may be found in **Appendix B**.

The Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW (DECCW, 2010) has been used in assessing the likelihood of encountering items of Aboriginal cultural heritage during the construction of the proposed development. The site is located within a sand dune system which is a landscape feature that may contain Aboriginal objects. However, there are no relevant confirmed site records on AHIMS, no known Aboriginal items in the vicinity, and the area has previously been highly disturbed due to the construction of the existing retaining wall and the natural coastal disturbance on the beach.

It is considered that further archaeological investigations and/or an Aboriginal Heritage Impact Permit are not required and that the proposed development can proceed with caution. In the event that any Aboriginal heritage items are found during the works, works should cease and the mitigation measures listed in this REF should be applied.

8.11 Non-indigenous Cultural Heritage

The site is not identified as an item of environmental heritage in Schedule 5 of the Port Macquarie-Hastings LEP, the NSW State Heritage Register or located in a heritage conservation area.

8.11.1 Mitigation measures

- All workers/contractors at each stage of the works would be informed of their obligations under the *National Parks and Wildlife Act 1974*, namely that it is illegal to disturb, damage or destroy a relic without the prior approval of the Chief Executive of OEH.
- If any Aboriginal object is discovered and/or harmed in, on or under the land, the proponent must:
  - not further harm the Aboriginal object,
  - immediately cease all work at the particular location,
  - secure the area so as to avoid further harm to the Aboriginal object,
  - notify the Office of Environment and Heritage (OEH) as soon as practicable on 131 555, providing any details of the Aboriginal object and its location, and
  - not recommence any work at the particular location unless authorised in writing by OEH.

8.12 Flora and Fauna

8.12.1 Existing environment

An Ecological Impact Assessment including database review and field study was undertaken by Cardno in 2018 to assess the impacts of the Stage 1 works. The full report is provided in **Appendix C**.

The vegetation within the Study Area is predominantly exotic grasses and planted trees. In particular, several *Araucaria heterophylla* (Norfolk Island Pine) and *Dracaena draco* (Dragon Tree) occur in close proximity to the proposed Stage 1 seawall location.

One threatened flora species was detected within the Study Area, *Sophora tomentosa* (Silverbush), which is listed as endangered under the BC Act. There were at least 45 saplings growing along the remains of the existing seawall. There were also numerous patches of mature specimens growing along the sandy beach/vegetation zones south of the proposed stage 1 seawall.

No threatened fauna species were detected within the study area. A Grey-headed Flying-fox (*Pteropus poliocephalus*), which is listed as vulnerable under the BC Act and EPBC Act, was observed foraging within the Littoral Rainforest vegetation adjacent to the Study Area. No evidence was found to indicate that the Study Area or the adjacent vegetation was being used as a roosting camp site. The habitat features for threatened fauna within the Study Area were limited as the site is highly modified/disturbed, however, sandy beach habitat occurs adjacently to the existing seawall. Threatened fauna species potentially using the site, would most likely be

moving through the site as they travel between areas of more optimal habitat. Habitats adjacent to the Study Area that would potentially be suitable for threatened fauna species include:

- Coastal Heath;
- Littoral Rainforest; and
- Rocky outcrops located in the intertidal zone.

No hollow-bearing trees were present within or in close proximity to the Study Area.

The retaining wall and location of the proposed seawall is not located in the intertidal zone, subtidal zone or sea and neither the rock nor concrete sections showed evidence of invertebrate species such as barnacles, periwinkles and littorinoids. This is because the walls are not regularly inundated, and therefore no sponges or types of ascidians were found.

The study area does not include the marine environment. The ocean waters off Flynns Beach are not mapped as a key fish habitat and there are no rivers, streams or estuaries associated with the beach. One of the consequences of the frequency and intensity of coastal storms is that the wave energy prevents the establishments of offshore seagrass beds and open coast mangrove or meadows of saltmarsh along much of the NSW open coast including Flynns Beach. The site is considered not to offer significant breeding habitat for fish or other aquatic species.

8.12.2 Potential Impacts

8.12.2.1 Vegetation

The project would require the removal of exotic grasses and will largely avoid native vegetation. No areas mapped as Littoral Rainforest, would be directly or indirectly impacted. Therefore, the project would not have any direct or indirect impact on any threatened ecological community listed under the BC Act or EPBC Act. The planted *Araucaria heterophylla* (Norfolk Island Pine) should be retained and protected in accordance with the *Australian Standard AS4970-2009 Protection of trees on development sites* and *Australian Standard AS4373 Pruning of amenity trees*.

8.12.2.2 Sandy Beach Habitat

Whilst the proposed seawall would replace the existing seawall in the same location, the new footpath would extent approximately 5m inward of the seawall for 80m (approximately 0.04ha). The proposed seawall has been designed taking into account the existing coastal environment and coastal processes and based on engineering principles as detailed in the Cardno Basis of Design Report (Cardno, 2018a). It is not anticipated that wave patterns will be changed as a result of the seawall. The new structure is unlikely to affect the long-shore drift of beach sediment. As such, the new seawall is unlikely to attenuate more sediment drift than the previous one. Therefore, the sandy beach habitat should not be greatly adversely affected, and together with beach nourishment when required, will largely maintain the existing sandy beach habitat at Flynns Beach.

8.12.2.3 Threatened Species

Two threatened species were detected within or in close proximity to the project:

- *Sophora tomentosa* (Silverbush) - endangered under the BC Act; and
- Grey-headed Flying-fox (*Pteropus poliocephalus*) - vulnerable under the BC Act and EPBC Act.

The project would require the removal of approximately 45 saplings of *Sophora tomentosa* that are growing along the remains of the existing seawall. As such, this species was assessed with assistance of the test of significance in accordance with the BC Act (See Ecological Assessment in **Appendix C**). The mature patches of *Sophora tomentosa* and Littoral Rainforest would be protected from any direct or indirect impact from construction by exclusion fencing and sediment and erosion controls. However, the sapling *Sophora tomentosa* that exist within Study Area would be required to be removed, with a high potential for translocation. As these saplings long-term viability in their current location is unlikely to be viable, the high chance of them being able to be translocated and as the patches of mature plants located to the south of the proposed seawall would be retained/protected, the project is unlikely to have a significant impact on this species such that a local population is likely to be at risk of extinction.

In addition, several other threatened birds and bat species had at least a moderate or higher chance of occurring within the Study Area, given they have suitable habitat within or in close proximity to the Study Area (**Table 4-2** of Ecological Assessment in **Appendix C**). As the amount of vegetation proposed to be affected is limited to

predominantly non-native disturbed areas and would avoid patches of native vegetation/habitat in areas adjacent to the Study Area, the project would likely have a negligible impact on threatened birds or bats. Furthermore, no hollow-bearing trees are proposed to be affected as part of the project. Therefore, the project is unlikely to have a significant impact on any threatened species listed under the BC Act and/or EPBC Act.

8.12.2.4 Fauna Habitat and Wildlife Corridors

The terrestrial habitat for threatened fauna species is limited as much of the Study Area is highly disturbed/modified, however, suitable sandy beach habitat occurs adjacent to the existing seawall. The project will affect a relatively small area of sandy beach in comparison the large area of similar habitat that will be protected along Flynns Beach. Furthermore, the affected sandy beach habitat is likely to be sub-optimal for the potentially occurring threatened species due to the continual visitation from the members of the community that would likely disturb the species natural behaviour e.g. foraging and nesting.

The value of the non-sandy beach habitat within the Study Area is limited and would likely have a low value for most potentially occurring threatened fauna species. Furthermore, no hollow-bearing trees were present within the Study Area. As the Study Area is surrounded by patches of native vegetation, any threatened fauna species that did occur within the Study Area, would most likely to traversing between patches of suitable habitat.

The vegetation surrounding the Study Area forms part of relatively intact line of native vegetation following the coastline to the north and south. This vegetation likely forms part of an important wildlife corridor for highly mobile bird and bat species. As the project would not result in the removal of any patches of native vegetation, it is unlikely to have an impact on an important wildlife corridor.

8.12.2.5 Critical Habitat

At present, there are four critical habitats declared under Section 53–55 of the TSC Act. These habitats are now consider to be Areas of Outstanding Biodiversity Value (AOBV) under the new BC Act:

- Gould's Petrel - critical habitat declaration;
- Little penguin population in Sydney's North Harbour - critical habitat declaration;
- Mitchell's Rainforest Snail in Stotts Island Nature Reserve - critical habitat declaration; and
- Wollemi Pine - critical habitat declaration.

None of the above listed critical habitats or AOBV occur within or in close proximity to the Study Area. Therefore, no critical habitats or AOBV would be impacted by the project.

8.12.2.6 Coastal Management SEPP

A review of the Coastal Management SEPP mapping indicated the Study Area occurs adjacent to three patches of areas that are mapped as Littoral Rainforest to the west and north (**Figure 6-2**). As such, the Study Are occurs within the 'proximity area for Littoral Rainforest'. The project would avoid any direct and indirect impact to any area mapped as Littoral Rainforest.

In addition, the Study Area occurs within the following areas mapped under the Coastal Management SEPP (DPE 2018);

- Coastal Environment Area; and
- Coastal Use Area.

8.12.2.7 Koala Habitat

A review of the Koala habitat mapping indicated that no areas within the Study Area or the adjacent vegetation is mapped as either 'Secondary' or 'Primary' Koala Habitat (Port Macquarie, 2014). Therefore, no Koala Habitat would be directly or indirectly impacted from the project.

8.12.2.8 Port Macquarie-Hastings DCP 2013

For endangered ecological communities, a fully vegetated buffer of 50m must be provided (Port-Macquarie 2013 – Section 2.3). The 50m buffer land surrounding this EEC is existing cleared land, including road infrastructure and development associated with Port Macquarie Surf Life Saving Club and Flynn's Beach. The buffer provisions to ecologically endangered communities and watercourses do not apply as the land likely has a current and valid approval for urban purposes. As such, the DCP provision for the requirement of a 50 m buffer is not required.

8.12.2.9 Key Threatening Processes

Key Threatening Processes (KTPs) are listed under the BC Act and EPBC Act. As the project would not result in the removal of any patches of native vegetation, and provided the proposed recommendations to avoid and mitigate are implemented, the project would be unlikely to contribute to any KTP.

In particular, patches of *Chrysanthemoides monilifera* subsp. *rotundata* (Bitou Bush) occurs in vegetation adjacent to the Study Area. The occurrence of species is listed as 'Invasion of Native Plant Communities by *Chrysanthemoides monilifera'* KTP. Provided the weeds management procedure are implemented, the project is unlikely to contribute to the spread of the species.

8.12.3 Mitigation measures

Recommended impact avoidance and mitigation measures that should be incorporated into the project design are described in below. These recommendations would avoid and mitigate impacts to flora, fauna and their habitat from the project within the study and adjacent areas.

8.12.3.1 Avoidance

- Use previously cleared / disturbed areas in preference to relatively undisturbed areas with native vegetation;
- Install project boundary fencing to protect adjacent areas of native vegetation and ensure activities and ancillary facilities are restricted to the project footprint; and
- Implement a stop-works procedure if threatened species are encountered during construction.

8.12.3.2 Mitigation

- All machinery should be cleaned of foreign soil and vegetative matter prior to entering the Study Area to avoid the spread of *Phytophthora cinnamomi,* pathogenic fungus (Myrtle Rust) and dispersal of seeds of non-native plants;
- Strict weed management, monitoring and control practices should be implemented in accordance with DPI to minimise the spread of exotic species into natural areas within the study area. In particular, the following plant species should be targeted:
  - *Chrysanthemoides monilifera* subsp. *rotundata* (Bitou Bush); and
  - *Lantana camara* (Lantana).
- Strict erosion and sediment control measures should be implemented, monitored and maintained to prevent impacts on adjacent areas, particularly following vegetation clearing and grubbing and prior to unfavourable weather events;
- The planted *Araucaria heterophylla* (Norfolk Island Pine) should be protected. Ongoing consultation will be required with the PMHC Arborist for excavation of retaining wall, site set up and access (cranes, concrete booms etc.) through the tree protection zones at the surf club end of the works.
- Implement dust control measures where necessary to protect adjacent retained vegetation and water quality in adjacent waterways and water bodies; and
- Stockpiling of materials should occur within previously disturbed areas and not within driplines or retained vegetation.
- Tree work must be carried out, coordinated and supervised by Council's tree officer.
- Works on the beach are not to impact on the rocky headland, rocky features on the beach, or any rocky outcrops.
- Where works are located on the beach, ensure no plant or equipment enter the ocean waters.
- The foreshore in close proximity to the seawall (5m) would be grassed to minimise disturbance of the structure caused by roots.
- Post-construction, the seawall alignment should be monitored at regular intervals to identify any infestation/proliferation of weeds, particularly any which are identified as priority weeds by DPI. Where

these are encountered, appropriate management strategies should be adopted to ensure the spread of these plants is suppressed.

***Sophora tomentosa* (Silverbush)**

- All patches of *Sophora tomentosa* (Silverbush) outside of the Study Area are required to be protected from any direct or indirect disturbances. This should be achieved by the use of exclusion fencing, and sediment and erosion control measures were appropriate. Signage may also be a useful means of ensure that the patches of this species that are to be retained are protected;
- All personnel associated with the construction phase of the project should be made aware of the species, particularly the locations to be avoided;
- The approximately 45 saplings of *Sophora tomentosa* (Silverbush) that occur along the remains of the existing seawall should be translocated were feasible to nearby suitable habitats, potentially to the south of the project in-between the existing patches of mature plants;
- Any impact/translocation of this species would require a permit/approval from OEH;
- Any translocation of the species would be required to be carried out by a suitably qualified person with experience with both the species and translocation procedures; and
- Any translocated specimens would require ongoing monitoring and maintenance to gauge the effectiveness and trigger any future management actions.

8.13 Noise

8.13.1 Existing environment

The site has very low background noise levels due to its location below Pacific Drive. The background noise level has been assumed to be around 40-45 dB(A). The nearest sensitive noise receivers to Flynns Beach are the residential properties located directly above on the other side of Pacific Drive approximately 75m from the beach.

8.13.2 Potential Impacts

It is expected that the equipment listed in **Section 4.2.4** would be required to undertake the construction works.

The typical A-weighted sound power levels for this equipment are also listed (taken from the Australian Standard Guide to Noise and Vibration Control on Construction Demolition and Maintenance Sites AS2436-2010).

Table 8-2 Estimated Noise Levels of Construction Equipment

Item	Typical Plant Type/ Acoustical Treatment	Maximum Noise Level La_{max}DB(A) at 7m
Bulldozer	Caterpiller D10	83
Jack Hammers	Silencing bags	85
Vibrator Roller	10-12 tonne	89
Water Cart		88
Dump Trucks	35 tonne	96
Excavator		86
Rockbreaker	Hydraulic	97
Truck		80

Item	Typical Plant Type/ Acoustical Treatment	Maximum Noise Level La_{max}DB(A) at 7m
Crane	Truck mounted	85
Compressor	600 CFM	75
Compressor	1500 CFM	80
Backhoe		88
Compactor	Vibrating Plate	92
Tip truck		83
Generator	Diesel	79
Mechanical broom		83
Piling Hammer	May be necessary for augured pile casings	93
Concrete truck		83
Concrete pump		84
Concrete vibrators		80
Drill		85
Drill	Air	85
Concrete saws		93
Welders		85
Concrete leveller		90
Cherry picker, truck mounted		80

As discussed in **Section 4.2.1**, the works would be undertaken in a number of stages. The noisiest stage is associated with the construction of the vertical seawall section due to the boring associated with the piles. This section will take approximately 20 working days to complete.

Although noise from trucks is anticipated, this noise would be short lived. The majority of the noise will be from the boring for the vertical seawall piles. The construction technique is to use a 600mm diameter CFA Piling Rig to auger piles into the stiff clay strata at 3m intervals. It is anticipated that approximately 3 bore holes would be drilled per day and approximately 60 are required. Each bore hole would be founded at approximately RL-6.0m. This stage of the works is therefore anticipated to take 20 working days depending on the weather and ocean conditions. In addition, the timing will depend on the type of materials discovered and if hard may take longer and may involve some minor hammering. At this stage it is anticipated that none of the bore holes will require hammering.

Noise levels would vary depending on the nature of the activities being undertaken and that the use of several items of construction equipment simultaneously is only expected to occur intermittently. Furthermore, the works would be of a temporary nature, and working hours would be restricted to the normal daytime construction hours as specified by the EPA.

Under the Interim Construction Noise Guideline (DECC, 2009) construction noise criteria is calculated as the rating background noise plus 10 dB(A) when undertaken within standard working hours. Based on an estimated average daytime background noise levels being 55 dB(A), the noise level objective during construction would be 65 dB(A) at the nearest residence.

Using the methodology in the AS2436-2010, the maximum predicted noise level during construction is estimated to at times exceed the construction noise level objective of 65 dB(A).

The Interim Construction Noise Guideline (DECCW 2009) states that, where the predicted noise level is greater that the noise affected level, all feasible and reasonable works practices should be applied to meet the noise affected level. All potentially impacted residents would be informed of the nature of the works, the expected noise levels and duration, as well as contact details for the contractor's representative.

8.13.3 Mitigation measures

- The contractor would take all reasonable steps to minimise noise, vibration and shock arising from construction works.
- Construction activities would be generally limited to:

  Monday to Saturday – 7.00 am to 5.00 pm;

  No works would be undertaken on Sundays or public holidays.
- If it were deemed necessary to undertake work outside these hours, prior consultation would be undertaken with Port Macquarie-Hastings Council and prior written approval would be required from the Principal's Authorised Person. In this regard, the contractor would be required to provide details including the locations and types of surrounding receivers likely to be affected, the nature of the proposed works and the noise characteristics of any powered equipment likely to be used, measures to be taken to reduce noise emissions and other information that Council may request.
- The closest residences would be notified in advance when periods of extended construction activity are likely to occur at elevated noise levels.
- Any noise complaint received would be investigated as soon as practicable. Any practicable and feasible measures to minimise noise would be identified. The complainant would be advised of the outcome.
- All possible steps would be taken to ensure construction equipment is operated to manufacturer's specifications.
- Consideration is to be given to respite periods by restricting the hours that the very noisy activities can occur, taking into account:
  - Times identified by the community when they are less sensitive to noise
  - If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
  - Specifications are to include noise control and include hammering as an item.

8.14 Waste management

8.14.1 Potential Impacts

The main waste material to result from the proposed seawall construction works would consist of the excavated spoil, which would be minimised by using excavated materials for foreshore landscaping works. The other

source of waste would be general miscellaneous construction waste, such as off cuts, packaging etc. All general waste would be taken off site for reuse or disposal.

Bins for personnel waste and portable toilets (sewered if practicable) would be provided at the construction work sites. Portable toilets would be regularly serviced.

Classification of the site in-situ material in accordance with the EPA guidelines "Waste Classification Guidelines, Part 1: Classifying Waste (DECC, 2009b) will be required prior to the removal of any excess material off-site.

It is recommended that excess material is suitably stockpiled and sufficient physical and chemical analysis performed incrementally to identify any gross contaminated material, with particular reference to material containing naturally occurring asbestos materials.

It is expected that marine sand encountered near the surface along the alignment could be disposed of on-site where the material free of fines and similar in composition to the existing marine sand encountered along the beachfront. Additionally, it is expected that some underlying cohesive material may be lost in the void created under the concrete access ramp, however this would be subject to additional geotechnical assessment not covered within this report.

Naturally Occurring Asbestos

The results of the asbestos identification testing undertaken on a representative sample of serpentine rock outside of the stage 1 works area indicated that there was no presence of asbestos detected in the sample recovered during the geotechnical investigation. However, it should be appreciated that the area is mapped as a high risk area for naturally occurring asbestos (NOA) as seen in NSW Government Publication 'Mapping of naturally occurring asbestos in NSW - Known and potential for occurrence'.

It should be noted that while NOA was not encountered during the investigation, the sample obtained was of a discrete piece of the NOA bearing serpentine rock and considered not representative of the entire rock mass. It is not expected that the depth of bulk excavations would extend into the underlying hard residual clays. In the event that serpentine is encountered onsite during excavation works, care should be taken to prevent the production of dust during the auguring or excavation of the rock mass. Where possible wetting of the material should be conducted, once excavated material should be kept wet and covered and disposed of in accordance with the EPA guidelines "Waste Classification Guidelines, Part 1: Classifying Waste (DECC, 2009b).

8.14.2 Mitigation Measures

- The contractors Waste Management Plan (WMP) details waste management procedures to be incorporated into the CEMP. The contractor would be responsible for the regular, safe and efficient disposal of all solid, liquid and gaseous contaminants and waste generated on site.
- The WMP adopts the objectives of the Waste Avoidance and Resource Recovery Act, namely, to encourage the most efficient use of resources, to reduce environmental harm, and to provide for the continual reduction in waste generation in line with the principles of environmentally sustainable development (ESD).
- The WMP is consistent with the Waste Classification Guidelines (DECCW 2009b) in that all waste removed from the site is to be classified and disposed of appropriately.
- The WMP includes:
    - details of, and the waste management action proposed for each type of waste
    - procedures that ensure the waste is transported to a lawful place
    - a description of the roles and responsibilities of everyone who manages the waste, including the site supervisor and sub-contractors.
- The WMP is to be regularly updated to record how waste is managed and audit where waste is taken.
- Adequate supervision is to be provided to ensure the waste management plan is implemented and complied with.

- Accurate written records are to be kept such as:
  - who transported the waste (company name, ABN, vehicle registration and driver details, date and time of transport, description of waste)
  - copies of waste dockets/receipts for the waste facility (date and time of delivery, name and address of the facility, it's ABN, contact person).
- The construction contractor is to ensure that waste generated by the works is transported to a place that can lawfully accept it as per Section 143 of the *Protection of the Environment Operations Act 1997*.
- All waste, would be recycled if practicable or alternatively taken to a licensed waste disposal facility.
- Solid waste materials including garbage would be collected and transported off the site to an approved waste disposal facility. Waste receptacles for recyclable and non-recyclable waste are to be provided for personnel waste.
- Any human wastes generated and other liquid or toxic wastes would be disposed of at a location off the site to an appropriate waste disposal facility.
- Employees are required to follow the Contaminated Waste Classification Flowchart in the WMP in order to determine actions that are required to deal with contaminated materials.
- Trucks used for the transport of excavated materials, loose debris and other materials or for the transportation of loose materials to site shall be loaded in such a manner and fitted with suitable tarpaulins as to prevent materials dropping from the truck during transportation along the foreshore and public roads.

8.15 Cumulative Impacts

It is anticipated that the contractor will undertake the seawall construction in stages. Staging will reduce the cumulative impacts particularly with respect to construction traffic and noise and impact on the amenity of the users of the beach.

The mitigation measures in this SEE and the contractors CEMP would ensure that any cumulative impacts are minimised together with the following plans and reports to be included in the Construction Environmental Management Plan:

- Community Consultation Plan
- Public Safety Plan
- Public Signage Plan
- Traffic Management Plan including Pedestrian Management
- Dilapidation Report (including condition of existing Norfolk Pines)
- Waste Management Plan
- Soil, Sand and Water Management Plan (including Emergency Oil and Fuel Spillage and storm contingency management)

Whilst short term construction impacts are predicted for users of the beach at each stage, the long term cumulative impact of a new seawall and stabilising the foreshore landward of the seawall would be the protection of the amenity of the beach against future coastal storms, rainfall events and sea level changes if they occur. In addition, the adaptive strategy built into the design of the seawall would result in long term protection of this important beach for the people of Port Macquarie and the wider community.

9 Environmental Management

Under the State Government's policy to improve the performance of the NSW construction industry, preparation of a CEMP is mandatory for all projects undertaken by or on behalf of government agencies or where funding is being provided by the government. The Construction Policy Steering Committee and the then Department of Infrastructure Planning and Natural Resources have produced Environmental Management System and EMP Guidelines aiming to assist contractors both in complying with the Government's policy and in demonstrating that compliance. The environmental management objectives and supporting actions presented in this section are intended to assist in this process.

The CEMP would include a risk assessment which ensures that the safeguards identified in this SEE, as well as any others that are considered relevant, are effectively translated into actual construction techniques and environmental management activities, controls and monitoring/verification to prevent or minimise environmental impacts. The CEMP should also identify the requirements for compliance with relevant legislation and any other regulatory requirements to ensure environmental safeguards described throughout this SEE are implemented. The environmental management objectives and supporting actions presented in this section are intended to assist in this process. Port Macquarie-Hastings Council would review the CEMP.

The CEMP should generally conform to the structure shown in **Table 9-1**.

Table 9-1 Construction Environmental Management Plan Structure

Background	Introduction to the document Description of the proposal and project details The context for the CEMP in regards to the overall project The CEMP objectives The contractor's environmental policy
Environmental Management	Environmental management structure of the organisation and specific team responsibilities with respect to the CEMP and its implementation Approval and licensing requirements relevant to the project Reporting requirements Environmental training Emergency contacts and response
Implementation	A project specific risk assessment A detailed list of environmental management safeguards and controls CEMP sub plans for specific environmental controls A detailed schedule assigning responsibility to each environmental management activity and control
Monitor and Review	Environmental monitoring Environmental auditing Corrective action CEMP review and document control procedures

9.2 Air Quality

Objective(s)

Avoidance/minimisation of off-site dust nuisance to neighbouring residences and the community.

Minimisation of air quality impacts resulting from machinery and vehicle emissions.

Action(s)

Action/Phase	Responsibility
Construction	
The contactor would ensure are undertaken to minimise dust, cement dust and other objectionable matter into the atmosphere.	Contractor
The contractor would take all proper precautions to minimise any nuisance arising from dust caused by the construction activities. Such precautions may include but not limited to covering loads on trucks with tarpaulins and to spraying the roads with water or other suitable liquids. Methods to suppress potential dust would be included in the CEMP to minimise dust formation and maintain a suitable level of air quality.	Contractor
No burning of materials on site.	Contractor

9.3 Soil, Sand and Water Management

Objective(s)

Minimise impacts of potential coastal storms and high rainfall events to the environment and the seawall under construction during construction works.

To effectively manage sediment and erosion control during the construction stage of the project.

Prevention/minimisation of impacts to the ocean waters.

