Government of South Australia
Department for Trade and Investment

APPLICATION ON NOTIFICATION – CROWN DEVELOPMENT

Type of development:	Section 131 – Crown Development
Development Number:	24017594
Applicant:	SA Water
Nature of Development:	Construct a 5.3 gigalitre per annum reverse osmosis desalination plant and ancillary infrastructure including marine intake and outfall pump station and marine pipelines, terrestrial pipelines and overhead transmission line and associated dredging and earthworks
Subject Land:	Lot 10 St Andrews Drive, Port Lincoln, AL10 of D129500 (CT 6275/756); Lot 3 St Andrews Drive, Port Lincoln, AL3 of D31966 (CR 5753/706); Lot 601 St Andrews Drive, Port Lincoln AL601 of D126465 (6252/673); Lot 82 Slipway Road, AL82 of D113518, Port Lincoln (CT 6193/313); Lot 11 St Andrews Drive, Port Lincoln, AL 11 D129500 (CT 6275/757); Lot 12 Greyhound Rd, Port Lincoln, AL12 of D129500 (CT 6275/758); Lot 70 Stamford Tce, Port Lincoln, QP70 of D124175 (CT 6248/729); Lot 20 Stamford Tce, Port Lincoln, SE499 of H510600 (CT 5401/703); Lot 1231 Proper Bay Rd, Port Lincoln, SE1231 of H510600 (CL 6221/531); 60 Kathai Dr, Duck Ponds, SE1237 of H510600 (CT 5149/26); Lot SE538 Blue Fin Rd, Duck Ponds of H510600 (CR 5757/942).
Planning & Design Code Version:	2024.10 (6 June 2024)
Zone:	Strategic Employment Zone, Deferred Urban Zone, Recreation Zone, Rural Zone and the Coastal Waters and Offshore Islands Zone.
Phone Number:	1800 752 664
Consultation Start Date:	27 June 2024
Consultation Close Date:	25 July 2024

During the notification period, the application documentation can be viewed on the SA Planning Portal: https://plan.sa.gov.au/en/state_developments.

Written representations must be received by the close date (indicated above) and can either be posted, hand-delivered, or emailed to the State Commission Assessment Panel (SCAP). A representation form is provided as part of this document.

Any representations received after the close date will not be considered.

Postal Address:
The Secretary
State Commission Assessment Panel
GPO Box 1815
ADELAIDE SA 5001

Street Address:
Planning and Land Use Services
Level 9, 83 Pirie Street
ADELAIDE SA 5001

**Please call 1800 752 664 (Plan SA Help desk) beforehand to confirm access and visitation arrangements.

Email Address: spcreps@sa.gov.au

PLANNING, DEVELOPMENT AND INFRASTRUCTURE ACT 2016
S131 – CROWN DEVELOPMENT

REPRESENTATION ON APPLICATION

Applicant:	**SA WATER**
Development Number:	24017594
Nature of Development:	Construct a 5.3 gigalitre per annum reverse osmosis desalination plant and ancillary infrastructure including marine intake and outfall pump station and marine pipelines, terrestrial pipelines and overhead transmission line and associated dredging and earthworks
Zone / Policy Area:	Strategic Employment Zone, Deferred Urban Zone, Recreation Zone, Rural Zone and the Coastal Waters and Offshore Islands Zone
Subject Land:	St Andrews Drive, Port Lincoln
Phone Number:	1800 752 664
Close Date:	Thursday 25 July 2024

My Name: ______________________ My phone number: ______________

Primary method(s) of contact: Email: ______________________

Postal Address: ______________________ Postcode: ________

You may be contacted via your nominated PRIMARY METHOD(s) OF CONTACT if you indicate below that you wish to be heard by the State Commission Assessment Panel in support of your submission.

My interests are:
(please tick one)

- ☐ owner of local property
- ☐ occupier of local property
- ☐ a representative of a company/other organisation affected by the proposal
- ☐ a private citizen

The address of the property affected is: ______________________

______________________ Postcode ________

My interests are:
(please tick one)

- ☐ I support the development
- ☐ I support the development with some concerns
- ☐ I oppose the development

The specific aspects of the application to which I make comment on are: ______________________

____

____

____

I:
(please tick one)

- ☐ wish to be heard in support of my submission
- ☐ do not wish to be heard in support of my submission
(Please tick one)

By:
(please tick one)

- ☐ appearing personally
- ☐ being represented by the following person
(Please tick one)

Signature: ______________________ **Date:** ______________

Return Address: State Commission Assessment Panel, GPO Box 1815, Adelaide, SA 5001 /or **Email:** spcreps@sa.gov.au

PLANNING, DEVELOPMENT AND INFRASTRUCTURE ACT 2016

SECTION 131 - CROWN DEVELOPMENT

NOTICE OF APPLICATION FOR APPROVAL TO DEVELOPMENT

Notice is hereby given that an application has been made by **SA Water** for approval to construct a 5.3 gigalitre per annum reverse osmosis desalination plant and ancillary infrastructure including marine intake and outfall pump station and marine pipelines, terrestrial pipelines and overhead transmission line and associated dredging and earthworks at St Andrews Drive, Port Lincoln. **Development Number: 24017594**

The development site is located at: Lot 10 St Andrews Drive, Port Lincoln, AL10 of D129500 (CT 6275/756); Lot 3 St Andrews Drive, Port Lincoln, AL3 of D31966 (CR 5753/706); Lot 601 St Andrews Drive, Port Lincoln AL601 of D126465 (6252/673); Lot 82 Slipway Road, AL82 of D113518, Port Lincoln (CT 6193/313); Lot 11 St Andrews Drive, Port Lincoln, AL 11 D129500 (CT 6275/757); Lot 12 Greyhound Rd, Port Lincoln, AL12 of D129500 (CT 6275/758); Lot 70 Stamford Tce, Port Lincoln, QP70 of D124175 (CT 6248/729); Lot 20 Stamford Tce, Port Lincoln, SE499 of H510600 (CT 5401/703); Lot 1231 Proper Bay Rd, Port Lincoln, SE1231 of H510600 (CL 6221/531); 60 Kathai Dr, Duck Ponds, SE1237 of H510600 (CT 5149/26); Lot SE538 Blue Fin Rd, Duck Ponds of H510600 (CR 5757/942).

The subject land is located within the Strategic Employment Zone, Deferred Urban Zone, Recreation Zone, Rural Zone and the Coastal Waters and Offshore Islands Zone of the Planning and Design Code, Version 2024.10 (6 June 2024).

A copy of the planning application is available for download from the SA Planning Portal at https://plan.sa.gov.au/en/state_developments and can also be viewed in person at Planning and Land Use Services, Department for Trade and Investment, Level 9, 83 Pirie Street, Adelaide (Please call 1800 752 664 (Plan SA Help desk) beforehand to confirm access and visitation arrangements) and the City of Port Lincoln, Level One, Civic Centre, 60 Tasman Terrace, Port Lincoln and District Council of Lower Eyre Peninsula, 32 Railway Terrace, Cummins.

Any person or body who desires to do so may make representations concerning the application by notice in writing delivered to the Secretary, State Commission Assessment Panel, GPO Box 1815, Adelaide SA 5001 **NOT LATER THAN THURSDAY 25 July 2024**. An online submission form is available on the SA Planning Portal, or submissions may also be emailed to: spcreps@sa.gov.au

Each person or body making a representation should state the reason for the representation and whether that person or body wishes to be given the opportunity to appear before the State Commission Assessment Panel (SCAP) to further explain the representation. Submissions received may be published in SCAP agenda papers.

Should you wish to discuss the application and the public notification procedure please contact Plan SA on 1800 752 664 or plansa@sa.gov.au

STATE COMMISSION ASSESSMENT PANEL
spcreps@sa.gov.au

REAL PROPERTY ACT, 1886

South Australia

The Registrar-General certifies that this Title Register Search displays the records maintained in the Register Book and other notations at the time of searching.

REGISTRAR - GENERAL SOUTH AUSTRALIA

Certificate of Title - Volume 6252 Folio 673

Parent Title(s) CT 6205/506, CT 6213/657

Creating Dealing(s) RTC 13492572

Title Issued 06/04/2021 **Edition** 1 **Edition Issued** 06/04/2021

Estate Type

FEE SIMPLE

Registered Proprietor

PORT LINCOLN MARINE SERVICES PTY. LTD. (ACN: 064 329 031)
OF PO BOX 1073 PORT LINCOLN SA 5606

Description of Land

ALLOTMENT 601 DEPOSITED PLAN 126465
IN THE AREA NAMED PORT LINCOLN
HUNDRED OF LINCOLN

Easements

SUBJECT TO EASEMENT(S) OVER THE LAND MARKED A ON D126465 TO DISTRIBUTION LESSOR CORPORATION (SUBJECT TO LEASE 8890000) (TG 8843534)

SUBJECT TO FREE AND UNRESTRICTED RIGHT(S) OF WAY OVER THE LAND MARKED B ON D126465 (RTC 13492572)

Schedule of Dealings

NIL

Notations

Dealings Affecting Title	NIL
Priority Notices	NIL
Notations on Plan	NIL
Registrar-General's Notes	NIL
Administrative Interests	NIL

REAL PROPERTY ACT, 1886
South Australia

This Crown Lease Register Search is a true and correct extract of the Register of Crown Leases maintained by the Registrar-General.

Crown Leases are granted and administered pursuant to the Crown Land Management Act 2009 by the Department for Environment and Water.

REGISTRAR - GENERAL SOUTH AUSTRALIA

Crown Lease - Volume 6221 Folio 531

Parent Title(s) CL 6206/950

Creating Dealing(s) TR:N 13076559

Title Issued 04/04/2019 **Edition** 2 **Edition Issued** 29/01/2021

Estate Type

CROWN LESSEE

Owner

THE CROWN

Crown Lessee

DEAN ANDREW LUKIN
OF UNIT 2 15 MONTEREY DRIVE PORT LINCOLN SA 5606

Description of Land

SECTION 668
HUNDRED OF LINCOLN
IN THE AREA NAMED TULKA

SECTION 669
HUNDRED OF LINCOLN
IN THE AREAS NAMED PORT LINCOLN AND TULKA

SECTION 1231
HUNDRED OF LINCOLN
IN THE AREA NAMED PORT LINCOLN

TOTAL AREA: 16.0HA (APPROXIMATE)

DIAGRAM BOOK PAGES 30, 179, 241-247 AND RP 6473

Lease Details

Lease Number OP020297

Lease Type PERPETUAL

Commencing On 12/03/1980

IN PERPETUITY

Conditions

CROWN LEASE CONDITIONS VIDE CL 1578/28

Easements

SUBJECT TO EASEMENT(S) OVER PORTION OF SECTION 1231 MARKED C, E AND F ON F28963 TO THE COUNCIL FOR THE AREA (LAND GRANT VOL. 4370 FOLIO 586)

Schedule of Dealings

Dealing Number	Description
14036031	CAVEAT BY COMMISSIONER OF STATE TAXATION
14089033	CAVEAT BY MQN008 PTY. LTD. (ACN: 658 142 744)

Notations

Dealings Affecting Title	NIL
Priority Notices	NIL
Registrar-General's Notes	NIL
Administrative Interests	NIL

Additional Information

This additional information is provided by the Department for Environment and Water and does not constitute part of the Crown Leases Register maintained by the Registrar-General. Contact the Department for Environment and Water to verify the currency of this information and to obtain further details.

Annual Rent

Annual Rent:	$100
Rent Review:	Not subject to rental reviews

This Crown Record Register Search is a true and correct extract of the Register of Crown Records maintained by the Registrar-General. Crown Land is administered pursuant to the Crown Land Management Act 2009 by the Department for Environment and Water.

Crown Record - Volume 5753 Folio 706

Parent Title(s)

Creating Dealing(s) RT 8857102

Title Issued 06/04/2000 **Edition** 2 **Edition Issued** 22/09/2016

Estate Type

CROWN LAND (ALIENATED)

Owner

THE CROWN

Custodian

SOUTH AUSTRALIAN WATER CORPORATION
OF ADELAIDE SA 5000

Description of Land

ALLOTMENT 3 DEPOSITED PLAN 31966
IN THE AREA NAMED PORT LINCOLN
OUT OF HUNDREDS (LINCOLN) AND HUNDRED OF LINCOLN

TOTAL AREA: 11.4HA (APPROXIMATE)

Easements

SUBJECT TO THE EASEMENT(S) TO THE ETSA CORPORATION (CT 5428/999)

Schedule of Dealings

NIL

Schedule of Interests

LAND DEDICATED FOR SEWERAGE PURPOSES PURSUANT TO THE CROWN LANDS ACT, 1929 BY GAZETTE 26/09/1991

Notations

Dealings Affecting Title	NIL
Priority Notices	NIL
Registrar-General's Notes	NIL
Administrative Interests	NIL

This Crown Record Register Search is a true and correct extract of the Register of Crown Records maintained by the Registrar-General. Crown Land is administered pursuant to the Crown Land Management Act 2009 by the Department for Environment and Water.

Crown Record - Volume 5757 Folio 942

Parent Title(s)

Creating Dealing(s) RT 8862505

Title Issued 14/04/2000 **Edition** 2 **Edition Issued** 22/09/2016

Estate Type

CROWN LAND (ALIENATED)

Owner

THE CROWN

Custodian

SOUTH AUSTRALIAN WATER CORPORATION
OF ADELAIDE SA 5000

Description of Land

SECTION 538
HUNDRED OF LINCOLN
IN THE AREA NAMED DUCK PONDS

TOTAL AREA: 2.287HA (CALCULATED)

Easements

NIL

Schedule of Dealings

NIL

Schedule of Interests

LAND DEDICATED FOR WATER WORKS PURPOSES PURSUANT TO THE CROWN LANDS ACT, 1929 BY GAZETTE 10/07/1975

Notations

Dealings Affecting Title	NIL
Priority Notices	NIL
Registrar-General's Notes	NIL
Administrative Interests	NIL

This Crown Record Register Search is a true and correct extract of the Register of Crown Records maintained by the Registrar-General. Crown Land is administered pursuant to the Crown Land Management Act 2009 by the Department for Environment and Water.

Crown Record - Volume 5858 Folio 760

Parent Title(s) CR 5753/939

Creating Dealing(s) RTD 8958588

Title Issued 08/11/2001 **Edition** 1 **Edition Issued** 08/11/2001

Estate Type

CROWN LAND (ALIENATED)

Owner

THE CROWN

Custodian

CITY OF PORT LINCOLN
OF PO BOX 1787 PORT LINCOLN SA 5606

Description of Land

ALLOTMENT 102 DEPOSITED PLAN 55761
IN THE AREA NAMED PORT LINCOLN
HUNDRED OF LINCOLN

TOTAL AREA: 15.10HA (CALCULATED)

Easements

SUBJECT TO EASEMENT(S) OVER THE LAND MARKED A ON DP 55761 (LAND GRANT VOL.4375 FOLIO 295)

Schedule of Dealings

NIL

Schedule of Interests

LAND DEDICATED FOR DRAINAGE AND COMMUNITY PURPOSES PURSUANT TO THE CROWN LANDS ACT, 1929 BY GAZETTE 16/11/2000

Notations

Dealings Affecting Title NIL

Priority Notices NIL

Registrar-General's Notes NIL

Administrative Interests NIL

REAL PROPERTY ACT, 1886

South Australia

The Registrar-General certifies that this Title Register Search displays the records maintained in the Register Book and other notations at the time of searching.

REGISTRAR - GENERAL SOUTH AUSTRALIA

Certificate of Title - Volume 5149 Folio 26

Parent Title(s) CT 4330/422

Creating Dealing(s) TG 7539898

Title Issued 13/10/1993 **Edition** 4 **Edition Issued** 10/08/2015

Estate Type

FEE SIMPLE

Registered Proprietor

MICHAEL STEPHEN HARRIS
OF PO BOX 785 PORT LINCOLN SA 5606

Description of Land

SECTION 1237
HUNDRED OF LINCOLN
IN THE AREA NAMED DUCK PONDS

Easements

SUBJECT TO EASEMENT(S) OVER THE LAND MARKED D TO THE ELECTRICITY TRUST OF SOUTH AUSTRALIA (TG 7539898)

SUBJECT TO EASEMENT(S) OVER THE LAND MARKED A TO THE MINISTER OF PUBLIC INFRASTRUCTURE (T 1607533)

SUBJECT TO EASEMENT(S) OVER THE LAND MARKED B AND C (PL 2564947 AND PL 3683033 RESPECTIVELY)

Schedule of Dealings

Dealing Number	Description
7566176	MORTGAGE TO AUSTRALIA & NEW ZEALAND BANKING GROUP LTD.
8569014	MORTGAGE TO AUSTRALIA & NEW ZEALAND BANKING GROUP LTD.

Notations

Dealings Affecting Title NIL

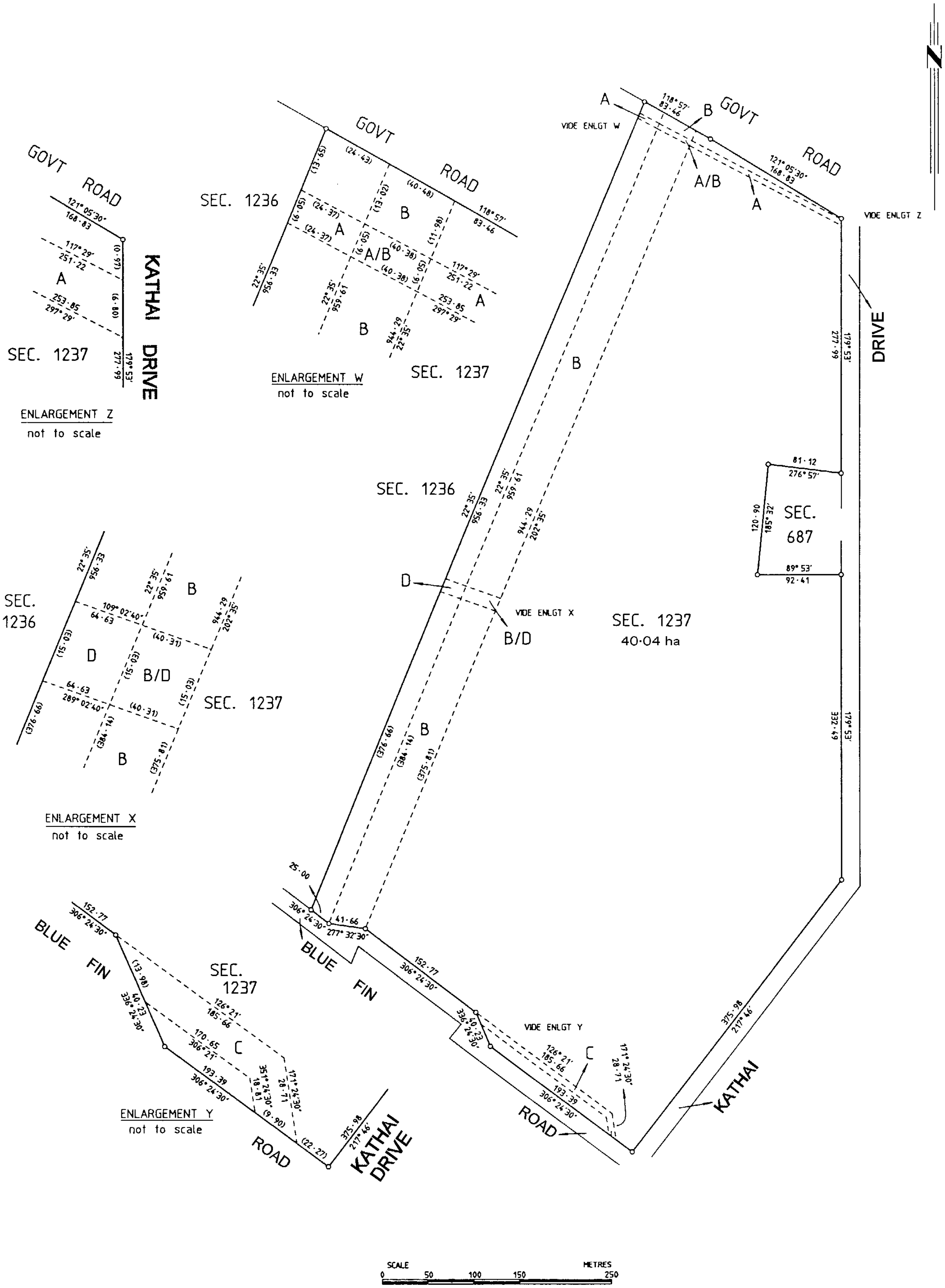
Priority Notices NIL

Notations on Plan NIL

Registrar-General's Notes

AMENDMENT TO DIAGRAM VIDE 156/94
AMENDMENT TO DIAGRAM VIDE 3/2009
AMENDMENT TO DIAGRAM VIDE 87/2007

Administrative Interests NIL



GOVT ROAD
KATHAI DRIVE
SEC. 1236
SEC. 1237
40·04 ha
SEC. 687
BLUE FIN ROAD
KATHAI
DRIVE
VIDE ENLGT W
VIDE ENLGT Z
VIDE ENLGT X
VIDE ENLGT Y
ENLARGEMENT Z
not to scale
ENLARGEMENT W
not to scale
ENLARGEMENT X
not to scale
ENLARGEMENT Y
not to scale
SCALE
METRES
0 50 100 150 250

REAL PROPERTY ACT, 1886

South Australia

The Registrar-General certifies that this Title Register Search displays the records maintained in the Register Book and other notations at the time of searching.