Action(s)

Action/Phase	Responsibility
Pre-construction	
A Soil, Sand and Water Management Plan (SSWMP) would be prepared including:.	Contractor
A: Soil	
Methods to minimise the discharge of water containing soil to the beach or ocean.	Contractor
Site specific measures to be implemented in accordance with the standards outlined in the 2004 Landcom publication Managing Urban Stormwater: Soils and Construction, 4th edition (“The Blue Book”).	Contractor
Installation of erosion sediment control devices, where required, before commencement of the works.	Contractor
A designated clean down area for construction vehicles exiting the beach will be established.	Contractor
Trucks shall be cleaned to the extent necessary to ensure that wheels and all surfaces are free of mud before they enter public roads. Water from such wheel clean down activities is not to enter the beach. The Contractor shall be responsible for the removal of mud spilt by construction equipment/vehicles on public roads and paved areas on the foreshore.	Contractor
B: Water	
Methods to prevent the discharge onto the foreshore, beach or ocean of any oils or similar materials or of any foaming or non-biodegradable detergents.	Contractor

Action/Phase	Responsibility
Washing out of concrete trucks and pumps on site will be undertaken at designated areas/wash out bays away from the beach environment.	Contractor
Methods to reduce the likelihood or impact of any fuel or petro-chemicals spills at the site related to refuelling of all light vehicles. Such refuelling will occur off site. Refuelling of any other vehicles will occur within a bunded area or other area to the satisfaction of Council to minimise the occurrence of fuel or oil spillage onto the foreshore, beach or ocean and to catch any spillages; on-going preventative maintenance of vehicles and machinery to minimise mechanical faults, all fuels (if any) are to be stored in a bunded area.	Contractor
Regularly servicing all vehicles and equipment used at the site off site.	Contractor
An Emergency Oil and Fuel Spillage Plan would be prepared. Such a plan would include keeping spill kits at the works site for the event of a fuel spillage, and all machinery would be suitably maintained to minimise the risk of any fuel leakage measures in the event of a pollution spill or the like on the foreshore or beach. Measures would include, but are not limited to: > Immediately cleaning up any oil or fuel spill or leaking from plant, equipment or vehicles. > Excavate any sand or impregnated soil if necessary and remove to approved disposal area. > Repair or maintain the equipment, plant or vehicle that caused the pollution.	Contractor
In the event of pollution to the ocean the Contractor is to undertake notification in accordance with the pollution notification requirements under the *Protection of the Environment Operations Act 1997*. This may include immediately contacting the Council or EPA and follow all directions given to clean up the contamination and prevent any further pollution.	Contractor
Reporting by the contractor how the incident occurred and what measures are to be taken to prevent such a spillage in the future from occurring.	Contractor
In areas where equipment might drip oil or cause other damage to surfaces, a protective cover of heavy gauge, flame resistant, oil proof sheeting would be provided so that no oil or grease contacts the surface under.	Contractor
Designing any temporary access tracks to the beach or on the foreshore so as to provide adequate drainage and stormwater control.	Contractor
C: Sand	
Methods to control water from the sea during normal tides from entering the beach works site on the beach whilst vehicles/equipment is located on the beach or a contingency plan to remove the construction vehicles/equipment from the beach.	Contractor
Measures to protect the stockpiles sand on the beach.	Contractor
Minimising any stockpiling of fill if required for the works and to transport to site as required.	Contractor
Protection of any stockpiled bore material from scour and erosion, including coverings or bunding as relevant.	Contractor
Locating any stockpiled bore materials and all other materials and works depots and areas landward of any potential overtopping wave area.	Contractor

Action/Phase	Responsibility
Ensuring vehicles leaving each works site are to be cleaned to ensure sediment is not tracked onto the public roads.	Contractor
Timing works, if practicable, to be timed to fall outside of high rainfall or coastal storms.	Contractor
Returning stockpiled sand on the beach to the base of the new seawall once the seawall works have been completed	Contractor
Stormwater and Overtopping	
The contractor would develop a Storm Contingency Plan in the event of high water levels on the beach, overtopping of the works area and foreshore by waves, and rain events during the construction stages of the seawall. The plan would aim to protect unfinished works, minimise risk to plant and equipment and minimise risk of pollution to the environment. The Storm Contingency Plan is also to provide for the safety of personnel.	Contractor
The Storm Contingency Plan would include a plan showing locations that may be overtopped by waves during a storm. Any construction works such as stockpiles, depots, equipment and the like would be located outside the area that has the potential to be overtopped by waves in a storm event.	Contractor
Prior to any preliminary works occurring on the site, a plan be developed showing locations that may be overtopped by waves during a storm. Any construction works such as stockpiles, depots, equipment and the like would be located outside the area that has the potential to be overtopped by waves in a storm event.	Contractor
Operation	
Monitoring by Council of the stormwater runoff and water quality would be undertaken to ensure the integrity of the works is maintained.	Council
Council to include the new seawall in its infrastructure maintenance plan and for periodic inspections.	Council
During and/or after a storm event inspections of the seawall would be undertaken by a suitably experienced engineer to ensure structural stability of the seawall.	Council

9.4 Sea Level Rise

Objective(s)

To protect the amenity of Flynns Beach for the enjoyment of the public in the event of sea level rise.

Action(s)

Action/Phase	Responsibility
Operation	
Observations would be undertaken by Council to ascertain changes in sea level conditions. In the event of sea level rise, Council would seek engineering expert advice as to wether the adaptive strategy should be implemented.	Council

Action/Phase	Responsibility
Council will keep records of any seawall damage and repairs, including landscaped areas as this will form an important inventory for future assessment of trigger levels for sea level rise adaptation.	Council

9.5 Visual Amenity

Objective(s)

Protect the visual amenity of the locality for residents and the local community.

Action(s)

Action/Phase	Responsibility
Construction	
Work areas and surrounding grounds would be kept clean and free from rubbish and debris.	Contractor
Store materials and supplies in locations that will permit easy cleaning of the area and not block accessways	Contractor
All materials used for construction such as hoses, cables, extension cords, and similar would be located, arranged and grouped to permit easy cleaning and maintenance and not block accessways. At the close of each work week and at the close of each day preceding a holiday, all such items would be removed from the construction area and stored in the site depot.	Contractor
On completion the site shall be left free from all scrap, rubbish, waste materials and debris resulting from work	Contractor
On completion of the work the contractor would remove all temporary depots, facilities and reinstate the areas disturbed by their construction activities to their condition existing prior to the commencement of work unless otherwise agreed to with Council. Disturbed areas shall be graded to uniform contours where required.	Contractor
Operation	
Landscaping of the foreshore by Council would be undertaken as soon as practicable after the completion of the seawall construction works.	Council
Sand nourishment comprising importation of suitable beach sand may be required to maintain the subaerial beach amenity if sea level rise projections eventuate. This sand nourishment will assist to retain the visual amenity of the sandy beach.	Council

9.6 Community Recreation

Objective(s)

To maintain the community recreation values of Flynns Beach for public enjoyment.

Action(s)

Action/Phase	Responsibility
Construction	
A Safety Management Plan would be prepared by the Contractor and the Contractor is to ensure that work is carried out at all times in a manner that is safe to both members of the public and the Contractor's work force. The Safety Management Plan would address public safety and construction work safety including occupational health and safety risk mitigation measures in relation to workers during construction. The contractor would be required to employ occupational health and safety risk mitigation measures in relation to workers during construction.	Contractor
Security and safety fencing as practicable for onsite conditions would be required to be in place prior to the commencement of any stage of the works.	Contractor
Construction works would be undertaken outside the summer period and in the main outside periods of high beach usage.	Contractor
The work site outside normal work hours will be made safe, kept tidy and equipment will be stowed in a secure state.	Contractor
Preparation of a dilapidation report that describes the state of the site at Flynns Beach including a detailed photographic record and reports of the condition of existing Norfolk Pine trees (including tree branches (in particular low lying branches) and the underlying root system), public areas to be used for access, roadways, any beach access ways, footpaths, utilities, existing conditions of buildings and structures including existing cracks, footings, plaster and the like. The report would be provided to, and approved by the Superintendent prior to the commencement of any works on the site.	Contractor
A Community Consultation Plan will be prepared by the Contractor to address public consultation during the construction works to facilitate recreation in the area during the construction period including alternative access routes to the foreshore, beach, Surf Life Saving Club and café.	Contractor
The Community Consultation Plan is to include liaison with Council to determine any dates that the beach or clubhouse may be required for special or specific public recreation events and the like. The construction program is to take into account any special or specific events.	Contractor
A Public Signage Plan would be prepared by the Contractor including which areas are closed and which routes are open.	Contractor
The following lessees are to be notified by Council 2 weeks prior to commencement of the proposed works – Surf Life Savings Club, Tennis Club and RSL Youth Club.	Contractor
Operation	
Signage would be provided alerting the public to any safety matters during storm events	Council

9.7 Public Access and Safety

Objective(s)

To protect the public and the construction personnel during the construction works.

Action(s)

Action/Phase	Responsibility
Construction	
Construction works would be undertaken outside the summer period and in the main outside periods of high beach usage.	Contractor
Signage would be provided to inform the public of the construction works as per the Signage Plan prepared by the Contractor.	Contractor
Work is to be carried out at all times in a manner that is safe to both members of the public and the Contractor's work force, including implementation of work health and safety and traffic management measures. Traffic management measures are detailed further in Section 8.9 and the Traffic and Pedestrian Management Plan associated with the CEMP.	Contractor
Security and safety fencing would be required to be in place prior to the commencement of any stage of the works.	Contractor
The work site outside normal work hours will be made safe, kept tidy and equipment will be stowed in a secure state.	Contractor
Contractors would be required to liaise closely with Council to determine any dates that the beach or clubhouse may be required for specific public access. Pedestrian access will be maintained at all times to the beach, the clubhouse and café. Car access and public access outside normal construction work times will be unrestricted except for the cordoned off areas, or as advised in a notice on the road above the beach.	Contractor
Operation	
Signage be provided following construction of the seawall alerting the public to any safety matters relating to storm events	Council

9.8 Traffic and Access

Objective(s)

Ensure that construction vehicles do not cause excessive inconvenience to road and pedestrian users.

Ensure the safety of road users and construction personnel for the duration of the works.

Minimise the pollution impacts resulting from the use of vehicles during construction.

Action(s)

Action/Phase	Responsibility
Pre-construction	
A Traffic Management Plan (TMP) would be prepared by the Contractor and would address safety issues with regard to construction traffic and public access.	Contactor

A TMP would cover all aspects of public access and traffic management at the site with the aim of minimising the impact of the construction work on the existing traffic flow and public access areas.	Contactor
Construction	
> Due to space and access restrictions workers and contractors will not be able to park on the construction site without making prior arrangements with the Project Manager. Parking is available on Pacific Drive as per local parking restrictions. > Traffic management specifically related to the proposed use of the southern exit point of Tuppenny Lane as an entrance for trucks and constructing vehicles. > A dilapidation report of Tuppenny Lane would be prepared prior to construction works. > Post construction any roads impacted by the works would be returned to a condition equivalent to or better than its prior condition. > All roads should be kept clean and free of dust and mud at all times. Where excavated material is tracked onto roads at any time, it would be removed immediately so that road pavements are kept safe and trafficable. > Roads shall, where necessary, be swept with a vacuum sweeper to remove any material. Where hosing of the road surface is carried out, loose material should be trapped to prevent it from being discharged into drains and waterways. > All construction traffic would comply with all applicable traffic laws and regulations including speed limits. > The contractor to minimise traffic inconvenience to the Surf Lifesaving Club operations, the café and users of the beach	Contractor

9.9 Cultural Heritage

Objective(s)

Minimise potential impacts to items and places of Aboriginal heritage due to the works

Action(s)

Action/Phase	Responsibility
Pre-construction	
All workers/contractors at each stage of the works would be informed of their obligations under the *National Parks and Wildlife Act 1974*, namely that it is illegal to disturb, damage or destroy a relic without the prior approval of the Chief Executive of OEH.	Contractor
Construction	

Action/Phase	Responsibility
If any Aboriginal object is discovered and/or harmed in, on or under the land, the proponent must: (a) not further harm the Aboriginal object, (b) immediately cease all work at the particular location, (c) secure the area so as to avoid further harm to the Aboriginal object, (d) notify the Office of Environment and Heritage (OEH) as soon as practicable on 131 555, providing any details of the Aboriginal object and its location, and (e) not recommence any work at the particular location unless authorised in writing by OEH.	Contractor

9.10 Flora and Fauna

Objective(s)

To minimise impacts on flora and fauna and the aquatic environment

Avoidance of weed invasion

Action(s)

Action/Phase	Responsibility
Pre-construction	
Install project boundary fencing to protect adjacent areas of native vegetation and ensure activities and ancillary facilities are restricted to the project footprint	Contractor
The approximately 45 saplings of *Sophora tomentosa* (Silverbush) that occur along the remains of the existing seawall should be translocated were feasible to nearby suitable habitats, potentially to the south of the project in-between the existing patches of mature plants; Any impact/translocation of this species would require a permit/approval from OEH; Any translocation of the species would be required to be carried out by a suitably qualified person with experience with both the species and translocation procedures Any translocated specimens would require ongoing monitoring and maintenance to gauge the effectiveness and trigger any future management actions.	Council
Construction	
Tree work must be carried out, coordinated and supervised by Council's tree officer.	Contractor
Use previously cleared / disturbed areas in preference to relatively undisturbed areas with native vegetation;	Contractor
Implement a stop-works procedure if threatened species are encountered during construction.	Contractor

Action/Phase	Responsibility
All machinery should be cleaned of foreign soil and vegetative matter prior to entering the Study Area to avoid the spread of *Phytophthora cinnamomi*, pathogenic fungus (Myrtle Rust) and dispersal of seeds of non-native plants	Contractor
Strict weed management, monitoring and control practices should be implemented in accordance with DPI to minimise the spread of exotic species into natural areas within the study area. In particular, the following plant species should be targeted: > *Chrysanthemoides monilifera subsp. rotundata* (Bitou Bush); and > *Lantana camara* (Lantana).	Contractor
Strict erosion and sediment control measures should be implemented, monitored and maintained to prevent impacts on adjacent areas, particularly following vegetation clearing and grubbing and prior to unfavourable weather events;	Contractor
The planted *Araucaria heterophylla* (Norfolk Island Pine) should be protected. Ongoing consultation will be required with the PMHC Arborist for excavation of retaining wall, site set up and access (cranes, concrete booms etc.) through the tree protection zones at the surf club end of the works.	Contractor
Implement dust control measures where necessary to protect adjacent retained vegetation and water quality in adjacent waterways and water bodies	Contractor
Stockpiling of materials should occur within previously disturbed areas and not within driplines or retained vegetation.	Contractor
All patches of *Sophora tomentosa* (Silverbush) outside of the Study Area are required to be protected from any direct or indirect disturbances. This should be achieved by the use of exclusion fencing, and sediment and erosion control measures were appropriate. Signage may also be a useful means of ensure that the patches of this species that are to be retained are protected; All personnel associated with the construction phase of the project should be made aware of the species, particularly the locations to be avoided;	Contractor
Works on the beach are not to impact on the rocky headland, rocky features on the beach, or any rocky outcrops.	Contractor
Where works are located on the beach, ensure no plant or equipment enter the ocean waters.	Contractor
Operation	
The foreshore in close proximity to the seawall (5m) would be grassed to minimise disturbance of the structure caused by roots.	Council
Post-construction, the seawall alignment should be monitored at regular intervals to identify any infestation/proliferation of weeds, particularly any which are identified as priority weeds by DPI. Where these are encountered, appropriate management strategies should be adopted to ensure the spread of these plants is suppressed.	Council

9.11 Noise

Objective(s)

Compliance with relevant recommendations specified in the Interim Construction Noise Guideline (DECC, 2009).

Avoidance/minimisation of noise impacts on nearby sensitive noise receivers.

Action(s)

Action/Phase	Responsibility
Construction	
The contractor would take all reasonable steps to minimise noise, vibration and shock arising from construction works	Contractor
Construction activities would be generally limited to: Monday to Saturday – 7.00 am to 5.00 pm; No works would be undertaken on Sundays or public holidays. If it were deemed necessary to undertake work outside these hours, prior consultation would be undertaken with Port Macquarie-Hastings Council. In this regard, the contractor would be required to provide details including the locations and types of surrounding receivers likely to be affected, the nature of the proposed works and the noise characteristics of any powered equipment likely to be used, measures to be taken to reduce noise emissions and other information that Council may request. The closest residences would be notified in advance when periods of extended construction activity are likely to occur at elevated noise levels.	Contractor
Any noise complaint received would be investigated as soon as practicable. Any practicable and feasible measures to minimise noise would be identified. The complainant would be advised of the outcome.	Contractor
All possible steps would be taken to ensure construction equipment is operated to manufacturer's specifications.	Contractor
Consideration is to be given to respite periods by restricting the hours that the very noisy activities can occur, taking into account: > Times identified by the community when they are less sensitive to noise > If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times. > Specifications are to include noise control and include hammering as an item.	Contractor

9.12 Waste Management

Objective(s)

Compliance the provisions of the *Protection of the Environment Operations (Waste) Regulation* 2005.

Maximise reuse/recycling of waste material and minimise waste disposed of to landfill.

Action(s)

Action/Phase	Responsibility
Pre-construction	
The contractor undertaking the works shall detail waste management procedures in a Waste Management Plan (WMP) to be incorporated into the CEMP. The contractor would be responsible for the regular, safe and efficient disposal of all solid, liquid and gaseous contaminants and waste generated on site. The WMP would adopt the objectives of the *Waste Avoidance and Resource Recovery Act*, namely, to encourage the most efficient use of resources, to reduce environmental harm, and to provide for the continual reduction in waste generation in line with the principles of environmentally sustainable development (ESD). The WMP would also need to be consistent with the *Waste Classification Guidelines* (DECCW 2009) in that all waste removed from the site is to be classified and disposed of appropriately. The WMP is to include: > details of, and the waste management action proposed for each type of waste > procedures that ensure the waste is transported to a lawful place > a description of the roles and responsibilities of everyone who manages the waste, including the site supervisor and sub-contractors. The WMP is to be regularly updated to record how waste is managed and audit where waste is taken.	Contractor
Construction	
Adequate supervision is to be provided to ensure the waste management plan is implemented and complied with. Accurate written records are to be kept such as: > who transported the waste (company name, ABN, vehicle registration and driver details, date and time of transport, description of waste) > copies of waste dockets/receipts for the waste facility (date and time of delivery, name and address of the facility, its ABN, contact person).	Contractor
The construction contractor is to ensure that waste generated by the works is transported to a place that can lawfully accept it as per Section 143 of the *Protection of the Environment Operations Act* 1997.	Contractor
All waste, would be recycled if practicable or alternatively taken to a licensed waste disposal facility.	Contractor
Solid waste materials including garbage would be collected in steel containers and transported off the site to an approved waste disposal facility. Waste receptacles for recyclable and non-recyclable waste are to be provided for personnel waste.	Contractor
Any human wastes generated and other liquid or toxic wastes would be disposed of at a location off the site to an appropriate waste disposal facility.	Contractor
Employees are required to follow the Contaminated Waste Classification Flowchart in the WMP in order to determine actions that are required to deal with contaminated materials.	Contractor

Action/Phase	Responsibility
Trucks used for the transport of excavated materials, loose debris and other materials or for the transportation of loose materials to site shall be loaded in such a manner and fitted with suitable tarpaulins as to prevent materials dropping from the truck during transportation along the foreshore and public roads.	Contractor

9.13 Naturally Occurring Asbestos

Objective(s)

To reduce the risk of asbestos contamination during works.

Action(s)

Action/Phase	Responsibility
Construction	
Excavations into the serpentinite should be managed with an Asbestos Management Plan, and be undertaken in accordance with WHS Regulations Part 8.4 Management of Naturally Occurring Asbestos.	Contractor

10 Conclusions

This Statement of Environmental Effects (SEE) has been prepared to support the preparation and lodgement of a Development Application on behalf of Port Macquarie-Hastings Council. Development Consent is sought for Coastal Protection Works comprising Stage 1 of a seawall and associated infrastructure at Flynns Beach, Port Macquarie

The proposed Stage 1 Flynns Beach Seawall is considered essential to ensure the long term amenity of Flynns Beach is retained for the enjoyment of the people of Port Macquarie as well as visitors. There would be no change to the existing beach and foreshore as a result of the proposal.

The works have the potential to cause minor adverse environmental impacts during construction related to restrictions of public access and recreational amenity, noise and traffic. However, these impacts would be temporary and are not considered to be significant. Particular care would need to be exercised while work is carried out in order to prevent potential water quality impacts.

The proposed new seawall is not considered to have a significant impact on any terrestrial or aquatic species, populations or communities that are of state and/or federal conservation significance. It is not considered that any threatened fauna would be reliant upon the habitat of Flynns Beach.

There are no known Aboriginal significant places or items identified and therefore a section 90 Aboriginal Heritage Impact Permit (AHIP) under the NPW Act would not be required. No items of European historic heritage were identified in the vicinity.

On the basis of the information presented in this SEE, it is concluded that by adopting the safeguards identified in this assessment there would be no significant adverse environmental impacts associated with the proposed works. The proposal is consistent with the relevant legislation and planning policies and guidleines

11 References

Cardno, (2018a) *Flynns Beach Seawall – Stage 1, Basis of Design Report*, prepared for Michilis Pty Ltd.

Cardno (2018b) *Geotechnical Interpretive Report, Flynns Beach Seawall Replacement – Stage 1,* prepared for Michilis Pty Ltd.

DECC (1990), Environmentally Friendly Seawalls – A Guide to Improving the Environmental Value of Seawalls and Seawall-Lined Foreshores in Estuaries, New South Wales Dept. of Environment and Climate Change,

DECC (2009a) Interim Construction Noise Guideline, NSW and Department of Environment and Climate Change

DECC (2009b) *NSW Department of Environment and Climate Change (DECC), "Waste Classification Guidelines, Part 1 - Classifying Waste," Department of Environment and Climate Change NSW, December 2009.* DP&I (2001) Comprehensive Coastal Assessment Toolkit

DECCW (2010) *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales*

Environment Protection Authority, 2000, *NSW Industrial Noise Policy*

Fisheries NSW's Policy and Guidelines for Fish Habitat Conservation and Management (2013 Update).

Landcom's Blue Book Volume 1 (2004), Managing Urban Stormwater: Soils and Construction – Volume 1,4th Edition, reprinted July 2006.

NSW Public Works MHL (2014) *Flynns Beach Seawall, Port Macquarie, Design Report.*

NSW Public Works MHL (MHL) 2013, *Concept Design for the Seawall at Flynns Beach, Port Macquarie*, Report No. 2182, January 2013.

NSW Public Works MHL (2014) *Flynns Beach Seawall, Port Macquarie, Review of Environmental Factors,* Report No. DC13220, February 2016.

NSW Department of Environment, Climate Change and Water *Interim Construction Noise Guideline* (DECCW, 2009).

Port Macquarie (2014). *Vegetation mapping within the Port Macquarie LGA.*

APPENDIX

C

ECOLOGICAL IMPACT ASSESSMENT

Ecological Impact Assessment

Flynns Beach Seawall Design & Construction

81018050

Prepared for

Port Macquarie-Hastings Council

26 October 2018

Cardno

Contact Information

Cardno (NSW/ACT) Pty Ltd
ABN 95 001 145 035

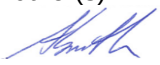
Unit 1
10 Denney Street
Broadmeadow 2292
Australia

Phone +61 2 4965 4555
Fax +61 2 4965 4666

Document Information

Prepared for	Port Macquarie-Hastings Council
Project Name	Flynns Beach Seawall Design & Construction
File Reference	81018050 Flynns Beach - Flora and Fauna Assessment Rev0.docm
Job Reference	81018050
Date	26 October 2018
Version Number	Rev0

Author(s):



Name: Dr Andrew Smith
Job title: Terrestrial Ecologist

Effective Date 26/10/2018

Approved By:

Name: Dr Craig Blount
Job title: Senior Environmental Scientist

Date Approved 26/10/2018

Document History

Version	Effective Date	Description of Revision	Prepared by	Reviewed by
RevA	27/06/2018	Draft for Client Review	Dr Andrew Smith	Dr Craig Blount
Rev0	26/10/2018	Final for Client	Dr Andrew Smith	Dr Craig Blount

Table of Contents

Appendices

Tables

Figures

Executive Summary

Cardno have been engaged by Michilis Pty Ltd to prepare a Statement of Environmental Effects (SEE) to support the preparation and lodgement of a Development Application on behalf of Port Macquarie-Hastings Council. Development Consent is sought for Coastal Protection Works comprising Stage 1 of a seawall and associated infrastructure at Flynns Beach, Port Macquarie (the project). An Ecological Impact Assessment (EIA) has been prepared to support the SEE for the works, which is the subject of this report.

The EIA included a desktop review and field surveys, with a focus on determining the likelihood of occurrence of threatened species, population and ecological communities, and migratory species listed under the NSW *Biodiversity Conservation Act 2016* (BC Act) and / or Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Field surveys were done on 16-17 May 2018 and included a flora survey, targeted threatened species searches, a bird census, herpetofauna searches, spotlighting and habitat assessments.

The vegetation within the Study Area was highly disturbed/modified and consisted predominantly of exotic grasses and planted trees. However, there were three patches of 'Littoral Rainforest' adjacent to the Study Area. This vegetation is mapped as such within the Coastal Management SEPP and is also commensurate with the following TECs:

- *Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*, which is listed as endangered under the BC Act; and
- *Littoral Rainforest and Coastal Vine Thickets of Eastern Australia*, which is listed as critically endangered under the EPBC Act.

One threatened flora species was detected within the Study Area, *Sophora tomentosa* (Silverbush), which is listed as endangered under the BC Act. There were at least 45 saplings growing along the remains of the existing seawall. There were also numerous patches of mature specimens growing along the sandy beach/vegetation zones south of the proposed seawall. The mature patches of *Sophora tomentosa* and Littoral Rainforest would be protected from any direct or indirect impact construction by exclusion fencing, and sediment and erosion controls. However, the sapling *Sophora tomentosa* that exist within Study Area would be required to be removed, with a high potential for translocation.

A Grey-headed Flying-fox (*Pteropus poliocephalus*), which is listed as vulnerable under the BC Act and EPBC Act, was observed foraging within the Littoral Rainforest vegetation adjacent to the Study Area. However, there was no evidence found to indicate that the Study Area and the adjacent vegetation is been used as a roosting camp site. Therefore, the Grey-headed Flying-fox is unlikely to be affected by the project.

The vegetation within and adjacent to the Study Area is not 'Secondary' or 'Primary' Koala habitat. Therefore, no Koala habitat is likely to be affected from the project.

Many other threatened or migratory birds or bat species had at least a moderate or higher chance of occurring within the Study Area given that they have suitable habitat in close proximity.

As the amount of vegetation/habitat that would be affected is limited to predominantly already disturbed non-native vegetation and that patches of native vegetation/habitat in areas adjacent to the Study Area would be avoided, the project would not have a significant impact on these threatened or migratory birds or bats. Furthermore, no hollow-bearing trees are proposed to be affected as part of the project.

In conclusion, the project would result in a small amount of vegetation/habitat being affected within the Study Area. However, provided the recommendations in this report are implemented, the project is unlikely to remove, modify, fragment or isolate any area of habitat important to the long-term survival of any threatened flora and fauna, populations or ecological communities in the locality.