REGISTRAR - GENERAL SOUTH AUSTRALIA

Certificate of Title - Volume 5169 Folio 212

Parent Title(s)	CT 4208/920				
Creating Dealing(s)	CONVERTED TITLE				
Title Issued	10/02/1994	**Edition**	4	**Edition Issued**	19/04/2016

Estate Type

FEE SIMPLE

Registered Proprietor

ROBIN JAMES MORTON
CHRISTINE KAYE ROSE MORTON
OF 6 ILLMAN AVENUE MURRAY BRIDGE SA 5253
AS JOINT TENANTS

Description of Land

ALLOTMENT 703 DEPOSITED PLAN 12075
IN THE AREA NAMED PORT LINCOLN
HUNDRED OF LINCOLN

Easements

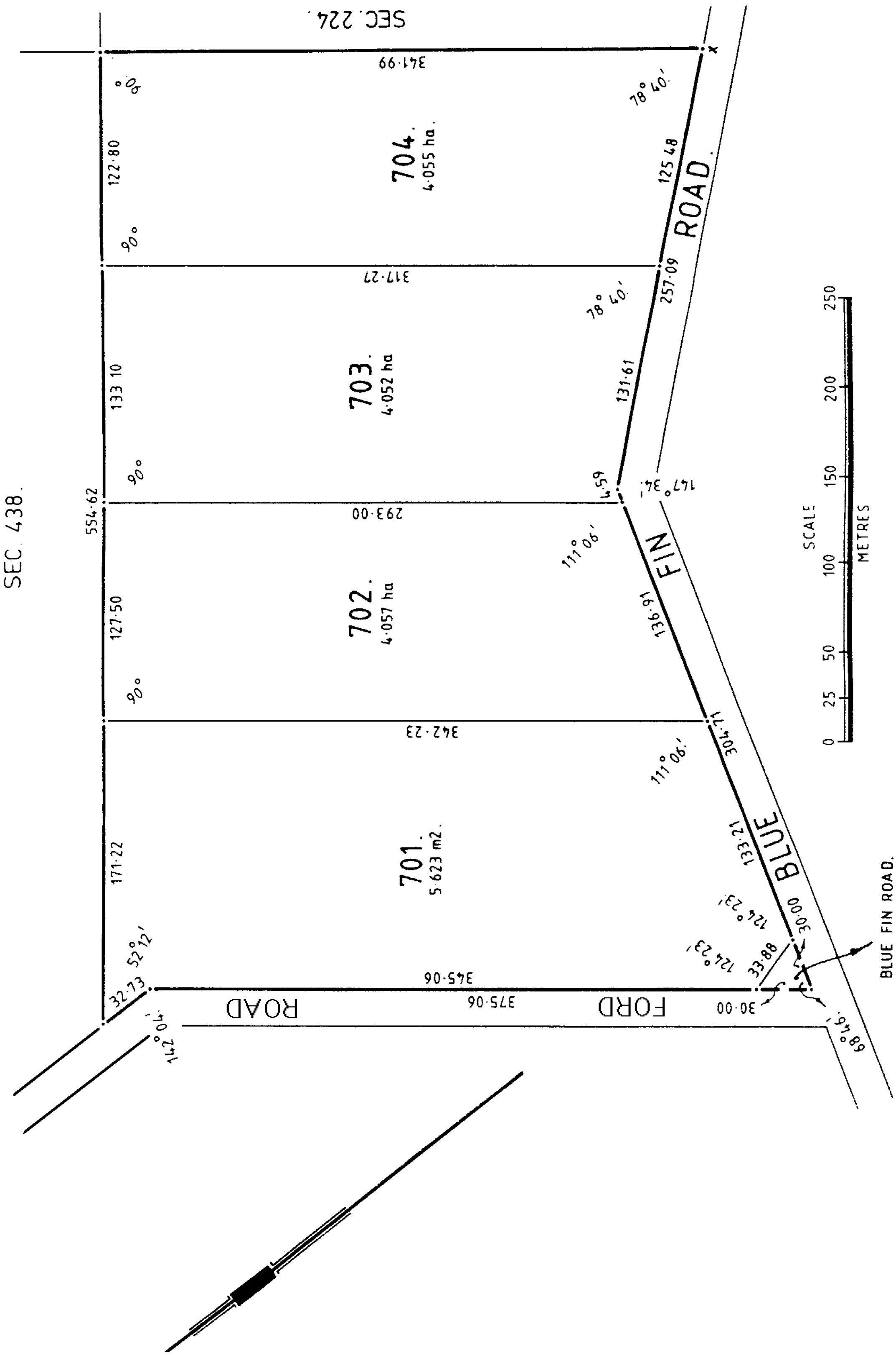
NIL

Schedule of Dealings

NIL

Notations

Dealings Affecting Title	NIL
Priority Notices	NIL
Notations on Plan	NIL
Registrar-General's Notes	NIL
Administrative Interests	NIL


SEC. 224.
SEC. 438.
704.
4·055 ha.
703.
4·052 ha
702.
4·057 ha
701.
5·623 m2.
341·99
317·27
293·00
342·23
345·06
375·06
30·00
122·80
133·10
127·50
171·22
554·62
32·73
125·48
257·09
131·61
4·59
136·91
304·77
133·21
30·00
33·88
90°
78°40'
111°06'
147°34'
124°23'
52°12'
142°04'
68°46'
BLUE FIN ROAD
FORD ROAD
BLUE FIN ROAD.
SCALE
METRES
0
25
50
100
150
200
250

REAL PROPERTY ACT, 1886

South Australia

The Registrar-General certifies that this Title Register Search displays the records maintained in the Register Book and other notations at the time of searching.

Certificate of Title - Volume 5287 Folio 229

Parent Title(s) CT 3253/118

Creating Dealing(s) CONVERTED TITLE

Title Issued 18/08/1995 **Edition** 8 **Edition Issued** 18/05/2018

Estate Type

FEE SIMPLE

Registered Proprietor

KYM LEON CLARKE
ELIZABETH ANN CLARKE
OF PO BOX 869 PORT LINCOLN SA 5606
1 / 2 SHARE AS JOINT TENANTS

KYM LEON CLARKE
ELIZABETH ANN CLARKE
OF PO BOX 869 PORT LINCOLN SA 5606
1 / 2 SHARE WITH NO SURVIVORSHIP

Description of Land

ALLOTMENT 8 FILED PLAN 158923
IN THE AREA NAMED PORT LINCOLN
HUNDRED OF LINCOLN

Easements

NIL

Schedule of Dealings

NIL

Notations

Dealings Affecting Title NIL

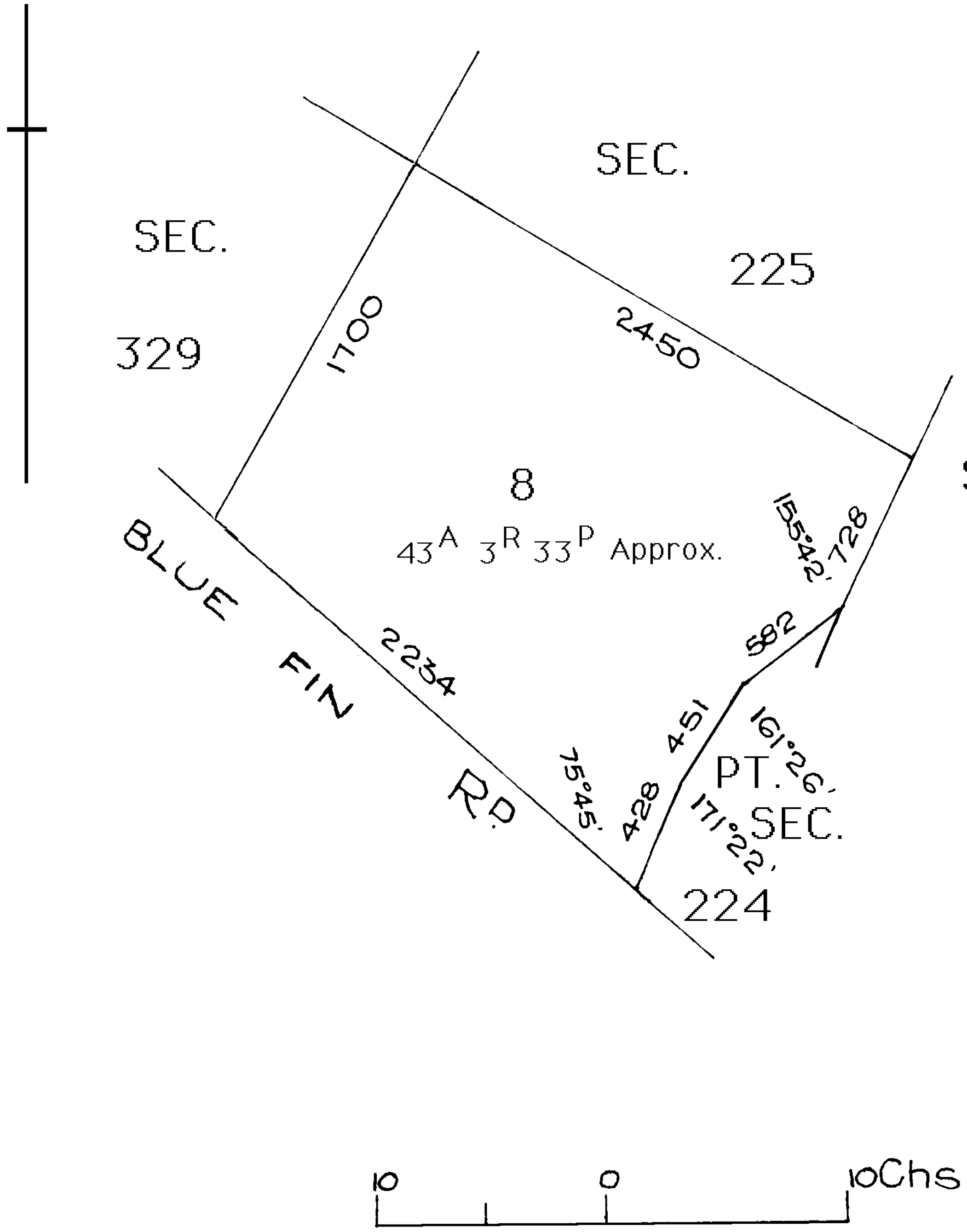
Priority Notices NIL

Notations on Plan NIL

Registrar-General's Notes NIL

Administrative Interests NIL

This plan is scanned for Certificate of Title 3253/118



FOR METRIC CONVERSION		
1 LINK	=	0·201168 metres
1 CHAIN	=	100 LINKS
1 ACRE	=	0·404686 hectares
1 ROOD	=	1011·7 m^2
1 PERCH	=	25·29 m^2

Note : Subject to all lawfully existing plans of division

REAL PROPERTY ACT, 1886

South Australia

The Registrar-General certifies that this Title Register Search displays the records maintained in the Register Book and other notations at the time of searching.

Certificate of Title - Volume 5401 Folio 703

Parent Title(s) CT 4318/34

Creating Dealing(s) CONVERTED TITLE

Title Issued 04/03/1997 **Edition** 5 **Edition Issued** 24/05/2006

Estate Type

FEE SIMPLE

Registered Proprietor

LINCOLN LAKES DEVELOPMENT CO. PTY. LTD. (ACN: 066 149 255)
OF 4 TASMAN TERRACE PORT LINCOLN SA 5606

Description of Land

SECTION 499
HUNDRED OF LINCOLN
IN THE AREA NAMED PORT LINCOLN

Easements

NIL

Schedule of Dealings

NIL

Notations

Dealings Affecting Title NIL

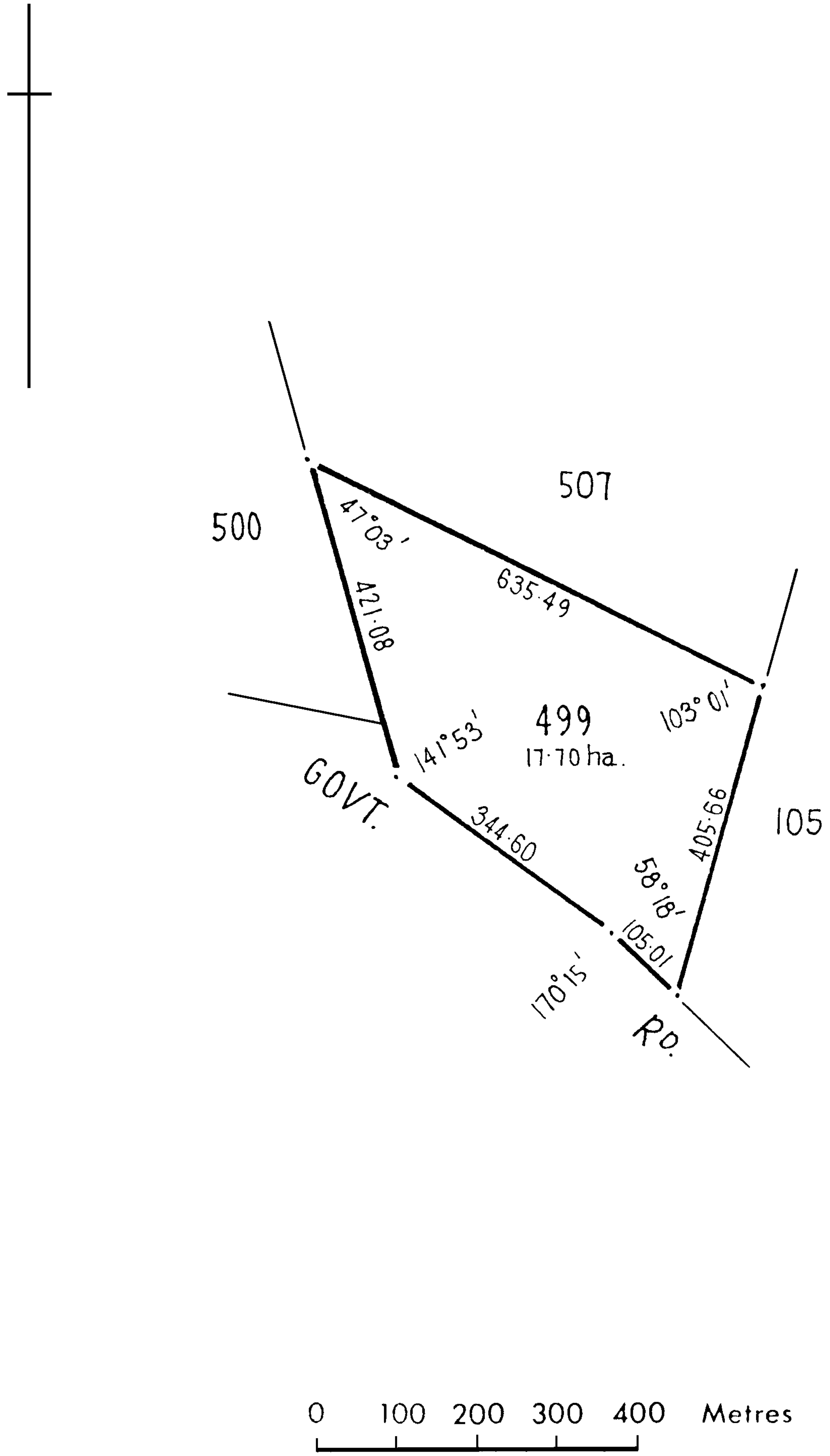
Priority Notices NIL

Notations on Plan NIL

Registrar-General's Notes

APPROVED FX54451

Administrative Interests NIL


500
507
47°03'
635.49
421.08
499
17.70 ha.
141°53'
103°01'
105
GOVT.
344.60
405.66
58°18'
105.01
170°15'
RD.
0 100 200 300 400 Metres

REAL PROPERTY ACT, 1886

South Australia

The Registrar-General certifies that this Title Register Search displays the records maintained in the Register Book and other notations at the time of searching.

Certificate of Title - Volume 5504 Folio 270

Parent Title(s)	CT 5169/213				
Creating Dealing(s)	TG 8386416				
Title Issued	18/02/1998	**Edition**	1	**Edition Issued**	18/02/1998

Estate Type

FEE SIMPLE

Registered Proprietor

GERD WILHELM JACKNER
RENATE JOHANNA JACKNER
OF PO BOX 627A PORT LINCOLN SA 5606
AS JOINT TENANTS

Description of Land

ALLOTMENT 704 DEPOSITED PLAN 12075
IN THE AREA NAMED PORT LINCOLN
HUNDRED OF LINCOLN

Easements

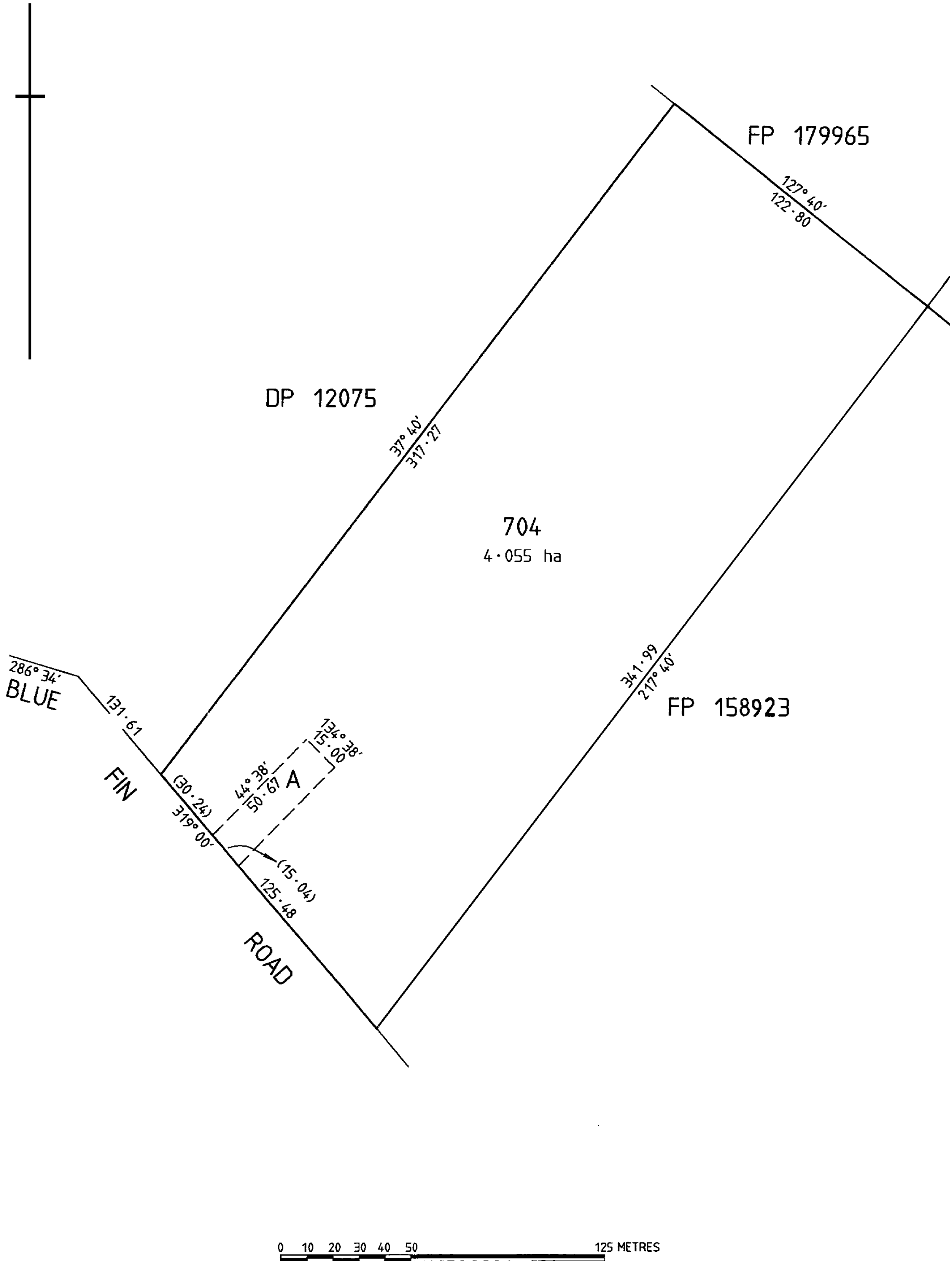
SUBJECT TO EASEMENT(S) OVER THE LAND MARKED A TO THE ETSA CORPORATION (TG 8386416)

Schedule of Dealings

NIL

Notations

Dealings Affecting Title	NIL
Priority Notices	NIL
Notations on Plan	NIL
Registrar-General's Notes	NIL
Administrative Interests	NIL


FP 179965
127° 40'
122·80
DP 12075
37° 40'
317·27
704
4·055 ha
341·99
217° 40'
FP 158923
286° 34'
BLUE
131·61
FIN
134° 38'
15·00
44° 38'
50·67
A
(30·24)
319° 00'
(15·04)
125·48
ROAD
0 10 20 30 40 50 125 METRES

REAL PROPERTY ACT, 1886

South Australia

The Registrar-General certifies that this Title Register Search displays the records maintained in the Register Book and other notations at the time of searching.