Terms and Abbreviations

Abbreviation	Description
BAM	Biodiversity Assessment Method
BDAR	Biodiversity Development Assessment Report
BC Act	NSW *Biodiversity Conservation Act 2016*
Bio Act	NSW *Biosecurity Act 2015*
BoM	Bureau of Meteorology
Cardno	Cardno (NSW/ACT) Pty Ltd
Council	Port Macquarie-Hastings
DPI	NSW Department of Primary Industries
DoEE	Commonwealth Department of Environment and Energy
EIA	Ecological Impact Assessment
EP&A Act	NSW *Environmental Planning & Assessment Act 1979*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
KTP	Key Threatening Processes
LGA	Local Government Area
MNES	Matters of National Environmental Significance
NPW Act	NSW *National Parks and Wildlife Act 1974*
OEH	NSW Office of Environment and Heritage
PCT	Plant Community Types
PMST	Protected Matters Search Tool
SEE	Statement of Environmental Effects
SEPP	State Environmental Planning Policy
TEC	Threatened Ecological Community
TSC Act	NSW *Threatened Species Conservation Act 1995*
WoNS	Weed of National Significance

1 Introduction

1.1 Background

Cardno (NSW/ACT) Pty Ltd (Cardno) have been engaged by Michilis Pty Ltd to prepare a Statement of Environmental Effects (SEE) to support the preparation and lodgement of a Development Application (DA) on behalf of Port Macquarie-Hastings Council (Council). Development Consent is sought for Coastal Protection Works comprising Stage 1 of a seawall and associated infrastructure at Flynns Beach, Port Macquarie (the project, see below). An Ecological Impact Assessment (EIA) has been prepared to support the SEE for the works, which is the subject of this report.

Flynns Beach is approximately 500 m in length and faces east-north-east. It is an embayed sandy beach located between two rocky headlands that faces east-north-east and hence it is somewhat protected from the dominant offshore wave direction from the south-south-east in comparison with open ocean beaches on the NSW mid-north coast. Rocky features are present throughout the foreshore area, with a rocky outcrop in the centre of the embayment creating a small salient feature towards the south of the beach.

The existing retaining wall, which supports the foreshore embankment providing protection to the landward foreshore of Flynns Beach from coastal erosion, is failing in sections. The existing 260-metre-long retaining wall constructed in the late 1970's, is in poor condition with concrete cancer taking over in some panels and posts. Undermining from ocean storms, groundwater and stormwater flows is also occurring in sections.

1.2 Description of the Project

Council is proposing to build a 336m seawall along Flynns Beach, which would be located immediately seaward of the existing retaining wall. The project involves the construction of an approximately 80m section of seawall (Stage 1) along Flynns Beach, with associated sustainable stormwater management and landscaping works. The function of the proposed seawall is to replace the existing retaining wall in order to protect the valuable public asset of Flynns Beach and the foreshore behind against coastal erosion.

For this DA, only Stage 1 of the proposed seawall is subject to the application. The remaining Stage 2/3 works will be subject to a separate DA in the future. Stage one consists of an approximate length of 80 metres of seawall between chainages 93.52 to 174.77.

The new seawall design comprises:

- A reinforced cantilever concrete seawall structure with integral wheelchair accessibility ramp and adjoining the existing boat ramp;
- A reinforced concrete beach access stairs adjacent to the proposed seawall;
- A new footpath slab at the top of the proposed wall for more suitable beach access; and
- Associated minor landscaping works including footpath and grassed areas;

The proposed seawall design has an allowance for Sea Level Rise (SLR) of 450mm to the year 2050. The design drawings for the Flynns Beach Seawall are provided in **Appendix A**.

1.3 Site Particulars

The Study Area is located at Flynns Beach, approximately 2.2 km south-east of Port Macquarie (**Figure 1-1**). Other specific site particulars are located in **Table 1-1**.

Table 1-1 Site Particulars.

Attribute	Site Particular
LGA	Port Macquarie-Hastings
Location	Flynns Beach
Area	The Study Area encompasses approximately 0.9 ha.
Current Land Use	The Study Area is located on disturbed/modified land that includes sandy beach, picnic tables, a road, carpark and other public facilities (**Figure 1-2**).

Attribute	Site Particular
Topography	The Study Area is located on a steep slope that faces east.
Zoning	RE1 – Public Recreation
Bioregion / Sub-region	North Coast / Macleay Hastings
Mitchell Landscape	Port Macquarie Coastal Ramp
Geology	Port Macquarie Complex
NSW WeedWise Local Areas	North Coast
Biodiversity Values Map (OEH 2018a)	None within or adjacent to the Study Area.

1.4 Objectives of the Ecological Impact Assessment

The overall aim of the EIA was to assess the potential impacts of the project on the flora and fauna of the local area. Specifically, it would:

- Determine if the project is likely to result in any significant impacts to flora and fauna, in particular threatened and / or migratory species, populations or ecological communities listed under State and / or Commonwealth legislation, or their associated habitats;
- Recommend measures to avoid, minimise and/or mitigate any potential impacts to flora, fauna and their habitat; and
- Determine whether the residual impacts (if any) to flora and fauna were ecologically acceptable following implementation of mitigation measures.

1.5 Legislative Requirements

The EIA addresses the following specific legislative planning requirements relating to flora and fauna:

- Potential impacts on threatened species, populations and ecological communities listed under the NSW *Biodiversity Conservation Act 2016* (BC Act);
- Potential impacts to nationally listed Matters of National Environmental Significance (MNES) under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act); and
- Potential requirements listed under the NSW *Biosecurity Act 2015* (Bio Act) for Priority Weeds for the Hunter local area.

The project does not occur within an area mapped as having high biodiversity value and would not results in the removal of native vegetation above the threshold. As such, the preparation of a Biodiversity Development Assessment Report (BDAR) in accordance with the Biodiversity Assessment Method (BAM) is not required and has not been included in this report.

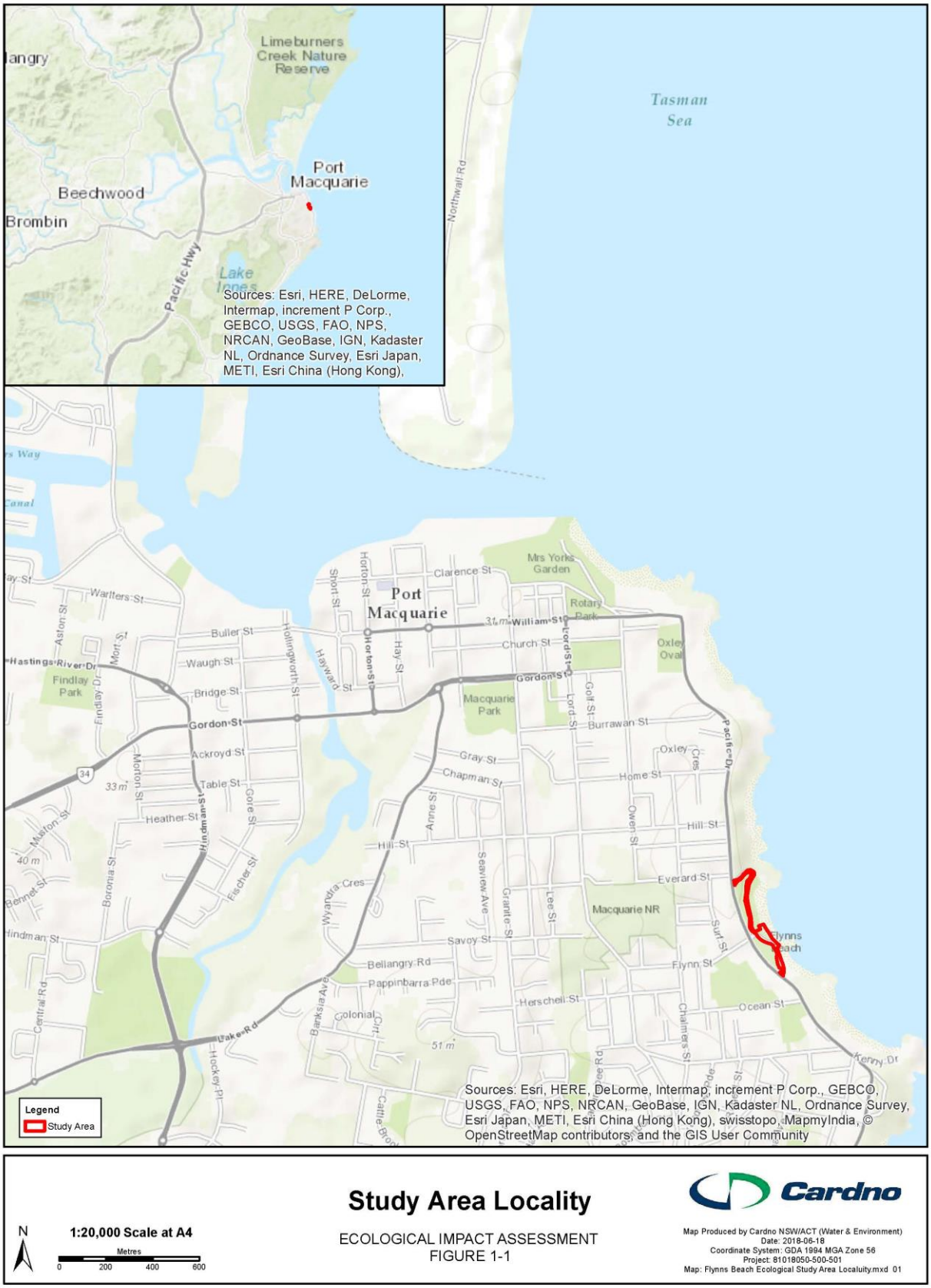


Figure 1-1 Study Area Locality.

Figure 1-2 Study Area.

2 Methods

2.1 Database Searches and Literature Review

A desktop review was undertaken to identify current records of threatened flora, fauna and ecological communities, migratory species, Areas of Outstanding Biodiversity Value and Key Threatening Processes (KTP) within 10 km of the Study Area (locality). This included searches of online databases and a review of available spatial data and literature relevant to the Study Area, including:

- The NSW Office of Environment and Heritage (OEH) BioNet Atlas database, which contains records of threatened species, populations and ecological communities and KTPs listed under the BC Act (Accessed May 2018);
- The Commonwealth Department of the Environment and Energy (DoEE) Protected Matters Search Tool (PMST) was used to identify MNES listed under the Commonwealth EPBC Act (Accessed May 2018);
- Local vegetation mapping (Port Macquarie 2014);
- Areas of Outstanding Biodiversity Value (AOBV) (OEH 2018a); and
- Habitat profiles for all threatened and migratory species, populations and ecological communities that are known, or have potential, to occur within the locality DoEE 2018b; OEH 2018b).

Marine dependant species were not considered in this assessment e.g. Sea Turtle, Whale, Albatross, Shearwater etc.

2.2 Field Survey

2.2.1 Terrestrial Ecology

A field survey of the flora and fauna was undertaken by a suitably qualified ecologist, Dr Andrew Smith, on 16-17 May 2018. The Study Area surveyed included that within, and immediately adjacent. **Table 2-1** provides the conditions during the field survey.

Table 2-1 The conditions during the survey period.

Field Survey Dates	Temperature (°C)	Rainfall (mm)	Sunrise / Sunset	Moonrise / Moonset
16 May 2018	8.2 – 21.0	0.0	06:29 / 16:59	08:50 / - 19:33
17 May 2018	11.5 – 21.3	0.0	06:30 / 16:59	09:44 / - 20:40

Sources: BoM (2018), Timebie (2018a; 2018b).

The flora survey identified and assessed the condition of vegetation within the Study Area. A random meander over the Study Area was undertaken to identify all plant species (including weeds). The survey included targeted searches for threatened flora species identified as potentially occurring as determined from the desktop review (**Section 2.1**).

A fauna survey was undertaken within the habitats in the Study Area. The species groups and sampling methods are given in **Table 2-2**.

Table 2-2 Fauna surveys conducted within the Study Area.

Fauna Group	Survey Types	Methods and Survey Effort
Diurnal Birds	Area search	Birds were identified from visual observations and call identification. A search for nests was also undertaken.
Herpetofauna	Habitat search	Opportunistic active searches for frogs and reptiles within suitable habitat (i.e. leaf litter, under rocks and long grass).
Nocturnal fauna	Spotlighting	30 minutes of spotlighting across the Study Area.
All	Opportunistic sightings	Opportunistic sightings of other fauna were recorded.

2.2.1.2 Habitat Assessment

The availability and quality of habitat within the Study Area was assessed with respect to the following factors:

- Structural and floral diversity;
- Diversity and extent of habitat types;
- Habitat connectivity, including continuity with similar habitats within the Study Area, and adjacent areas via habitat corridors;
- Location and utilisation of key habitat features including tree hollows, water bodies, caves and crevices and rocky areas;
- Degree of disturbance and degradation evident from visual inspections; and
- Topographic features such as aspect and slope.

2.2.1.3 Secondary Indications and Incidental Observations

Opportunistic sightings of secondary indications of resident fauna were noted. Indicators included:

- Distinctive scats and detectable scents left by mammals;
- Collection of predator scats for potential prey species identification;
- Nests made by various guilds of birds;
- Whitewash, regurgitation pellets and prey remains from owls;
- Skeletal material of vertebrate fauna;
- Calls of fauna;
- Footprints left by mammals;
- Chewed She-oak (*Allocasuarina* spp.) cones indicative of feeding by the Glossy Black-Cockatoo (*Calyptorhynchus lathami*);
- Chewed fruit remains indicative of past feeding by frugivorous birds such as fruit-doves and Grey-headed Flying Foxes (*Pteropus poliocephalus*); and
- Any other signs of fauna activities.

2.2.2 Survey Limitations

Survey efficacy is influenced by a range of factors. For this type of survey, such limitations are characteristic of snapshot surveys that do not account for temporal variation. Given the short period of time spent on site, the detection of certain species and ecological values may be affected by:

- Seasonal migration (particularly migratory birds);
- Seasonal flowering periods (some species are cryptic and are unlikely to be detected outside of the known flowering period);
- Seasonal availability of food, such as blossoms for some fauna;
- Weather conditions during the survey period (some species may go through cycles of activity related to specific weather conditions, for example some microchiropteran bats (microbats), reptiles and frogs can be inactive during cold weather); and
- Species life-cycle (cycles of activity related to breeding).

These potential limitations have been addressed by applying the precautionary principle in cases where the survey methodology may have given a false negative result (e.g. a species that could reasonably be expected to occur, based on previous records and available habitat, was not observed). All species have been assessed on the basis of the presence of suitable habitat and the likely significance of that habitat to support a viable local population.

3 Results

3.1 Desktop Searches

3.1.1 BioNet Atlas

The results from the BioNet Atlas database searches indicated that 77 threatened species have been recorded within 10 km of the Study Area, including two frog, 39 bird, 20 mammal, two insect and 14 flora species (**Table 3-1**). In addition, nine threatened ecological communities (TECs) are known, or are predicted to occur, within 10 km of the Study Area (**Table 3-2**).

Table 3-1 Threatened species listed under the BC Act and / or EPBC Act recorded within 10 km of the Study Area (BioNet Atlas).

Family	Scientific Name	Common Name	BC Act	EPBC Act	Records
Frogs					
Myobatrachidae	*Crinia tinnula*	Wallum Froglet	V	-	47
Hylidae	*Litoria aurea*	Green and Golden Bell Frog	E	V	3
Birds					
Casuariidae	*Dromaius novaehollandiae*	Emu population in the New South Wales North Coast Bioregion and Port Stephens local government area	EP	-	1
Anseranatidae	*Anseranas semipalmata*	Magpie Goose	V	-	3
Anatidae	*Oxyura australis*	Blue-billed Duck	V	-	1
	Stictonetta naevosa	Freckled Duck	V	-	10
Columbidae	*Ptilinopus magnificus*	Wompoo Fruit-Dove	V	-	7
	Ptilinopus regina	Rose-crowned Fruit-Dove	V	-	13
Ciconiidae	*Ephippiorhynchus asiaticus*	Black-necked Stork	E	-	44
Ardeidae	*Botaurus poiciloptilus*	Australasian Bittern	E	E	5
	Ixobrychus flavicollis	Black Bittern	V	-	2
Accipitridae	*Circus assimilis*	Spotted Harrier	V	-	6
	Haliaeetus leucogaster	White-bellied Sea-Eagle	V	C	58
	Hieraaetus morphnoides	Little Eagle	V	-	1
	Lophoictinia isura	Square-tailed Kite	V	-	20
	Pandion cristatus	Eastern Osprey	V	-	57
Gruidae	*Grus rubicunda*	Brolga	V	-	2
Burhinidae	*Burhinus grallarius*	Bush Stone-curlew	E	-	2
	Esacus magnirostris	Beach Stone-curlew	CE	-	2
Haematopodidae	*Haematopus fuliginosus*	Sooty Oystercatcher	V	-	36

Family	Scientific Name	Common Name	BC Act	EPBC Act	Records
	Haematopus longirostris	Pied Oystercatcher	E	-	18
Charadriidae	*Charadrius mongolus*	Lesser Sand-plover	V	E, C,J,K	56
Jacanidae	*Irediparra gallinacea*	Comb-crested Jacana	V	-	4
Scolopacidae	*Calidris canutus*	Red Knot	-	E, C,J,K	3
	Numenius madagascariensis	Eastern Curlew	-	CE, C,J,K	15
	Xenus cinereus	Terek Sandpiper	V	C,J,K	4
Laridae	*Onychoprion fuscata*	Sooty Tern	V	-	1
	Sternula albifrons	Little Tern	E	C,J,K	13
Cacatuidae	*Calyptorhynchus lathami*	Glossy Black-Cockatoo	V	-	15
Psittacidae	*Glossopsitta pusilla*	Little Lorikeet	V	-	18
	Lathamus discolor	Swift Parrot	E	CE	8
	Pezoporus wallicus wallicus	Eastern Ground Parrot	V	-	4
Strigidae	*Ninox connivens*	Barking Owl	V	-	1
	Ninox strenua	Powerful Owl	V	-	12
Tytonidae	*Tyto longimembris*	Eastern Grass Owl	V	-	29
	Tyto novaehollandiae	Masked Owl	V	-	6
Meliphagidae	*Anthochaera phrygia*	Regent Honeyeater	CE	CE	1
Neosittidae	*Daphoenositta chrysoptera*	Varied Sittella	V	-	25
Campephagidae	*Coracina lineata*	Barred Cuckoo-shrike	V	-	27
Artamidae	*Artamus cyanopterus cyanopterus*	Dusky Woodswallow	V	-	4
Petroicidae	*Petroica boodang*	Scarlet Robin	V	-	2
Mammals					
Dasyuridae	*Dasyurus maculatus*	Spotted-tailed Quoll	V	E	20
	Phascogale tapoatafa	Brush-tailed Phascogale	V	-	2
	Planigale maculata	Common Planigale	V	-	4
Phascolarctidae	*Phascolarctos cinereus*	Koala	V	V	1547
Petauridae	*Petaurus australis*	Yellow-bellied Glider	V	-	1

Family	Scientific Name	Common Name	BC Act	EPBC Act	Records
	Petaurus norfolcensis	Squirrel Glider	V	-	23
Pseudocheiridae	*Petauroides volans*	Greater Glider	-	V	2
Potoroidae	*Aepyprymnus rufescens*	Rufous Bettong	V	-	1
Pteropodidae	*Pteropus poliocephalus*	Grey-headed Flying-fox	V	V	88
	Syconycteris australis	Common Blossom-bat	V	-	1
Emballonuridae	*Saccolaimus flaviventris*	Yellow-bellied Sheathtail-bat	V	-	3
Molossidae	*Mormopterus norfolkensis*	Eastern Freetail-bat	V	-	15
Vespertilionidae	*Chalinolobus nigrogriseus*	Hoary Wattled Bat	V	-	1
	Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	-	3
	Miniopterus australis	Little Bentwing-bat	V	-	34
	Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V	-	17
	Myotis macropus	Southern Myotis	V	-	8
	Scoteanax rueppellii	Greater Broad-nosed Bat	V	-	13
	Vespadelus troughtoni	Eastern Cave Bat	V	-	7
Muridae	*Pseudomys gracilicaudatus*	Eastern Chestnut Mouse	V	-	14
Insects					
Nymphalidae	*Argynnis hyperbius*	Laced Fritillary	E	CE	4
Petaluridae	*Petalura gigantea*	Giant Dragonfly	E	-	4
Flora					
Apocynaceae	*Cynanchum elegans*	White-flowered Wax Plant	E	E	1
Casuarinaceae	*Allocasuarina defungens*	Dwarf Heath Casuarina	E	E	5
Euphorbiaceae	*Chamaesyce psammogeton*	Sand Spurge	E	-	4
Fabaceae (Caesalpinioideae)	*Senna acclinis*	Rainforest Cassia	E	-	1
Fabaceae (Faboideae)	*Sophora tomentosa*	Silverbush	E	-	7
Juncaginaceae	*Maundia triglochinoides*	-	V	-	9
Myrtaceae	*Eucalyptus nicholii*	Narrow-leaved Black Peppermint	V	V	3
	Melaleuca biconvexa	Biconvex Paperbark	V	V	30
Orchidaceae	*Dendrobium melaleucaphilum*	Spider orchid	E	-	1

Family	Scientific Name	Common Name	BC Act	EPBC Act	Records
	Diuris sp. aff. *chrysantha*	Byron Bay Diuris	E	-	1
	Oberonia titania	Red-flowered King of the Fairies	V	-	1
	Peristeranthus hillii	Brown Fairy-chain Orchid	V	-	1
Rubiaceae	*Asperula asthenes*	Trailing Woodruff	V	V	2
Rutaceae	*Acronychia littoralis*	Scented Acronychia	E	E	7

Key: CE = Critically Endangered, E = Endangered, EP = Endangered Population, V = Vulnerable.

Table 3-2 Threatened ecological communities listed under the BC Act and / or EPBC Act that are known, or are predicted, to occur within 10 km of the Study Area (BioNet Atlas).

Ecological Community Name	BC Act	EPBC Act	Records
Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions – BC Act *Subtropical and Temperate Coastal Saltmarsh* – EPBC Act	E	V	Known
Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E	-	Known
Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions – BC Act *Littoral Rainforest and Coastal Vine Thickets of Eastern Australia* – EPBC Act	E	CE	Known
Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions – BC Act *Lowland Rainforest of Subtropical Australia* – EPBC Act	E	CE	Known
Lowland Rainforest on Floodplain in the New South Wales North Coast Bioregion – BC Act *Lowland Rainforest of Subtropical Australia* – EPBC Act	E	CE	Known
Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion	E	-	Known
Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E	-	Known
Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E	-	Known
Themeda grassland on seacliffs and coastal headlands in the NSW North Coast, Sydney Basin and South East Corner Bioregions	E	-	Known

Key: CE = Critically Endangered, E = Endangered, V = Vulnerable.

3.1.2 Commonwealth EPBC Protected Matters database

The results of Commonwealth EPBC Protected Matters database search indicated that 34 threatened species and four TECs are known, or have potential, to occur within 10 km of the Study Area, including 13 bird, one frog, one insect, seven mammal and 12 flora species (**Table 3-3**). In addition, 30 migratory species are known, or are predicted, to occur within 10 km of the Study Area (**Table 3-4**).

Table 3-3 Threatened species and ecological communities listed under the BC Act, FM Act and/or EPBC Act that are known, or have the potential, to occur within 10 km of the Study Area (PMST).

Scientific Name	Common Name	BC Act / FM Act	EPBC Act	Type of Presence
Birds				
Anthochaera phrygia	Regent Honeyeater	CE	CE	Species or species habitat **known** to occur within area
Botaurus poiciloptilus	Australasian Bittern	E	E	Species or species habitat **known** to occur within area
Calidris canutus	Red Knot	-	E	Species or species habitat **known** to occur within area
Calidris ferruginea	Curlew Sandpiper	E	CE	Species or species habitat **known** to occur within area
Charadrius mongolus	Lesser Sand Plover	V	E	Roosting **known** to occur within area
Dasyornis brachypterus	Eastern Bristlebird	E	E	Species or species habitat **likely** to occur within area
Erythrotriorchis radiatus	Red Goshawk	CE	V	Species or species habitat **likely** to occur within area
Grantiella picta	Painted Honeyeater	V	V	Species or species habitat **may** occur within area
Lathamus discolor	Swift Parrot	E	CE	Species or species habitat **known** to occur within area
Limosa lapponica baueri	Western Alaskan Bar-tailed Godwit	-	V	Species or species habitat **likely** to occur within area
Limosa lapponica menzbieri	Northern Siberian Bar-tailed Godwit	-	CE	Species or species habitat **may** occur within area
Numenius madagascariensis	Eastern Curlew	-	CE	Species or species habitat **known** to occur within area
Rostratula australis	Australian Painted Snipe	E	E	Species or species habitat **may** occur within area
Frogs				
Litoria aurea	Green and Golden Bell Frog	E	V	Species or species habitat **known** to occur within area
Insects				
Argynnis hyperbius inconstans	Australian Fritillary	E	CE	Species or species habitat **likely** to occur within area
Mammals				
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	Species or species habitat **likely** to occur within area
Dasyurus maculatus maculatus	Spotted-tailed Quoll (SE mainland population)	V	E	Species or species habitat **known** to occur within area

Scientific Name	Common Name	BC Act / FM Act	EPBC Act	Type of Presence
Petauroides volans	Greater Glider	-	V	Species or species habitat **known** to occur within area
Phascolarctos cinereus	Koala (combined populations of Qld, NSW and the ACT)	V	V	Species or species habitat **known** to occur within area
Potorous tridactylus tridactylus	Long-nosed Potoroo (SE mainland)	V	V	Species or species habitat **likely** to occur within area
Pseudomys novaehollandiae	New Holland Mouse	-	V	Species or species habitat **likely** to occur within area
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	Roosting **known** to occur within area
Flora				
Acronychia littoralis	Scented Acronychia	E	E	Species or species habitat **likely** to occur within area
Allocasuarina defungens	Dwarf Heath Casuarina	E	E	Species or species habitat **known** to occur within area
Arthraxon hispidus	Hairy-joint Grass	V	V	Species or species habitat **may** occur within area
Asperula asthenes	Trailing Woodruff	V	V	Species or species habitat **likely** to occur within area
Cryptostylis hunteriana	Leafless Tongue-orchid	V	V	Species or species habitat **likely** to occur within area
Cynanchum elegans	White-flowered Wax Plant	E	E	Species or species habitat **known** to occur within area
Euphrasia arguta	-	CE	CE	Species or species habitat **may** occur within area
Macadamia integrifolia	Macadamia Nut	-	V	Species or species habitat **may** occur within area
Melaleuca biconvexa	Biconvex Paperbark	V	V	Species or species habitat **known** to occur within area
Phaius australis	Lesser Swamp-orchid	E	E	Species or species habitat **may** occur within area
Syzygium paniculatum	Magenta Lilly Pilly	E	V	Species or species habitat **may** occur within area
Thesium australe	Austral Toadflax	V	V	Species or species habitat **likely** to occur within area
Ecological community				
Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community		E	E	Community **may** occur within area

Scientific Name	Common Name	BC Act / FM Act	EPBC Act	Type of Presence
Littoral Rainforest and Coastal Vine Thickets of Eastern Australia		E	CE	Community **likely** to occur within area
Lowland Rainforest of Subtropical Australia		E	CE	Community **likely** to occur within area
Subtropical and Temperate Coastal Saltmarsh		E	V	Community **likely** to occur within area

Key: CE = Critically Endangered, E = Endangered, V = Vulnerable.