REGISTRAR - GENERAL SOUTH AUSTRALIA

Certificate of Title - Volume 5870 Folio 921

Parent Title(s)	CT 4132/868, CT 5767/949				
Creating Dealing(s)	RTC 9194179				
Title Issued	22/04/2002	**Edition**	4	**Edition Issued**	05/04/2023

Estate Type

FEE SIMPLE

Registered Proprietor

ROCKET TECHNOLOGIES INTERNATIONAL PTY. LTD. (ACN: 633 429 375)
OF 535 CONNORS ROAD HELIDON QLD 4344

Description of Land

ALLOTMENT 62 DEPOSITED PLAN 57787
IN THE AREA NAMED PORT LINCOLN
HUNDRED OF LINCOLN

Easements

SUBJECT TO EASEMENT(S) OVER THE LAND MARKED A FOR WATER SUPPLY PURPOSES TO THE SOUTH AUSTRALIAN WATER CORPORATION (RTC 9194179)

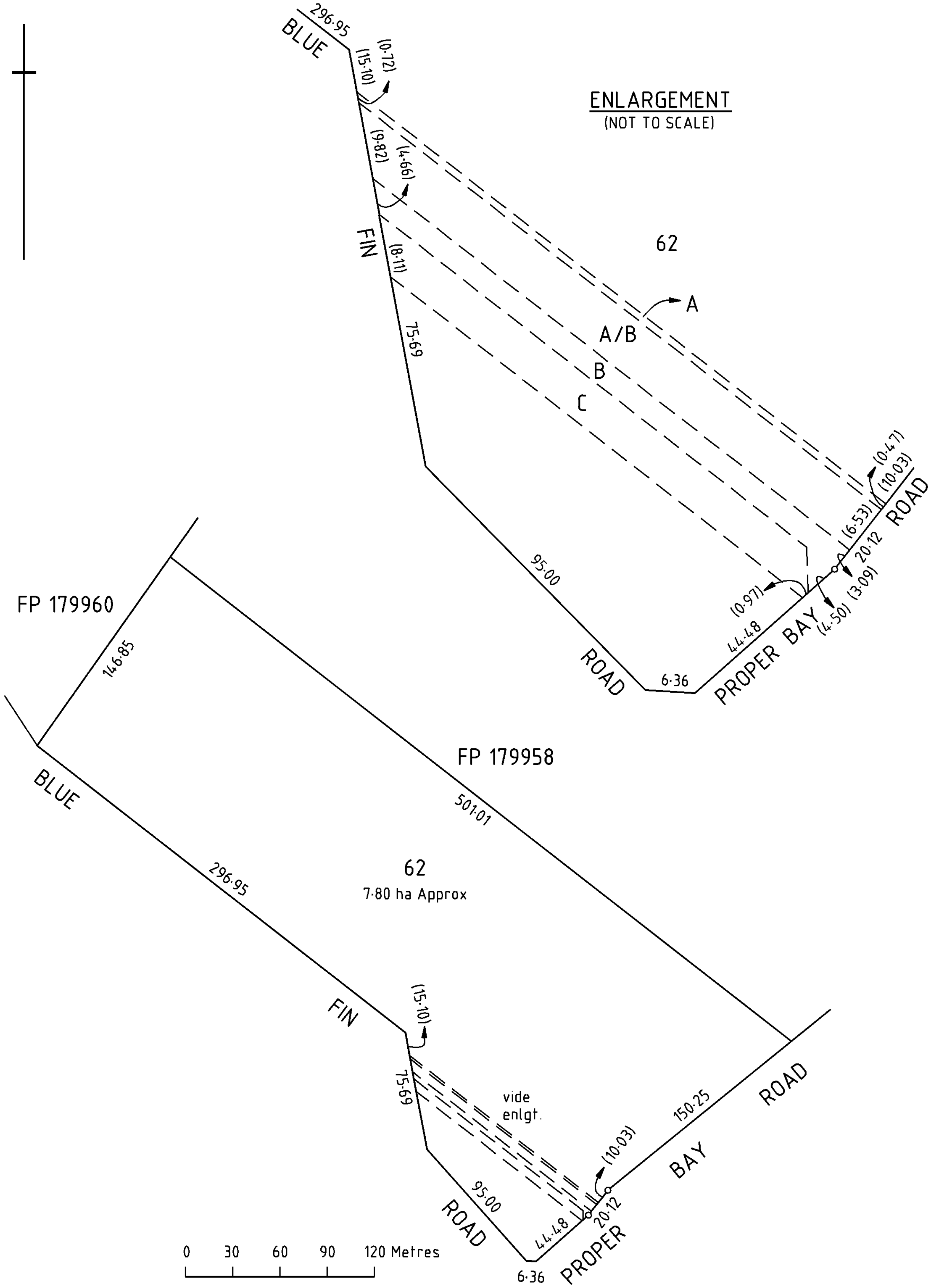
SUBJECT TO EASEMENT(S) OVER THE LAND MARKED B AND C TO DISTRIBUTION LESSOR CORPORATION (SUBJECT TO LEASE 8890000) (RTC 9194179)

Schedule of Dealings

Dealing Number	Description
14006888	MORTGAGE TO LIGHTBUD PTY. LTD. (ACN: 097 223 820)

Notations

Dealings Affecting Title	NIL
Priority Notices	NIL
Notations on Plan	NIL
Registrar-General's Notes	NIL
Administrative Interests	NIL


296·95
BLUE
(0·72)
(15·10)
ENLARGEMENT
(NOT TO SCALE)
(9·82)
(4·66)
FIN
62
(8·11)
A
A/B
75·69
B
C
(0·47)
(10·03)
(6·53)
ROAD
20·12
95·00
(3·09)
(0·97)
(4·50)
44·48
BAY
PROPER
ROAD
6·36
FP 179960
146·85
FP 179958
BLUE
501·01
296·95
62
7·80 ha Approx
FIN
(15·10)
75·69
vide
enlgt.
150·25
ROAD
(10·03)
BAY
95·00
20·12
44·48
ROAD
PROPER
6·36
0
30
60
90
120 Metres

REAL PROPERTY ACT, 1886

South Australia

The Registrar-General certifies that this Title Register Search displays the records maintained in the Register Book and other notations at the time of searching.

Certificate of Title - Volume 6193 Folio 313

Parent Title(s) CT 6118/762

Creating Dealing(s) RTC 12706936

Title Issued 07/07/2017 **Edition** 3 **Edition Issued** 26/06/2020

Estate Type

FEE SIMPLE

Registered Proprietor

MINISTER FOR TRANSPORT, INFRASTRUCTURE AND LOCAL GOVERNMENT
OF ADELAIDE SA 5000

Description of Land

ALLOTMENT 82 DEPOSITED PLAN 113518
IN THE AREAS NAMED LINCOLN NATIONAL PARK AND PORT LINCOLN
OUT OF HUNDREDS (LINCOLN) AND HUNDREDS OF FLINDERS AND LINCOLN

Easements

NIL

Schedule of Dealings

Dealing Number	Description
8430050	LEASE TO VITERRA OPERATIONS PTY. LTD. (ACN: 007 556 256) COMMENCING ON 25/11/1997 AND EXPIRING ON 24/11/2096 OF PORTION (C1.C2.C3.C4.C5.C6.C7.C8.C9.C10.C11.F1.F2.F3.F4.F5.F6.F7.G1.G2.8 CONVEYOR GALLERY.10 TOWER.13 TRANSFORMER.14 CONVEYOR GALLERY AND 15 CONVEYOR GALLERY IN G396/1997) TOGETHER WITH CERTAIN RIGHTS
10434611	LEASE TO FLINDERS PORTS PTY. LTD. COMMENCING ON 2/11/2001 AND EXPIRING ON 2/11/2100 OF PORTION (TENANCY W1.TENANCY W2 AND TENANCY W3 IN G381/2001)
12142654E	CAVEAT BY WESTPAC BANKING CORPORATION OVER LEASE 10434611
13367275	CAVEAT BY VITERRA OPERATIONS PTY. LTD. (ACN: 007 556 256) OVER LEASE 10434611 OVER PORTION (C1.C2.C3.C4.C5.C6.C7.C8.C9.C10.C11.F1.F2.F3.F4.F5.F6.F7.G1.G2.8 CONVEYOR GALLERY.10 TOWER.13 TRANSFORMER.14 CONVEYOR GALLERY AND 15 CONVEYOR GALLERY IN G396/1997)

Notations

Dealings Affecting Title NIL

Priority Notices NIL

Notations on Plan NIL

Registrar-General's Notes

PLAN FOR LEASE PURPOSES VIDE G274/2000
PLAN FOR LEASE PURPOSES VIDE G381/2001
PLAN FOR LEASE PURPOSES VIDE G396/1997

Administrative Interests NIL

REAL PROPERTY ACT, 1886

South Australia

The Registrar-General certifies that this Title Register Search displays the records maintained in the Register Book and other notations at the time of searching.

Certificate of Title - Volume 6248 Folio 729

Parent Title(s) CT 5913/429, CT 6170/376, CT 6186/645

Creating Dealing(s) RTC 13349907

Title Issued 22/12/2020 **Edition** 1 **Edition Issued** 22/12/2020

Estate Type

FEE SIMPLE

Registered Proprietor

LINCOLN LAKES DEVELOPMENT CO. PTY. LTD. (ACN: 066 149 255)
OF PO BOX 1073 PORT LINCOLN SA 5606

Description of Land

ALLOTMENT COMPRISING PIECES 70 AND 71 DEPOSITED PLAN 124175
IN THE AREA NAMED PORT LINCOLN
HUNDRED OF LINCOLN

Easements

SUBJECT TO EASEMENT(S) OVER THE LAND MARKED A ON D124175 (T 6123689)

SUBJECT TO EASEMENT(S) OVER THE LAND MARKED B ON D124175 TO THE COUNCIL FOR THE AREA (RTC 12670021)

SUBJECT TO SERVICE EASEMENT(S) OVER THE LAND MARKED D ON D124175 FOR SEWERAGE PURPOSES TO SOUTH AUSTRALIAN WATER CORPORATION (223LG RPA)

SUBJECT TO SERVICE EASEMENT(S) OVER THE LAND MARKED E ON D124175 FOR WATER SUPPLY PURPOSES TO SOUTH AUSTRALIAN WATER CORPORATION (223LG RPA)

Schedule of Dealings

NIL

Notations

Dealings Affecting Title NIL

Priority Notices NIL

Notations on Plan NIL

Registrar-General's Notes NIL

Administrative Interests NIL

REAL PROPERTY ACT, 1886

South Australia

The Registrar-General certifies that this Title Register Search displays the records maintained in the Register Book and other notations at the time of searching.

REGISTRAR - GENERAL SOUTH AUSTRALIA

Certificate of Title - Volume 6275 Folio 757

Parent Title(s)	CT 6252/672				
Creating Dealing(s)	RTC 13872880				
Title Issued	20/09/2022	**Edition**	1	**Edition Issued**	20/09/2022

Estate Type

FEE SIMPLE

Registered Proprietor

OSCAR & SIMBA PTY. LTD. (ACN: 618 130 180)
OF UNIT 2 15 MONTEREY DRIVE PORT LINCOLN SA 5606

Description of Land

ALLOTMENT 11 DEPOSITED PLAN 129500
IN THE AREA NAMED PORT LINCOLN
HUNDRED OF LINCOLN

Easements

SUBJECT TO EASEMENT(S) OVER THE LAND MARKED C ON D129500 TO DISTRIBUTION LESSOR CORPORATION (SUBJECT TO LEASE 8890000) (RTC 13872880)

SUBJECT TO EASEMENT(S) OVER THE LAND MARKED D ON D129500 TO SOUTH AUSTRALIAN WATER CORPORATION (RTC 13872880)

SUBJECT TO SERVICE EASEMENT(S) OVER THE LAND MARKED G ON D129500 FOR SEWERAGE PURPOSES TO SOUTH AUSTRALIAN WATER CORPORATION (223LG RPA)

SUBJECT TO SERVICE EASEMENT(S) OVER THE LAND MARKED H ON D129500 FOR DRAINAGE PURPOSES TO THE COUNCIL FOR THE AREA (223LG RPA)

TOGETHER WITH FREE AND UNRESTRICTED RIGHT(S) OF WAY OVER THE LAND MARKED B ON D129500 (RTC 13492572)

TOGETHER WITH RIGHT(S) OF WAY OVER THE LAND MARKED K ON D129500 (RTC 13872880)

Schedule of Dealings

Dealing Number	Description
13488735	MORTGAGE TO BEECH CAPITAL PTY. LTD. (ACN: 639 057 720)

Notations

Dealings Affecting Title	NIL
Priority Notices	NIL
Notations on Plan	NIL
Registrar-General's Notes	NIL
Administrative Interests	NIL

REAL PROPERTY ACT, 1886

South Australia

The Registrar-General certifies that this Title Register Search displays the records maintained in the Register Book and other notations at the time of searching.

REGISTRAR - GENERAL SOUTH AUSTRALIA

Certificate of Title - Volume 6275 Folio 758

Parent Title(s)	CT 5673/340				
Creating Dealing(s)	RTC 13872880				
Title Issued	20/09/2022	**Edition**	1	**Edition Issued**	20/09/2022

Estate Type

FEE SIMPLE

Registered Proprietor

DEAN ANDREW LUKIN
OF UNIT 2 15 MONTEREY DRIVE PORT LINCOLN SA 5606

Description of Land

ALLOTMENT 12 DEPOSITED PLAN 129500
IN THE AREA NAMED PORT LINCOLN
HUNDRED OF LINCOLN

Easements

SUBJECT TO EASEMENT(S) OVER THE LAND MARKED C ON D129500 TO DISTRIBUTION LESSOR CORPORATION (SUBJECT TO LEASE 8890000) (RTC 13872880)

SUBJECT TO EASEMENT(S) OVER THE LAND MARKED D ON D129500 TO SOUTH AUSTRALIAN WATER CORPORATION (RTC 13872880)

Schedule of Dealings

Dealing Number	Description
13397385	MORTGAGE TO SPEEDY BUSINESS LOANS PTY. LTD. (ACN: 639 255 717)
13488933	MORTGAGE TO BEECH CAPITAL PTY. LTD. (ACN: 639 057 720)
14036031	CAVEAT BY COMMISSIONER OF STATE TAXATION
14082895	CAVEAT BY MQN008 PTY. LTD. (ACN: 658 142 744)

Notations

Dealings Affecting Title	NIL
Priority Notices	NIL
Notations on Plan	NIL
Registrar-General's Notes	NIL
Administrative Interests	NIL

This Crown Record Register Search is a true and correct extract of the Register of Crown Records maintained by the Registrar-General. Crown Land is administered pursuant to the Crown Land Management Act 2009 by the Department for Environment and Water.

Crown Record - Volume 5858 Folio 759

Parent Title(s) CR 5753/939

Creating Dealing(s) RTD 8958588

Title Issued 08/11/2001 **Edition** 1 **Edition Issued** 08/11/2001

Estate Type

CROWN LAND (ALIENATED)

Owner

THE CROWN

Custodian

CITY OF PORT LINCOLN
OF PO BOX 1787 PORT LINCOLN SA 5606

Description of Land

ALLOTMENT 101 DEPOSITED PLAN 55761
IN THE AREA NAMED PORT LINCOLN
HUNDRED OF LINCOLN

TOTAL AREA: 4.576HA (CALCULATED)

Easements

SUBJECT TO EASEMENT(S) OVER THE LAND MARKED A ON DP 55761 (LAND GRANT VOL.4375 FOLIO 295)

Schedule of Dealings

NIL

Schedule of Interests

LAND DEDICATED FOR DRAINAGE AND COMMUNITY PURPOSES PURSUANT TO THE CROWN LANDS ACT, 1929 BY GAZETTE 16/11/2000

Licence Number	Description
OL022451	ANNUAL LICENCE TO PLASTIC FABRICATIONS PTY LTD FOR COMMERCIAL OR INDUSTRIAL PURPOSES COMMENCING ON 01/06/2002 AND EXPIRING ON 31/05/2024

Notations

Dealings Affecting Title

Lodgement Date	Dealing Number	Description	Status
08/12/2009	11306482	REQUEST FOR NEW TITLES - DEPOSITED PLAN	UNREGISTERED - DATA ENTRY INCOMPLETE

Priority Notices NIL

Registrar-General's Notes

UNAPPROVED D82953

Administrative Interests NIL

REAL PROPERTY ACT, 1886

South Australia

The Registrar-General certifies that this Title Register Search displays the records maintained in the Register Book and other notations at the time of searching.

REGISTRAR - GENERAL SOUTH AUSTRALIA

Certificate of Title - Volume 6275 Folio 756

Parent Title(s) CT 6252/672

Creating Dealing(s) RTC 13872880

Title Issued 20/09/2022 **Edition** 2 **Edition Issued** 05/10/2022

Estate Type

FEE SIMPLE

Registered Proprietor

SOUTH AUSTRALIAN WATER CORPORATION
OF GPO BOX 1751 ADELAIDE SA 5001

Description of Land

ALLOTMENT 10 DEPOSITED PLAN 129500
IN THE AREA NAMED PORT LINCOLN
HUNDRED OF LINCOLN

Easements

SUBJECT TO RIGHT(S) OF WAY OVER THE LAND MARKED K ON D129500 (RTC 13872880)

TOGETHER WITH FREE AND UNRESTRICTED RIGHT(S) OF WAY OVER THE LAND MARKED B ON D129500 (RTC 13492572)

Schedule of Dealings

NIL

Notations

Dealings Affecting Title	NIL
Priority Notices	NIL
Notations on Plan	NIL
Registrar-General's Notes	NIL
Administrative Interests	NIL

SA Water

Section 131 Development Application Report

Eyre Peninsula's new reverse osmosis seawater desalination plant

Version: 0.7

Date: 14/06/2024

Status: Revised Final

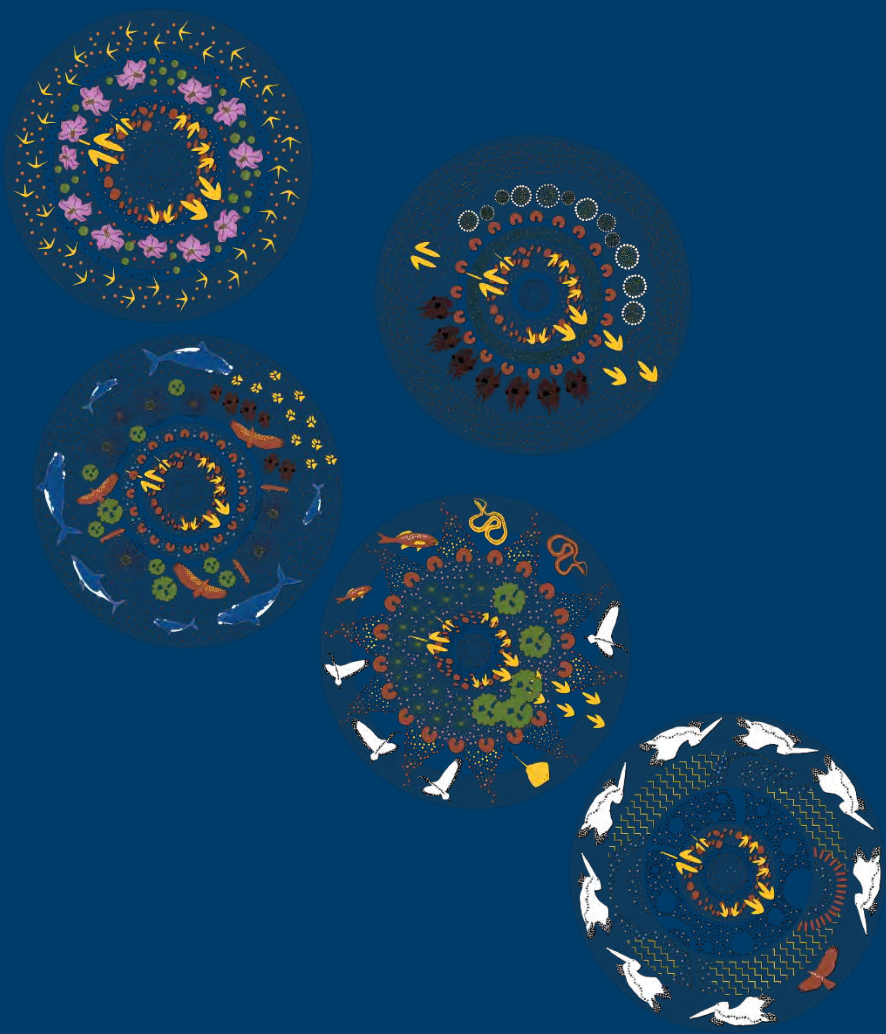
Document ID: TBD

Confidentiality: OFFICIAL

Government of South Australia

Acknowledgment of country

SA Water acknowledges the Traditional Owners of Country throughout South Australia. We recognise their unique and continuing connection to lands and waters. We pay respect to Elders past and present and extend that respect to all Aboriginal and Torres Strait Islander peoples visiting or living in South Australia.



Document Controls

Version History

Version	Date	Author	Comments
0.1	24/07/2023	SA Water	First draft
0.2	07/02/24	WSP	Impact Assessments and report update
0.3	08/02/24	SA Water	SA Water review
0.4	17/05/2024	SA Water	Marine incorporation
0.5	24/05/2024	WSP	Impact Assessment and report update
0.6	03/06/2024	WSP	Final
0.7	14/06/2024	WSP	Revised final

Template: Report Version 4.2 22/11/19

Contents

Contents (continued)

Contents (continued)

Contents (continued)

Contents (continued)

List of figures

List of figures (continued)

List of figures (continued)

List of tables

List of tables (continued)

Glossary

The following glossary items are used in this document:

Term	Description
ADCP	An Acoustic Doppler Current Profiler is an instrument that measures how fast water currents move across the water column with sound, using a principle of sound waves called the Doppler effect.
Aquifer recharge	The transfer of surface water to ground water.
Australian Standards	Published documents setting out specifications and procedures designed to ensure products, services and systems are safe, reliable, and consistently perform the way they were intended to.
Bathymetry (Bathymetric data)	The measurement of the depth of the ocean floor from the water surface; the oceanic equivalent of topography. Bathymetric data, which includes information about the depths and shapes of underwater terrain and is usually referenced to tidal vertical datums.
BDAC	Barngarla Determination Aboriginal Corporation
Biodiversity	The variety of different species, the genetic variability of each species, and the variety of different ecosystems that they form.
Construction phase	The phase from site mobilisation to demobilisation to support construction of the Eyre Peninsula Desalination Plant Project.
Clean water	Water of a quality level compliant with the Australian Drinking Water Guidelines. This water is considered safe for drinking.
Contractor	The successful proponent selected by SA Water to design and construct the Project.
Desalination	The process of removing salts and other minerals from seawater to produce drinking water.
Desalination Plant	The infrastructure required to desalinate seawater and convert it to potable water.
Desalinated water transfer pipeline	The pipeline built by the Contractor which transfers the treated water from the desalination plant.
Diffuser	An outlet designed to break up the flow of brine into small streams and 'jet' these streams into a large volume of surrounding seawater with sufficient velocity to mix and disperse the brine rapidly and effectively.
Discharge	The saline concentrate that will be emitted from the outfall pipeline into the marine environment.
Discharge pipeline	The pipeline built by the Contractor which transfers the wastewater and saline water to the sea.
Dissolved oxygen	The amount of oxygen freely available in water and necessary for aquatic life and the oxidation of organic materials.
Hydrodynamic modelling	Allows water movements, speeds and directions to be simulated on a computer to give a representation of how the estuary processes work and predicts how future processes (as a result of sea level rise or changes to flood defences) might behave.
Intake	The drawing of seawater into the desalination plant system.
Intake pipeline	The pipeline(s) built by the Contractor which transfers the seawater to the pump station and the desalination plant.
Marine environment	The seawater environment.
Matters of National Environmental Significance	Matters protected under the *Environment Protection and Biodiversity Conservation Act 1999.*
Operation phase	Desalination plant operations post commissioning.

Term	Description
Outfall	The discharge of brine from the desalination plant system back into the marine environment.
PM_{10}	Particles with an aerodynamic of 10 micrometres or less are a common air pollutant present in dust.
Reverse Osmosis	A process of removing contaminants, particularly salt, from water through processing through a semi-permeable membrane.
Saline waste	A liquid by-product of the desalination process that has a higher concentration of suspended and dissolved materials (particularly salt) than intake seawater due to the salt concentrating effect of the reverse osmosis system.
Salinity	The dissolved salt content of a body of water.
SCAP	The State Commission Assessment Panel (SCAP) is established under South Australia's *Planning, Development and Infrastructure Act 2016*.
Seawater or brine discharge	The waste stream that will be emitted from the outfall pipeline.
Siltstones	A sedimentary rock composed of silt-sized particles.
Terrestrial Environment	The land environment.
Transfer pipeline	The pipeline built by the Contractor which transfers the treated water from the desalination plant.
Turbidity	A measure of water cloudiness caused by suspended solids.

References

The following table identifies the documents and/or articles that are referenced in this document:

Title/URL
Aboriginal Heritage Act 1988
Aquaculture Act 2001
Aquaculture (Zones – Lower Eyre Peninsula) Policy 2023
Coast Protection Board Policy Document 2016
Commonwealth Aboriginal and Torres Strait Islander Heritage Protection Act 1984
Commonwealth Native Title Act 1993
Crown Land Management Act 2009
Dangerous Substances Act 1979
Department for Infrastructure and Transport, Protecting Waterways Guideline July 2016
Environment Protection Act 1993
Environmental Protection Agency Government of South Australia (EPA) 1999, Stormwater Pollution Prevention
Environmental Protection Agency's Handbook for Pollution Avoidance on Commercial and Residential Building Sites 2004
Environmental Protection Authority Government of South Australia 2021, EPA Industry: Construction environmental management plans (CEMP)
Environmental Protection Authority Government of South Australia 2021, EPA Water Quality: Environmental management of dewatering during construction activities
Environment Protection and Biodiversity Conservation Act 1999
Environment Protection (Commercial and Industrial Noise) Policy 2023
Environment Protection (Water Quality) Policy 2015
Environment Protection Regulations 2009
Fisheries Management Act 2007
Harbors and Navigation Act 1993
Heavy Vehicle National Law (South Australia) Act 2013
Heritage Places Act 1993
Historic Shipwrecks Act 1981
Landscape South Australia Act 2019 *(LSA Act)*
National Environment Protection Council Act 1994 (NEPC Act)
Native Title (South Australia) Act 1994
Native Vegetation Act 1991
Planning and Design Code (P&D Code, published 23 May 2024, Version 2024.9)
Planning, Development and Infrastructure Act 2016 (PDI Act)
Planning, Development and Infrastructure (General) Regulations 2017 (PDI Regulations)
Port Lincoln Stormwater Management Plan 2014
Road Traffic Act 1961

Title/URL
Safe Drinking Water Act 2011
South Australian Public Health Act 2011
South Australian Water Corporation Act 1994
Standards Australia (2005) *Guide to the Sampling and Investigation of Potentially Contaminated Soil Part 1: Non-Volatile and Semi-Volatile Compounds.*
Underwater Cultural Heritage Act 2018
Water Industry Act 2012

Abbreviations

Abbreviation	Meaning
AAQA	*Ambient Air Quality Assessment guideline*
AAQMS	Ambient air quality monitoring stations
ADCP	Acoustic Doppler Current Profiler
ADP	Adelaide Desalination Plant
AEMP	Aquaculture environmental monitoring program
AHD	Australian Height Datum
Air EPP	*Environment Protection (Air Quality) Policy 2016*
Air NEPC	*National Environment Protection (Ambient Air Quality) Measure 2016*
Air Toxics NEPM	*National Environment Protection (Air Toxics) Measure*
ALA	Atlas of Living Australia
ANZECC	Australian and New Zealand Guidelines for Fresh and Marine Waters
ARI	Average Recurrence Interval
AS	Australian Standard
ASRIS	Australian Soil Resource Information System
AST	Aboveground storage tank
AWS	Automatic Weather Station
BAL	Bushfire Attack Level
BB	Boston Bay
BDAC	Barngarla Determination Aboriginal Corporation RNTBC
BoM	Bureau of Meteorology
BHP	Broken Hill Proprietary Company Limited
BLP	Billy Lights Point
BMT	Company – SA Water's marine modelling consultants
BRUVS	Baited Remote Underwater Video Station
BTEX	Benzene, Toluene, Ethylbenzene, Xylene
BYDA	Before you Dig Australia
CASANZ	Clean Air Society of Australia and New Zealand
CCTV	Closed circuit television
CEMP	Construction Environmental Management Plan
CFD	Computational Fluid Dynamics
CFS	South Australian Country Fire Service
CIP	Clean in place
CO	Carbon monoxide
CPB	Coast Protection Board
CR	Crown Record
CT	Certificate of Title
CWOI	Coastal Waters and Offshore Islands
DA	Development Application
DCCEEW	Australian Department of Climate Change, Energy, the Environment and Water
DEW	Department for Environment and Water
DIDO	Drive in / drive out
DIT	Department for Infrastructure and Transport
DMP	Dredge Management Plan

Abbreviation	Meaning
DN	Nominal diameter
DO	Desired Outcome
DPF	Designated Performance feature
DPIE	NSW Department of Planning, Industry and Environment (now DCCEEW)
DPTI	SA Department of Planning, Transport and Infrastructure (now DIT)
DTS/DPF	Deemed-to-satisfy Criteria
DWTP	Desalinated water transfer pipeline
ECI	Early Contractor Involvement
EP Act	*Environment Protection Act 1993*
EPA	South Australian Environment Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EPLB	Eyre Peninsula Landscape Board
EPP	Environment Protection Policy
FFL	Finished floor level
FIFO	Fly in/ fly out
GL	Gigalitre
GL/annum	Gigalitre per annum
GLCs	Ground level concentrations
ha	hectares
HAB	Harmful algal bloom
HDV	Heavy duty vehicle
Heritage Places Act	*Heritage Places Act 1993*
Heritage SA	Heritage South Australia
HGV	Heavy duty vehicles defined as vehicles with a gross weight greater than 3.5 tonnes
Historic Shipwrecks Act	*Historic Shipwrecks Act 1981*
HV	High voltage
IAQM	Institute of Air Quality Management
IAGM guidance	Guidance on the Assessment of Dust from Demolition and Construction
IBRA	Interim Biogeographical Region of Australia
km	Kilometre
kV	Kilovolt
L	Litre
LCVIA	Landscape Character and Visual Amenity Assessment
LGA	Local Government Authority
Long Term Plan	Long Term Plan for the Eyre Region
LPG	Liquefied natural gas
LSA Act	*Landscape South Australia Act 2019*
LV	Low voltage
m	Metre
MIPS	Marine intake and outfall pump station
mm	milimeter
Mg/L	Milligram per litre
Minister	Minister for Planning or their delegate
ML	Megalitre

Abbreviation	Meaning
ML/d	Megalitre per day
Mm	Millimetre
MNES	Matters of national environmental significance
MSRP	Marine Science Review Panel
m/s	Metres per sections
M^3	Cubic metre
M^3/h	Cubic metres per hour
NAGD	National Assessment Guidelines for Dredging
NBN	National Broadband Network
NO_x	Nitrogen oxides
NEPC	National Environment Protection Council
NEPC Act	*National Environment Protection Council Act 1994*
NEPMs	National Environment Protection Measures
NGERS	National Greenhouse and Energy Reporting Scheme
NHMRC	National Health and Medical Research Council
NOAA	United States National Oceanic and Atmospheric Administration
NPI	National Pollutant Inventory
NPW	National Parks and Wildlife
NSW	New South Wales
NTU	Nephelometric turbidity units
NV Act	*Native Vegetation Act 1991*
NVC	Native Vegetation Council
O_3	Ozone
OEMP	Operational Emergency Management Plan
OSOM	Oversize / Overmass
P&D Code	Planning and Design Code
PAHs	Total polycyclic aromatic hydrocarbons
Pb	Lead
PBO	Proper Bay Outer
PCA	Potentially contaminating activity
PDI Act	*Planning, Development and Infrastructure Act 2016*
PDI Regulations	*Planning, Development and Infrastructure (General) Regulation 2017*
PIRSA	Primary Industries and Regions SA
PLUS	Planning and Land Use Services
PO	Performance outcome
$PM_{2.5}$	Particulate matters with an aerodynamic diameter equal to or less than 2.5 micrometres in diameter
PM_{10}	Particles with an aerodynamic of 10 micrometres or less
ppm	Parts per million
PRG	Project Reference Group
Project	Eyre Peninsula Desalination Plant
PSD	Particle size distribution
PSI	Preliminary Site Investigation
PSU	Practical salinity units
PTS	Permanent threshold shift
RCP	Representative Concentration Pathway

Abbreviation	Meaning
RDAEP	Regional Development Australia Eyre Peninsula
Report	Development Application Report for the Eyre Peninsula Desalination Plant
RH	Relative humidity
RO	Reverse osmosis
SA	South Australia
SA Water	South Australian Water Corporation
SA CFS	South Australian Country Fire Services
SAPN	SA Power Networks
SARDI	South Australian Research and Development Institute
SARIG	South Australian Resources Information Gateway
SASQAP	SA Shellfish Quality Assurance Program
SATC	South Australian Tourism Commission
SAW	SA Water
SCAP	State Commission Assessment Panel
SEB	Significant Environmental Benefit
SEDMP	Soil Erosion and Drainage Management Plan
SIA	Social Impact Assessment
Site	The reverse osmosis desalination plant site
SO_2	Sulphur dioxide
SPC	State Planning Commission
SPP	State Planning Policy
SR	Sensitive Receptor
SSC	Site Selection Committee
SVOCs	Semi volatile organic compounds
T	Tonnes
t/m^3	Tonnes per cubic metre
TBM	Tunnel boring machine
TIA	Traffic Impact Assessment
TRA	Tourism Research Australia
TSP	Total suspended particulates
TSS	Total suspended solids
TTS	Temporary threshold shift
UCH Act	*Commonwealth Underwater Cultural Heritage Act 2018*
UF	Ultrafiltration
UN	United Nations
VOCs	Volatile organic compounds
VP	Viewpoint
WSP	WSP Australia Pty Limited
WWPS	Wastewater pump station
WWTP	Wastewater Treatment Plant
ZCEF	Zero Cost Energy Future
ZTVI	Zone of Theoretical Visual Influence
$\mu g/m^3$	Micrograms per cubic metre

Executive Summary

The South Australian Water Corporation (SA Water) proposes to construct a seawater desalination plant located on a cleared and disturbed site at Billy Lights Point, approximately 4 km south-east of Port Lincoln's city centre, at the southern end of Eyre Peninsula. The proposal seeks development approval under Section 131 of the *Planning, Development and Infrastructure Act 2016* (PDI Act).

The proposed Eyre Peninsula Desalination Plant Project ('the Project') would exist across several land parcels, and would include a main reverse osmosis (RO) desalination plant site, pump station, seawater intake and saline waste outfall pipelines and a drinking water transfer pipeline (DWTP) to the existing SA Water North Side Hill tanks. It is located on an area previously cleared and disturbed by mining product export and handling activities, and the neighbouring marine environment also supports existing aquaculture and shipping activities.

In 2008, SA Water released a Long Term Plan for the Eyre Region (2008) (the Long Term Plan) to address drought conditions and climate change, a declining aquifer recharge and envisaged water allocation reductions from the Southern Basins. The Long Term Plan identified seawater desalination as the preferred future supply option to ensure a long-term, climate independent water source for SA Water customers living and working in the region. Water supply since this time has used groundwater borefields in the Southern Eyre Peninsula Basins and water from the River Murray.

The Uley South Basin cannot sustain current groundwater extraction rates in the long-term. A water allocation review is currently being undertaken by the Eyre Peninsula Landscape Board supported by the Department for Environment and Water. The new water allocation plan is anticipated to come into force on 1 July 2026 and SA Water's allocated groundwater extraction limits from the Uley South Basin are expected to be significantly reduced, affecting water supply security and potentially reducing growth in the region through limited water supply to business and agriculture.

The Project is therefore driven by both the long term, climate independent water security needs of the Eyre Peninsula, and the requirement for management and protection of the Uley South Groundwater Basin. The secondary Project drivers are water quality improvement for the Eyre Peninsula, and the ability to support economic growth in the region.

The Eyre Peninsula has a unique SA Water customer demand profile with approximately one third of water provided for residential customers, one third for primary production and one third for industry. Reduced water availability would have a significant risk of negative impacts to regional liveability conditions and commercial productivity. The proposed Project is expected to provide drinking water and water supplies for approximately 35,000 people within Port Lincoln and Eyre Peninsula.

Site Selection

In 2021, SA Water investigated 20 alternative sites for the development of a desalination plant at the southern end of the Eyre Peninsula. In October 2021, the ex-BHP brownfield site at Billy Lights Point was identified as the preferred location for the desalination plant.

The site at Billy Lights Point is SA Water's preferred option based on consideration of a range of factors, including but not limited to environmental, geological, and technical attributes, access to water delivery infrastructure, cost, schedule to construct and its existing cleared and disturbed condition.

Project Description

The proposed Project would involve the construction of a new 16 megalitres (ML) per day (ML/d) or 5.3 gigalitres (GL) per annum (GL/annum) desalination plant and all necessary associated infrastructure, such as infrastructure for sourcing the seawater, treating the seawater, transferring the treated drinking water to our existing network system, and returning the saline concentrate from the desalination plant to the ocean.