Table 3-4 Migratory species listed under the EPBC Act that are known, or have the potential, to occur within 10 km of the Study Area (PMST).

Scientific Name	Common Name	BC Act	EPBC Act	Type of Presence
Migratory Marine Birds				
Apus pacificus	Fork-tailed Swift	-	C, J, K	Species or species habitat **likely** to occur within area
Migratory Terrestrial Species				
Cuculus optatus	Oriental Cuckoo	-	Bonn	Species or species habitat **may** occur within area
Hirundapus caudacutus	White-throated Needletail	-	C, J, K	Species or species habitat **known** to occur within area
Monarcha melanopsis	Black-faced Monarch	-	Bonn	Species or species habitat **known** to occur within area
Monarcha trivirgatus	Spectacled Monarch	-	Bonn	Species or species habitat **known** to occur within area
Myiagra cyanoleuca	Satin Flycatcher	-	Bonn	Species or species habitat **known** to occur within area
Rhipidura rufifrons	Rufous Fantail	-	Bonn	Species or species habitat **known** to occur within area
Migratory Wetlands Species				
Actitis hypoleucos	Common Sandpiper	-	Bonn, C, J, K	Species or species habitat **known** to occur within area
Arenaria interpres	Ruddy Turnstone	-	Bonn, C, J, K	Roosting **known** to occur within area
Calidris acuminata	Sharp-tailed Sandpiper	-	Bonn, C, J, K	Species or species habitat **known** to occur within area
Calidris canutus	Red Knot	-	E, Bonn, C, J, K	Species or species habitat **known** to occur within area
Calidris ferruginea	Curlew Sandpiper	E	CE, Bonn, C, J, K	Species or species habitat **known** to occur within area
Calidris melanotos	Pectoral Sandpiper	-	Bonn, C, K	Species or species habitat **may** occur within area
Calidris ruficollis	Red-necked Stint	-	Bonn, C, J, K	Roosting **known** to occur within area
Charadrius bicinctus	Double-banded Plover	-	Bonn	Roosting **known** to occur within area
Charadrius mongolus	Lesser Sand Plover	V	E, Bonn, C, J, K	Roosting **known** to occur within area

Scientific Name	Common Name	BC Act	EPBC Act	Type of Presence
Gallinago hardwickii	Latham's Snipe	-	Bonn, J, K	Roosting **may** occur within area
Gallinago megala	Swinhoe's Snipe	-	Bonn, C, J, K	Roosting **likely** to occur within area
Gallinago stenura	Pin-tailed Snipe	-	Bonn, C, J, K	Roosting **likely** to occur within area
Limosa lapponica	Bar-tailed Godwit	-	Bonn, C, J, K	Species or species habitat **known** to occur within area
Numenius madagascariensis	Eastern Curlew	-	CE, Bonn, C, J, K	Species or species habitat **known** to occur within area
Numenius minutus	Little Curlew	-	Bonn, C, J, K	Roosting **likely** to occur within area
Numenius phaeopus	Whimbrel	-	Bonn, C, J, K	Roosting **known** to occur within area
Pandion haliaetus	Osprey	V	Bonn	Roosting **known** to occur within area
Pluvialis fulva	Pacific Golden Plover	-	Bonn, C, J, K	Roosting **known** to occur within area
Pluvialis squatarola	Grey Plover	-	Bonn, C, J, K	Roosting **known** to occur within area
Tringa brevipes	Grey-tailed Tattler	-	Bonn, C, J, K	Roosting **known** to occur within area
Tringa nebularia	Common Greenshank	-	Bonn, C, J, K	Species or species habitat **known** to occur within area
Xenus cinereus	Terek Sandpiper	V	Bonn, C, J, K	Roosting **known** to occur within area

Key: CE = Critically Endangered, E = Endangered, V = Vulnerable, Bonn = Convention on the Conservation of Migratory Species of Wild Animals, C = CAMBA (China–Australia Migratory Bird Agreement), J = JAMBA (Japan-Australia Migratory Bird Agreement), K = ROKAMBA (Republic of Korea–Australia Migratory Bird Agreement).

3.1.3 Local Vegetation Mapping (Port Macquarie 2014)

The local vegetation mapping indicated that at there is negligible to no native vegetation within the Study Area (Port Macquarie 2014). However, the following two vegetation communities are located adjacent to Study Area (**Figure 3-1**):

- Coastal Banksia – Coastal She-oak Headland Woodland; and
- Coastal Headland Brushbox Littoral Rainforest.

The Coastal Headland Brushbox Littoral Rainforest is commensurate with the following threatened ecological communities:

- *Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*, which is listed as endangered under the BC Act; and
- *Littoral Rainforest and Coastal Vine Thickets of Eastern Australia*, which is listed as critically endangered under the EPBC Act.

3.1.4 Koala Habitat Mapping (Port Macquarie 2014)

The local Koala habitat mapping indicated that no Koala habitat occurs within the Study Area (Port Macquarie 2014). The vegetation adjacent to the Study Area is mapped as ‘other’ and not ‘Secondary’ or ‘Primary’ Koala habitat (**Figure 3-2**).

Figure 3-1 Local Vegetation Mapping (Port Macquarie 2014).

Figure 3-2 Koala Habitat Mapping (Port Macquarie 2014).

3.2 Field Survey

3.2.1 Flora

3.2.1.1 General

One threatened flora species was detected within the Study Area, *Sophora tomentosa* (Silverbush), which is listed as endangered under the BC Act. There were at least 56 growing within or in close proximity to the Study Area. There were also numerous patches of mature specimens growing along the sandy beach/vegetation zones south of the proposed seawall (**Plate 3-1**; **Figure 3-2**).

Plate 3-1. A patch of mature *Sophora tomentosa* (Silverbush) growing in close proximity to the propped project.

The vegetation within the Study Area was predominantly exotic grasses and planted trees. In particular, several *Araucaria heterophylla* (Norfolk Island Pine) and *Dracaena draco* (Dragon Tree) occur in close proximity to the proposed seawall location. The adjacent vegetation was found to have been accurately mapped (Port Macquarie 2014) (See **Section 3.1.3**). At least three patches of this adjacent vegetation were commensurate with the following threatened ecological communities (**Figure 3-3**):

- *Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*, which is listed as endangered under the BC Act; and
- *Littoral Rainforest and Coastal Vine Thickets of Eastern Australia*, which is listed as critically endangered under the EPBC Act.

3.2.1.2 Priority Weed Species

Whilst there were many species of weed detected within the Study Area, two were listed as priority weed species within the North Coast region NSW WeedWise local area under the NSW *Biosecurity Act 2015* (DPI 2018):

- *Chrysanthemoides monilifera* subsp. *rotundata* (Bitou Bush): **Prohibition on dealings** – Must not be imported into the State or sold, **Biosecurity Zone** – The Bitou Bush Biosecurity Zone is established for all land within the State except land within 10 kilometres of the mean high water mark of the Pacific Ocean between Cape Byron in the north and Point Perpendicular in the south. *Within the Biosecurity Zone this weed must be eradicated where practicable, or as much of the weed destroyed as practicable, and any remaining weed suppressed. The local control authority must be notified of any new infestations of this weed within the Biosecurity Zone*. This species is also listed as a Weed of National Significance (WoNS) (DoEE 2018c); and
- *Lantana camara* (Lantana): **Prohibition on dealings** – Must not be imported into the State or sold. This species is also listed as a WoNS (DoEE 2018c).

A full list of flora species detected during the field survey is given in **Appendix B: Table B1-1**.

3.2.2 **Fauna**

3.2.2.1 General

Whilst no threatened fauna species listed under the BC Act or EPBC Act were detected within the Study Area. A Grey-headed Flying-fox (*Pteropus poliocephalus*), which is listed as vulnerable under the BC Act and EPBC Act, was observed foraging within the Littoral Rainforest vegetation adjacent to the Study Area (**Figure 3-3**). No evidence was found to indicate that the Study Area or the adjacent vegetation was being used as a roosting camp site.

The most often encountered fauna were birds that are known to be common within the urban/coastal Port Macquarie region, with the Grey Butcherbird (*Cracticus torquatus*), Welcome Swallow (*Hirundo neoxena*) and Little Wattlebird (*Anthochaera chrysoptera*) being the most commonly encountered. During the spotlighting survey, two Common Ringtail Possums (*Pseudocheirus peregrinus*) were observed within the vegetation adjacent to the Study Area as well as the Grey-headed Flying-fox.

A full list of fauna species detected during the field survey is given in **Appendix B: Table B1-2**.

3.2.2.2 Terrestrial Habitat Features

The habitat features for threatened fauna within the Study Area were limited as the site is highly modified/disturbed, however, sandy beach habitat occurs adjacently to the existing seawall. Threatened species potentially using the site, would most likely be moving through the site as they travel between areas of more optimal habitat. Habitats adjacent to the Study Area that would potentially be suitable for threatened fauna species include:

- Coastal Health;
- Littoral Rainforest; and
- Rocky outcrops located in the intertidal zone.

No hollow-bearing trees were present within or in close proximity to the Study Area.

Figure 3-3 Ecological Constraints within the Study Area.

4 Assessment of Likelihood of Occurrence and Potential for Impact

Threatened species, populations and ecological communities, and migratory species (listed under the BC Act and / or EPBC Act) that are known, or have potential, to occur within a 10 km radius of the Study Area have been considered in this section. The likelihood of occurrence within the Study Area of each species or TEC was assessed using the criteria described in **Table 4-1** and the findings presented in **Table 4-2**. This assessment was undertaken based on previous records, the results of the field survey and known species habitat requirements. **Table 4-2** also provides an assessment of the potential impact of the project on each species and TEC.

Table 4-1 Likelihood of occurrence criteria.

Likelihood Rating	Criteria
Known	The species was recorded within the Study Area during the field surveys.
High	It is likely that a species would inhabit or utilise habitat within the Study Area. Criteria for this category may include: > Species recently and/or regularly recorded in contiguous or nearby habitat. > High quality habitat or resources present within the Study Area. > Species is known or likely to maintain a resident population surrounding the Study Area. > Species is known or likely to visit during migration or in response to seasonal availability of resources present on site.
Moderate	Potential habitat for a species occurs within the Study Area. Criteria for this category may include: > Species previously recorded in contiguous habitat albeit not recently (>10 years). > Habitat present, but poor quality, depauperate or modified types and/or resources. > Species has potential to utilise habitat during migration or seasonal availability of resources. > Cryptic flora species with potential habitat within the Study Area that have not been targeted by surveys (for example, surveys were not undertaken with the flowering season.
Low	It is unlikely that the species inhabits the area, if it did, it would likely be a transient visitor. Criteria for this category may include: > The Study Area does not support the specific habitat types or resources required by the species. > The Study Area is beyond the current distribution of the species or is isolated from known populations. > Non cryptic flora species not observed during targeted surveys.
None/Absent	The habitat within the Study Area is unsuitable for the species.

Table 4-2 Assessment of likelihood of occurrence of threatened species, populations and communities, and migratory species assessment of potential impacts.

Species / Population / Ecological Community Name	Source	BC Act	EPBC Act	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Insects						
Laced Fritillary (*Argynnis hyperbius*)	BioNet - 4 PMST - L	E	CE	The Australian Fritillary is found in open swampy coastal habitat. Eggs are laid singly on a leaf of the caterpillar's food plant, the Arrowhead Violet (*Viola betonicifolia*).	**Low**. This species was not detected during the field survey and no suitable swamp or similar habitat occurs within or in close proximity to the Study Area. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.
Giant Dragonfly (*Petalura gigantea*)	BioNet - 4	E	-	Live in permanent swamps and bogs with some free water and open vegetation. Adults emerge from late October and are short-lived, surviving for one summer after emergence. Adults spend most of their time settled on low vegetation on or adjacent to the swamp. They hunt for flying insects over the swamp and along its margins.	**Low**. This species was not detected during the field survey and no suitable swamp or similar habitat occurs within or in close proximity to the Study Area. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.
Frogs						
Wallum Froglet (*Crinia tinnula*)	BioNet - 47	V	-	Wallum Froglets are found in a wide range of habitats, usually associated with acidic swamps on coastal sand plains. They typically occur in sedgelands and wet heathlands. They can also be found along drainage lines within other vegetation communities and disturbed areas, and occasionally in swamp sclerophyll forests. The species breeds in swamps with permanent water as well as shallow ephemeral pools and drainage ditches	**Low**. This species was not detected during the field survey and no suitable swamp or similar habitat occurs within or in close proximity to the Study Area. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.

Species / Population / Ecological Community Name	Source	BC Act	EPBC Act	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Green and Golden Bell Frog (*Litoria aurea*)	BioNet – 3 PMST - K	E	V	Inhabits marshes, dams and stream-sides, particularly those containing Bullrushes (*Typha* spp.) or Spikerushes (*Eleocharis* spp.). Optimum habitat includes water-bodies that are unshaded, free of predatory fish such as Plague Minnow (*Gambusia holbrooki*), have a grassy area nearby and diurnal sheltering sites available. Some sites, particularly in the Greater Sydney region occur in highly disturbed areas.	**Low**. This species was not detected during the field survey and no suitable swamp or similar habitat occurs within or in close proximity to the Study Area. T Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.
Birds						
Emu population in the New South Wales North Coast Bioregion and Port Stephens local government area (*Dromaius novaehollandiae*)	BioNet - 1	EP	-	On the NSW north coast, Emus occur in a range of predominantly open lowland habitats, including grasslands, heathland, shrubland, open and shrubby woodlands, forest, and swamp and sedgeland communities, as well as the ecotones between these habitats. They also occur in plantations of tea-tree and open farmland, and occasionally in littoral rainforest.	**Low**. This species was not detected during the field survey and is not known to occur in the general locality. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.
Magpie Goose (*Anseranas semipalmata*)	BioNet - 3	V	-	Mainly found in shallow wetlands (less than 1 m deep) with dense growth of rushes or sedges.	**Low**. This species was not detected during the field survey and no suitable wetland or similar habitat occurs within or in close proximity to the Study Area. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.
Blue-billed Duck (*Oxyura australis*)	BioNet - 1	V	-	The Blue-billed Duck prefers deep water in large permanent wetlands and swamps with dense aquatic vegetation. The species is completely aquatic, swimming low in the water along the edge of dense cover. It will fly if disturbed, but prefers to dive if approached.	**Low**. This species was not detected during the field survey and no suitable wetland or similar habitat occurs within or in close proximity to the Study Area. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.

Species / Population / Ecological Community Name	Source	BC Act	EPBC Act	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Freckled Duck (*Stictonetta naevosa*)	BioNet - 10	V	-	Prefer permanent freshwater swamps and creeks with heavy growth of Cumbungi, Lignum or Tea-tree. During drier times they move from ephemeral breeding swamps to more permanent waters such as lakes, reservoirs, farm dams and sewage ponds.	**Low**. This species was not detected during the field survey and no suitable wetland or similar habitat occurs within or in close proximity to the Study Area. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.
Wompoo Fruit-Dove (*Ptilinopus magnificus*)	BioNet - 7	V	-	Occurs in, or near rainforest, low elevation moist eucalypt forest and brush box forests.	**Moderate**. Whilst this species was not detected during the field survey, suitable rainforest occurs adjacent to the Study Area. Therefore, this has at least a moderate likelihood of occurring within the Study Area.	**Unlikely**. No important habitat for this species would be impacted as part of the project. Also, if this species were detected within the Study Area, it would likely be passing through to access patches of suitable habitat that occurs outside of the Study Area. Therefore, this species is unlikely to be impacted by the project.
Rose-crowned Fruit-Dove (*Ptilinopus regina*)	BioNet - 13	V	-	Rose-crowned Fruit-doves occur mainly in sub-tropical and dry rainforest and occasionally in moist eucalypt forest and swamp forest, where fruit is plentiful.	**Moderate**. Whilst this species was not detected during the field survey, suitable rainforest occurs adjacent to the Study Area. Therefore, this has at least a moderate likelihood of occurring within the Study Area.	**Unlikely**. No important habitat for this species would be impacted as part of the project. Also, if this species were detected within the Study Area, it would likely be passing through to access patches of suitable habitat that occurs outside of the Study Area. Therefore, this species is unlikely to be impacted by the project.

Species / Population / Ecological Community Name	Source	BC Act	EPBC Act	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Black-necked Stork (*Ephippiorhynchus asiaticus*)	BioNet - 44	E	-	Floodplain wetlands (swamps, billabongs, watercourses and dams) of the major coastal rivers are the key habitat in NSW for the Black-necked Stork. Secondary habitat includes minor floodplains, coastal sandplain wetlands and estuaries.	**Low**. This species was not detected during the field survey and no suitable wetland or similar habitat occurs within or in close proximity to the Study Area. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.
Australasian Bittern (*Botaurus poiciloptilus*)	BioNet - 5 PMST - K	E	E	The distribution of this species ranges from south-east Queensland to south-east South Australia, Tasmania and south-west of Western Australia. Preferred habitat includes permanent and seasonal freshwater habitats. It forages in shallow water in wetlands with tall dense vegetation.	**Low**. This species was not detected during the field survey and no suitable wetland or similar habitat occurs within or in close proximity to the Study Area. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.
Black Bittern (*Ixobrychus flavicollis*)	BioNet - 2	V	-	Solitary species, living near water (estuarine to brackish) in mangroves and other trees which need to form only a narrow fringe of cover. A riparian species that occasionally ventures into the open within estuarine habitats. Sedentary resident along Dora and Stockton Creeks in western Lake Macquarie has also been recorded semi-regularly in the Paterson River but is likely to occur in any brackish to estuarine forested coastal creeks in the lower NSW coast.	**Low**. This species was not detected during the field survey and no suitable wetland or similar habitat occurs within or in close proximity to the Study Area. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.
Australian Painted Snipe (*Rostratula australis*)	PMST - M	E	E	This species has a widespread distribution along the east coast of Australia. Preferred habitats include shallow freshwater wetlands, swamps and inundated grassland.	**Low**. This species was not detected during the field survey and no suitable wetland or similar habitat occurs within or in close proximity to the Study Area. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.

Species / Population / Ecological Community Name	Source	BC Act	EPBC Act	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Spotted Harrier (*Circus assimilis*)	BioNet - 6	V	-	Found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands. Also found in grassy open woodland including *Acacia* and mallee remnants, inland riparian woodland, grassland and shrub steppe.	**Low**. This species was not detected during the field survey and no suitable native grassland or similar habitat occurs within or in close proximity to the Study Area. Therefore, this species has a low chance of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.
White-bellied Sea-Eagle (*Haliaeetus leucogaster*)	BioNet - 58	V	-	Habitats are characterised by the presence of large areas of open water including larger rivers, swamps, lakes, and the sea. Occurs at sites near the sea or sea-shore, such as around bays and inlets, beaches, reefs, lagoons, estuaries and mangroves; and at, or in the vicinity of freshwater swamps, lakes, reservoirs, billabongs and saltmarsh.	**Moderate**. Whilst this species was not detected during the field survey, this species is highly mobile and known to occur in the locality. Therefore, this has at least a moderate likelihood of occurring within the Study Area.	**Unlikely**. No important habitat for this species would be impacted as part of the project. Also, if this species were detected within the Study Area, it would likely be passing through to access patches of suitable habitat that occurs outside of the Study Area. Therefore, this species is unlikely to be impacted by the project.
Little Eagle (*Hieraaetus morphnoides*)	BioNet - 1	V	-	Occupies open eucalypt forest, woodland or open woodland. Also locates in Sheoak or *Acacia* woodlands and riparian woodlands of interior NSW.	**Low**. This species was not detected during the field survey and no suitable forest/woodland or similar habitat occurs within or in close proximity to the Study Area. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.

Species / Population / Ecological Community Name	Source	BC Act	EPBC Act	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Red Goshawk (*Erythrotriorchis radiatus*)	PMST - L	CE	V	Red Goshawks inhabit open woodland and forest, preferring a mosaic of vegetation types, a large population of birds as a source of food, and permanent water, and are often found in riparian habitats along or near watercourses or wetlands. In NSW, preferred habitats include mixed subtropical rainforest, *Melaleuca* swamp forest and riparian *Eucalyptus* forest of coastal rivers.	**Low**. This species was not detected during the field survey and no suitable forest/woodland or similar habitat occurs within or in close proximity to the Study Area. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.
Square-tailed Kite (*Lophoictinia isura*)	BioNet - 20	V	-	Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses.	**Low**. This species was not detected during the field survey and no suitable forest/woodland or similar habitat occurs within or in close proximity to the Study Area. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.
Eastern Osprey (*Pandion cristatus*)	BioNet - 57	V	-	Favour coastal areas, especially the mouths of large rivers, lagoons and lakes. Feed on fish over clear, open water.	**Moderate**. Whilst this species was not detected during the field survey, this species is highly mobile and known to occur in the locality. Therefore, this has at least a moderate likelihood of occurring within the Study Area.	**Unlikely**. No important habitat for this species would be impacted as part of the project. Also, if this species were detected within the Study Area, it would likely be passing through to access patches of suitable habitat that occurs outside of the Study Area. Therefore, this species is unlikely to be impacted by the project.

Species / Population / Ecological Community Name	Source	BC Act	EPBC Act	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Brolga (*Grus rubicunda*)	BioNet - 2	V	-	Though Brolgas often feed in dry grassland or ploughed paddocks or even desert claypans, they are dependent on wetlands too, especially shallow swamps, where they will forage with their head entirely submerged.	**Low**. This species was not detected during the field survey and no suitable wetland/grassland or similar habitat occurs within or in close proximity to the Study Area. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.
Bush Stone-curlew (*Burhinus grallarius*)	BioNet - 2	E	-	Inhabits open forests and woodlands with a sparse grassy groundlayer and fallen timber.	**Low**. This species was not detected during the field survey and no suitable forest/woodland or similar habitat occurs within or in close proximity to the Study Area. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.
Beach Stone-curlew (*Esacus magnirostris*)	BioNet - 2	CE	-	Beach Stone-curlews are found exclusively along the coast, on a wide range of beaches, islands, reefs and in estuaries, and may often be seen at the edges of or near mangroves. They forage in the intertidal zone of beaches and estuaries, on islands, flats, banks and spits of sand, mud, gravel or rock, and among mangroves. Beach Stone-curlews breed above the littoral zone, at the backs of beaches, or on sandbanks and islands, among low vegetation of grass, scattered shrubs or low trees; also among open mangroves.	**Moderate**. Whilst this species was not detected during the field survey, suitable beach habitat occurs adjacent to the Study Area. Therefore, this has at least a moderate likelihood of occurring within the Study Area.	**Unlikely**. No important habitat for this species would be impacted as part of the project. Also, if this species were detected within the Study Area, it would likely be passing through to access patches of suitable habitat that occurs outside of the Study Area. Therefore, this species is unlikely to be impacted by the project.

Species / Population / Ecological Community Name	Source	BC Act	EPBC Act	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Sooty Oystercatcher (*Haematopus fuliginosus*)	BioNet - 36	V	-	Favours rocky headlands, rocky shelves, exposed reefs with rock pools, beaches and muddy estuaries. Forages on exposed rock or coral at low tide for foods such as limpets and mussels.	**Moderate**. Whilst this species was not detected during the field survey, suitable beach habitat occurs adjacent to the Study Area. Therefore, this has at least a moderate likelihood of occurring within the Study Area.	**Unlikely**. No important habitat for this species would be impacted as part of the project. Also, if this species were detected within the Study Area, it would likely be passing through to access patches of suitable habitat that occurs outside of the Study Area. Therefore, this species is unlikely to be impacted by the project.
Pied Oystercatcher (*Haematopus longirostris*)	BioNet - 18	E	-	Favours intertidal flats of inlets and bays, open beaches and sandbanks. Forages on exposed sand, mud and rock at low tide, for molluscs, worms, crabs and small fish. The chisel-like bill is used to pry open or break into shells of oysters and other shellfish.	**Moderate**. Whilst this species was not detected during the field survey, suitable beach habitat occurs adjacent to the Study Area. Therefore, this has at least a moderate likelihood of occurring within the Study Area.	**Unlikely**. No important habitat for this species would be impacted as part of the project. Also, if this species were detected within the Study Area, it would likely be passing through to access patches of suitable habitat that occurs outside of the Study Area. Therefore, this species is unlikely to be impacted by the project.

Species / Population / Ecological Community Name	Source	BC Act	EPBC Act	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Lesser Sand-plover (*Charadrius mongolus*)	BioNet - 56 PMST - K	V	E, C,J,K	In non-breeding grounds in Australia, this species usually occurs in coastal littoral and estuarine environments. It inhabits large intertidal sandflats or mudflats in sheltered bays, harbours and estuaries, and occasionally sandy ocean beaches, coral reefs, wave-cut rock platforms and rocky outcrops. It also sometime occurs in short saltmarsh or among mangroves.	**Moderate**. Whilst this species was not detected during the field survey, suitable beach habitat occurs adjacent to the Study Area. Therefore, this has at least a moderate likelihood of occurring within the Study Area.	**Unlikely**. No important habitat for this species would be impacted as part of the project. Also, if this species were detected within the Study Area, it would likely be passing through to access patches of suitable habitat that occurs outside of the Study Area. Therefore, this species is unlikely to be impacted by the project.
Comb-crested Jacana (*Irediparra gallinacea*)	BioNet - 4	V	-	Inhabit permanent freshwater wetlands, either still or slow-flowing, with a good surface cover of floating vegetation, especially water-lilies, or fringing and aquatic vegetation.	**Low**. This species was not detected during the field survey and no suitable wetland or similar habitat occurs within or in close proximity to the Study Area. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.
Red Knot (*Calidris canutus*)	BioNet - 3 PMST - K	-	E, C,J,K	In Australasia the Red Knot mainly inhabit intertidal mudflats, sandflats and sandy beaches of sheltered coasts, in estuaries, bays, inlets, lagoons and harbours; sometimes on sandy ocean beaches or shallow pools on exposed wave-cut rock platforms or coral reefs. They are occasionally seen on terrestrial saline wetlands near the coast, such as lakes, lagoons, pools and pans, and recorded on sewage ponds and saltworks, but rarely use freshwater swamps.	**Moderate**. Whilst this species was not detected during the field survey, suitable beach habitat occurs adjacent to the Study Area. Therefore, this has at least a moderate likelihood of occurring within the Study Area.	**Unlikely**. No important habitat for this species would be impacted as part of the project. Also, if this species were detected within the Study Area, it would likely be passing through to access patches of suitable habitat that occurs outside of the Study Area. Therefore, this species is unlikely to be impacted by the project.