The assessments presented in the development application are based on concept designs, with detailed design development progressing in parallel to the development approval process. Specific key elements of the Project include:

- A seawater intake and outfall pump station, located within an existing SA Water wastewater treatment plant (WWTP).
- Seawater intake and saline waste outfall pipelines, located within a tunnel under the shore from the pump station into the marine environment at Boston Bay.
- Lighting and security fencing for the pump station.
- A desalination facility, located approximately 600 m south-west of the pump station, which will include within its boundary:
  a. Feed water pre-treatment system
  b. 5.3 GL/annum desalination plant, incorporating a reverse osmosis (RO) treatment system (equivalent of 16 ML/d)
  c. Post-RO water treatment, including remineralisation, pH correction, and disinfection (chlorination)
- Seawater transfer and saline waste pipelines, extending from the pump station to the desalination plant.
- An underground desalinated water transfer pipeline (DWTP) extending for approximately 7 kilometres (km) from the RO desalination plant to the existing SA Water North Side Hill tanks on Blue Fin Road, Duck Ponds.
- A 11 kilovolt (kV) aboveground transmission line extending west of the desalination plant for approximately 3.3 km, including power poles.
- A new vehicle access point for the desalination plant facility from St Andrews Drive and
- Potential laydown areas for terrestrial and marine works which will be identified in consultation with Council and local landholders as part of the detailed design phase.

The desalination facility itself will also incorporate the following ancillary components:

- bunded and impervious areas for the handling and storage of chemicals associated with the RO desalination plant
- transformer(s), power cabling and switchgear for distributing power within the site
- site offices and amenities
- internal access roads and parking areas
- stormwater management infrastructure
- other buried services across the site
- lighting, security camera poles and security fencing with vehicle and pedestrian gates
- a storage shed.

The Project and the associated development application does not include the augmentation of two existing above ground transmission lines that will connect the 11 kV transmission line to the existing SA Power Networks substations at Sleaford Terrace and Wingard Terrace. These electricity connections will be additional transmission lines only and do not require new poles.

It should be noted that while any future expansion of the plant's capacity (from 5.3GL/annum to 8GL/annum) to meet future water demand would require a separate DA, the desalination plant site contains sufficient space to accommodate a larger plant. In addition, all pipelines and marine infrastructure proposed within the DA are 'future proofed' and sized to support an 8GL/annum plant. This is proposed as pipeline and marine infrastructure construction are the most significant potential environmental impacts, and would minimise disturbance as much as practicable, to a single construction phase.

In addition, the far-field hydrodynamic modelling was undertaken for a very conservative scenario of 12GL/annum, which far exceeds both the proposed 5.3 and potential ultimate 8GL/annum plant capacity. The marine impact assessment and near to mid-field hydrodynamic modelling studies were undertaken for a 8GL/annum saline waste discharge to match the 'future proofed' sizing of the pipelines and marine infrastructure. Therefore, the marine impact assessment outcomes are an order of magnitude greater than would be expected from the actual proposed 5.3GL/annum plant, which is the focus of this development application.

Project Location

The Project site is primarily located within the City of Port Lincoln Council area, with the exception of a small portion of the DWTP located within the Lower Eyre Peninsula Council area.

The proposed RO desalination plant site is situated approximately 4 km south-east of the Port Lincoln city centre adjacent to Billy Lights Point in the Eyre Peninsula, South Australia. The Site comprises approximately 8 hectares (ha) with the coast to the south and other land holders to the east and west. A new access road is proposed with an entry and exit point from St Andrews Drive. The harbour to the east of Port Lincoln is naturally deep and provides for a commercial fishing fleet and major agricultural exports.

The RO desalination plant would be located on land owned by SA Water. The proposed seawater intake and outfall pump station site is located in a disused lagoon within an existing SA Water WWTP approximately 600 m north-east of the desalination facility. Seawater intake and saline waste outfall pipelines will connect the pump station to the marine environment at Boston Bay via a tunnel under the shoreline and seabed. Seawater transfer and saline waste pipelines from the marine intake and outfall pump station to the RO desalination facility will traverse the northern boundary of the WWTP before passing through an easement along the northern boundary of the property to the west of the WWTP, and into the RO desalination facility site.

The aboveground transmission line and underground DWTP would be co-located adjacent to a disused rail corridor and road corridor between the desalination facility and a point along Greyhound Road, from where the transmission line will divert northwards to terminate at Windsor Road, and the DWTP would continue to follow the road corridor to the North Side Hill tanks. Land uses along the transmission line and DWTP route include rural, light industrial, vacant open space and vegetated land.

Potential laydown areas for terrestrial and marine works would be finalised in consultation with the City of Port Lincoln Council, Lower Eyre Peninsula Council and local landholders as part of the detailed design phase.

Stakeholder Information

SA Water are committed to consulting with the community throughout the various stages of the Project and have undertaken a significant number of consultation activities to date. There is a dedicated page on SA Water Water Talks website – *watertalks.sawater.com.au/getthefacts*, which is regularly updated with important information, and regular project newsletters are sent to118 people signed up to an email distribution list. SA Water also engages with local news outlets, sharing project milestones, providing expert spokespeople and actively responding to enquiries.

On 3 April 2023, a dedicated Project Information Centre (PIC) was opened in Port Lincoln opposite a busy shopping precinct. The PIC is available for interested persons to visit at a time that suits them, to learn about, obtain information and ask questions about the Project. The PIC opening hours are regularly advertised in the local print media. In addition, multiple community information sessions have been held in various towns across the Eyre Peninsula.

To further support a collaborative approach, SA Water established the Eyre Peninsula Desalination Project Reference Group (PRG), made up of community and industry representatives. The PRG is not a decision-making body and the group's primary purpose is to engage stakeholder and industry through information sharing and proactive and positive dialogue. PRG members provide insights on behalf of the body they represent, while still being mindful of broader community views.

Throughout the planning and design process of the Project, SA Water has proactively engaged with many of the State Government agencies expected to act as referral bodies during the development assessment process. Similarly, SA Water assembled a pre-lodgement working group to provide a forum for information sharing, comprised of the following State Government agencies:

- South Australian Environment Protection Authority (EPA)
- Department for Trade and Investment (via Planning and Land Use Services (PLUS))
- Department for Environment and Water (DEW)
- Department for Health & Wellbeing (DHW)
- Department of Primary Industries and Regions, South Australia (PIRSA)
- Department for Infrastructure & Transport (DIT).

In early May 2023, three Community Marine Science Forums were held for the public in the PIC. The forums consisted of representatives from SA Water, the South Australian Research and Development Institute (SARDI) (who conducted part of the marine science research), and the independent Chair of the Marine Science Review Panel (who provide independent expert peer review and advice relating to the marine assessment's undertaken for the proposed development).

On 21 September 2023, in recognition of aquaculture industry feedback regarding the marine science, SA Water facilitated a marine science forum in Adelaide. The objective of the marine science forum was to provide an opportunity to address concerns raised by marine scientists supporting the aquaculture industry with the marine science research produced to date.

SA Water has also maintained frequent and ongoing engagement with all local Councils across the Eyre Peninsula whose residents fall within SA Water's Eyre Peninsula network. Of particular focus are the Councils most directly affected impacted by the proposed Project, including the City of Port Lincoln and the District Council of Lower Eyre Peninsula. A Technical Working Group (TWG) with the City of Port Lincoln Council and the District Council of Lower Eyre Peninsula is active and addresses land use, transport and other matters in the development assessment process.

Impact Assessment

A range of environmental and social technical studies and assessments, undertaken by suitably qualified technical specialists, were completed both on land and in the marine environment to inform and support this development application. Study outputs informed the design development in reducing potential impacts on the surrounding environment. Noting the existing multi-user marine system and port activities surrounding the proposed Project, the Project's marine studies were also informed and peer reviewed by an independent Marine Science Review Panel made up of technical specialists from the University of Adelaide, CSIRO and independent subject matter experts. Marine modelling was undertaken by SARDI, who are recognised as leading experts for Spencer Gulf hydrodynamics.

The selection of a previously disturbed brownfield site (Billy lights Point) and use of an existing SA Water site (WWTP), in conjunction with flora and fauna surveys, have enabled the Project's terrestrial components to be optimised to previously disturbed areas. While some native vegetation regrowth within the brownfield areas will require clearance, this has been minimised and significant native vegetation areas avoided. The clearance is necessary for the building of the RO desalination plant itself, however the proposed Significant Environmental Benefit (SEB) Offset site within the Uley Basin will provide additional environmental gain in parallel to reduced groundwater extraction from the existing borefields. Terrestrial studies demonstrate the plant can be built and operated in a way that minimises its impacts upon the local environment. The proposed location of the RO desalination plant on a derelict brownfield industrial site would also result in negligible noise and traffic impacts once constructed, with a commitment to the detailed design to incorporate visual and noise impact mitigation controls.

Project marine studies indicate the RO desalination plant can be built as proposed, with expected minor impacts on the marine environment, including but not limited to marine fauna, cetaceans, flora and water quality. Mitigation and management measures can further reduce potential impacts both during construction and operations to as low as reasonably practicable. While some construction impacts cannot be avoided, these are short term in duration with the adoption of a construction method of tunnelling to lay-on-bed for the pipelines reducing both the duration of works and potential scale of marine environmental impacts.

The 3 phases of marine hydrodynamic modelling and the marine studies have all confirmed the proposed location is suitable to host a RO desalination plant of the proposed volume with minimal impacts to immediate and surrounding marine receptors or the multi-user marine system. Marine infrastructure design, proposed locations and construction methods were informed by marine habitat mapping, seabed topography, hydrodynamic modelling and marine baseline information results to ensure the proposed infrastructure physically avoids significant habitat (e.g. seagrass beds or reef habitat), with construction techniques adopted to minimise the physical extent and duration of impacts during construction. Optimisation of the design has also ensured that the desalination discharge is able to rapidly disperse the saline waste to ambient levels.

The far-field hydrodynamic modelling conducted for the Project considered a highly conservative scenario of 12 GL/annum. This exceeds both the proposed plant capacity of 5.3 GL/annum and a potential future capacity of 8 GL/annum. Additionally, the marine impact assessment and the near to mid-field hydrodynamic modelling were based on an 8 GL/annum saline waste discharge, which is greater than the 5.3 GL/annum capacity currently proposed. Consequently, the findings from these assessments are expected to be greater than what would be observed with the actual proposed capacity of 5.3 GL/annum plant. This conservative approach enhances confidence that the plant will have minimal impact on the marine environment.

This conservative approach was adopted as a proactive measure to appropriately address the potential impacts within the marine environment and comprehensively address stakeholder concerns. The near, mid and far-field modelling results align, indicating the proposed RO desalination plant can be built within the multi-user system with minimal impacts on the environment. It is noted that surrounding livelihoods within the multi-user marine system are important local economic activities, and any future Project activities will include at a minimum marine monitoring programs to ensure activities do not adversely affect existing livelihoods, and compliance with required environmental legislation, guidelines and any license conditions.

While all marine waters have the potential for marine mammals to transition through them, the proposed Project area is not considered a significant cetacean breeding, nursing or migration area under Commonwealth or State legislation. This differs to Sleaford Bay, which has a designated Marine Park sanctuary, protecting whale aggregations that are regular observed in this region. Boston Bay and Proper Bay are multi-user areas, which include ship yards, a grain and cruise liner port, fisheries and aquaculture. The construction phase, and related activities may temporarily disturb cetaceans, however management measures to cease marine construction activities during any observed presence would prevent harm. Tunnelling options and short marine construction timeframes further reduce the risk of impacts to local marine mammals.

In summary, the studies undertaken to inform this assessment highlight that by occupying a brownfield site, utilising previously disturbed areas and marine areas with lower habitat value, and adopting lower impact construction methods (such as tunnelling avoiding coastal vegetation and seagrass beds), the majority of predicted negative impacts during the construction period will be manageable and can be mitigated further through effective management techniques, and the final detailed design.

The potential operational impacts from the proposed RO desalination plant both on land and the marine environment are predicted to be as low as reasonably practicable, and residual risks will be managed through detailed monitoring, stakeholder engagement, and aspects such as noise mitigated through final detailed design.

The key concern raised by stakeholders in relation to elevated salinities in the marine system have been addressed, with marine studies and modelling demonstrating negligible expected cumulative salinity effects and minor elevations in salinity from the plant being within natural variability in a short distance (<100m) and well within salinity tolerances of resident marine species.

Planning and land use

A Planning and Land Use Assessment was prepared to review the planning and land use context for the proposed development against the relevant legislation.

Legislative and policy framework

The relevant legislation guiding planning and land use for the project is the PDI Act and associated regulations. The Project comprises both building work and a change in land use, and therefore requires approval under the Act.

The Project is proposed by a State Agency, being SA Water, so falls under the 'Crown Development' assessment pathway established under Section 131 of the PDI Act.

As per Schedule 13 of the Planning, Development and Infrastructure (General) Regulation 2017 (PDI Regulations), Project works that may be exempt from requiring approval (where not located under the Coastal Areas Overlay under the Planning and Design Code (P&D Code) unless approved by the Coast Protection Board (CPB)) include road alterations, construction of certain pump stations, and construction or alterations of pipes and underground cables. The construction of a powerline under 33 kV may also be exempt.

Existing conditions

The following Zones and Subzones under the P&D Code apply to the Project:

- Strategic Employment Zone: desalination facility site – part, overhead transmission line – part, DWTP – part.
- Deferred Urban: RO desalination facility site – part, seawater intake and outfall pump station – all, saline waste/seawater transfer pipelines – all, DWTP – part, overhead transmission line – part.
- Coastal Waters and Offshore Islands Zone: seawater intake and saline waste outfall pipelines – all.
- Recreation Zone: DWTP – part, overhead transmission line – part.
- Rural Zone: DWTP – part.

The following Overlays apply to the Project:

- Coastal Areas: parts of all infrastructure.
- Hazards (Bushfire – High Risk): DWTP – part.
- Hazards (Bushfire – Medium Risk): RO desalination plant site, marine intake and outfall pump station, seawater intake and saline waste outfall pipelines, terrestrial pipelines – part, overhead transmission line – part.
- Hazards (Bushfire – General Risk): DWTP – part, overhead transmission line – part.
- Native Vegetation: whole of Project site.
- Significant Landscape Protection: DWTP – part.
- State Significant Native Vegetation: DWTP – part.
- Water Protection Area: DWTP – part.
- Water Resources: DWTP – part, overhead transmission line - part.

Impact assessment

An assessment of the Project was undertaken against the relevant objectives and principles of the Development Control under the P&D Code and concluded the Project is generally compliant with the relevant policies under the Zone, Subzone, Overlays and General Development Provisions.

Management and mitigation

Construction impact management will meet policy requirements, particularly in relation to traffic, safety and dust. Overall, the Project constitutes a type of development that will support the desired outcomes of the relevant Zones.

Noise

A terrestrial Noise Impact Assessment was prepared to quantitatively assess the potential noise impacts associated with the construction and operation of the Project and has recommended mitigation measures to avoid or minimise these impacts. Marine noise impacts are summarised in the marine section later in this executive summary.

Legislative and policy framework

The noise assessment was undertaken in accordance with the noise-related Assessment Provisions contained within the P&D Code. An assessment of noise and vibration levels for the Project is required under the South Australian EPA's Environment Protection (Commercial and Industrial Noise) Policy 2023.

Existing conditions

The closest noise sensitive receivers to the Project are situated within the General Neighbourhood Zone and the Waterfront Neighbourhood Zone located approximately 250 m North of the RO desalination plant.

Impact assessment

Terrestrial site noise modelling was undertaken using SoundPlan 8.2 environmental noise modelling software for sensitive receptors surrounding the Project.

The predicted L_{eq} noise levels for some of the sensitive receptors would exceed the night-time site noise criteria, assuming noise emissions are subject to a noise character penalty. The main contributors to noise are the RO desalination plant building evaporative coolers and open roller doors.

Management and mitigation

A review of the RO desalination plant building evaporative coolers and roller doors is proposed at the detailed design stage of the Project. Mitigation measures would be introduced if the final design for the evaporative coolers and roller doors is found to result in unacceptable noise impacts. In this circumstance, to meet the relevant noise criteria, the design of the evaporative coolers could be altered, and/or additional noise mitigation provided to these specific sources, including enclosure of the evaporative cooling units, reduction of fan speed of the evaporative cooling units and operation with the roller doors generally closed.

Air quality and odour

An Air Quality Impact Assessment was prepared to identify and qualitatively assess potential air quality impacts associated with the construction and operation of the Project and has recommended mitigation measures to avoid or minimise these impacts.

Legislative and policy framework

The assessment was undertaken in accordance with the National Environment Protection (Ambient Air Quality) Measure 2021, *Environment Protection Act 1993* (EP Act) and Environment Protection (Air Quality) Policy 2016.

Existing conditions

Two sensitive receptors were identified within approximately 250 m of the Project site, including one residential property within a new housing development, and a beach and recreational area. The housing development proposes a number of future dwellings approximately 250 m from the Project site.

Located in a coastal area surrounded by bushland and an existing industrial area, local air emissions sources include wind-blown dust from vacant unvegetated land, vehicles on the local road network, industrial facilities, natural sources (i.e. sea salt) and shipping operations. The local air quality is anticipated to be good to very good.

Impact assessment

Construction

Dust emissions from vegetation clearance, earthworks, construction and vehicle movements activities are likely to occur. Impacts would be localised and transient, with works to include the use of appropriate mitigation measures including, but not limited to, water sprays or dust suppression surfactants. This would present a low risk of dust soiling and related potential human health impacts at sensitive receptor locations.

Combustion emissions from on-site vehicles, plant and equipment and offshore vessel operation, and fugitive emissions from fuel, gas and oil storage areas are also possible. The area currently has emissions from existing users within the marine and coastal environment. The Project's emission impacts are anticipated to be minor noting the distance to sensitive receptors, and mitigation measures that will be implemented during construction.

Odour emissions from the stockpiling and disposal of spoil containing marine sediments is likely, however the consequence is considered to be minor based on consideration of volume, location and duration.

Operation

The operation phase requires a low frequency and number of vehicles and the consequences of related dust emissions and engine fuel combustion emissions are expected to be minor.

Combustion emissions from the diesel-powered (back-up) generator and fire pump would be rare noting their use would be limited to periods of power failure or fire. The related consequence and negative impact of these emissions was assessed to be insignificant, not posing direct nuisance, health or negative effects.

If not appropriately stored on site, there is the potential for odour generation from organic material, such as fine solids from the pre-treatment filters and seaweed from the gross solids trap. The consequence of these impacts is considered to be moderate. There is also the potential for odour emissions from the process lagoon and on-site wastewater pump station, however these impacts are expected to be minor given the likelihood of venting is possible but minor if it does occur.

Emissions from storage tanks and refuelling trucks and dust generation from the manual loading of limestone onto hoppers is likely, but is considered to have a minor consequence mitigation measures through the design, Construction Environment Management Plan and Operational Environment Management Plan.

Management and mitigation

Proposed mitigation measures to avoid or minimise potential air quality impacts during construction and operation include:

- Development and implementation of an Air Quality Management Plan.
- Dust, combustion emission and odour controls during construction and operation, as described in the full DA.

Aboriginal cultural heritage

Existing conditions

The Project area is within the Barngarla Determination Area. Native Title was found not to exist on the basis of extinguishment within the Project land parcel areas. The Barngarla Determination Aboriginal Corporation RNTBC (BDAC) is the registered Native Title body corporate appointed to manage the Barngarla Determination. Even though Native Title is extinguished over the Project site, SA Water acknowledges that Barngarla people maintain a connection to the area and acknowledges them as Traditional Owners for the Project site. SA Water also acknowledges the Traditional Owners of the western Eyre Peninsula region; the Nauo, also maintain connections to the Project site.

Impact assessment

Native Title and Aboriginal cultural heritage are key considerations in the planning, design and construction of this Project.

SA Water has taken steps to assess cultural heritage risks associated with the Project site, including obtaining an independent desktop assessment and conducting a search of central archives (including the Register of Aboriginal Sites and Objects) managed by Aboriginal Affairs and Reconciliation. SA Water has sought, unsuccessfully, to conduct a heritage survey of the Project site with BDAC and to seek feedback from BDAC on cultural heritage sites and values within, and around, the Project site.

Although no cultural heritage survey with the Barngarla people was carried out to date, sites of cultural heritage significance identified through desktop assessments were considered in the current design and construction methodology.

SA Water acknowledges the publicly stated heritage significance of Billy Lights Point to the Barngarla People including statements that the construction of a RO desalination plant at Billy Lights Point risks damage to Aboriginal heritage.

SA Water continues to seek constructive engagement with BDAC regarding measures to minimise any damage to their cultural heritage as a consequence of the Project.