Species / Population / Ecological Community Name	Source	BC Act	EPBC Act	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Curlew Sandpiper (*Calidris ferruginea*)	PMST - K	E	CE	It generally occupies littoral and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats of sheltered coasts. It also occurs in non-tidal swamps, lakes and lagoons on the coast and sometimes inland.	**Low**. This species was not detected during the field survey and no suitable estuarine or similar habitat occurs within or in close proximity to the Study Area. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.
Western Alaskan Bar-tailed Godwit (*Limosa lapponica baueri*)	PMST - L	-	V	Breed in north-east Siberia and western Alaska. The Bar-tailed Godwit is found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. It is found often around beds of seagrass and, sometimes, in nearby saltmarsh. It has been sighted in coastal sewage farms and saltworks, saltlakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats. It is rarely found on inland wetlands or in areas of short grass, such as farmland, paddocks and airstrips, although it is commonly recorded in paddocks at some locations overseas. *L. l. baueri* have shorted bills and longer wings, and are more common in NSW than *L. l. menbieri*.	**Moderate**. Whilst this species was not detected during the field survey, suitable beach habitat occurs adjacent to the Study Area. Therefore, this has at least a moderate likelihood of occurring within the Study Area.	**Unlikely**. No important habitat for this species would be impacted as part of the project. Also, if this species were detected within the Study Area, it would likely be passing through to access patches of suitable habitat that occurs outside of the Study Area. Therefore, this species is unlikely to be impacted by the project.

Species / Population / Ecological Community Name	Source	BC Act	EPBC Act	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Northern Siberian Bar-tailed Godwit (*Limosa lapponica menzbieri*)	PMST - M	-	CE	Breed in northern Siberia. The Bar-tailed Godwit is found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. It is found often around beds of seagrass and, sometimes, in nearby saltmarsh. It has been sighted in coastal sewage farms and saltworks, saltlakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats. It is rarely found on inland wetlands or in areas of short grass, such as farmland, paddocks and airstrips, although it is commonly recorded in paddocks at some locations overseas. *L. l. menbieri* have long bills and shorter wings, and are less common in NSW than *L. l. baueri*.	**Moderate**. Whilst this species was not detected during the field survey, suitable beach habitat occurs adjacent to the Study Area. Therefore, this has at least a moderate likelihood of occurring within the Study Area.	**Unlikely**. No important habitat for this species would be impacted as part of the project. Also, if this species were detected within the Study Area, it would likely be passing through to access patches of suitable habitat that occurs outside of the Study Area. Therefore, this species is unlikely to be impacted by the project.
Eastern Curlew (*Numenius madagascariensis*)	BioNet - 15 PMST - K	-	CE, C,J,K	The Eastern Curlew is most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass. Occasionally, the species occurs on ocean beaches (often near estuaries), and coral reefs, rock platforms, or rocky islets. The birds are often recorded among saltmarsh and on mudflats fringed by mangroves, and sometimes use the mangroves. The birds are also found in saltworks and sewage farms. The numbers of Eastern Curlew recorded during one study were correlated with wetland areas.	**Moderate**. Whilst this species was not detected during the field survey, suitable beach habitat occurs adjacent to the Study Area. Therefore, this has at least a moderate likelihood of occurring within the Study Area.	**Unlikely**. No important habitat for this species would be impacted as part of the project. Also, if this species were detected within the Study Area, it would likely be passing through to access patches of suitable habitat that occurs outside of the Study Area. Therefore, this species is unlikely to be impacted by the project.
Terek Sandpiper (*Xenus cinereus*)	BioNet - 4 PMST - K	V	C,J,K	The Terek Sandpiper mostly forages in the open, on soft wet intertidal mudflats or in sheltered estuaries, embayments, harbours or lagoons. The species has also been recorded on islets, mudbanks, sandbanks and spits, and near mangroves and occasionally in samphire (*Halosarcia* spp.).	**Low**. This species was not detected during the field survey and no suitable intertidal mudflat or similar habitat occurs within or in close proximity to the Study Area. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.

Species / Population / Ecological Community Name	Source	BC Act	EPBC Act	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Sooty Tern (*Onychoprion fuscata*)	BioNet - 1	V	-	Large flocks can be seen soaring, skimming and dipping but seldom plunging in off shore waters.	**Moderate**. Whilst this species was not detected during the field survey, suitable beach habitat occurs adjacent to the Study Area. Therefore, this has at least a moderate likelihood of occurring within the Study Area.	**Unlikely**. No important habitat for this species would be impacted as part of the project. Also, if this species were detected within the Study Area, it would likely be passing through to access patches of suitable habitat that occurs outside of the Study Area. Therefore, this species is unlikely to be impacted by the project.
Little Tern (*Sternula albifrons*)	BioNet - 13	E	C,J,K	Almost exclusively coastal, preferring sheltered environments; however may occur several kilometres from the sea in harbours, inlets and rivers (with occasional offshore islands or coral cay records). Nests in small, scattered colonies in low dunes or on sandy beaches just above high tide mark near estuary mouths or adjacent to coastal lakes and islands.	**Moderate**. Whilst this species was not detected during the field survey, suitable beach habitat occurs adjacent to the Study Area. Therefore, this has at least a moderate likelihood of occurring within the Study Area.	**Unlikely**. No important habitat for this species would be impacted as part of the project. Also, if this species were detected within the Study Area, it would likely be passing through to access patches of suitable habitat that occurs outside of the Study Area. Therefore, this species is unlikely to be impacted by the project.
Glossy Black-Cockatoo (*Calyptorhynchus lathami*)	BioNet - 15	V	-	Occurs in forests and woodlands where it forages predominantly on *Allocasuarina* cones. Requires large Eucalypt tree hollows for nesting.	**Low**. This species was not detected during the field survey and no suitable forest/woodland or similar habitat occurs within or in close proximity to the Study Area. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.

Species / Population / Ecological Community Name	Source	BC Act	EPBC Act	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Little Lorikeet (*Glossopsitta pusilla*)	BioNet - 18	V	-	This species forages primarily in the canopy of open Eucalyptus forest and woodland, yet also finds food in Angophora, Melaleuca and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity. Also use isolated flowering trees in open country, e.g. paddocks, roadside remnants and urban trees also help sustain viable populations of the species.	**Low**. This species was not detected during the field survey and no suitable forest/woodland or similar habitat occurs within or in close proximity to the Study Area. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.
Swift Parrot (*Lathamus discolor*)	BioNet - 8 PMST - K	E	CE	On the mainland this species frequents Eucalypt forests and woodlands with large trees having high nectar production during winter. Mainland winter foraging sites often vary from year to year. Nests only in Tasmania, but regularly visits the Hunter Region in winter. Visits the Hunter Region when food sources are abundant or food sources are lacking in other areas. Food sources used in the Hunter include *E. robusta* (Swamp Mahogany) on the coast, and near coastal to inland Swift Parrots use *C. maculata* (Spotted Gum), *E. fibrosa* (Broad-leaved Ironbark) and *E. crebra* (Narrow-leaved Ironbark). Occasional records have come from *E. alba* (White Box) and *E. sideroxylon* (Mugga Ironbark). These food source trees have been recorded as roosting sites for Swift Parrot.	**Low**. This species was not detected during the field survey and no suitable forest/woodland or similar habitat occurs within or in close proximity to the Study Area. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.

Species / Population / Ecological Community Name	Source	BC Act	EPBC Act	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Eastern Ground Parrot (*Pezoporus wallicus wallicus*)	BioNet - 4	V	-	The Ground Parrot occurs in high rainfall coastal and near coastal low heathlands and sedgelands, generally below one metre in height and very dense (up to 90% projected foliage cover). These habitats provide a high abundance and diversity of food, adequate cover and suitable roosting and nesting opportunities for the Ground Parrot, which spends most of its time on or near the ground. When flushed, birds fly strongly and rapidly for up to several hundred metres, at a metre or less above the ground.	**Moderate**. Whilst this species was not detected during the field survey, suitable coastal heath habitat occurs adjacent to the Study Area. Therefore, this has at least a moderate likelihood of occurring within the Study Area.	**Unlikely**. No important habitat for this species would be impacted as part of the project. Also, if this species were detected within the Study Area, it would likely be passing through to access patches of suitable habitat that occurs outside of the Study Area. Therefore, this species is unlikely to be impacted by the project.
Barking Owl (*Ninox connivens*)	BioNet - 1	V	-	Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. It is flexible in its habitat use, and hunting can extend in to closed forest and more open areas. Sometimes able to successfully breed along timbered watercourses in heavily cleared habitats (e.g. western NSW) due to the higher density of prey on these fertile riparian soils.	**Low**. This species was not detected during the field survey and no suitable forest/woodland or similar habitat occurs within or in close proximity to the Study Area. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.
Powerful Owl (*Ninox strenua*)	BioNet - 12	V	-	Occurs in wet or dry sclerophyll forests and woodlands where suitable prey species occur (being predominantly arboreal mammals). Requires large hollows, usually in Eucalypt trees, for nesting. Roosts in dense vegetation within such areas. Roosts in dense vegetation within such species as *S. glomulifera* (Turpentine), *A. littoralis* (Black She-Oak), *A. melanoxylon* (Blackwood), *A. floribunda* (Rough-barked Apple), *E. cupressiformis* (Cherry Ballart) and *M. nodosa* (Ball Honeymyrtle).	**Low**. This species was not detected during the field survey and no suitable forest/woodland or similar habitat occurs within or in close proximity to the Study Area. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.

Species / Population / Ecological Community Name	Source	BC Act	EPBC Act	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Eastern Grass Owl (*Tyto longimembris*)	BioNet - 29	V	-	Eastern Grass Owls are found in areas of tall grass, including grass tussocks, in swampy areas, grassy plains, swampy heath, and in cane grass or sedges on flood plains.	**Low**. This species was not detected during the field survey and no suitable forest/woodland or similar habitat occurs within or in close proximity to the Study Area. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.
Masked Owl (*Tyto novaehollandiae*)	BioNet - 6	V	-	Lives in dry eucalypt forests and woodlands from sea level to 1100 m. A forest owl, but often hunts along the edges of forests, including roadsides.	**Low**. This species was not detected during the field survey and no suitable forest/woodland or similar habitat occurs within or in close proximity to the Study Area. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.
Regent Honeyeater (*Anthochaera phrygia*)	BioNet - 1 PMST - K	CE	CE	The species inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. Regent Honeyeaters inhabit woodlands that support a significantly high abundance and species richness of bird species. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes.	**Low**. This species was not detected during the field survey and no suitable forest/woodland or similar habitat occurs within or in close proximity to the Study Area. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.
Painted Honeyeater (*Grantiella picta*)	PMST - M	V	V	Inhabits Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus *Amyema*.	**Low**. This species was not detected during the field survey and no suitable forest/woodland or similar habitat occurs within or in close proximity to the Study Area. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.

Species / Population / Ecological Community Name	Source	BC Act	EPBC Act	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Eastern Bristlebird (*Dasyornis brachypterus*)	PMST - L	E	E	Habitat for central and southern populations is characterised by dense, low vegetation including heath and open woodland with a heathy understorey. In northern NSW the habitat occurs in open forest with dense tussocky grass understorey and sparse mid-storey near rainforest ecotone; all of these vegetation types are fire prone.	**Low**. This species was not detected during the field survey and is not known to occur in the general locality. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.
Varied Sittella (*Daphoenositta chrysoptera*)	BioNet - 25	V	-	This species inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland.	**Low**. This species was not detected during the field survey and no suitable forest/woodland or similar habitat occurs within or in close proximity to the Study Area. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.
Barred Cuckoo-shrike (*Coracina lineata*)	BioNet - 27	V	-	Rainforest, eucalypt forests and woodlands, clearings in secondary growth, swamp woodlands and timber along watercourses. They are usually seen in pairs or small flocks foraging among foliage of trees for insects and fruit. They are active birds, frequently moving from tree to tree.	**Low**. This species was not detected during the field survey and no suitable forest/woodland or similar habitat occurs within or in close proximity to the Study Area. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.
Dusky Woodswallow (*Artamus cyanopterus cyanopterus*)	BioNet - 4	V	-	In New South Wales, the species is widespread from coast to inland, including the western slopes of the Great Dividing Range and farther west. It is sparsely scattered in, or largely absent from, much of the Upper Western region. The majority of breeding records for this species, as well as presence records within the breeding period, occur on the western slopes of the Great Dividing Range, a region dominated by woodland and open dry forest.	**Low**. This species was not detected during the field survey and no suitable forest/woodland or similar habitat occurs within or in close proximity to the Study Area. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.

Species / Population / Ecological Community Name	Source	BC Act	EPBC Act	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Scarlet Robin (*Petroica boodang*)	BioNet - 2	V	-	The Scarlet Robin lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs.	**Low**. This species was not detected during the field survey and no suitable forest/woodland or similar habitat occurs within or in close proximity to the Study Area. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.
Mammals						
Spotted-tailed Quoll (SE mainland population) (*Dasyurus maculatus maculatus*)	BioNet - 20 PMST - K	V	E	Found in a variety of forested habitats. This species creates a den in fallen hollow logs or among rocky outcrops. Generally does not occur in otherwise suitable habitats that are in close proximity to urban development. Hunter Region records are largely confined to the surrounding ranges.	**Low**. Whilst potential habitat for this species occur in close proximity to the Study Area, it is known to avoid highly disturbed/modified habitats. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.
Brush-tailed Phascogale (*Phascogale tapoatafa*)	BioNet - 2	V	-	Prefer dry sclerophyll open forest with sparse groundcover of herbs, grasses, shrubs or leaf litter. Also inhabit heath, swamps, rainforest and wet sclerophyll forest.	**Low**. Whilst potential habitat for this species occurs in close proximity to the Study Area, this habitat is restricted to small isolated patches. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.
Common Planigale (*Planigale maculata*)	BioNet - 4	V	-	Common Planigales inhabit rainforest, eucalypt forest, heathland, marshland, grassland and rocky areas where there is surface cover, and usually close to water. They are active at night and during the day shelter in saucer-shaped nests built in crevices, hollow logs, beneath bark or under rocks.	**Moderate**. Whilst this species was not detected during the field survey, suitable rainforest/heath habitat occurs adjacent to the Study Area. Therefore, this has at least a moderate likelihood of occurring within the Study Area.	**Unlikely**. No important habitat for this species would be impacted as part of the project. Therefore, this species is unlikely to be impacted by the project.

Species / Population / Ecological Community Name	Source	BC Act	EPBC Act	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Koala (combined populations of Qld, NSW and the ACT) (*Phascolarctos cinereus*)	BioNet – 1547 PMST - K	V	V	Occurs in forests and woodlands where it requires suitable feed trees (particularly *Eucalyptus* spp.) and habitat linkages. Will occasionally cross open areas, although it becomes more vulnerable to predator attack and road mortality during these excursions.	**Low**. There are a high number of records of this species in general locality to the Study Area. However, this species was not detected during the field survey and no suitable feed trees or forest/woodland habitat occurs within or in close proximity to the Study Area. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.
Yellow-bellied Glider (*Petaurus australis*)	BioNet - 1	V	-	Occur in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils. Forest type preferences vary with latitude and elevation; mixed coastal forests to dry escarpment forests in the north; moist coastal gullies and creek flats to tall montane forests in the south.	**Low**. This species was not detected during the field survey and no suitable mature eucalypt forest or similar habitat occurs within or in close proximity to the Study Area. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.
Squirrel Glider (*Petaurus norfolcensis*)	BioNet - 23	V	-	This species occurs in eucalypt forests and woodlands where it feeds on sap exudates and blossoms. In these areas tree hollows are utilised for nesting sites. This species also requires winter foraging resources when the availability of normal food resources may be limited, such as winter-flowering shrub and small tree species. Widely distributed across the lower hunter region.	**Low**. This species was not detected during the field survey and no suitable forest/woodland or similar habitat occurs within or in close proximity to the Study Area. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.

Species / Population / Ecological Community Name	Source	BC Act	EPBC Act	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Greater Glider (*Petauroides volans*)	BioNet – 2 PMST - K	-	V	The Greater Glider is an arboreal marsupial, largely restricted to eucalypt forests and woodlands. It is primarily folivorous, with a diet mostly comprising eucalypt leaves, and occasionally flowers. It is found in highest abundance typically in taller, montane, moist eucalypt forests, with relatively old trees and abundant hollows. The distribution may be patchy even in suitable habitat. The greater glider favours forests with a diversity of eucalypt species, due to seasonal variation in its preferred tree species.	**Low**. This species was not detected during the field survey and no suitable forest/woodland or similar habitat occurs within or in close proximity to the Study Area. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.
Rufous Bettong (*Aepyprymnus rufescens*)	BioNet - 1	V	-	Rufous Bettongs inhabit a variety of forests from tall, moist eucalypt forest to open woodland, with a tussock grass understorey. A dense cover of tall native grasses is the preferred shelter.	**Low**. This species was not detected during the field survey and no suitable forest/woodland or similar habitat occurs within or in close proximity to the Study Area. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.
Long-nosed Potoroo (SE mainland) (*Potorous tridactylus tridactylus*)	PMST - L	V	V	Rufous Bettongs inhabit a variety of forests from tall, moist eucalypt forest to open woodland, with a tussock grass understorey. A dense cover of tall native grasses is the preferred shelter.	**Low**. This species was not detected during the field survey and no suitable forest/woodland or similar habitat occurs within or in close proximity to the Study Area. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.

Species / Population / Ecological Community Name	Source	BC Act	EPBC Act	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Grey-headed Flying-fox (*Pteropus poliocephalus*)	BioNet – 88 PMST - K	V	V	This species forages over a large area for nectar/fruits. Seasonally roosts in communal base camps situated within wet sclerophyll forests or rainforests. Frequently observed to forage in flowering Eucalypts. May occur anywhere within the Hunter Region where food or roosting resources are available.	**High.** At least one was detected foraging in vegetation adjacent to the Study Area. Also, a large roosting camp is known to occur in close proximity to the Study Area. Therefore, this has at least a high likelihood of occurring within the Study Area.	**Unlikely**. No important habitat for this species would be impacted as part of the project. Also, if this species were detected within the Study Area, it would likely be passing through to access patches of suitable habitat that occurs outside of the Study Area. Therefore, this species is unlikely to be impacted by the project.
Large-eared Pied Bat (*Chalinolobus dwyeri*)	PMST - L	V	V	This species forages in tall open forests and the edges of rainforest. It roosts in mine shafts and similar structures. Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of Fairy Martin (*H. ariel*), frequenting low to mid-elevation dry open forest and woodland close to these features. Females have been recorded raising young in maternity roosts (c. 20-40 females) from November through to January in roof domes in sandstone caves. They remain loyal to the same cave over many years. Found in well-timbered areas containing gullies. The relatively short, broad wing combined with the low weight per unit area of wing indicates manoeuvrable flight. This species probably forages for small, flying insects below the forest canopy. Hunter Region records for this species are largely confined to the Watagan Mountains, but it has been recorded on the southern side of Port Stephens.	**Moderate**. Suitable edge of rainforest habitat occurs adjacent to the Study Area. Therefore, this has at least a moderate likelihood of occurring within the Study Area.	**Unlikely**. No important habitat for this species would be impacted as part of the project. Also, if this species were detected within the Study Area, it would likely be passing through to access patches of suitable habitat that occurs outside of the Study Area. Therefore, this species is unlikely to be impacted by the project.

Species / Population / Ecological Community Name	Source	BC Act	EPBC Act	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Common Blossom-bat (*Syconycteris australis*)	BioNet - 1	V	-	Common Blossom-bats often roost in littoral rainforest and feed on nectar and pollen from flowers in adjacent heathland and paperbark swamps. They have also been recorded in a range of other vegetation communities, such as subtropical rainforest, wet sclerophyll forest and other coastal forests.	**Moderate**. Suitable littoral rainforest/heathland habitat occurs adjacent to the Study Area. Therefore, this has at least a moderate likelihood of occurring within the Study Area.	**Unlikely**. No important habitat for this species would be impacted as part of the project. Also, if this species were detected within the Study Area, it would likely be passing through to access patches of suitable habitat that occurs outside of the Study Area. Therefore, this species is unlikely to be impacted by the project.
Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*)	BioNet - 3	V	-	Range of habitats from rainforest to arid shrubland, roosts in tree-hollows. The species is known to occur in the Hunter Region.	**Moderate**. Suitable rainforest habitat occurs adjacent to the Study Area. Therefore, this has at least a moderate likelihood of occurring within the Study Area.	**Unlikely**. No important habitat for this species would be impacted as part of the project. Also, if this species were detected within the Study Area, it would likely be passing through to access patches of suitable habitat that occurs outside of the Study Area. Therefore, this species is unlikely to be impacted by the project.
Eastern Freetail-bat (*Mormopterus norfolkensis*)	BioNet - 15	V	-	This species is distributed south of Sydney extending north into south-eastern Queensland. There are no records west of the Great Dividing Range. Most records of this species have been reported from dry Eucalypt forest and woodland. It is expected that open forested areas and the cleared land adjacent to bushland, constitutes important habitat for this species. It is a predominantly treedwelling species, roosting in hollows or behind loose bark in mature Eucalypts.	**Low**. This species was not detected during the field survey and no suitable forest/woodland or similar habitat occurs within or in close proximity to the Study Area. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.

Species / Population / Ecological Community Name	Source	BC Act	EPBC Act	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Hoary Wattled Bat (*Chalinolobus nigrogriseus*)	BioNet - 1	V	-	In NSW, the Hoary Wattled Bat occurs in dry open eucalypt forests, favouring forests dominated by Spotted Gum, boxes and ironbarks, and heathy coastal forests where Red Bloodwood and Scribbly Gum are common. Because it flies fast below the canopy level, forests with naturally sparse understorey layers may provide the best habitat.	**Low**. This species was not detected during the field survey and no suitable forest/woodland or similar habitat occurs within or in close proximity to the Study Area. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.
Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)	BioNet - 3	V	-	The Eastern False Pipistrelle prefers moist habitats, with trees taller than 20 m. Generally roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings. Hibernates in winter.	**Moderate**. Suitable moist habitat occurs adjacent to the Study Area. Therefore, this has at least a moderate likelihood of occurring within the Study Area.	**Unlikely**. No important habitat for this species would be impacted as part of the project. Also, if this species were detected within the Study Area, it would likely be passing through to access patches of suitable habitat that occurs outside of the Study Area. Therefore, this species is unlikely to be impacted by the project.
Little Bentwing-bat (*Miniopterus australis*)	BioNet - 34	V	-	Inhabits moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. Generally found in well-timbered areas. Little Bentwing-bats roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats.	**Moderate**. Suitable rainforest habitat occurs adjacent to the Study Area. Therefore, this has at least a moderate likelihood of occurring within the Study Area.	**Unlikely**. No important habitat for this species would be impacted as part of the project. Also, if this species were detected within the Study Area, it would likely be passing through to access patches of suitable habitat that occurs outside of the Study Area. Therefore, this species is unlikely to be impacted by the project.

Species / Population / Ecological Community Name	Source	BC Act	EPBC Act	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*)	BioNet - 17	V	-	This species utilises a range of habitats for foraging, including rainforest, wet and dry sclerophyll forests, woodlands and open grasslands. Requires caves or similar structures for roosting habitat.	**Moderate**. Suitable rainforest habitat occurs adjacent to the Study Area. Therefore, this has at least a moderate likelihood of occurring within the Study Area.	**Unlikely**. No important habitat for this species would be impacted as part of the project. Also, if this species were detected within the Study Area, it would likely be passing through to access patches of suitable habitat that occurs outside of the Study Area. Therefore, this species is unlikely to be impacted by the project.
Southern Myotis (*Myotis macropus*)	BioNet - 8	V	-	Generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. Forage over streams and pools catching insects and small fish by raking their feet across the water surface.	**Moderate**. Suitable foraging habitat occurs adjacent to the Study Area. Therefore, this has at least a moderate likelihood of occurring within the Study Area.	**Unlikely**. No important habitat for this species would be impacted as part of the project. Also, if this species were detected within the Study Area, it would likely be passing through to access patches of suitable habitat that occurs outside of the Study Area. Therefore, this species is unlikely to be impacted by the project.

Species / Population / Ecological Community Name	Source	BC Act	EPBC Act	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Greater Broad-nosed Bat (*Scoteanax rueppellii*)	BioNet - 13	V	-	Utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. Although this species usually roosts in tree hollows, it has also been found in buildings.	**Moderate**. Suitable rainforest habitat occurs adjacent to the Study Area. Therefore, this has at least a moderate likelihood of occurring within the Study Area.	**Unlikely**. No important habitat for this species would be impacted as part of the project. Also, if this species were detected within the Study Area, it would likely be passing through to access patches of suitable habitat that occurs outside of the Study Area. Therefore, this species is unlikely to be impacted by the project.
Eastern Cave Bat (*Vespadelus troughtoni*)	BioNet - 7	V	-	A cave-roosting species that is usually found in dry open forest and woodland, near cliffs or rocky overhangs. It is occasionally found along cliff-lines in wet eucalypt forest and rainforest.	**Moderate**. Suitable rainforest habitat occurs adjacent to the Study Area. Therefore, this has at least a moderate likelihood of occurring within the Study Area.	**Unlikely**. No important habitat for this species would be impacted as part of the project. Also, if this species were detected within the Study Area, it would likely be passing through to access patches of suitable habitat that occurs outside of the Study Area. Therefore, this species is unlikely to be impacted by the project.
Eastern Chestnut Mouse (*Pseudomys gracilicaudatus*)	BioNet - 14	V	-	In NSW the Eastern Chestnut Mouse is mostly found, in low numbers, in heathland and is most common in dense, wet heath and swamps. In the tropics it is more an animal of grassy woodlands.	**Moderate**. Whilst this species was not detected during the field survey, suitable heath habitat occurs adjacent to the Study Area. Therefore, this has at least a moderate likelihood of occurring within the Study Area.	**Unlikely**. No important habitat for this species would be impacted as part of the project. Therefore, this species is unlikely to be impacted by the project.