Management and mitigation

SA Water will ensure compliance with Native Title and Aboriginal Heritage laws in relation to this Project and an authorisation under the *Aboriginal Heritage Act 1998* (SA) will be required for the Project.

SA Water acknowledges the publicly stated heritage significance of Billy Lights Point to the Barngarla People, including the risk of damage to cultural heritage arising from construction of the RO desalination plant. SA Water continues to seek engagement with BDAC regarding measures to minimise any damage to their cultural heritage as a consequence of the Project. SA Water has lodged a Section 21 and Section 23 Authorisation request under the *Aboriginal Heritage Act 1988* seeking authorisation of the Minister to damage, disturb or interfere with any Aboriginal site or object, where this cannot be avoided by project design or construction methodology.

The current design has removed the potential for impacts on coastal and intertidal areas adjacent to the RO desalination plant site and WWTP at Billy Lights Point. This includes restricting development on the RO desalination site to previous industrial areas and avoid sensitive coastal cliffs and intertidal reefs by tunnelling into deeper water offshore, before constructing marine intakes and an outfall.

Non-Aboriginal heritage

An assessment of impacts on non-Aboriginal was undertaken for the Project.

Legislative and policy framework

Non-Aboriginal heritage places and items are mostly managed under the following legislation:

- *Heritage Places Act 1993*
- *Historic Shipwrecks Act 1981*
- *Commonwealth Underwater Cultural Heritage Act 2018*
- PDI Act.

Existing conditions

The Project site will not directly impact any registered local, State, National, Commonwealth or World heritage places or items. No local, National, Commonwealth or World heritage places or items were identified within 2 km of the Project site.

Within 2 km of the Project site, six terrestrial State heritage places are registered; the nearest being the State heritage listed dwelling 'Ravendale House' located adjacent to the proposed overhead transmission line on Windsor Avenue.

One shipwreck is recorded within 2 km of the proposed marine components of the Project. The expected location of this shipwreck is recorded at approximately 1 km from the marine intake and outfall pipelines, however it should be noted that the location of this shipwreck is not verified, and the location of shipwrecks and related relics may shift due to coastal processes.

Impact assessment

The construction and operation of the Project is not expected to result in direct impacts on any registered non-Aboriginal heritage places or items (including shipwrecks).

The key potential impacts on non-Aboriginal heritage places and items include:

- Potential vibration impacts and temporary visual amenity impacts to the State heritage listed dwelling 'Ravendale House', located in close proximity to construction works and construction transport routes.
- Potential indirect impacts on shipwreck number 440 due to desalination plant outflow discharges. This presents a low risk as the outflow discharge is located approximately 1 km away from the shipwreck.
- The risk of unexpected finds of non-Aboriginal heritage items during ground disturbing construction works in the marine or terrestrial environment.

Management and mitigation

The following measures will be evaluated to manage potential indirect impacts on non-Aboriginal heritage places and items:

- Implement the recommendations of the visual impact assessment to mitigate any potential visual impacts of the Project to the 'setting' of any heritage places in the wider area; in particular, the State heritage listed dwelling 'Ravendale House'.
- As a risk mitigation strategy, heritage listed structures within 10 m of the preferred construction traffic route could be assessed for the risk of vibration damage. Consideration should also be given to the existing nature of use of the road, condition of the road surface, and condition of the heritage structure.
- Undertake earthworks with care, particularly when working in close proximity to heritage places.
- Have contingency in place for any unexpected discovery of non-Aboriginal heritage items during works in both the marine and terrestrial environment; including an unexpected finds protocol and stop work procedure, until items are assessed.

Visual and landscape

A Landscape Character and Visual Impact Assessment was prepared to assess the Project's likely visual impacts from publicly accessible viewpoints and sensitive receptor localities.

Legislative and policy framework

The Landscape Character and Visual Impact Assessment was undertaken to support the relevant amenity provisions of the P&D Code.

Existing conditions

The Project landscape character assessment considered the landscape character of the locality is of a moderate scenic quality and has a moderate sensitivity to change.

Seven viewpoints were assessed within the 2.5 km Zone of Theoretical Visual Influence (i.e., the defined area where modification to the contextual landscape from the Project could be potentially discernible to the naked eye). Of these, four were considered to be a sensitive receptor or sensitive receptor locality:

- SRL01 – Proper Bay Headland, centred on the Billy Lights Point Reserve car park and Parnkalla Trailhead.
- SRL02 – Hindmarsh Street and Port Lincoln Tourist Park.
- SR03 – Windsor Avenue, adjacent to Navigator College, looking southeast.
- SR04 – Greyhound Road, looking east along the redundant trainline.

Impact assessment

During construction, changes to visual amenity will occur at sensitive receptors SR03 and SR04 as a result of earthworks along Windsor Avenue and Greyhound Road. However, these changes will be temporary.

During operation, the predicted visual impact for SRL01 and SRL02 is 'no change'. At SR03, the visual impact is predicted to be 'no change' to 'slight adverse', as the transmission poles will recede from view with distance from the sensitive receptor locality. The visual impact at SR04 is predicted to be 'slight adverse' to 'moderate adverse', as views of the RO desalination plant will be inconsequential within the wider landscape.

Management and mitigation

The use of muted colours in material selection and finishes will ensure the RO desalination plant and intake and outfall pump station structures will complement the tones and hues of the wider landscape. Non-reflective finishes are also recommended for the transmission poles to ensure the visual impact of poles diminishes within increasing distance.

It is envisaged all potential light spill from emergency and security lighting or after-hours maintenance activities will be managed to eliminate inconvenience to nearby residents, road users, visitors and wildlife.

Traffic and transport

A Traffic and Transport Impact Assessment was prepared to assess any reasonably foreseeable traffic and safety issues that may arise or be exacerbated during Project construction and operation and also to identify appropriate measures for mitigation.

Legislative and policy framework

Legislation relevant to the traffic and access requirements for the Project are:

- *Road Traffic Act 1961*
- EP Act
- *Heavy Vehicle National Law Act 2013*
- PDI Act
- P&D Code.

Existing conditions

Key roads in the locality are:

- St Andrews Drive: a sealed two-lane undivided local road that provides access to residential areas, industrial properties and Billy Lights Point. The posted speed limit along this road within proximity of the Project site is 60 kilometres per hour (km/h).
- Greyhound Road: an undivided unsealed connector road that links Proper Bay Road with Murray Point.

- Proper Bay Road: an undivided sealed road that links the township of Port Lincoln with Sleaford Conservation Park.
- Blue Fin Road: an undivided partly sealed road that forms a T-junction with Proper Bay Road and terminates at the junction with the railway line. The road continues on the northern side of the railway line as an unsealed road and provides access to the North Side Hill water storage tanks.

Proper Bay Road and St Andrews Drive carry approximately 3,690 and 3,320 vehicles per day respectively.

Junctions in the locality that are significant to this development application are:

- Le Brun Street/Luke Street/St Andrews Terrace
- Dublin Street/Porter Street
- Dublin Street/Luke Street
- Marina Drive/St Andrews Drive
- Marina Drive/Stamford Terrace/Ravendale Road
- St Andrews Drive/existing site access to the desalination plant site
- St Andrews Drive/existing access road to the WWTP.

Overall, there have been few crashes recorded in the local road network over the most recent completed five year data period (2018 to 2022). Casualty crashes have been recorded on Stamford Terrace and at 4 intersections. The highest number of crashes (15) occurred at the Luke Street/St Andrews Terrace/Verran Terrace/Le Brun Street intersection.

Impact assessment

Traffic movements generated by construction activities will mainly result from works at the RO desalination plant and marine intake and outfall pump station sites, and to a lesser extent from transmission line and pipeline works.

The majority of Project traffic movements will be general access vehicles (i.e. cars and trucks that are legally permitted to use any local road) and have local origins, including the transportation of construction personnel and delivery of materials and products. The highest concentration of traffic movements is likely to occur near the Project site along Marina Drive and St Andrews Drive.

Assumptions on the generation of vehicle trips by the construction activities (over the construction period) were estimated based on the estimated construction schedule and related staff and contractor numbers. During the peak construction period, there could be up to 96 heavy vehicle movements and 25 light vehicle movements per day to and from the Project site. These estimated traffic movements would be distributed across the local road network and vary according to the stage of construction and the location of construction activity.

Construction activities would take place between 6 am and 6 pm, 7 days per week. Construction personnel would travel daily to and from the Project site by bus or light vehicles at the start and end of each shift. Heavy vehicle movements would generally be distributed throughout the day (up to 7 vehicle movements per hour), although concrete deliveries would likely be concentrated over a few hours in the morning, before the peak period during large pours (up to 12 concrete trucks per hour).

Only a few (up to 3) oversize/over mass (OSOM) vehicle movements would be required for the delivery of large plant items and prefabricated sections. These would most likely be long distance trips with remote origins, with the preferred routes maximising the use of existing gazetted routes.

Potential impacts along construction routes due to Project generated construction traffic generated include congestion and delays at some intersections due to increased traffic volumes and trucks turning, wear and tear of the road pavement and increased safety risks.

Once operational, the RO desalination plant would be attended daily by staff and occasionally by maintenance staff, which will involve a small number of mainly light vehicles and the occasional heavy vehicle (during deliveries).

Management and mitigation

Recommended measures to mitigate the risks to safety associated with Project construction traffic include intersection and road upgrades, maintenance of the road condition, implementing traffic controls, including the use of truck turning warning signs (on approaches to junctions), scheduling vehicle movements to avoid conflicts with local traffic, and keeping residents informed of changes to road and traffic conditions.

Flora and fauna

A Terrestrial Flora and Fauna Impact Assessment was carried out to identify potential ecological constraints, including threatened species and communities, and provide recommendations to avoid impacts.

Legislative and policy framework

The Terrestrial Flora and Fauna Impact Assessment was undertaken in accordance with:

- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).
- *Native Vegetation Act 1991* (NV Act). The Project would most likely fall under approval Pathway 4: Risk assessment (requires Native Vegetation Council approval and a Significant Environmental Benefit offset/payment into the Native Vegetation Fund).
- *National Parks and Wildlife Act 1972* (NPW Act).

Existing conditions

Between July 2021 and December 2023 extensive flora and fauna field surveys were conducted to support the assessment.

Whilst the RO desalination plant is located within a brownfields area it contains large areas of remnant and regenerating native vegetation despite past disturbance. The condition of vegetation is considered to range from poor in previously disturbed areas, to good in the remnant vegetation patches.

The seawater intake and outfall pump station site will be located within a disused treatment lagoon at the WWTP site. Remnant vegetation is mainly found around the edges of the WWTP site, and is considered to be in a moderate to good condition.

The shore environment at Boston Bay contains vegetation in a moderate condition. This shore environment will be avoided by the Project, by locating the marine intake and outfall pipelines in a tunnel between the marine intake and outfall pump station and the marine environment. The marine intake and outfall pipelines would also be located away from aquaculture leases.

The overhead electricity transmission line and DWTP will be located within and adjacent to the disused rail corridor between the desalination facility and Greyhound Road. The disused rail corridor has been previously disturbed through rail activities and contains remnant and regenerating native vegetation. From Greyhound Road, the co-located infrastructure corridor runs adjacent to a combination of sealed and unsealed roads, with roadside vegetation comprised of various species and conditions.

Impact assessment

The Project is expected to require approximately 23.39 ha of native vegetation clearance. The largest areas of impact are at the RO desalination plant site (5.0 ha) and along the transmission line and DWTP route between the desalination facility and Greyhound Road (9.3 ha). This includes the removal of approximately 1.6 ha of *Eucalyptus conglobata* low woodland on fertile loams over limestone, listed as rare under the South Australian Provisional List of Threatened Ecosystems.

Plants classified as 'rare' under the NPW Act that may potentially be impacted by the Project include Alcock's Wattle (*Acacia alcockii*), Port Lincoln Mallee (*Eucalyptus conglobulata ssp. conglobulata*), Tate's Grasstree (*Xanthorrhoea semiplana ssp. tateana*) and Spoon-leaved Spyridium (*Spyridium spathulatum*).

Rare and threatened fauna listed under the NPW Act that may potentially be impacted by the Project include the White-bellied Sea-eagle (*Haliaeetus leucogaster*) and Eastern Osprey (*Pandion haliaetus*).

Based on a desktop assessment and field survey findings, Matters of National Environmental Significance (MNES), as listed under the EPBC Act, with the potential to occur within in the area include 1 threatened ecological community, 2 threatened flora species, 7 threatened fauna species and 10 migratory species. The criteria for significant impacts to MNES have been applied to the Protected Matters identified within the assessment of the Project. Based on the targeted fauna and flora surveys and habitat assessments, the results indicate the Project is not expected to significantly impact upon MNES. Regardless, SA Water will submit a Self-Referral to DCCEEW for formal assessment against the EPBC Act.

Management and mitigation

The Project has sought to avoid and/or minimise impacts on conservation values where possible. During the design development, infrastructure has been located within previously disturbed and cleared areas, and vegetation clearance has been minimised thus reducing potential impacts on threatened flora and fauna, and infrastructure has been co-located within existing or disused infrastructure corridors, as far as possible.

Residual impacts of the Project will be offset by the rehabilitation of vegetation on SA Water land at the Uley South Basin area. The proposed offset will rehabilitate an area of the Critically Endangered Ecological Community Drooping Sheoak Grassy Woodland on calcrete of the Eyre Yorke Block Bioregion[1]. The offset would contribute to habitat for threatened fauna known to occur at the site, including Southern Emu-wren and White-bellied Whipbird. The offset rehabilitates ecological corridors to Coffin Bay National Park and adjacent Heritage Agreements.

Site contamination

A Preliminary Site Investigation (PSI) was prepared to identify potential site contamination issues that may have resulted from past and/or current site use(s), and which may significantly impact the proposed use of the site and/or represent potential public health or environmental risks.

The PSI considered the desalination facility site and the adjacent land parcel containing the transmission line and DWTP easement (study area).

Legislative and policy framework

The PSI was developed in accordance with the State Planning Commission's guideline *Practice Direction 14 – Site Contamination Assessment 2021*, in addition to other guiding documents.

Existing conditions

Based on a review of selected historical aerial imagery from 1950, 1958, 1967, 1973, 1986, 1995, 2008, 2015 and 2021, the PSI identified the study area has historically been used for the transfer and transport of sand by ship as part of Broken Hill Proprietary Company Limited's (BHP) sand mining operations, as well as metal fabrication. There is abandoned infrastructure on-site including a damaged jetty, rail loading shed, other ancillary buildings, and a disused railway line which runs in an east-west direction through the site.

The PSI identified the following potentially contaminating activities to have occurred in the study area:

- Railway operations
- Bulk shipping facilities
- Abrasive blasting
- Fill or soil importation
- Liquid organic chemical substances – organic.

1 No clearance to this ecological community is proposed by the Project.

The study area is not currently registered on the list of sites notified to the South Australian (SA) Environment Protection Authority (EPA) (Site Contamination Index) or currently regulated by the EPA as a contaminated site. Part of the study area was previously subject to an EPA licence for a prescribed activity of environmental significance (abrasive blasting), however the licence is no longer in effect. No other current or historic records related to EPA environmental authorisations are listed for the study area, and there are no Environmental Protection Orders for the study area.

Previous soil investigations identified elevated concentrations of heavy metals (hexavalent chromium, copper, zinc) and Polycyclic Aromatic Hydrocarbons (PAHs) at some locations within the study area, however, these were not found in concentrations that exceed human health guidelines for commercial/industrial land use.

Impact assessment

Previous investigations indicate that superficial waste soils may not be suitable for reuse as fill on-site, however soils are considered suitable to remain on-site in non-environmentally sensitive areas.

Potential existing impacts on groundwater from historical activities such as bulk fuel storage is unknown, as groundwater data is not available for the study area.

Management and mitigation

Further assessment is proposed to be undertaken to determine if any contamination is still present in soils and groundwater due to historical bulk fuel storage on site. Remediation and waste classification would be undertaken prior to the removal of any soil from site.

Geology and groundwater

A desktop study regarding geology and groundwater to identify potential subsurface conditions, including regional geology and expected subsurface materials, the potential for the presence of acid sulfate soils, groundwater levels and likelihood of encountering rock, was undertaken for the Project. The study considered the desalination facility site and the proposed DWTP route (study area).

Legislative and policy framework

The following legislation and codes are relevant to the geology and groundwater desktop assessment undertaken for the Project:

- PDI Act
- *Work Health and Safety Act 2012*
- *The Building Code of Australia*
- *Excavation Work Code of Practice.*

Existing conditions

The study area is mainly underlain by Quaternary sediments (limestone/siltstone/sandstone) that overlay igneous and metamorphic rocks such as granite and gneiss.

Previous geotechnical investigations indicate that fill material at the desalination facility site overlies calcareous sediments, which is underlain by dense clayey/silty sand or clayey gravel material. Rock material (granite or limestone/ sandstone/ siltstone) was encountered underneath the dense clayey layers at depths of 1.4 metres below ground level (mbgl).

Along the DWTP route, topsoil material overlies limestone/calcareous sediments, or loose to dense clayey sand/silty sand/gravelly sand/silty gravelly sand.

Groundwater may potentially be encountered at a depth of 2 mbgl within the RO desalination plant site, and at a depth of less than 1 mbgl along the DWTP route. However, groundwater levels are subject to seasonal, climatic and tidal variations.

Acid sulfate soils are not likely to occur within the RO desalination plant site, but have a very low to moderate probability to occur along the DWTP route.

Impact assessment

The key risks associated with the soil and geography of the Project site include the risk of encountering rock material (granite or sedimentary rocks) during excavation, the risk of erosion due to loamy soils, encountering shallow groundwater, and the instability of slopes and excavated areas due to reactive and plastic soils. Fill material is likely to be encountered across the Project site.

Management and mitigation

To manage the potential risks related to soils and geology, it is important that an intrusive geotechnical site investigation be carried out as part of the detailed design phase to understand the expected subsurface profile, groundwater depths and potential geotechnical and acid sulfate soil risks.

Additional investigations should also include further geotechnical investigation to inform benching/battering, or shoring design in accordance with the *Safework Australia Excavation Work Code of Practice (2015*); as well as a slope risk assessment undertaken by a suitably experienced geotechnical professional.

The conditions of the Project site, including but not limited to ground variability, groundwater levels, drainage, and slope stability, will be considered in the detailed design phase. Mitigation measures to minimise erosion risks are provided in the following section.

Soils, drainage and erosion

A Stormwater, Drainage and Erosion Impact Assessment was undertaken for the Project.

Legislative and policy framework

Legislation and policy guidance relevant to soils, drainage and erosion requirements for the Project include:

- EP Act.
- The Environment Protection (Water Quality) Policy 2015 (under the EP Act).
- SA EPA Stormwater Pollution Prevention - Code of Practice for the Building and Construction Industry 1999.
- SA EPA Water Quality: Environmental management of dewatering during construction activities 2021.
- SA EPA Construction environmental management plan (CEMP) 2024.
- Department for Infrastructure and Transport (DIT) Protecting Waterways Guideline 2021.
- SA EPA Handbook for Pollution Avoidance on Commercial and Residential Building Sites 2004.
- Port Lincoln Stormwater Management Plan 2014.
- Coastal Protection Board Development Plan 2016.

Existing conditions

The topography of the RO desalination plant site slopes down in all directions from the south-western side of the site (with an elevation of approximately 10 metres Australian Height Datum (mAHD)) towards the coast (with an elevation of approximately 4 mAHD at the shoreline). Overland flow drains towards the north-east or south to the shoreline. During larger storm events, overland flow drains towards the north-west, from where it may eventually enter the saltmarsh and mangrove area and flow towards the Port Lincoln marina and ocean. The contributing catchment to the desalination facility site is limited to the site itself and potentially a small portion of the land to the west of the site.

A combination of sealed and unsealed roads/tracks exist along the transmission line and DWTP route, and will be used to access and maintain this infrastructure. The majority of these access tracks and roads have formal drainage infrastructure or have been designed to prevent ponding on the track/road surface.

Impact assessment

Construction of the Project would temporarily expose the natural ground surface and sub-surface though the removal of vegetation, excavation of surface soils and earthworks activities. The exposure of soil to surface water runoff and wind can increase soil erosion potential, particularly where construction activities are undertaken in soil landscapes susceptible to erosion. The soil type expected within the Project site indicates that there is potential for erosion in surface soils, if appropriate mitigation measures are not implemented. If not properly managed, the exposure of the natural ground surface may result in potential sedimentation of surrounding land, drainage lines or downstream watercourses. Construction activities also have the potential to exacerbate flooding conditions by obstructing overland flows, if not adequately managed.