Species / Population / Ecological Community Name	Source	BC Act	EPBC Act	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
New Holland Mouse (*Pseudomys novaehollandiae*)	PMST - L	-	V	This species has a patchy distribution within open woodlands, heathlands and in hind dune vegetation throughout Eastern Australia. In the Hunter Region the species stronghold is in the Myall Lakes region.	**Low**. Whilst potentially suitable heath habitat occurs in close proximity to the Study Area, this species is not known to occur in the general locality. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.
Flora						
Acronychia littoralis (Scented Acronychia)	BioNet - 7 PMST - L	E	E	Scented Acronychia occurs in transition zones between littoral rainforest and swamp sclerophyll forest; between littoral and coastal cypress pine communities; and margins of littoral forest. The species mainly occurs within 2km from the coast on sandy soil.	**Low**. Suitable littoral rainforest habitat occurs adjacently to the Study Area. However this species was not detected within or in close proximity to the Study Area during the field survey. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.
Allocasuarina defungens (Dwarf Heath Casuarina)	BioNet - 5 PMST - K	E	E	Dwarf Heath Casuarina grows mainly in tall heath on sand, but can also occur on clay soils and sandstone. The species also extends onto exposed nearby-coastal hills or headlands adjacent to sandplains.	**Low**. Suitable heath habitat occurs adjacently to the Study Area. However this species was not detected within or in close proximity to the Study Area during the field survey. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.
Arthraxon hispidus (Hairy-joint Grass)	PMST - M	V	V	Moisture and shade-loving grass, found in or on the edges of rainforest and in wet eucalypt forest, often near creeks or swamps.	**Low**. Suitable edge of rainforest habitat occurs adjacently to the Study Area. However this species was not detected within or in close proximity to the Study Area during the field survey. Also, the species is not generally known from the locality. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.

Species / Population / Ecological Community Name	Source	BC Act	EPBC Act	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Asperula asthenes (Trailing Woodruff)	BioNet - 2 PMST - L	V	V	Occurs in damp sites, often along river banks.	**Low**. This species was not detected during the field survey and no suitable damp or similar habitat occurs within or in close proximity to the Study Area. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.
Chamaesyce psammogeton (Sand Spurge)	BioNet - 4	E	-	Grows on fore-dunes, pebbly strandlines and exposed headlands, often with Spinifex (*Spinifex sericeus*) and Prickly Couch (*Zoysia macrantha*).	**Low**. Suitable fore-dune habitat occurs adjacently to the Study Area. However this species was not detected within or in close proximity to the Study Area during the field survey. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.
Cryptostylis hunteriana (Leafless Tongue-orchid)	PMST - K	V	V	Does not appear to have well defined habitat preferences and is known from a range of communities, including swamp-heath and woodland. The larger populations typically occur in woodland dominated by Scribbly Gum (*Eucalyptus sclerophylla*), Silvertop Ash (*E. sieberi*), Red Bloodwood (*Corymbia gummifera*) and Black Sheoak (*Allocasuarina littoralis*); appears to prefer open areas in the understorey of this community and is often found in association with the Large Tongue Orchid (*C. subulata*) and the Tartan Tongue Orchid (*C. erecta*).	**Low**. This species was not detected during the field survey and no suitable woodland or similar habitat occurs within or in close proximity to the Study Area. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.

Species / Population / Ecological Community Name	Source	BC Act	EPBC Act	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Cynanchum elegans (White-flowered Wax Plant)	BioNet - 1 PMST - M	E	E	The White-flowered Wax Plant usually occurs on the edge of dry rainforest vegetation. Other associated vegetation types include littoral rainforest; Coastal Tea-tree *Leptospermum laevigatum* – Coastal Banksia *Banksia integrifolia* subsp. *integrifolia* coastal scrub; Forest Red Gum *Eucalyptus tereticornis* aligned open forest and woodland; Spotted Gum *Corymbia maculata* aligned open forest and woodland; and Bracelet Honeymyrtle *Melaleuca armillaris* scrub to open scrub.	**Low**. This species was not detected during the field survey and no suitable edge of dry rainforest or similar habitat occurs within or in close proximity to the Study Area. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.
Dendrobium melaleucaphilum (Spider Orchid)	BioNet - 1	E	-	Grows frequently on *Melaleuca styphelioides*, less commonly on rainforest trees or on rocks in coastal districts. Flowers July–October.	**Low**. Suitable rainforest trees and coastal rocks habitat occurs adjacently to the Study Area. However this species was not detected within or in close proximity to the Study Area during the field survey. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.
Diuris sp. aff. *chrysantha* (Byron Bay Diuris)	BioNet - 1	E	-	Occurs in low-growing grassy heath on clay soil.	**Low**. This species was not detected during the field survey and no suitable grassy heath or similar habitat occurs within or in close proximity to the Study Area. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.
Eucalyptus nicholii (Narrow-leaved Black Peppermint)	BioNet - 3	V	V	Typically grows in dry grassy woodland, on shallow soils of slopes and ridges. Found primarily on infertile soils derived from granite or metasedimentary rock.	**Low**. This species was not detected during the field survey and no suitable grassy woodland or similar habitat occurs within or in close proximity to the Study Area. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.

Species / Population / Ecological Community Name	Source	BC Act	EPBC Act	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Euphrasia arguta	PMST - M	CE	CE	Historic records of the species noted the following habitats: 'in the open forest country around Bathurst in sub humid places', 'on the grassy country near Bathurst', and 'in meadows near rivers'.	**Low**. This species was not detected during the field survey and no suitable open forest or similar habitat occurs within or in close proximity to the Study Area. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.
Macadamia integrifolia (Macadamia Nut)	PMST - M	-	V	The Macadamia Nut grows in remnant rainforest, preferring partially open areas such as rainforest edges. However, this habitat is not continuously fit for the species.	**Low**. Suitable rainforest habitat occurs adjacently to the Study Area. However this species was not detected within or in close proximity to the Study Area during the field survey. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.
Maundia triglochinoides	BioNet - 9	V	-	Grows in swamps, lagoons, dams, channels, creeks or shallow freshwater 30–60 cm deep on heavy clay, low nutrients. Associated with wetland species e.g. *Triglochin procerum*.	**Low**. This species was not detected during the field survey and no suitable swamps, lagoons, dams, channels, creeks, shallow freshwater or similar habitat occurs within or in close proximity to the Study Area. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.
Melaleuca biconvexa (Biconvex Paperbark)	BioNet - 30 PMST - K	V	V	Biconvex Paperbark generally grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects.	**Low**. This species was not detected during the field survey and no suitable damp or similar habitat occurs within or in close proximity to the Study Area. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.

Species / Population / Ecological Community Name	Source	BC Act	EPBC Act	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Oberonia titania (Red-flowered King of the Fairies)	BioNet - 1	V	-	Red-flowered King of the Fairies occurs in littoral and subtropical rainforest and paperbark swamps, but it can also occur in eucalypt-forested gorges and in mangroves.	**Low**. Suitable rainforest habitat occurs adjacently to the Study Area. However this species was not detected within or in close proximity to the Study Area during the field survey. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.
Peristeranthus hillii (Brown Fairy-chain Orchid)	BioNet - 1	V	-	Restricted to coastal and near-coastal environments, particularly Littoral Rainforest and the threatened ecological community Lowland Rainforest on Floodplain.	**Low**. Suitable littoral rainforest habitat occurs adjacently to the Study Area. However this species was not detected within or in close proximity to the Study Area during the field survey. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.
Phaius australis (Lesser Swamp-orchid)	PMST - M	E	E	Swampy grassland or swampy forest including rainforest, eucalypt or paperbark forest, mostly in coastal areas.	**Low**. This species was not detected during the field survey and no suitable swamp or similar habitat occurs within or in close proximity to the Study Area. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.
Senna acclinis (Rainforest Cassia)	BioNet - 1	E	-	Grows on the margins of subtropical, littoral and dry rainforests. Often found as a gap phase shrub.	**Low**. Suitable littoral rainforest habitat occurs adjacently to the Study Area. However this species was not detected within or in close proximity to the Study Area during the field survey. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.

Species / Population / Ecological Community Name	Source	BC Act	EPBC Act	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Sophora tomentosa (Silverbush)	BioNet - 7	E	-	Silverbush occurs on coastal dunes.	**Detected**. This species was detected growing in numerous patches along the beach sand/vegetation interface, within the Study Area and south of the proposed seawall location.	**Likely**. At least 45 sapling that occurs along the existing remains of the seawall would be required to be removed.
Syzygium paniculatum (Magenta Lilly Pilly)	PMST - M	E	V	On the south coast the Magenta Lilly Pilly occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral (coastal) rainforest. On the central coast Magenta Lilly Pilly occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities.	**Low**. Suitable littoral rainforest habitat occurs adjacently to the Study Area. However this species was not detected within or in close proximity to the Study Area during the field survey. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.
Thesium australe (Austral Toadflax)	PMST - L	V	V	Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast. Often found in association with Kangaroo Grass (*Themeda australis*).	**Low**. This species was not detected during the field survey and no suitable grassland or similar habitat occurs within or in close proximity to the Study Area. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.
Ecological Communities						

Species / Population / Ecological Community Name	Source	BC Act	EPBC Act	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions – BC Act *Subtropical and Temperate Coastal Saltmarsh* – EPBC Act	BioNet - K	E	V	Coastal Saltmarsh occurs in the intertidal zone on the shores of estuaries and lagoons that are permanently or intermittently open to the sea. It is frequently found as a zone on the landward side of mangrove stands. Characteristic plants include *Baumea juncea*, Sea Rush (*Juncus krausii* subsp. *australiensis*), Samphire (*Sarcocornia quinqueflora* subsp. *quinqueflora*), Marine Couch (*Sporobolus virginicus*), Streaked Arrowgrass (*Triglochin striata*), Knobby Club-rush (*Ficinia nodosa*), Creeping Brookweed (*Samolus repens*), Swamp Weed (*Selliera radicans*), Seablite (*Suaeda australis*) and Prickly Couch (*Zoysia macrantha*).	**Absent**. The vegetation within and adjacent to the Study Area is considered not be commensurate with this ecological community.	**None.** As this ecological community is not present within or adjacent to the Study Area, it would not be impacted from the project.
Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	BioNet - K	E	-	This community is associated with coastal areas subject to periodic flooding and in which standing fresh water persists for at least part of the year in most years. Typically occurs on silts, muds or humic loams in low-lying parts of floodplains, alluvial flats, depressions, drainage lines, backswamps, lagoons and lakes but may also occur in backbarrier landforms where floodplains adjoin coastal sandplains. Generally occur below 20 m elevation on level areas.	**Absent**. The vegetation within and adjacent to the Study Area is considered not be commensurate with this ecological community.	**None.** As this ecological community is not present within or adjacent to the Study Area, it would not be impacted from the project.
Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions – BC Act *Littoral Rainforest and Coastal Vine Thickets of Eastern Australia* – EPBC Act	BioNet - K	E	CE	Littoral Rainforest is generally a closed forest, the structure and composition of which is strongly influenced by its proximity to the ocean. The plant species of this community are predominantly rainforest species. Several species have compound leaves, and vines may be a major component of the canopy.	**Detected**. This ecological community occurs in three patches to the west and north adjacent to the Study Area.	**Potentially**. Due to the close proximity of this ecological community to the project, it has the potential to be impacted and has been assessed further (see **Section 6.1** and **Section 5.2**).

Species / Population / Ecological Community Name	Source	BC Act	EPBC Act	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions – BC Act *Lowland Rainforest of Subtropical Australia* – EPBC Act	BioNet - K	E	CE	Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions is an ecological community of subtropical rainforest and some related, structurally complex forms of dry rainforest. Lowland Rainforest, in a relatively undisturbed state, has a closed canopy, characterised by a high diversity of trees whose leaves may be mesophyllous and encompass a wide variety of shapes and sizes.	**Absent**. The vegetation within and adjacent to the Study Area is considered not be commensurate with this ecological community.	**None.** As this ecological community is not present within or adjacent to the Study Area, it would not be impacted from the project.
Lowland Rainforest on Floodplain in the New South Wales North Coast Bioregion – BC Act *Lowland Rainforest of Subtropical Australia* – EPBC Act	BioNet - K	E	CE	Lowland Rainforest on Floodplain is a rainforest community which now occurs only as small remnants in scattered localities on the NSW north coast, with less than 1000ha in total thought to remain. Larger stands of the community typically have a dense canopy, which blocks most light from reaching the ground, creating cool, moist conditions within. Lowland Rainforest on Floodplain supports a rich diversity of plants and animals. Typical tree species in the community include figs (*Ficus macrophylla, F. obliqua* and *F. watkinsiana*), palms (*Archontophoenix cunninghamiana* and *Livistona australis),* Silky Oak (*Grevillea robusta*), Black Bean (*Castanospermum australe)* and Brush Cherry (*Syzygium australe*).	**Absent**. The vegetation within and adjacent to the Study Area is considered not be commensurate with this ecological community.	**None.** As this ecological community is not present within or adjacent to the Study Area, it would not be impacted from the project.

Species / Population / Ecological Community Name	Source	BC Act	EPBC Act	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion	BioNet - K	E	-	This subtropical forest occurs on the coastal floodplains of the North Coast of NSW. It has a tall open tree layer of eucalypts, angophoras, melaleucas and bloodwoods, which may exceed 40 m in height, but can be considerably shorter in regrowth stands or under conditions of lower site quality. While the composition of the tree stratum varies considerably, the most widespread and abundant dominant trees include *Eucalyptus tereticornis* (forest red gum), *E. siderophloia* (grey ironbark), *Corymbia intermedia* (pink bloodwood) and, north of the Macleay floodplain, *Lophostemon suaveolens* (swamp turpentine).	**Absent**. The vegetation within and adjacent to the Study Area is considered not be commensurate with this ecological community.	**None.** As this ecological community is not present within or adjacent to the Study Area, it would not be impacted from the project.
Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions – BC Act *Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community* – EPBC Act	BioNet – K PMST - M	E	E	This community is found on the coastal floodplains of NSW. It has a dense to sparse tree layer in which *Casuarina glauca* (Swamp Oak) is the dominant species northwards from Bermagui. Other trees including *Acmena smithii* (Lilly Pilly), *Glochidio*n spp. (Cheese Trees) and Melaleuca spp. (paperbarks) may be present as subordinate species, and are found most frequently in stands of the community northwards from Gosford.	**Absent**. The vegetation within and adjacent to the Study Area is considered not be commensurate with this ecological community.	**None.** As this ecological community is not present within or adjacent to the Study Area, it would not be impacted from the project.

Species / Population / Ecological Community Name	Source	BC Act	EPBC Act	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	BioNet - K	E	-	This swamp community has an open to dense tree layer of eucalypts and paperbarks although some remnants now only have scattered trees as a result of partial clearing. The trees may exceed 25 m in height, but can be considerably shorter in regrowth stands or under conditions of lower site quality where the tree stratum is low and dense. The most widespread and abundant dominant trees include *Eucalyptus robusta* (swamp mahogany), *Melaleuca quinquenervia* (paperbark).	**Absent**. The vegetation within and adjacent to the Study Area is considered not be commensurate with this ecological community.	**None.** As this ecological community is not present within or adjacent to the Study Area, it would not be impacted from the project.
Themeda grassland on seacliffs and coastal headlands in the NSW North Coast, Sydney Basin and South East Corner Bioregions	BioNet - K	E	-	*Themeda australis* is the dominant species in the Themeda Grassland on seacliffs and coastal headlands in the NSW North Coast, Sydney Basin and South East Corner bioregion ecological commmunity. *Themeda australis* is an extremely widespread species, but in this community it may have a distinctive appearance, being prostrate and having glaucous leaves.	**Absent**. The vegetation within and adjacent to the Study Area is considered not be commensurate with this ecological community.	**None.** As this ecological community is not present within or adjacent to the Study Area, it would not be impacted from the project.
Migratory Species						
Fork-tailed Swift (*Apus pacificus*)	PMST - L	-	C, J, K	This species is almost exclusively aerial, flying from less than 1 m to at least 300 m above ground and probably much higher.	**Moderate**. This species has the potential to fly over the Study Area during migration. Therefore, this species has the potential to occur.	**Unlikely**. If present, this species would likely only be transiting through the Study Area, and would be unlikely to experience any substantial impacts due to the project.

Species / Population / Ecological Community Name	Source	BC Act	EPBC Act	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Oriental Cuckoo (*Cuculus optatus*)	PMST - M	-	Bonn	Forest, woodland, riverside trees.	**Low**. This species was not detected during the field survey and no suitable forest/woodland or similar habitat occurs within or in close proximity to the Study Area. Therefore, this species has a low likelihood of occurring within the Study Area.	**Unlikely**. As this species has a low likelihood of occurring, the species is unlikely to be impacted from the project.
White-throated Needletail (*Hirundapus caudacutus*)	PMST - K	-	C, J, K	Non-breeding habitat only: Found across a range of habitats, more often over wooded areas, where it is almost exclusively aerial. Large tracts of native vegetation, particularly forest, may be a key habitat requirement for species. Found to roost in tree hollows in tall trees on ridge-tops, on bark or rock faces. Appears to have traditional roost sites.	**Moderate**. This species has the potential to fly over the Study Area during migration. Therefore, this species has the potential to occur.	**Unlikely**. If present, this species would likely only be transiting through the Study Area, and would be unlikely to experience any substantial impacts due to the project.
Black-faced Monarch (*Monarcha melanopsis*)	PMST - K	-	Bonn	This species is a wet forest specialist, found mainly in rainforest and wet sclerophyll forest, especially in sheltered gullies and slopes with a dense understorey of ferns and/or shrubs.	**Moderate**. Whilst this species was not detected during the field survey, suitable rainforest occurs adjacent to the Study Area. Therefore, this has at least a moderate likelihood of occurring within the Study Area.	**Unlikely**. No important habitat for this species would be impacted as part of the project. Also, if this species were detected within the Study Area, it would likely be passing through to access patches of suitable habitat that occurs outside of the Study Area. Therefore, this species is unlikely to be impacted by the project.

Species / Population / Ecological Community Name	Source	BC Act	EPBC Act	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Spectacled Monarch (*Monarcha trivirgatus*)	PMST - K	-	Bonn	Dense vegetation, mainly in rainforest but also in moist forest or wet sclerophyll and occasionally in other dense vegetation such as mangroves, drier forest and woodlands.	**Moderate**. Whilst this species was not detected during the field survey, suitable rainforest occurs adjacent to the Study Area. Therefore, this has at least a moderate likelihood of occurring within the Study Area.	**Unlikely**. No important habitat for this species would be impacted as part of the project. Also, if this species were detected within the Study Area, it would likely be passing through to access patches of suitable habitat that occurs outside of the Study Area. Therefore, this species is unlikely to be impacted by the project.
Satin Flycatcher (*Myiagra cyanoleuca*)	PMST - K	-	Bonn	This species is found in eucalypt forest and woodlands, at high elevations when breeding. They are particularly common in tall wet sclerophyll forest, often in gullies or along water courses. In woodlands they prefer open, grassy woodland types. During migration, habitat preferences expand, with the species recorded in most wooded habitats except rainforests. Wintering birds in northern Qld will use rainforest - gallery forests interfaces, and birds have been recorded wintering in mangroves and paperbark swamps.	**Low**. No suitable wet sclerophyll forest or similar habitat occurs within the Study Area. Therefore, it is considered that this species has a low likelihood of occurring.	**Unlikely**. As this species has a low likelihood of occurring, it is unlikely to be impacted from the project.
Rufous Fantail (*Rhipidura rufifrons*)	PMST - K	-	Bonn	The Rufous Fantail locates in moist, dense habitats, including mangroves, rainforest, riparian forests and thickets, and wet eucalypt forests with a dense understorey. When on passage a wider range of habitats are used including dry eucalypt forests and woodlands and Brigalow shrublands.	**Moderate**. Whilst this species was not detected during the field survey, suitable rainforest occurs adjacent to the Study Area. Therefore, this has at least a moderate likelihood of occurring within the Study Area.	**Unlikely**. No important habitat for this species would be impacted as part of the project. Also, if this species were detected within the Study Area, it would likely be passing through to access patches of suitable habitat that occurs outside of the Study Area. Therefore, this species is unlikely to be impacted by the project.

Species / Population / Ecological Community Name	Source	BC Act	EPBC Act	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Common Sandpiper (*Actitis hypoleucos*)	PMST - K	-	Bonn, C, J, K	The species utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats. The Common Sandpiper has been recorded in estuaries and deltas of streams, as well as on banks farther upstream; around lakes, pools, billabongs, reservoirs, dams and claypans, and occasionally piers and jetties. The muddy margins utilised by the species are often narrow, and may be steep. The species is often associated with mangroves, and sometimes found in areas of mud littered with rocks or snag.	**Moderate**. Whilst this species was not detected during the field survey, suitable beach habitat occurs adjacent to the Study Area. Therefore, this has at least a moderate likelihood of occurring within the Study Area.	**Unlikely**. No important habitat for this species would be impacted as part of the project. Also, if this species were detected within the Study Area, it would likely be passing through to access patches of suitable habitat that occurs outside of the Study Area. Therefore, this species is unlikely to be impacted by the project.
Ruddy Turnstone (*Arenaria interpres*)	PMST - K	-	Bonn, C, J, K	In Australasia, the Ruddy Turnstone is mainly found on coastal regions with exposed rock coast lines or coral reefs. It also lives near platforms and shelves, often with shallow tidal pools and rocky, shingle or gravel beaches.	**Moderate**. Whilst this species was not detected during the field survey, suitable exposed rock coast line habitat occurs adjacent to the Study Area. Therefore, this has at least a moderate likelihood of occurring within the Study Area.	**Unlikely**. No important habitat for this species would be impacted as part of the project. Also, if this species were detected within the Study Area, it would likely be passing through to access patches of suitable habitat that occurs outside of the Study Area. Therefore, this species is unlikely to be impacted by the project.

Species / Population / Ecological Community Name	Source	BC Act	EPBC Act	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Sharp-tailed Sandpiper (*Calidris acuminata*)	PMST - K	-	Bonn, C, J, K	In Australasia, the Sharp-tailed Sandpiper prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. This includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, saltpans and hypersaline saltlakes inland. They also occur in saltworks and sewage farms. They use flooded paddocks, sedgelands and other ephemeral wetlands, but leave when they dry. They use intertidal mudflats in sheltered bays, inlets, estuaries or seashores, and also swamps and creeks lined with mangroves. They tend to occupy coastal mudflats mainly after ephemeral terrestrial wetlands have dried out, moving back during the wet season. They may be attracted to mats of algae and water weed either floating or washed up around terrestrial wetlands, and coastal areas with much beachcast seaweed. Sometimes they occur on rocky shores and rarely on exposed reefs.	**Low**. No suitable wetland or similar habitat occurs within or adjacent to the Study Area. Therefore, it is considered that this species has a low likelihood of occurring.	**Unlikely**. As this species has a low likelihood of occurring, it is unlikely to be impacted from the project.
Red Knot (*Calidris canutus*)	PMST - K	-	E, Bonn, C, J, K	As above.	As above.	As above.
Curlew Sandpiper (*Calidris ferruginea*)	PMST - K	E	CE, Bonn, C, J, K	As above.	As above.	As above.
Pectoral Sandpiper (*Calidris melanotos*)	PMST - M	-	Bonn, C, K	In New South Wales (NSW), the Pectoral Sandpiper is widespread, but scattered. Records exist east of the Great Divide, from Casino and Ballina, south to Ulladulla. West of the Great Divide, the species is widespread in the Riverina and Lower Western regions.	**Low**. No suitable wetland or similar habitat occurs within or adjacent to the Study Area. Therefore, it is considered that this species has a low likelihood of occurring.	**Unlikely**. As this species has a low likelihood of occurring, it is unlikely to be impacted from the project.

Species / Population / Ecological Community Name	Source	BC Act	EPBC Act	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Red-necked Stint (*Calidris ruficollis*)	PMST - K	-	Bonn, C, J, K	In Australasia, the Red-necked Stint is mostly found in coastal areas, including in sheltered inlets, bays, lagoons and estuaries with intertidal mudflats, often near spits, islets and banks and, sometimes, on protected sandy or coralline shores. Occasionally they have been recorded on exposed or ocean beaches, and sometimes on stony or rocky shores, reefs or shoals.	**Moderate**. Whilst this species was not detected during the field survey, suitable beach habitat occurs adjacent to the Study Area. Therefore, this has at least a moderate likelihood of occurring within the Study Area.	**Unlikely**. No important habitat for this species would be impacted as part of the project. Also, if this species were detected within the Study Area, it would likely be passing through to access patches of suitable habitat that occurs outside of the Study Area. Therefore, this species is unlikely to be impacted by the project.
Double-banded Plover (*Charadrius bicinctus*)	PMST - K	-	Bonn	The Double-banded Plover is found on littoral, estuarine and fresh or saline terrestrial wetlands and also saltmarsh, grasslands and pasture. It occurs on muddy, sandy, shingled or sometimes rocky beaches, bays and inlets, harbours and margins of fresh or saline terrestrial wetlands such as lakes, lagoons and swamps, shallow estuaries and rivers. The species is sometimes associated with coastal lagoons, inland saltlakes and saltworks.	**Moderate**. Whilst this species was not detected during the field survey, suitable beach habitat occurs adjacent to the Study Area. Therefore, this has at least a moderate likelihood of occurring within the Study Area.	**Unlikely**. No important habitat for this species would be impacted as part of the project. Also, if this species were detected within the Study Area, it would likely be passing through to access patches of suitable habitat that occurs outside of the Study Area. Therefore, this species is unlikely to be impacted by the project.
Lesser Sand Plover (*Charadrius mongolus*)	PMST - K	V	E, Bonn, C, J, K	As above.	As above.	As above.

Species / Population / Ecological Community Name	Source	BC Act	EPBC Act	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Latham's Snipe (*Gallinago hardwickii*)	PMST - M	-	Bonn, J, K	This species occurs in permanent and ephemeral wetlands up to 2000 m above sea-level. They usually inhabit open, freshwater wetlands with low, dense vegetation (e.g. swamps, flooded grasslands or heathlands, around bogs and other water bodies). However, they can also occur in habitats with saline or brackish water, in modified or artificial habitats, and in habitats located close to humans or human.	**Low**. No suitable wetland or similar habitat occurs within or adjacent to the Study Area. Therefore, it is considered that this species has a low likelihood of occurring.	**Unlikely**. As this species has a low likelihood of occurring, it is unlikely to be impacted from the project.
Swinhoe's Snipe (*Gallinago megala*)	PMST - L	-	Bonn, C, J, K	During the non-breeding season Swinhoe's Snipe occurs at the edges of wetlands, such as wet paddy fields, swamps and freshwater streams. The species is also known to occur in grasslands, drier cultivated areas (including crops of rapeseed and wheat) and market gardens.	**Low**. No suitable wetland or similar habitat occurs within or adjacent to the Study Area. Therefore, it is considered that this species has a low likelihood of occurring.	**Unlikely**. As this species has a low likelihood of occurring, it is unlikely to be impacted from the project.
Pin-tailed Snipe (*Gallinago stenura*)	PMST - L	-	Bonn, C, J, K	During non-breeding period the Pin-tailed Snipe occurs most often in or at the edges of shallow freshwater swamps, ponds and lakes with emergent, sparse to dense cover of grass/sedge or other vegetation. The species is also found in drier, more open wetlands such as claypans in more arid parts of species' range. It is also commonly seen at sewage ponds; not normally in saline or inter-tidal wetlands.	**Low**. No suitable wetland or similar habitat occurs within or adjacent to the Study Area. Therefore, it is considered that this species has a low likelihood of occurring.	**Unlikely**. As this species has a low likelihood of occurring, it is unlikely to be impacted from the project.
Bar-tailed Godwit (*Limosa lapponica*)	PMST - K	-	Bonn, C, J, K	As above.	As above.	As above.
Eastern Curlew (*Numenius madagascariensis*)	PMST - K	-	CE, Bonn, C, J, K	As above.	As above.	As above.