Additionally, fuels, oils, or other chemicals from accidental spills and leaks during construction could potentially pollute stormwater flows and flow into downstream watercourses or the ocean.

Once constructed, the Project will result in an increase in impervious surfaces within the Project site, that may result in changes in the existing flow regimes (volume, duration, velocity, etc.) of surface runoff in the area and associated potential erosion and sedimentation impacts.

Accidental spills/leaks during operation of the desalination facility and the use of new access tracks and access roads may also result in pollution of downstream watercourses.

Management and mitigation

A Sediment Erosion and Drainage Management Plan will be developed for the Project, to include measures to minimise the disturbance of land during construction, as well as measures to capture and treat stormwater and implement dust control measures.

The location, design and operation of the Project facilities and infrastructure are expected to be completed such that the adverse impacts to the natural environment and other land uses are minimised, including:

- Installing drainage infrastructure (consisting of a network of pits and pipes and a rock-lined swale) to capture stormwater runoff from impervious surfaces and overland flows for discharge into the existing stormwater system. Stormwater quality improvement devices such as a gross pollutant trap and combined sediment and oil interceptor device are proposed, to improve stormwater quality prior to discharging into a detention basin.
- Limiting stormwater runoff from the Project site to pre-development peak flow levels and treating stormwater in accordance with the relevant guidelines and planning conditions.
- Installing rainwater tanks to enable the reuse of rainwater on-site.
- Maintaining vehicles used on-site, and providing appropriate spill kits for vehicles.
- Monitoring and maintenance of the above measures.

Easements and Services

A desktop assessment of easements and services across the Project site was undertaken, including a Before you Dig Australia (BYDA) search and review of the Location SA Map Viewer to identify existing utility services within the Project site.

Impact assessment

The saline waste/seawater transfer pipelines linking the marine intake and outfall pump station to the RO desalination plant will be installed underground. These pipelines are expected to intersect with existing communications services at St Andrews Drive.

Management and mitigation

A detailed engineering survey and underground service location search during detailed design would identify all existing utility services. Prior to construction, existing utility services will be physically located to confirm the depth and location of the existing utility services and further mitigate the risk of any clash and/or damage to these services.

Risk mitigation measures provided in SA Power Networks guidelines, such as adequate clearing distances and consultation with relevant service authorities prior to construction, would be included in the Project Construction Environmental Plan (CEMP).

Marine environment

Marine studies were undertaken to inform the impact assessment and Project development, and to define mitigation and management measures for potential marine impacts associated with the Project. Marine findings were peer reviewed by an independent Marine Science Review Panel.

Legislative and policy framework

The following legislation and policies are relevant to the Project from a marine perspective.

- EPBC Act
- EP Act
- NV Act
- *Coast Protection Act 1972*
- *Aquaculture Act 2001*
- *Aquaculture (Zones – Lower Eyre Peninsula) Policy 2023*
- *Fisheries Management Act 2007.*

Existing conditions

The proposed Project site is located at Billy Lights Point within Boston Bay, at the southern point of the Eyre Peninsula.

Boston Bay and its adjacent embayments are located within the Eyre marine bioregion at the south-western boundary of Spencer Gulf, and support a range of marine habitats and species, including extensive seagrass beds and diverse fauna, fish, phytoplankton and zooplankton communities. A number of these marine species are listed as threatened (endangered or vulnerable) under the EPBC Act and/or the NPW Act. Coastal and marine habitats found within the Eyre marine bioregion include cliffs, rocky shores, reefs, seagrass meadows, mangroves and sand and mud tidal deltas.

The marine environment at the Lower Eyre Peninsula hosts a range of economically valuable aquaculture resources, including blue mussels (*Mytilus galloprovincialis*), southern bluefin tuna (*Thunnus maccoyii*), yellowtail kingfish (*Seriola lalandi*) and macroalgae (seaweed), and are subject to seven aquaculture zones and four aquaculture exclusion zones designated under the Aquaculture (Zones – Lower Eyre Peninsula) Policy 2023.

The Lincoln Cove marina wharf, located off Porter Bay to the north of Billy Lights Point, is the main wharf/ boat ramp facility for commercial fishers, aquaculture operators, recreational and emergency services vessels. The approach channel to the marina runs to the north from the proposed marine intake and outfall pipe alignments.

Water movement within the Spencer Gulf is strongly seasonal and influenced by multiple oceanographic processes, including tidal streams and local meteorology. Water quality within Boston Bay and Proper Bay is mainly influenced by freshwater inputs (e.g. Tod River), the existing Port Lincoln WWTP at Billy Lights Point, aquacultural operations, algal blooms and shipping and fishing activities.

Impact assessment

The marine studies identified the key marine impacts during construction are likely to include:

- Removal of approximately 1 ha of seagrasses within the direct works area during construction and potential impacts to seagrasses surrounding the works area due to an increase in turbidity resulting from the works.
- Water quality impacts during construction, including the disturbance of sediments resulting in increased turbidity and the potential release of nutrients, contaminants or algal cysts.
- Underwater noise and vibration impacts during piling, dredging and tunnel boring, resulting in changes to the behaviour and physiology of marine fauna. No blasting or use of explosives is anticipated.
- Risk of hydrocarbon and chemical spills/leaks from construction vessels or equipment.
- Risk that marine pest species will be introduced to the area by construction equipment.
- Temporary impacts on commercial and recreational fishing operations due to the implementation of temporary exclusion zones during construction.

It was identified that the greatest risk for potential impacts to the marine environment during operation stems from the saline discharge, if not adequately dispersed quickly, and from the chemicals used during the pre-treatment process or to reduce marine biofouling. These potential impacts are related to the following issues:

- Elevated salinity and temperature of the saline discharge stream that results from the RO process.
- Reduction in dissolved oxygen as a result of stratification induced by saline discharge.
- Natural elements within the outfall discharge that concentrate during the RO process.
- Elevated concentrations of chemicals of pre-treatment chemicals in the saline discharge.
- Elevated suspended solid, nutrient and heavy metal concentrations due to saline discharge.

Another identified potential impact was the risk for the intake structure to entrap marine organisms against intake screens. Fish and other marine biota could be at risk from entrapment or entrainment if unable to overcome the water's intake velocity into the structure. Organisms that have planktonic early life stages (eggs and larvae), and are small enough to pass through the intake screens, are likely to be entrained.

The presence of permanent infrastructure on the seabed can result in changes to natural hydrodynamic coastal processes such as currents and sediment transport.

Underwater noise from the Project during operation will be limited to noise from seawater pumps. An underwater noise assessment undertaken for the Project recommended that with the incorporation of appropriate management measures and given the threshold distances for marine fauna likely to be present near the construction area, the risk of impacts to marine fauna from underwater noise is low.

Management and mitigation

The design of the marine infrastructure avoids significant impacts to the coastal, intertidal and nearshore zone through adoption of a tunnel to deliver the marine intake and outfall pipelines to a location approximately 500 m offshore before continuing as lay on bed pipelines.

A Dredge Management Plan (DMP) submitted for EPA approval would identify potential environmental risks associated with proposed dredging work and include all practical measures to avoid and minimise impacts, including measures such as avoiding sensitive habitat (e.g. seagrass) during anchoring, minimising movement of anchor points, containing any contaminants from dredging, biofouling mitigation methods and a Ballast Water Management Plan. A post construction habitat survey is proposed to verify the construction footprint remained within the defined areas outlined in the DMP and to document recovery in the area.

During construction Marine Mammal Observers would be used to visually monitor for the presence of marine mammals, establishment of shut down and observation zones, and standard operating procures. These measures would be included in the CEMP and DMP.

A Spill Management Plan and Emergency Response Plan would outline contingency measures in the event of accidental spills/leaks, and a Waste Management Program would seek to reduce, remove or reuse chemicals or waste from the site.

Any construction exclusion zone is expected to be of a short duration and only be in place while construction works are undertaken. Notification of construction periods would be published in the local paper prior to marine works. The exclusion zone would be limited to the area immediately around the intake/outfall structure construction works.

A conservative approach was taken in preparing the Project Concept Design. The proposed intake velocity of 0.15 metres per second would avoid entrapment of marine animals. At the outfall, a minimum dilution of 40:1 would limit (after dilution) a salinity increase to within natural variation.

An Operational Environmental Management and Monitoring Plan would incorporate a monitoring program in accordance with any development application outcomes or conditions and EPA licensing requirements.

The monitoring program shall include:

- Process monitoring to confirm that performance is within acceptable range (as supported by environmental assessments).
- Discharge water quality monitoring.
- Diffuser performance validation.
- Habitat / receiving environment monitoring and water quality.

Further modelling and field measurements would be used to demonstrate the outfall design system achieves the required mixing and dispersion requirements.

Discharge of any chemicals requires approval from the EPA and the operation of the RO desalination plant must comply with any EPA discharge license conditions. Chemicals used during the pre-treatment and cleaning processes, including anti-scalents, are required to have been subject to previous ecotoxicology testing. All chemicals use or release must be monitored and comply with any prescribed EPA limits. Screens and equipment maintenance would ensure the RO desalination plant runs efficiently and achieves the predicted dosing and dilutions.

Additional ecotoxicology assessments are proposed, which will investigate and monitor the effects of longer-term exposure of saline discharge on blue mussels (*Mytilus galloprovincialis*).

Operation navigational requirements and decisions on whether exclusion zones are required around marine intake and outfall structures are dependent on guidance from the Department for Infrastructure and Transport.

Sustainability

Legislative and policy framework

Legislation and policy guidance relevant to waste management for the Project include the EP Act and the South Australian Government's Waste Strategy 2020-2025.

Impact assessment and management and mitigation

During Project construction there will be waste produced and where possible, waste will be minimised, and recycling of materials and waste will occur in accordance with the waste hierarchy. Wastes, which are not able to be collected by the existing Resource Recovery Centre in Port Lincoln will be transported to other appropriate nearby waste management facilities for further processing.

A Waste Management Plan (WMP) will form part of the CEMP. The WMP will demonstrate how the waste requirements of the EP Act are to be implemented during construction.

SA Water has a commitment to the United Nations Sustainable Development Goals and have programs across the State to action the commitment.

In addition, SA Water has adopted an ambitious target to achieve net zero Scope 1 and Scope 2 carbon emissions by 2030. To support this, SA Water has developed a Net Zero Greenhouse Gas Emissions Pathway to 2030 (Pathway), informed by industry guidance from the Water Services Association of Australia (WSAA) document (2023). One initiative in SA Water's Pathway is to establish biodiverse carbon plantings on its landholdings to sequester and off-set a portion of its scope 1 and 2 emissions. SA Water plans to implement Stage 1 of the biodiverse carbon plantings initiative, which is subject to finalisation of the planting design and carbon measurement methodology and subject to all related regulatory assessments/approvals.

The proposed carbon plantings initiatives are estimated to be able to off-set, on average, between 58 per cent and 100 percent of the Projects operational emissions over a 30-year period.

Social and community

A Social Impact Assessment (SIA) was undertaken to identify, assess and mitigate the social implications of the Project.

Legislative and policy framework

The following legislation is relevant to the socio-economic context of the proposed Project:

- PDI Act
- *Aboriginal Heritage Act 1988*
- EP Act (including policies under this Act)
- EPBC Act
- *Heritage Places Act 1993.*

Impact assessment

A variety of potential impacts were identified in the Social Impact Assessment, falling under the categories of:

- Livelihoods
- Health and Wellbeing
- Surroundings
- Way of Life
- Accessibility
- Community Values.

The impacts under these headings have been split into Social Benefits, Social Impacts During Construction and Social Impacts Post Construction/Plant Operations. Potential social impacts are expected to be manageable through a mix of mitigation methods, monitoring, controls applied to equipment during detailed design and establishment of engagement protocols and processes, and not anticipated to cause harm. Expected Project benefits include the ability to support regional economic growth and residential wellbeing through improved security of water supply, catchment health benefits through Uley Basin SEB and reduced groundwater basin usage.

Management and mitigation

SA Water and its appointed contractors will prepare CEMPs and Community Engagement Plans to cover identified potential impacts and consider potential mitigation.

An Operational Community Engagement Plan would outline how SA Water will engage with the community throughout the lifecycle of the proposed Project.

Tourism, Recreation, and Industry

Tourism is a significant industry for Port Lincoln and the Eyre Peninsula, generating valuable economic output and creating jobs. Mitigating impacts to the environment and amenity of places that attract visitors to the region will ensure the project does not negatively impact tourism. The area is also an existing multi-user industry area with port, fisheries, aquaculture, and recreational fishing in marine and lands surrounding the Project.

Legislative and policy framework

The PDI Act is relevant to the tourism context of the proposed Project.

Impact assessment

Several potential impacts were identified during the construction and operation of the Project. Potential negative impacts include:

- Changes to pedestrian access.
- Visual amenity and temporary changes to landscape – these would be redressed through detailed design incorporating factors to reduce the visual impact, and good housekeeping during construction and operations.

- Increased demand on accommodation and services due to increased workforce – a small workforce is expected during operations and construction workforce numbers would be higher. SA Water is reviewing construction workforce accommodation requirements.
- Construction traffic and activities impacting local access and pedestrian and traffic movements – traffic management plans and monitoring would minimise the potential for excess nuisance and safety risks arising from Project related traffic impacts.
- Construction and operation resulting in noise and some odour (construction spoil or operational screen debris), thus potentially negatively impacting amenity – detailed design will include modelling of terrestrial noise outputs and identify any physical design factors to reduce the potential to exceed noise criteria at sensitive receptors. Odour is not expected to be a significant effect, and Project plans will include waste material storage, handling and disposal requirements to minimise potential odour.
- Construction and operation impacts to the marine environment, with recognised livelihood, recreational and cultural values – the Project would include detailed marine monitoring, and additional mussel ecotoxicology activities to proactively monitor the potential for negative effects to existing marine industries, and recreational fisheries.

Potential benefits include the development of new tourism opportunities by developing the plant as an educational tourism destination, possibly in collaboration with tourism operators and organisations such as Regional Development Australia Eyre Peninsula.

The Project will also bring the benefit of a secure, climate independent water supply, allowing the region's industries and economy to grow, including industry and tourism.

Management and mitigation

Mitigation of impacts to Tourism, Recreation and Industry impacts will be addressed under the Construction Environment Management Plan (CEMP), Community Engagement Plan and Operational Community Engagement Plan developed to address social and community impacts. It is expected that regular communications about construction and operational activities, traffic management, monitoring of marine system health and other management methods will be used to inform and mitigate potential impacts to the community.

Conclusion

The South Australian Water Corporation (SA Water) proposes to construct a seawater desalination plant located on a brownfield site at Billy Lights Point, approximately 4 km south-east of Port Lincoln's city centre, at the southern end of Eyre Peninsula. The proposal seeks development approval under Section 131 of the *Planning, Development and Infrastructure Act 2016*.

The Project is proposed in response to significant requirements for long-term, climate-independent sources of drinking and industrial water for the Eyre Peninsula, in order to support the existing economy, and future regional economic growth and residential water demands. The selection of Billy Lights Point was subject to a comprehensive site selection process, involving commissioning and review of numerous site investigations.

SA Water believe the selection of the brownfield site and use of existing SA Water land within an industrial zone is appropriate and reduces the potential land-based impacts of the proposal, while providing a better technical solution to access required water infrastructure. The small scale of the plant, once constructed, is expected to have minor operational impacts given its small size and operational workforce numbers.

Consultation feedback has informed both the assessments undertaken and the design of the Project. Key modifications have included adoption of a tunnel solution through the coastal interface to avoid disturbing sensitive marine and coastal environments, restricting the RO desalination plant footprint to degraded areas thereby avoiding coastal vegetation and repurposing cleared areas of existing SA Water land parcels.

The assessment has demonstrated the proposed desalination plant and related infrastructure can be constructed and operated at the proposed location with minimal impacts on the receiving environment and related receptors. Impacts would be mitigated and managed further by development and implementation of a range of management plans including but not limited to CEMP and OEMP (and appropriate sub plans), in consultation with the EPA and other regulators. Peer review of the Project's marine studies and design by the independent Marine Science Review Panel were integral in providing leading scientific rigour to the assessments.

SA Water is committed to ongoing future engagement with existing industries and stakeholders to support the continued sustainable use of the marine system.

The Eyre Peninsula Desalination Plant should be granted development approval under the Section 131 of the PDI Act, considering:

- The proposed 5.3 GL/annum RO desalination plant and associated infrastructure is not seriously at variance with the Planning and Design Code.
- It provides a necessary long-term water security solution for the Eyre Peninsula
- It would enhance the health of the Uley South Basin
- It supports relevant State and local government guidelines and strategic directions
- Potential environmental, social and economic impacts have been investigated in detail, minimised through mitigation in design and can be further reduced by appropriate management during construction and operation to a reasonable level and as low as reasonably possible.

1 Introduction

This Development Application Report (Report) details the proposal, the relevant existing circumstances and expected environmental impacts resulting from the proposed development of a desalination plant in Port Lincoln, South Australia.

The proposed Eyre Peninsula Desalination Plant ('the Project') comprises several land parcels, including the main reverse osmosis (RO) desalination plant site, marine intake and outfall pump station, seawater intake and saline waste outfall pipelines in the marine environment and desalinated water (drinking water) transfer pipeline (DWTP) to the existing SA Water North Side Hill tanks.

The Eyre Peninsula has a unique customer demand profile with SA Water's network with approximately one third of water provided for residential customers, one third for primary production and one third for industry.

The primary drivers for Project are:

- Long term, climate independent water security for Eyre Peninsula
- Sustainable and proactive environmental water source management and protection of the Uley South Basin.

The secondary drivers for the Project are:

- Water quality improvement for Eyre Peninsula
- Enable economic growth within Eyre Peninsula.

Once complete, the Project is expected to provide drinking water/water supplies for approximately 35,000 people within Port Lincoln and Eyre Peninsula.

1.1 Background

In 2008, the South Australian Water Corporation (SA Water) released a Long-Term Plan for the Eyre Region (2008) (the Long-Term Plan) which sought to address drought conditions and climate change; a declining aquifer recharge and envisaged water allocation reductions from the Southern Basins. The Long-Term Plan identified seawater desalination as the preferred future supply option to ensure a long term, climate independent water source for SA Water customers living and working in the region.

A new water source was anticipated to have been required in 2014/15; however, through careful management following the development of the Long-Term Plan, supply has been maintained through use of various borefields in the Southern Basins and supply from the River Murray. The commissioning of a 10 million litre (L) potable water storage tank outside of Port Lincoln further bolstered capacity for the local area while SA Water continued progress optioneering on a sustainable long-term option. Through multiple investigations, an option to develop a desalination plant at the southern end of the Eyre Peninsula was confirmed as the preferred long-term option.

In 2021, SA Water investigated 20 alternative sites for the development of a desalination plant at the southern end of the Eyre Peninsula utilising a Multi-Criteria Analysis (MCA). The criteria considered were environment and heritage; construction complexities; connectivity to existing network; stakeholder impacts and financial considerations. Six sites were short-listed and further assessed in a second MCA with a separate risk and opportunity workshop also held to inform the preferred site. Ultimately the ex-BHP site at Billy Lights Point was identified as the preferred location for the desalination plant in October 2021.

In November 2021 and in response to stakeholder concerns the then Minister for Environment and Water established an independent Site Selection Committee (SSC) to make a recommendation to SA Water and the South Australian government regarding their preferred site for the construction of the desalination plant while Billy Lights Point remained the base case. The Minister also directed SA Water to undertake further scientific modelling and additional baseline monitoring of the marine environment to respond to stakeholder concerns.

The SSC was chaired by the then Member for Flinders, and comprised representatives from local government, the aquaculture industry, recreational fishing, Regional Development Australia (SA Eyre Peninsula Branch), Eyre Peninsula Landscape Board (EPLB). The SSC was independently facilitated, with the terms of reference, meeting minutes and associated documents published on the Project page at watertalks.sawater.com.au; to ensure transparency and accountability for all parties.