Species / Population / Ecological Community Name	Source	BC Act	EPBC Act	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Little Curlew (*Numenius minutus*)	PMST - L	-	Bonn, C, J, K	The Little Curlew is most often found feeding in short, dry grassland and sedgeland, including dry floodplains and blacksoil plains, which have scattered, shallow freshwater pools or areas seasonally inundated. Open woodlands with a grassy or burnt understorey, dry saltmarshes, coastal swamps, mudflats or sandflats of estuaries or beaches on sheltered coasts, mown lawns, gardens, recreational areas, ovals, racecourses and verges of roads and airstrips are also used.	**Moderate**. Whilst this species was not detected during the field survey, suitable beach habitat occurs adjacent to the Study Area. Therefore, this has at least a moderate likelihood of occurring within the Study Area.	**Unlikely**. No important habitat for this species would be impacted as part of the project. Also, if this species were detected within the Study Area, it would likely be passing through to access patches of suitable habitat that occurs outside of the Study Area. Therefore, this species is unlikely to be impacted by the project.
Whimbrel (*Numenius phaeopus*)	PMST - K	-	Bonn, C, J, K	The Whimbrel is often found on the intertidal mudflats of sheltered coasts. It is also found in harbours, lagoons, estuaries and river deltas, often those with mangroves, but also open, unvegetated mudflats. It is occasionally found on sandy or rocky beaches, on coral or rocky islets, or on intertidal reefs and platforms. It has been infrequently recorded using saline or brackish lakes near coastal areas.	**Moderate**. Whilst this species was not detected during the field survey, suitable beach habitat occurs adjacent to the Study Area. Therefore, this has at least a moderate likelihood of occurring within the Study Area.	**Unlikely**. No important habitat for this species would be impacted as part of the project. Also, if this species were detected within the Study Area, it would likely be passing through to access patches of suitable habitat that occurs outside of the Study Area. Therefore, this species is unlikely to be impacted by the project.
Osprey (*Pandion haliaetus*)	PMST - K	V	Bonn	As above.	As above.	As above.

Species / Population / Ecological Community Name	Source	BC Act	EPBC Act	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Pacific Golden Plover (*Pluvialis fulva*)	PMST - K	-	Bonn, C, J, K	In non-breeding grounds in Australia this species usually inhabits coastal habitats, though it occasionally occurs around inland wetlands. Pacific Golden Plovers usually occur on beaches, mudflats and sandflats (sometimes in vegetation such as mangroves, low saltmarsh such as *Sarcocornia,* or beds of seagrass) in sheltered areas including harbours, estuaries and lagoons, and also in evaporation ponds in saltworks. The species is also sometimes recorded on islands, sand and coral cays and exposed reefs and rocks. They are less often recorded in terrestrial habitats, usually wetlands such as fresh, brackish or saline lakes, billabongs, pools, swamps and wet claypans, especially those with muddy margins and often with submerged vegetation or short emergent grass.	**Moderate**. Whilst this species was not detected during the field survey, suitable beach habitat occurs adjacent to the Study Area. Therefore, this has at least a moderate likelihood of occurring within the Study Area.	**Unlikely**. No important habitat for this species would be impacted as part of the project. Also, if this species were detected within the Study Area, it would likely be passing through to access patches of suitable habitat that occurs outside of the Study Area. Therefore, this species is unlikely to be impacted by the project.
Grey Plover (*Pluvialis squatarola*)	PMST - K	-	Bonn, C, J, K	In non-breeding grounds in Australia, Grey Plovers occur almost entirely in coastal areas, where they usually inhabit sheltered embayments, estuaries and lagoons with mudflats and sandflats, and occasionally on rocky coasts with wave-cut platforms or reef-flats, or on reefs within muddy lagoons. They also occur around terrestrial wetlands such as near-coastal lakes and swamps, or salt-lakes.	**Moderate**. Whilst this species was not detected during the field survey, suitable beach habitat occurs adjacent to the Study Area. Therefore, this has at least a moderate likelihood of occurring within the Study Area.	**Unlikely**. No important habitat for this species would be impacted as part of the project. Also, if this species were detected within the Study Area, it would likely be passing through to access patches of suitable habitat that occurs outside of the Study Area. Therefore, this species is unlikely to be impacted by the project.

Species / Population / Ecological Community Name	Source	BC Act	EPBC Act	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Grey-tailed Tattler (*Tringa brevipes*)	PMST - K	-	Bonn, C, J, K	The Grey-tailed Tattler is often found on sheltered coasts with reefs and rock platforms or with intertidal mudflats. It can also be found at intertidal rocky, coral or stony reefs as well as platforms and islets that are exposed at low tide. It has been found around shores of rock, shingle, gravel or shells and also on intertidal mudflats in embayments, estuaries and coastal lagoons, especially fringed with mangroves.	**Moderate**. Whilst this species was not detected during the field survey, suitable beach habitat occurs adjacent to the Study Area. Therefore, this has at least a moderate likelihood of occurring within the Study Area.	**Unlikely**. No important habitat for this species would be impacted as part of the project. Also, if this species were detected within the Study Area, it would likely be passing through to access patches of suitable habitat that occurs outside of the Study Area. Therefore, this species is unlikely to be impacted by the project.
Common Greenshank (*Tringa nebularia*)	PMST - K	-	Bonn, C, J, K	It occurs in sheltered coastal habitats, typically with large mudflats and saltmarsh, mangroves or seagrass. Habitats include embayments, harbours, river estuaries, deltas and lagoons and are recorded less often in round tidal pools, rock-flats and rock platforms.	**Moderate**. Whilst this species was not detected during the field survey, suitable beach habitat occurs adjacent to the Study Area. Therefore, this has at least a moderate likelihood of occurring within the Study Area.	**Unlikely**. No important habitat for this species would be impacted as part of the project. Also, if this species were detected within the Study Area, it would likely be passing through to access patches of suitable habitat that occurs outside of the Study Area. Therefore, this species is unlikely to be impacted by the project.
Terek Sandpiper (*Xenus cinereus*)	PMST - K	V	Bonn, C, J, K	As above.	As above.	As above.

Key: CE = Critically Endangered, E = Endangered, V = Vulnerable, EP = Endangered Population, Bonn = Convention on the Conservation of Migratory Species of Wild Animals, C = China-Australia Migratory Bird Agreement, J = Japan-Australia Migratory Bird Agreement, K = Republic of Korea-Australia Migratory Bird Agreement, PMST- K = Known, PMST - L = Likely, PMST - M = May.

5 Matters of National Environmental Significance

An EPBC Act Protected Matters Search was undertaken within the DoEE on-line database to identify MNES which are known or have the potential to occur within a 10 km radius of the Study Area (**Appendix C**). These data, combined with the results of the field survey and other local knowledge and records, were utilised to assess whether the type of activity proposed within the Study Area would have, or is likely to have, a significant impact upon a MNES.

The identified MNES and site-specific responses are listed below.

5.1 Wetlands of International Importance

Based on the desktop search, no Wetland of International Importance listed under the EPBC Act occurs within the search area. Therefore, the project would not have a significant impact on any listed Wetlands of International Importance.

5.2 Listed Threatened Ecological Communities

Based on the desktop search, four TECs listed under the EPBC Act potentially occur within the Study Area. Based on the field inspection, *Littoral Rainforest and Coastal Vine Thickets of Eastern Australia* which is listed as critically endangered under the EPBC Act, was detected occurring adjacent to the Study Area. These three isolated patches occur to the west and north of the Study Area, between Pacific Drive and the ocean (**Figure 3-2**). The project would not require the removal of any vegetation that would be commensurate with this TEC as it would utilise existing access track and disturbed/modified areas. Therefore, the project would not have a significant impact on any TEC listed under the EPBC Act.

5.3 Listed Threatened Species

In total, 34 threatened species listed under the EPBC Act, or their habitat, were known or are predicted to occur within 10 km of the Study Area. During the field survey, one threatened species was detected foraging in native vegetation adjacent to the Study Area, the Grey-headed Flying-fox (*Pteropus poliocephalus*) which is listed as vulnerable under the EPBC Act (**Figure 3-2**). In addition, the following six threatened species were considered to have at least a moderate or high likelihood of occurrence (**Table 4-2**):

- Lesser Sand-plover (*Charadrius mongolus*) – endangered;
- Red Knot (*Calidris canutus*) – endangered;
- Western Alaskan Bar-tailed Godwit (*Limosa lapponica baueri*) – vulnerable;
- Northern Siberian Bar-tailed Godwit (*Limosa lapponica menzbieri*) – critically endangered;
- Eastern Curlew (*Numenius madagascariensis*) – critically endangered; and
- Large-eared Pied Bat (*Chalinolobus dwyeri*) – vulnerable.

The Grey-headed Flying-fox roosts in large camps with the closest located approximately 1.9 km north-west of the Study Area at Kooloonbury Creek (115) (DoEE 2018a). The last survey of the camp indicated that there were approximately 16,000–49,000 Grey-headed Flying-fox as well as other bat species using the camp (February 2018 - DoEE 2018a). The area within and adjacent to Study Area is not considered to be part of a Grey-headed Flying-fox camp but is considered to provide foraging habitat for the species, which is known to commute up to 50 km when foraging (DECCW 2009). This species has potential to fly over Study Area but is unlikely to be significantly impacted by the project given it would avoid native vegetation that has the potential to provide foraging habitat.

In regards to the potential occurring threatened species that were not detected during survey, the project is also unlikely to have a significant impact on these species. This is because the project would avoid native vegetation that has the potential to provide foraging habitat for these species. Therefore, no threatened species listed under the EPBC Act are considered likely to be significantly impacted from the project.

5.4 Listed Migratory species

In total, 30 migratory species listed under the EPBC Act have been recorded, or have suitable habitat, within 10 km of the Study Area. During the field survey, no migratory species listed under the EPBC Act were

detected within the Study Area. However, based on the presence of suitable habitat within the Study Area, the following 15 migratory species were considered to have at least a moderate likelihood of occurrence (**Table 4-2**) (excludes threatened species assessed above that are also listed as migratory):

- Fork-tailed Swift (*Apus pacificus*);
- White-throated Needletail (*Hirundapus caudacutus*);
- Black-faced Monarch (*Monarcha melanopsis*);
- Spectacled Monarch (*Monarcha trivirgatus*);
- Rufous Fantail (*Rhipidura rufifrons*);
- Common Sandpiper (*Actitis hypoleucos*);
- Ruddy Turnstone (*Arenaria interpres*);
- Red-necked Stint (*Calidris ruficollis*);
- Double-banded Plover (*Charadrius bicinctus*);
- Little Curlew (*Numenius minutus*);
- Whimbrel (*Numenius phaeopus*);
- Pacific Golden Plover (*Pluvialis fulva*);
- Grey Plover (*Pluvialis squatarola*);
- Grey-tailed Tattler (*Tringa brevipes*); and
- Common Greenshank (*Tringa nebularia*).

As the project would avoid native vegetation/habitat for these species, it is unlikely to substantially modify, destroy or isolate habitat, result in the establishment of a harmful invasive species or seriously disrupt the life-cycle or migration of an ecologically significant proportion of a population of a migratory species.

5.5 Summary

Based on this assessment, the project is unlikely to have any significant impact on a MNES listed under the EPBC Act. Further assessments under the provisions of the EPBC Act are not necessary.

6 Predicted Impacts

6.1 Vegetation

The project would require the removal of exotic grasses and will largely avoid native vegetation. No areas mapped as Littoral Rainforest, which is list as endangered under the BC Act and critically endangered under the EPBC Act, would be directly or indirectly impacted. Therefore, the project would not have and direct or indirect impact any threatened ecological community listed under the BC Act or EPBC Act. The planted *Araucaria heterophylla* (Norfolk Island Pine) should be retained and protected in accordance with the *Australian Standard AS4970-2009 Protection of trees on development sites* and *Australian Standard AS4373 Pruning of amenity trees*.

6.2 Sandy Beach Habitat

Whilst the proposed seawall would replace the existing seawall in situ, the new footpath would extent approximately 5 m from the existing seawall for 80 m (approximately 0.04 ha). The proposed seawall has been designed taking into account the existing coastal environment and coastal processes and based on engineering principles as detailed in the Cardno Basis of Design Report (Cardno 2018). It is not anticipated that wave patterns will be changed as a result of the seawall. The new structure is unlikely to affect the long-shore drift of beach sediment. As such, the new seawall is unlikely to attenuate more sediment drift than the previous one. Therefore, the sandy beach habitat should not be greatly adversely affected, and together with beach nourishment when required, will largely maintain the existing sandy beach habitat at Flynns Beach.

6.3 Threatened Species

Two threatened species were detected within or in close proximity to the project:

- *Sophora tomentosa* (Silverbush) - endangered under the BC Act; and
- Grey-headed Flying-fox (*Pteropus poliocephalus*) - vulnerable under the BC Act and EPBC Act.

The project would require the removal of approximately 45 saplings of *Sophora tomentosa* that are growing along the remains of the existing seawall. As such, this species was assessed with assistance of the test of significance in accordance with the BC Act (See **Appendix D**). As these saplings long-term viability in their current location is unlikely to be viable, the high chance of them being able to be translocated and as the patches of mature plants located to the south of the proposed seawall would be retained/protected, the project is unlikely to have a significant impact on this species such that a local population is likely to be at risk of extinction.

In addition, several other threatened birds and bat species had at least a moderate or higher chance of occurring within the Study Area, given they have suitable habitat within or in close proximity to the Study Area (**Table 4-2**). As the amount of vegetation proposed to be affected is limited to predominantly non-native disturbed areas and would avoid patches of native vegetation/habitat in areas adjacent to the Study Area, the project would likely have a negligible impact on threatened birds or bats. Furthermore, no hollow-bearing trees are proposed to be affected as part of the project. Therefore, the project is unlikely to have a significant impact on any threatened species listed under the BC Act and/or EPBC Act.

6.4 Fauna Habitat and Wildlife Corridors

The terrestrial habitat for threatened fauna species is limited as much of the Study Area is highly disturbed/modified, however, suitable sandy beach habitat occurs adjacent to the existing seawall. The project will affect a relatively small area of sandy beach in comparison the large area of similar habitat that will be protected along Flynns Beach. Furthermore, the affected sandy beach habitat is likely to be sub-optimal for the potentially occurring threatened species due to the continual visitation from the members of the community that would likely disturb the species natural behaviour e.g. foraging and nesting.

The value of the non-sandy beach habitat within the Study Area is limited and would likely have a low value for most potentially occurring threatened fauna species. Furthermore, no hollow-bearing trees were present within the Study Area. As the Study Area is surrounded by patches of native vegetation, any threatened fauna species that did occur within the Study Area, would most likely to traversing between patches of suitable habitat.

The vegetation surrounding the Study Area forms part of relatively intact line of native vegetation following the coastline to the north and south. This vegetation likely forms part of an important wildlife corridor for

highly mobile bird and bat species. As the project would not result in the removal of any patches of native vegetation, it is unlikely to have an impact on an important wildlife corridor.

6.5 Critical Habitat

At present, there are four critical habitats declared under Section 53–55 of the TSC Act. These habitats are now consider to be Areas of Outstanding Biodiversity Value (AOBV) under the new BC Act:

- Gould's Petrel - critical habitat declaration;
- Little penguin population in Sydney's North Harbour - critical habitat declaration;
- Mitchell's Rainforest Snail in Stotts Island Nature Reserve - critical habitat declaration; and
- Wollemi Pine - critical habitat declaration.

None of the above listed critical habitats or AOBV occur within or in close proximity to the Study Area. Therefore, no critical habitats or AOBV would be impacted by the project.

6.6 Coastal Management SEPP

A review of the Coastal Management SEPP mapping indicated the Study Area occurs adjacent to three patches of areas that are mapped as Littoral Rainforest to the west and north (**Figure 3-3**) (DPE 2018). As such, the Study Are occurs within the 'proximity area for Littoral Rainforest'. The project would avoid any direct and indirect impact to any area mapped as Littoral Rainforest.

In addition, the Study Area occurs within the following areas mapped under the Coastal Management SEPP (DPE 2018);

- Coastal Environment Area; and
- Coastal Use Area.

6.7 Koala Habitat

A review of the Koala habitat mapping indicated that no areas within the Study Area or the adjacent vegetation is mapped as either 'Secondary' or 'Primary' Koala Habitat (**Figure 3-2**) (Port Macquarie 2014). Therefore, no Koala Habitat would be directly or indirectly impacted from the project.

6.8 Port Macquarie DCP 2013

For endangered ecological communities, a fully vegetated buffer of 50m must be provided (Port-Macquarie 2013 – Section 2.3). The 50m buffer land surrounding this EEC is existing cleared land, including road infrastructure and development associated with Port Macquarie Surf Life Saving Club and Flynn's Beach. The buffer provisions to ecologically endangered communities and watercourses do not apply as the land likely has a current and valid approval for urban purposes. As such, the DCP provision for the requirement of a 50 m buffer is not required.

6.9 Key Threatening Processes

Key Threatening Processes (KTPs) are listed under the BC Act and EPBC Act. As the project would not result in the removal of any patches of native vegetation, and provided the proposed recommendations to avoid and mitigate are implemented (**Section 7**), the project would be unlikely to contribute to any KTP.

In particular, patches of *Chrysanthemoides monilifera* subsp. *rotundata* (Bitou Bush) occurs in vegetation adjacent to the Study Area. The occurrence of species is listed as 'Invasion of Native Plant Communities by *Chrysanthemoides monilifera'* KTP. Provided the weeds management procedure are implemented, the project is unlikely to contribute to the spread of the species.

7 Recommendations for Avoidance and Mitigation

Recommended impact avoidance and mitigation measures that should be incorporated into the project design are described in **Sections 7.1** and **Section 7.2** below. These recommendations would avoid and mitigate impacts to flora, fauna and their habitat from the project within the study and adjacent areas.

7.1 Avoidance

- Use previously cleared / disturbed areas in preference to relatively undisturbed areas with native vegetation;
- Install project boundary fencing to protect adjacent areas of native vegetation and ensure activities and ancillary facilities are restricted to the project footprint; and
- Implement a stop-works procedure if threatened species are encountered during construction.

7.2 Mitigation

7.2.1 General

- All machinery should be cleaned of foreign soil and vegetative matter prior to entering the Study Area to avoid the spread of *Phytophthora cinnamomi,* pathogenic fungus (Myrtle Rust) and dispersal of seeds of non-native plants;
- Strict weed management, monitoring and control practices should be implemented in accordance with DPI to minimise the spread of exotic species into natural areas within the study area. In particular, the following plant species should be targeted:
  - *Chrysanthemoides monilifera* subsp. *rotundata* (Bitou Bush); and
  - *Lantana camara* (Lantana).
- Strict erosion and sediment control measures should be implemented, monitored and maintained to prevent impacts on adjacent areas, particularly following vegetation clearing and grubbing and prior to unfavourable weather events;
- The planted *Araucaria heterophylla* (Norfolk Island Pine) should be retained and protected in accordance with the *Australian Standard AS4970-2009 Protection of trees on development sites* and *Australian Standard AS4373 Pruning of amenity trees*;
- Implement dust control measures where necessary to protect adjacent retained vegetation and water quality in adjacent waterways and water bodies; and
- Stockpiling of materials should occur within previously disturbed areas and not within driplines or retained vegetation.

7.2.2 *Sophora tomentosa* (Silverbush)

- All patches of *Sophora tomentosa* (Silverbush) outside of the Study Area are required to be protected from any direct or indirect disturbances. This should be achieved by the use of exclusion fencing, and sediment and erosion control measures were appropriate. Signage may also be a useful means of ensure that the patches of this species that are to be retained are protected;
- All personnel associated with the construction phase of the project should be made aware of the species, particularly the locations to be avoided;
- The approximately 45 saplings of *Sophora tomentosa* (Silverbush) that occur along the remains of the existing seawall should be translocated were feasible to nearby suitable habitats, potentially to the south of the project in-between the existing patches of mature plants;
- Any impact/translocation of this species would require a permit/approval from OEH;
- Any translocation of the species would be required to be carried out by a suitably qualified person with experience with both the species and translocation procedures; and

> Any translocated specimens would require ongoing monitoring and maintenance to gauge the effectiveness and trigger any future management actions.

8 Conclusion

The vegetation within the Study Area is highly disturbed/modified and consisted predominantly of exotic grasses and planted trees. However, there were three patches of Littoral Rainforest adjacent to the Study Area. This vegetation is mapped as such within the Coastal Management SEPP and is also commensurate with the following TECs:

- *Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*, which is listed as endangered under the BC Act; and
- *Littoral Rainforest and Coastal Vine Thickets of Eastern Australia*, which is listed as critically endangered under the EPBC Act.

One threatened flora species was detected within the Study Area, *Sophora tomentosa* (Silverbush), which is listed as endangered under the BC Act. There were at least 45 saplings growing along the remains of the existing seawall. There were also numerous patches of mature specimens growing along the sandy beach/vegetation zones south of the proposed seawall. The mature patches of *Sophora tomentosa* and Littoral Rainforest would be protected from any direct or indirect impact from construction by exclusion fencing and sediment and erosion controls. However, the 45 sapling *Sophora tomentosa* that exist within Study Area would be required to be removed, with a high potential for translocation.

A Grey-headed Flying-fox (*Pteropus poliocephalus*), which is listed as vulnerable under the BC Act and EPBC Act, was observed foraging within the Littoral Rainforest vegetation adjacent to the Study Area. However, there was no evidence found to indicate that the Study Area and the adjacent vegetation is been used as a roosting camp site. Therefore, the Grey-headed Flying-fox is unlikely to be affected by the project.

The vegetation within and adjacent to the Study Area is not ‘Secondary’ or ‘Primary’ Koala habitat. Therefore, no Koala habitat would likely be impacted from the project.

Many other threatened or migratory birds and bat species had at least a moderate or higher chance of occurring within the Study Area given that they have suitable habitat is in close proximity to the Study Area.

As the amount of vegetation/habitat that would be affected is limited to predominantly already disturbed non-native vegetation and that patches of native vegetation/habitat in areas adjacent to the Study Area would be avoided, the project would not have a significant impact on these threatened or migratory birds or bats. Furthermore, no hollow-bearing trees are proposed to be affected as part of the project.

In conclusion, the project would result in a small amount vegetation/habitat being affected within the Study Area. However, provided the recommendations in this report are implemented, the project is unlikely to remove, modify, fragment or isolate any area of habitat important to the long-term survival of any threatened flora or fauna, population or ecological communities in the locality.

9 References

BoM (Bureau of Meteorology) (2018). Daily Weather Observations. Port Macquarie, New South Wales. June 2018. http://www.bom.gov.au/climate/dwo/IDCJDW2115.latest.shtml

Cardno (2018). Geotechnical Interpretive Report, Flynns Beach Seawall Replacement – Stage 1.

*DECCW (Department of Environment, Climate Change and Water) (2009). Draft National Recovery Plan for the Grey-headed Flying-fox Pteropus poliocephalus. Prepared by Dr Peggy Eby. Department of Environment, Climate Change and Water NSW, Sydney. July 2009.*http://www.environment.nsw.gov.au/resources/threatenedspecies/08214dnrpflyingfox.pdf

DoEE (Commonwealth Department of Environment and Energy) (2018a). National Flying-fox monitoring viewer. http://www.environment.gov.au/webgis-framework/apps/ffc-wide/ffc-wide.jsf

DoEE (2018b). Species Profile and Threats Database. http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

DoEE (2018c). Weeds of National Significance. http://www.environment.gov.au/biodiversity/invasive/weeds/weeds/lists/wons.html

DPE (NSW Department of Planning and Environment) (2018). State Environment Planning Policy (Coastal Management) 2018 – maps. http://webmap.environment.nsw.gov.au/PlanningHtml5Viewer/?viewer=SEPP_CoastalManagement

DPI (NSW Department of Primary Industries) (2018). Priority Weeds for the North Coast. http://weeds.dpi.nsw.gov.au/WeedBiosecurities?AreaId=107

OEH (NSW Office of Environment and Heritage) (2018). Biodiversity Value Map. https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BVMap

OEH (2018b). Threatened Biodiversity Profile. http://www.environment.nsw.gov.au/threatenedspeciesapp/

Port Macquarie-Hastings (2013). Port Macquarie-Hastings Development Control Plan 2013. file:///C:/Users/Andrew.Smith/Downloads/pmh_dcp_2013_pts1-3_v20170412.pdf

Port Macquarie (2014). Vegetation mapping within the Port Macquarie LGA.

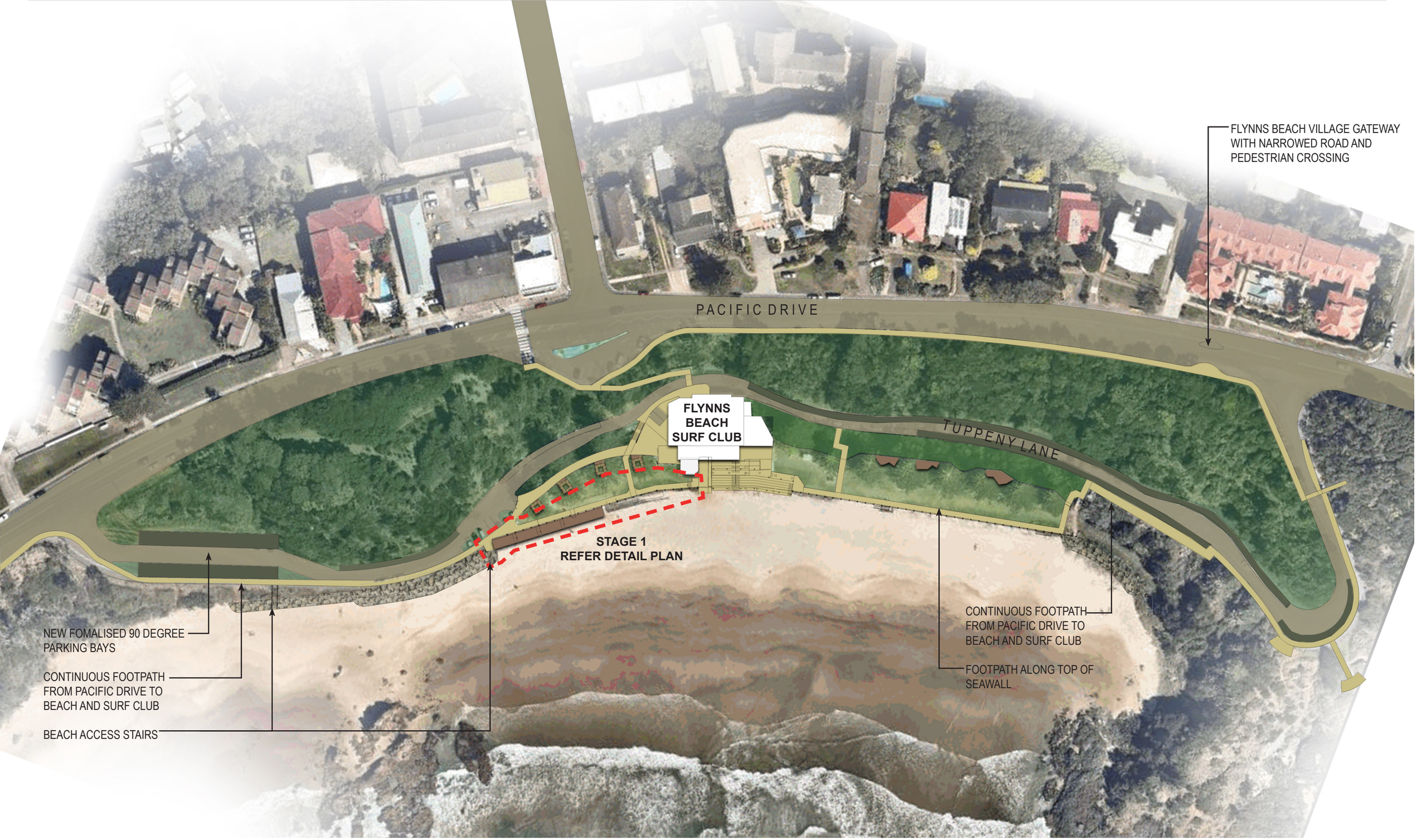
Timebie (2018a). Daylight Hours of Port Macquarie Australia. http://www.timebie.com/sun/portmacquariensw.php

Timebie (2018b). Moonrise Moonset Time of Port Macquarie Australia. http://www.timebie.com/moon/portmacquariensw.php

Flynns Beach Seawall Design & Construction

APPENDIX A

DESIGN DRAWINGS



FLYNNS BEACH MASTER PLAN

DRAFT 27.10.17

FLYNNS
BEACH
SURF CLUB

NEW
ACCESS
STEPS

+6.15

2.1m WIDE
PARALLEL
PARKING

+3.75

+4.50

TOE
LEVEL
1.5m

DEMOLISH
EXISTING
PATH

DEMOLISH EXISTING RAMP

STAGE 1 EXTENT OF WORK

MIN 3.5m WIDE
CARRIAGEWAY

NO PARKING

+4.50

+2.50

+3.00

+3.50

+4.00

2.1m WIDE
PARALLEL
PARKING

SHARED DELIVERY/ SERVICES
VEHICLE DRIVE AND PEDESTRIAN
FOOTPATH. REMOVEABLE
BOLLARDS AT WESTERN ENTRY.

SEATING DECK AROUND NORFOLK
ISLAND PINES PROTECTS THE
ROOTS AND PROVIDES GENEROUS
SEATING OPTIONS

LIGHTWEIGHT TIMBER
VEHICLE RAMP 3.6m WIDE

NEW SEAWALL WITH 2m WIDE FOOTPATH

STEPS DOWN TO SHOWER AREA.
SHOWER AND DECK TO BE
REINSTATED.

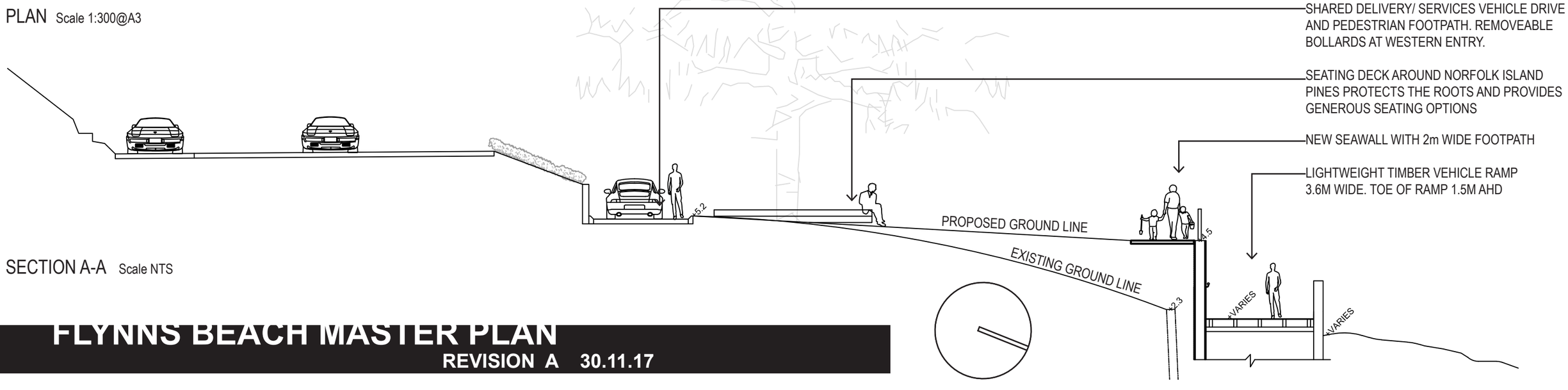
DISABLED PARKING

NEW BEACH ACCESS STEPS 3m WIDE

CONTINUOUS FOOTPATH FROM PACIFIC DRIVE

FUTURE ROCK WALL UPGRADE

PLAN Scale 1:300@A3



SECTION A-A Scale NTS

FLYNNS BEACH MASTER PLAN

REVISION A 30.11.17

Flynns Beach Seawall Design & Construction

APPENDIX B

FLORA AND FAUNA SPECIES

Table 1B-1. Flora species observed within the Study Area or in close proximity.

Family	Scientific Name	Common Name	Bio Act	BC Act	EPBC Act	WoNS
Trees						
Araucariaceae	*Araucaria heterophylla*	Norfolk Island Pine	-	-	-	-
Arecaceae	*Archontophoenix cunninghamiana*	Bangalow Palm	-	-	-	-
Asparagaceae	*Dracaena draco*	Dragon Tree	-	-	-	-
Dicksoniaceae	*Dicksonia antarctica*	Tree Fern	-	-	-	-
Moraceae	*Ficus macrophylla*	Moreton Bay Fig	-	-	-	-
Pittosporaceae	*Pittosporum undulatum*	Sweet Pittosporum	-	-	-	-
Shrubs						
Asteraceae	*Chrysanthemoides monilifera* subsp. *rotundata**	Bitou Bush	Yes	KTP		Yes
Fabaceae	*Senna pendula* var. *glabrata**	-	-	-	-	-
	Acacia longifolia var. *sophorae*	Coastal Wattle	-	-	-	-
	Sophora tomentosa	**Silverbush**	-	E	-	
Lamiaceae	*Westringia fruticosa*	Coast Westringia	-	-	-	-
Proteaceae	*Banksia integrifolia*	Coast Banksia	-	-	-	-
Verbenaceae	*Lantana camara**	Lantana	Yes	-	-	Yes
Ground cover						
Amaryllidaceae	*Crinum pedunculatum*	Swamp Lily	-	-	-	-
Apiaceae	*Hydrocotyle bonariensis**	Pennywort	-	-	-	-
Asteraceae	*Bidens pilosa**	Cobbler's Pegs	-	-	-	-
	Conyza sp.*	A Fleabane	-	-	-	-
	*Hypochaeris radicata**	Flatweed	-	-	-	-
	*Sonchus oleraceus**	Common Sow-thistle	-	-	-	-
Convolvulaceae	*Dichondra repens*	Kidney Weed	-	-	-	-
Cyperaceae	*Gahnia* sp.		-	-	-	-
Lomandraceae	*Lomandra longifolia*	Spiky-headed Mat-rush	-	-	-	-
Oxalidaceae	*Oxalis* sp.	-	-	-	-	-
Phormiaceae	*Dianella caerulea* var. *producta*	Blue Flax Lily	-	-	-	-
Poaceae	*Chloris gayana**	Rhodes Grass	-	-	-	-
	Cynodon dactylon	Common Couch	-	-	-	-
	Imperata cylindrica	Blady Grass	-	-	-	-
	Paspalidium distans	-	-	-	-	-
	*Pennisetum clandestinum**	Kikuyu Grass	-	-	-	-
	Sporobolus virginicus	Sand Couch	-	-	-	-
	*Stenotaphrum secundatum**	Buffalo Grass	-	-	-	-
Violaceae	*Viola banksii*	-	-	-	-	-
Vines						
Convolvulaceae	*Ipomoea indica**	Morning Glory	-	-	-	-
Passifloraceae	*Passiflora subpeltata**	White Passionflower	-	-	-	-
Smilacaceae	*Smilax australis*	Lawyer Vine	-	-	-	-
Epiphytes						
Polypodiaceae	*Platycerium bifurcatum*	Elkhorn	-	-	-	-

Key: * = Introduced species, E = Endangered, KTP = Key Threatening Process

Table 1B-2. Fauna species observed within the Study Area or in close proximity.

Family	Scientific Name	Common Name	BC Act	EPBC Act
Birds				
Artamidae	*Cracticus torquatus*	Grey Butcherbird	-	-
Corvidae	*Corvus tasmanicus*	Forest Raven	-	-
Hirundinidae	*Hirundo neoxena*	Welcome Swallow	-	-
Laridae	*Thalasseus bergii*	Crested Tern	-	-
Meliphagidae	*Anthochaera chrysoptera*	Little Wattlebird	-	-
Phalacrocoracidae	*Phalacrocorax carbo*	Great Cormorant	-	-
Timaliidae	*Zosterops lateralis*	Silvereye	-	-
Mammals				
Pseudocheiridae	*Pseudocheirus peregrinus*	Common Ringtail Possum	-	-
Pteropodidae	*Pteropus poliocephalus*	Grey-headed Flying-fox	V	V

Key: * = Introduced species.

Flynns Beach Seawall Design & Construction

APPENDIX C

PMST RESULTS

Australian Government
Department of the Environment and Energy

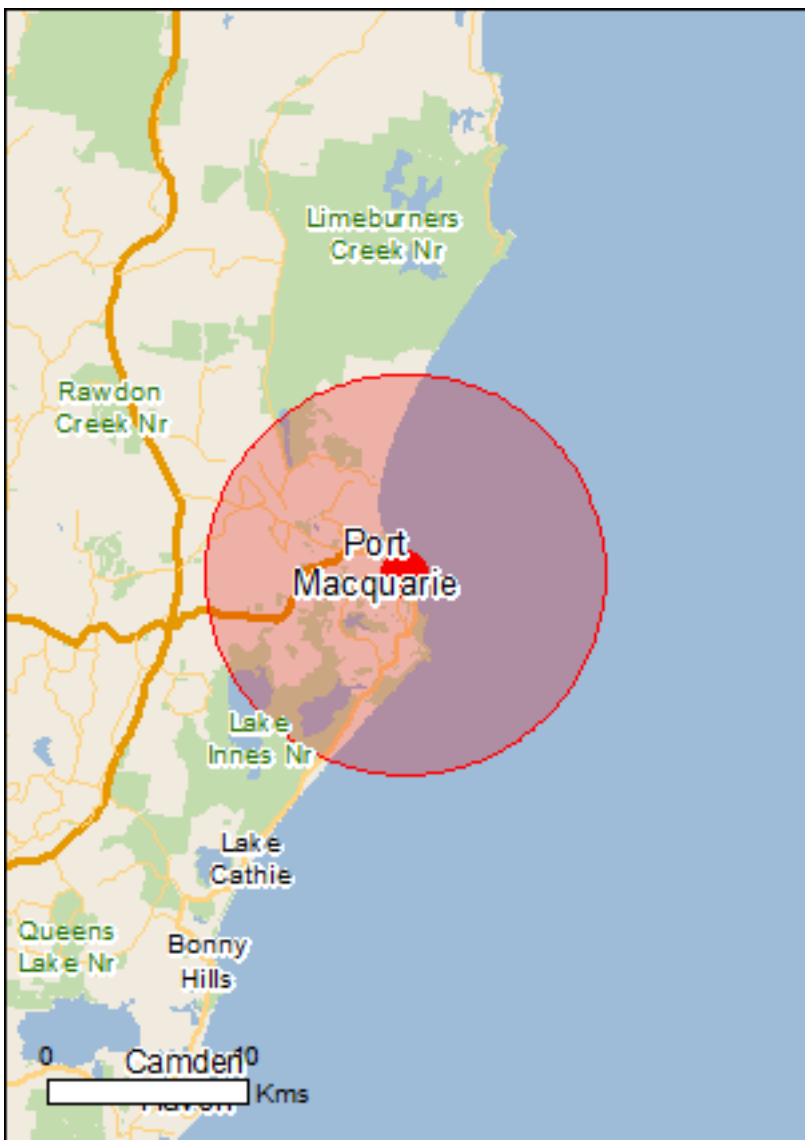
EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

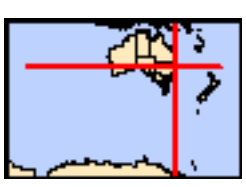
Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 18/05/18 11:06:14



Coordinates
Buffer: 10.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	4
Listed Threatened Species:	68
Listed Migratory Species:	68

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	5
Commonwealth Heritage Places:	None
Listed Marine Species:	90
Whales and Other Cetaceans:	14
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	5
Regional Forest Agreements:	1
Invasive Species:	37
Nationally Important Wetlands:	1
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Commonwealth Marine Area [Resource Information]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside the Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

Name
EEZ and Territorial Sea

Marine Regions [Resource Information]

If you are planning to undertake action in an area in or close to the Commonwealth Marine Area, and a marine bioregional plan has been prepared for the Commonwealth Marine Area in that area, the marine bioregional plan may inform your decision as to whether to refer your proposed action under the EPBC Act.

Name
Temperate East

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community	Endangered	Community may occur within area
Littoral Rainforest and Coastal Vine Thickets of Eastern Australia	Critically Endangered	Community likely to occur within area
Lowland Rainforest of Subtropical Australia	Critically Endangered	Community likely to occur within area
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Species or species habitat known to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Dasyornis brachypterus Eastern Bristlebird [533]	Endangered	Species or species

Name	Status	Type of Presence
		habitat likely to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea antipodensis gibsoni Gibson's Albatross [82270]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat likely to occur within area
Fregetta grallaria grallaria White-bellied Storm-Petrel (Tasman Sea), White-bellied Storm-Petrel (Australasian) [64438]	Vulnerable	Species or species habitat likely to occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat may occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat likely to occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat known to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Pterodroma leucoptera leucoptera Gould's Petrel, Australian Gould's Petrel [26033]	Endangered	Species or species habitat may occur within area
Pterodroma neglecta neglecta Kermadec Petrel (western) [64450]	Vulnerable	Foraging, feeding or related behaviour may

Name	Status	Type of Presence
		occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche bulleri platei Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta cauta Shy Albatross, Tasmanian Shy Albatross [82345]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta steadi White-capped Albatross [82344]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Fish		
Epinephelus daemelii Black Rockcod, Black Cod, Saddled Rockcod [68449]	Vulnerable	Species or species habitat likely to occur within area
Frogs		
Litoria aurea Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat known to occur within area
Insects		
Argynnis hyperbius inconstans Australian Fritillary [88056]	Critically Endangered	Species or species habitat likely to occur within area
Mammals		
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat likely to occur within area
Dasyurus maculatus maculatus (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area

Name	Status	Type of Presence
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Petauroides volans Greater Glider [254]	Vulnerable	Species or species habitat known to occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Potorous tridactylus tridactylus Long-nosed Potoroo (SE mainland) [66645]	Vulnerable	Species or species habitat likely to occur within area
Pseudomys novaehollandiae New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat likely to occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Roosting known to occur within area
Plants		
Acronychia littoralis Scented Acronychia [8582]	Endangered	Species or species habitat likely to occur within area
Allocasuarina defungens Dwarf Heath Casuarina [21924]	Endangered	Species or species habitat known to occur within area
Arthraxon hispidus Hairy-joint Grass [9338]	Vulnerable	Species or species habitat may occur within area
Asperula asthenes Trailing Woodruff [14004]	Vulnerable	Species or species habitat likely to occur within area
Cryptostylis hunteriana Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat likely to occur within area
Cynanchum elegans White-flowered Wax Plant [12533]	Endangered	Species or species habitat known to occur within area
Euphrasia arguta [4325]	Critically Endangered	Species or species habitat may occur within area
Macadamia integrifolia Macadamia Nut, Queensland Nut Tree, Smooth-shelled Macadamia, Bush Nut, Nut Oak [7326]	Vulnerable	Species or species habitat may occur within area
Melaleuca biconvexa Biconvex Paperbark [5583]	Vulnerable	Species or species habitat known to occur within area
Phaius australis Lesser Swamp-orchid [5872]	Endangered	Species or species habitat may occur within area
Syzygium paniculatum Magenta Lilly Pilly, Magenta Cherry, Daguba, Scrub Cherry, Creek Lilly Pilly, Brush Cherry [20307]	Vulnerable	Species or species habitat may occur within area

Name	Status	Type of Presence
Thesium australe		
Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat likely to occur within area
Reptiles		
Caretta caretta		
Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas		
Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Eretmochelys imbricata		
Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Natator depressus		
Flatback Turtle [59257]	Vulnerable	Breeding likely to occur within area
Sharks		
Carcharias taurus (east coast population)		
Grey Nurse Shark (east coast population) [68751]	Critically Endangered	Species or species habitat likely to occur within area
Carcharodon carcharias		
White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus		
Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Anous stolidus		
Common Noddy [825]		Species or species habitat likely to occur within area
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardenna carneipes		
Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area
Calonectris leucomelas		
Streaked Shearwater [1077]		Species or species habitat may occur within area
Diomedea antipodensis		
Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora		
Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans		
Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi		
Northern Royal Albatross [64456]	Endangered	Foraging, feeding or

Name	Threatened	Type of Presence
		related behaviour likely to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat likely to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Sternula albifrons Little Tern [82849]		Species or species habitat may occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Species or species habitat may occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Migratory Marine Species		
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	Species or species habitat likely to occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or

Name	Threatened	Type of Presence
		related behaviour likely to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Dugong dugon Dugong [28]		Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat may occur within area
Manta alfredi Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat may occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding likely to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat known to occur

Name	Threatened	Type of Presence
		within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area
Charadrius bicinctus Double-banded Plover [895]		Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Roosting may occur within area
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area

Name	Threatened	Type of Presence
Pluvialis squatarola		
Grey Plover [865]		Roosting known to occur within area
Tringa brevipes		
Grey-tailed Tattler [851]		Roosting known to occur within area
Tringa nebularia		
Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Xenus cinereus		
Terek Sandpiper [59300]		Roosting known to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land - Australian Postal Commission
Commonwealth Land - Australian Postal Corporation
Commonwealth Land - Australian Telecommunications Commission
Commonwealth Land - Commonwealth Bank of Australia
Commonwealth Land - Defence Service Homes Corporation

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat known to occur within area
Anous stolidus		
Common Noddy [825]		Species or species habitat likely to occur within area
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within area
Arenaria interpres		
Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris canutus		
Red Knot, Knot [855]	Endangered	Species or species habitat known to occur

Name	Threatened	Type of Presence
		within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat may occur within area
Catharacta skua Great Skua [59472]		Species or species habitat may occur within area
Charadrius bicinctus Double-banded Plover [895]		Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Charadrius ruficapillus Red-capped Plover [881]		Roosting known to occur within area
Cuculus saturatus Oriental Cuckoo, Himalayan Cuckoo [710]		Species or species habitat may occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea gibsoni Gibson's Albatross [64466]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat likely to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Roosting may occur within area
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur

Name	Threatened	Type of Presence
		within area
Heteroscelus brevipes Grey-tailed Tattler [59311]		Roosting known to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat known to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area
Pluvialis squatarola Grey Plover [865]		Roosting known to occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Foraging, feeding or related behaviour likely to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species

Name	Threatened	Type of Presence
		habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area
Sterna albifrons Little Tern [813]		Species or species habitat may occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Species or species habitat may occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche sp. nov. Pacific Albatross [66511]	Vulnerable*	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Roosting known to occur within area
Fish		
Acentronura tentaculata Shortpouch Pygmy Pipehorse [66187]		Species or species habitat may occur within area
Festucalex cinctus Girdled Pipefish [66214]		Species or species habitat may occur within area
Filicampus tigris Tiger Pipefish [66217]		Species or species habitat may occur within area
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area
Hippichthys heptagonus Madura Pipefish, Reticulated Freshwater Pipefish [66229]		Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Hippocampus whitei White's Seahorse, Crowned Seahorse, Sydney Seahorse [66240]		Species or species habitat may occur within area
Histiogamphelus briggsii Crested Pipefish, Briggs' Crested Pipefish, Briggs' Pipefish [66242]		Species or species habitat may occur within area
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area
Solegnathus dunckeri Duncker's Pipehorse [66271]		Species or species habitat may occur within area
Solegnathus spinosissimus Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area
Solenostomus paegnius Rough-snout Ghost Pipefish [68425]		Species or species habitat may occur within area
Solenostomus paradoxus Ornate Ghostpipefish, Harlequin Ghost Pipefish, Ornate Ghost Pipefish [66184]		Species or species habitat may occur within area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Mammals		
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
Arctocephalus pusillus Australian Fur-seal, Australo-African Fur-seal [21]		Species or species habitat may occur within area
Dugong dugon Dugong [28]		Species or species habitat may occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or

Name	Threatened	Type of Presence
		related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Hydrophis elegans Elegant Seasnake [1104]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding likely to occur within area
Pelamis platurus Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and other Cetaceans		[Resource Information]
Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Delphinus delphis Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Stenella attenuata		
Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Tursiops aduncus		
Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops truncatus s. str.		
Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

State and Territory Reserves [Resource Information]

Name	State
Lake Innes	NSW
Limeburners Creek	NSW
Macquarie	NSW
Sea Acres	NSW
Woregore	NSW

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included.

Name	State
North East NSW RFA	New South Wales

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Acridotheres tristis		
Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Anas platyrhynchos		
Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis		
European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia		
Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Lonchura punctulata		
Nutmeg Mannikin [399]		Species or species habitat likely to occur within area
Passer domesticus		
House Sparrow [405]		Species or species habitat likely to occur within area
Pycnonotus jocosus		
Red-whiskered Bulbul [631]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat known to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Alternanthera philoxeroides Alligator Weed [11620]		Species or species habitat likely to occur within area
Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
Asparagus aethiopicus Asparagus Fern, Ground Asparagus, Basket Fern, Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425]		Species or species habitat likely to occur within area
Asparagus plumosus Climbing Asparagus-fern [48993]		Species or species

Name	Status	Type of Presence
		habitat likely to occur within area
Cabomba caroliniana Cabomba, Fanwort, Carolina Watershield, Fish Grass, Washington Grass, Watershield, Carolina Fanwort, Common Cabomba [5171]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera subsp. rotundata Bitou Bush [16332]		Species or species habitat likely to occur within area
Eichhornia crassipes Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Sagittaria platyphylla Delta Arrowhead, Arrowhead, Slender Arrowhead [68483]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Senecio madagascariensis Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]		Species or species habitat likely to occur within area

Nationally Important Wetlands	[Resource Information]
Name	State
Limeburners Creek Nature Reserve	NSW

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-31.44301 152.92606

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

Department of the Environment
GPO Box 787
Canberra ACT 2601 Australia
+61 2 6274 1111

Flynns Beach Seawall Design & Construction

APPENDIX D

ASSESSMENT OF SIGNIFICANCE

As per the assessment carried out within **Table 4-2**, the following threatened species / communities listed under the BC Act have been applied further detailed assessment via the application of Assessment of Significance due to potential levels of impacts likely to result from the project:

- *Sophora tomentosa* (Silverbush) – endangered.

a) in the case of a threatened species, whether the proposed development or activity 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,

Sophora tomentosa (Silverbush) occurs in coastal areas in Queensland and northern NSW. It was previously common north from Port Stephens but is now uncommon and found only north of Old Bar, near Taree. The largest known population, at Port Macquarie, is estimated at up to 500 plants, other populations are of less than 20 plants. It is also found in a number of other countries. It occurs on coastal dunes and the seeds are likely dispersed by sea currents.

The project would result in the removal of approximately 45 saplings that are growing along the remains of the existing seawall. The numerous patches of mature plants located south of the project would be protected. There is a high chance that these saplings can be translocated to nearby habitat. These saplings long-term viability in their current location is unlikely to be viable, the high chance of them being able to be translocated and as the patches of mature plants located to the south of the proposed seawall would be retained/protected. Therefore, the proposed development is unlikely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

> ***(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 applicable.

c) In relation to the habitat of a threatened species or ecological community:

> ***(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and***

The project would directly result in the removal of approximately 45 *Sophora tomentosa* (Silverbush) saplings that are growing along the remains of the existing seawall.

> ***(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and***

The habitat that is proposed to be impacted is currently fragmented from past developments and largely isolated from mature patches of this species. Therefore, no habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development.

> ***(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,***

The habitat that is proposed to be impacted is considered to be sub-optimal for this species as it is highly disturbed modified. Due to the nature of the area that the 45 saplings are located that they could grow to maturity. Therefore, the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of this species in the locality is considered to be low.

d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly)

No Areas of Outstanding Biodiversity Value (AOBV) occur within or in close proximity to the Study Area. Therefore, the proposed development is unlikely to have an adverse effect on AOBV (either directly or indirectly). See **Section 6.4** for further details.

e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

In total, one Key Threatening Processes (KTPs) listed under the BC Act has the potential to occur as a result of the project, Invasion of Native Plant Communities by *Chrysanthemoides monilifera.* However, due to the

small scale of the project and provided the avoidance and mitigation measure proposed in this report are implement, the project would likely only have a negligible contribution to this KTP. See **Section 6.7** for further details.

Conclusion

There were approximately 45 saplings of *Sophora tomentosa* (Silverbush) growing along the remains of the existing seawall. There was also numerous patches of mature specimens growing along the sandy beach/vegetation zones south of the proposed seawall. The mature patches of *Sophora tomentosa* would be protected from any direct or indirect impact from the project. Protection measure would include exclusion fencing, and sediment and erosion controls were appropriate. However, the sapling *Sophora tomentosa* that exist within the Study Area would be required to be removed, with a high potential for translocation. As these saplings long-term viability in their current location is unlikely to be viable, the high chance of them being able to be translocated and as the patches of mature plants located to the south of the proposed seawall would be retained/protected, the project is unlikely to have a significant impact on this species such that a local population is likely to be at risk of extinction. As such, no further assessment is required.

About Cardno

Cardno is a professional infrastructure and environmental services company, with expertise in the development and improvement of physical and social infrastructure for communities around the world. Cardno's team includes leading professionals who plan, design, manage and deliver sustainable projects and community programs. Cardno is an international company listed on the Australian Securities Exchange [ASX:CDD].

Contact

Unit 1
10 Denney Street
Broadmeadow 2292
Australia

Phone +61 2 4965 4555
Fax +61 2 4965 4666

Web Address