Twenty initial sites were considered by the SSC and these were shortlisted to four sites that were subject to assessment against environmental, social, technical and financial criteria. Throughout this process Billy Lights Point remained the base case and was not assessed by the SSC. Through the assessment process, the SSC recommended a site at Sleaford West; noting there were significant risks and costs associated with the recommendation.

In addition to the site selection process, funding options for the desalination plant were also investigated by the SSC. Discussions were undertaken with the National Water Grid Authority to seek funding to supplement the budget available to SA Water for the Billy Lights Point site.

In parallel to the SSC activities SA Water undertook a comprehensive program of marine review, data collection and analysis activities to specifically address the concerns of the aquaculture industry related to the site at Billy Lights Point. The conclusion of that work was that with the appropriate engineering design, the science indicates that a desalination plant at Billy Lights Point can be built with minimal impact on the marine and coastal environments.

To support SA Water and the SSC an independent Marine Science Review Panel (MSRP) was assembled to independently review the marine science activities being undertaken by SA Water and provide advice to the SSC. The MSRP consisted of national and internationally recognised marine scientists whose membership was endorsed by the SSC. The MSRP has continued to support SA Water since the disbandment of the SSC at the completion of its mandate.

SA Water then evaluated the SSC recommended site at Sleaford West, it's second preferred site at Point Boston and the base case site of Billy Lights Point and selected Billy Lights Point as the quickest solution to ensure water security to the region, with the least impact on future water costs for customers. Billy Lights Point was selected as it is:

- in close proximity to existing water and electricity networks, requiring a short, extension to the electricity transmission network and a short water transfer main to connect to the SA Water network
- a disturbed industrial site that is large enough to accommodate future growth and SA Water has ensured that the footprint is minimised so as to reduce the visual and environmental impacts
- relatively sheltered with a flatter landscape, helping to reduce construction risks and challenges and deliver the best value option for customers.

In March 2023, the South Australian Government accepted SA Water's recommendation to select Billy Lights Point at Port Lincoln as the subject site for development of the desalination plant, and in the 2023-24 State Budget, $330 million was allocated to the project.

1.2 Proposed Development

SA Water proposes the construction of a 5.3 gigalitre (GL) per annum (GL/annum) RO seawater desalination plant, a 7 kilometre (km) desalinated water transfer pipeline, associated marine works and infrastructure including seawater intake and saline waste outfall pipelines, siteworks and laydown areas, fencing and directional signage, and a 3.5 km overhead electricity transmission line (the Project).

The marine works and infrastructure are expected to be constructed for an eight GL/annum ultimate capacity, including the marine intake and outfall pipes.

The development application can be considered as three main elements:

- RO desalination plant and saline waste/seawater transfer pipelines
- Marine intake and outfall pump station and associated intake and outfall pipelines within the marine environment
- Desalinated water transfer pipeline (DWTP) to North Side Hill tanks.

It should also be noted that while an expansion of the capacity of the RO desalination plant from 5.3 GL/annum to eight GL/annum would require a separate development application, the RO desalination plant site contains sufficient space to accommodate a larger plant. In addition, all terrestrial pipelines and marine infrastructure are 'future proofed' and sized to support an eight GL/annum RO desalination plant. This decision by SA Water is in recognition that the construction of the saline waste/seawater transfer pipeline and marine intake and outfall pump station are the most impactful to the environment and sizing for a possible expansion of the RO desalination plant at some future date removes the requirement to disturb the environment a second time. The marine impact assessment and modelling were therefore undertaken for an eight GL/annum saline waste discharge to match the built capability of the terrestrial pipelines and marine infrastructure. This assessment of a larger desalination plant capacity is therefore conservative compared to the 5.3 GL/annum RO desalination plant proposed.

1.3 Proposed Timelines

Commencement of site works for the Project is approximated for early 2025. The proposed schedule is dependant upon a range of factors that may be subject to change, including but not limited to regulatory requirements and approvals, procurement, construction resourcing and other Project matters.

Initial works would likely include construction for the marine intake and outfall pipelines. This will involve construction of a tunnel boring machine (TBM) launch shaft at the site of the marine intake and outfall pump station, followed by boring of a tunnel under the shoreline, which will form part of the marine intake and outfall pipeline route. It is expected that pipeline installation will commence toward the end of 2025, and will involve pipelines being laid on the seabed and through the tunnel; connecting to the location of the TBM launch shaft (which will later become the site of the marine intake and outfall pump station).

Construction of the saline waste/seawater transfer pipelines between the marine intake and outfall pump station site and the RO desalination plant site is planned to commence at the end of 2025.

Construction of the marine intake and outfall pump station at the TBM launch site, including an associated wet well, is planned to commence in January 2026.

Construction of the RO desalination plant and associated infrastructure is planned to commence in mid-2025 and be completed by mid-2026.

Construction of the DWTP and the SA Power Networks (SAPN) power supply is planned to commence mid-2025 and be completed by early-mid 2026.

1.4 Scope of this Development Application

The scope of this document is to provide an assessment of the proposed development against the provisions of the Planning and Design Code (P&D Code), the *Planning, Development and Infrastructure Act 2016* (PDI Act) and Planning, Development and Infrastructure (General) Regulation 2017 (PDI Regulations).

1.5 Structure and Content of this Development Application

The environmental assessments forming part of this Report are separated into terrestrial environs (i.e. the RO desalination plant and ancillary activities) and the marine environs (i.e. the marine intake and outfall infrastructure). Several technical studies have been undertaken for the marine environment and are outline in Section 8.3.

The structure of this Report is outlined as follows:

1. Section 1 – *Introduction* provides an overview of the Project background, proposed development, and proposed timelines for activities proposed under this development application.
2. Section 2 – *Subject sites* provides an overview of the site locality, site history, and land tenure.
3. Section 3 – *Proposed development* describes the details of the proposed development, including on land components as well as works and processes within the coastal and marine environments.
4. Section 4 – *Procedural matters* provides an overview of the rationale and benefits of the Project, as well as the expected development assessment pathway.
5. Section 5 – *Strategic context* outlines the Project's consistency with State targets, local government guidelines and strategic directions.
6. Section 6 – *Pre-lodgement information provision* provides an overview of the information provision activities undertaken to date, including government agencies, Councils and the Eyre Peninsula communities.
7. Section 7 – *Existing conditions* describes existing conditions of the Project site, including terrestrial and marine environments.
8. Section 8 – *Assessment* provides an assessment against the relevant policies of the P&D Code; and details the results of the environmental assessments completed for the Project including noise, air quality and odour, Aboriginal cultural heritage, non-Aboriginal heritage, visual amenity, traffic and access, contamination, geotechnical, easements and services, bushfire, marine studies.
9. Section 9 – *Other whole of development matters* provides information about matters relating to Project as a whole, including land access, social and community impacts (positive and negative), and sustainability.
10. Section 10 – *Construction, operation and decommissioning* provide details on how the Project will generally be managed during the construction and operation phases. Details include resourcing, health and safety, environmental management, emergency management and security.
11. Section 11 – *Conclusion and recommendations* concludes the assessment.

2 Subject sites

2.1 Location and Legal Description

2.1.1 Site Location

The Project is primarily located within the City of Port Lincoln council area, with the exception of a small portion of the DWTP which is located within the Lower Eyre Peninsula Council area. The proposed RO desalination plant site is situated approximately 4 km south-east of the Port Lincoln city centre at Billy Lights Point, as shown below in Figure 2.1.

The City of Port Lincoln is located 650 km west of Adelaide and is a region that produces 50% of South Australia's wheat, barley and oil seed. The harbour to the east of Port Lincoln is naturally deep and provides for a commercial fishing fleet and major agricultural exports. A population of approximately 14,400 people currently reside in Port Lincoln, with the population expected to increase at a 0.6% average annual rate from 2021to 2041, as per population projections from Planning and Land Use Services (PLUS) (PlanSA, 2023).

The locality for the Project can be characterised as in keeping with the expected land uses from east to west along the DWTP route – some rural, light industrial, vacant open space and vegetated land through to the desalination plant site as strategic employment.

The RO desalination plant site is irregular in shape to provide access to St Andrews Drive along its northern boundary. The allotment is approximately 8 hectares (ha) with the coast to the south and other land holders to the east and west. The topography of the site falls away to the shoreline; with an approximate maximum elevation within the site of 10 m Australian Height Datum (AHD), descending to approximately AHD at the shoreline. The site has scattered vegetated areas, along with a rubble corridor following the northern boundary.

The RO desalination plant site has recently been subject to a land division, to remove it from a larger allotment which was formally used as a Broken Hill Proprietary Company Limited (BHP) sand mine. Existing infrastructure remains within the larger allotment from this previous land use. This infrastructure includes:

- a sand storage shed and loading docks
- redundant rail infrastructure
- a storage shed
- a redundant electricity transformer near the wharf to the south of the site
- a metal fabrication business within a corrugated iron shed to the central-eastern portion of the site
- offshore infrastructure including a redundant jetty.

This infrastructure is <u>not on the SA Water land parcel, is not owned </u>by SA Water, and is therefore excluded from the Project.

The marine intake and outfall pump station is located within an existing SA Water wastewater treatment plant (WWTP) approximately 600 metres (m) east of the RO desalination plant site over land.

The DWTP will traverse a steep gradient to connect the RO desalination plant site to the existing tank infrastructure at SA Waters North Side Hill tanks, located north-west of the RO desalination plant site, through approximately 7 km of underground pipework.

Eyre Peninsula Desalination Plant Project

Figure 2.1
Project Location

Legend

- Substation
- Local Government Area
- Desalination Plant Site Boundary
- Easement
- New Site Access
- SAPN Transmission Line
- Overhead Transmission Line
- Outgoing Treated Water Transfer Pipeline
- Seawater Transfer Pipeline
- Sewer Rising Main
- Saline Waste Transfer Pipeline

Marine Infrastructure

- Marine Outfall
- Raw Seawater Intake
- Marine Tunnel Portion

0 500 1,000
Metres

Coordinate system: GDA2020 MGA Zone 53

Scale ratio correct when printed at A3

1:24,000

Date: 22/05/2024

Data sources: WSP, DataSA, MetroMap WMS Services:

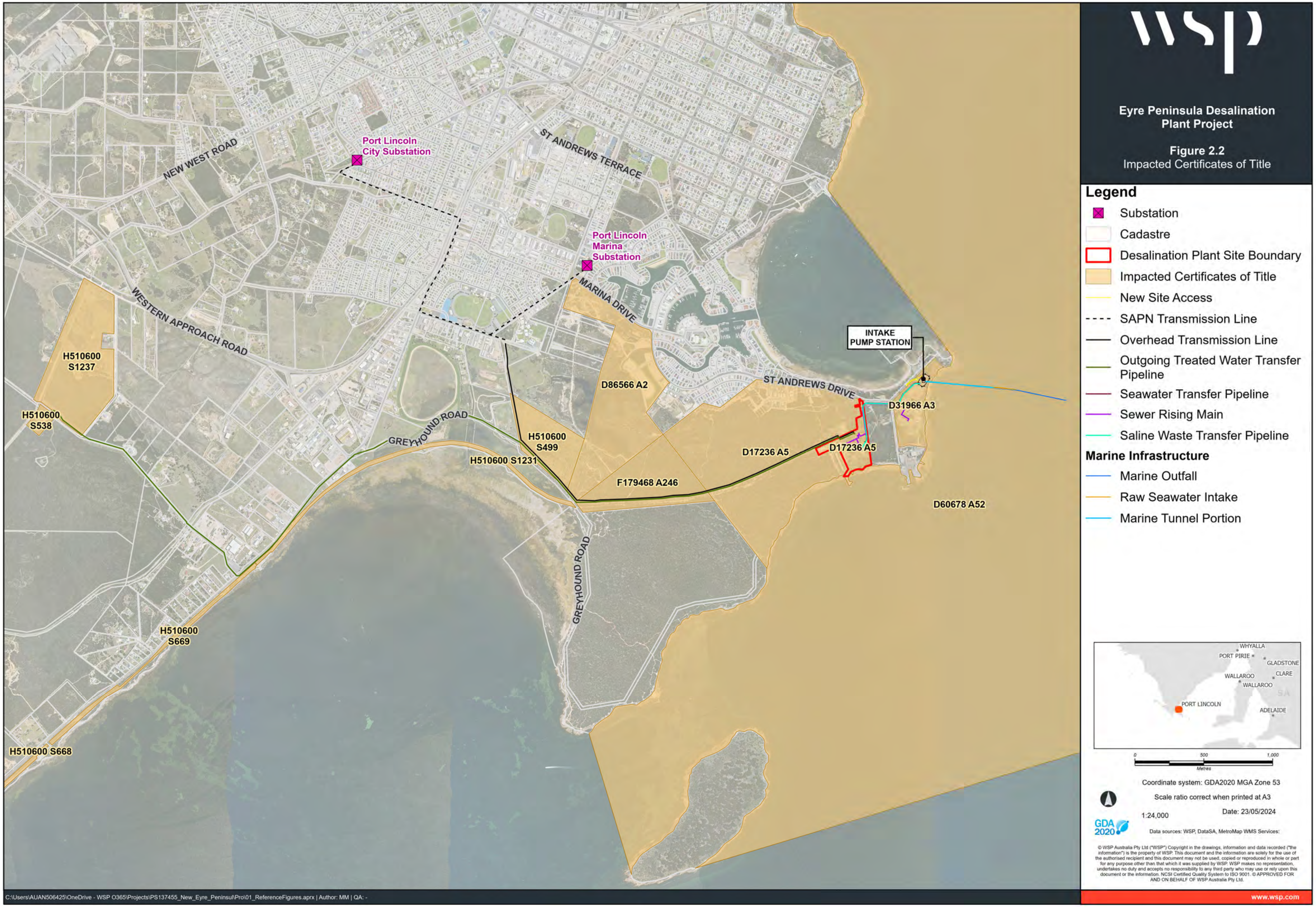
2.1.2 Legal Description

Table 2.1 lists the relevant Certificates of Title (CT) for all components of the Project, including the RO desalination plant, marine intake and outfall pump station, all terrestrial and marine pipelines and the transmission line:

Table 2.1 Impacted Certificates of Title

Allotment / Hundred	Deposited Plan / Section	Title	Address	Suburb	Description
S538	HS10600	CR 5757/942	Lot 538 Blue Fin Road	Duck Ponds	Known as North Side Hill - current tank site
S1237	H510600	CT 5149/26	60 Kathai Drive	Duck Ponds	DWTP alignment in roadway
S1231	H510600	CL 6221/531	Lot 1231 Proper Bay Road	Port Lincoln	DWTP alignment in Crown Lease
S499	H510600	CT 5401/703	Lot 20 Stamford Terrace	Port Lincoln	DWTP alignment
QP70	D124175	CT 6248/729	Lot 70 Stamford Terrace	Port Lincoln	DWTP alignment
AL12	D129500	CT 6275/758	Lot 12 Greyhound Road	Port Lincoln	DWTP alignment
AL11	D129500	CT 6275/757	Lot 11 Greyhound Road	Port Lincoln	DWTP alignment
A10	D129500	CT 6275/756	Lot 10 St Andrews Drive	Port Lincoln	RO Desalination Plant
			Northern portion adjacent St Andrews Drive	Port Lincoln	Existing roadway – no CTs
A3	D31966	CR 5753/706	Lot 3 St Andrews Drive	Port Lincoln	Current SA Water WWTP
A82	D11351	CT 6193/313	Lot 82 Slipway Road	Port Lincoln	Land under water in Proper Bay and surrounds for the marine intakes and outfall pipelines

CTs in relation to the Project are shown in Figure 2.2.


Eyre Peninsula Desalination Plant Project
Figure 2.2
Impacted Certificates of Title
Legend
Substation
Cadastre
Desalination Plant Site Boundary
Impacted Certificates of Title
New Site Access
SAPN Transmission Line
Overhead Transmission Line
Outgoing Treated Water Transfer Pipeline
Seawater Transfer Pipeline
Sewer Rising Main
Saline Waste Transfer Pipeline
Marine Infrastructure
Marine Outfall
Raw Seawater Intake
Marine Tunnel Portion
Port Lincoln City Substation
Port Lincoln Marina Substation
NEW WEST ROAD
ST ANDREWS TERRACE
WESTERN APPROACH ROAD
MARINA DRIVE
ST ANDREWS DRIVE
GREYHOUND ROAD
INTAKE PUMP STATION
H510600 S1237
H510600 S538
H510600 S499
H510600 S1231
D86566 A2
F179468 A246
D17236 A5
D17236 A5
D31966 A3
D60678 A52
H510600 S669
H510600 S668
WHYALLA
PORT PIRIE
GLADSTONE
CLARE
WALLAROO
WALLAROO
PORT LINCOLN
ADELAIDE
0
500
1,000
Metres
Coordinate system: GDA2020 MGA Zone 53
Scale ratio correct when printed at A3
1:24,000
Date: 23/05/2024
Data sources: WSP, DataSA, MetroMap WMS Services:
© WSP Australia Pty Ltd ("WSP") Copyright in the drawings, information and data recorded ("the information") is the property of WSP. This document and the information are solely for the use of the authorised recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that which it was supplied by WSP. WSP makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information. NCSI Certified Quality System to ISO 9001. © APPROVED FOR AND ON BEHALF OF WSP Australia Pty Ltd.
www.wsp.com
C:\Users\AUAN506425\OneDrive - WSP O365\Projects\PS137455_New_Eyre_Peninsul\Pro\01_ReferenceFigures.aprx | Author: MM | QA: -

2.2 Site History

The RO desalination plant site has recently been subject to a land division to remove it from a larger allotment which was formally used as a BHP sand mine with associated railway infrastructure.

Historic aerial photographic evidence shows of this wider allotment being undisturbed from 1950-1967 with internal roads and jetty constructed to the south of the site in 1967. Records exist that this wider allotment previously had licences for bulk shipping facilities (SA EPA, 1997).

Further buildings were added to the wider allotment in the mid-1980s to support the BHP sand mine operation.

From 1995 there is evidence of the marina being constructed to the north/north-west of this wider allotment.

More recently, the previous landowner for the wider allotment had proposed to construct a wharf development, heavy vehicle bypass, shopping centre, industrial development, residential land division, a PGA standard 18-hole golf course and associated tourism facilities to be known as Lukin Quays. This proposal did not eventuate, and a portion of the land was subsequently purchased by SA Water for the purpose of the Project.

To support the Project, a Development Plan Amendment was made to the Port Lincoln City Council's Development Plan, to rezone the site of the RO desalination plant to a zone appropriate for the proposed use. The former Development Plan has since been repealed and replaced with the P&D code. The details of policy that remains in the P&D Code is discussed in Section 8.1.

2.3 Land Tenure

The RO desalination plant will be located on allotment 10 of deposited plan 129500, CT 6275/756 (the Site or Project site). This parcel is owned by SA Water, along with the location of the marine intake and outfall pump station within the WWTP, on allotment 3 of deposited plant 31966, Crown Record (CR) 5752/706.

Land title records indicate that the RO desalination plant site was previously owned by BHP. BHP were granted CT ownership on 1 May 1968 and retained ownership until 12 April 2016; when ownership was transferred to Dean Lukin Collection Pty Ltd and to several related businesses before being subdivided with a portion purchased by SA Water on 20 September 2022.

Land to the north and west of the proposed RO desalination plant is under CT 6275/756, and is owned by Oscar & Simba P/L, and land to the east of the proposed RO desalination plant site is under CT 6252/673, and is owned by Port Lincoln Marine Services P/L. A Schedule 1 licence with the South Australian Environment Protection Authority (EPA) is held for CT 6252/673 to consent abrasive blasting activities on this land.

The land under sea adjacent to the WWTP being the proposed location of the marine intake and outfall pipelines, is under CT 6193/313, and is owned by the Minister for Transport and Infrastructure. This parcel contains easements to Viterra Operations and Flinders Ports to provide access to their port infrastructure.

Easements are expected to be sought for access to the seabed for the marine intake and outfall pipelines, as well land neighbouring the RO desalination plant to support the saline waste/seawater transfer pipelines as a matter of due course.

The current land tenure for the Project site and surrounds is shown in Figure 2.3.

Eyre Peninsula Desalination Plant Project

Figure 2.3
Land Tenure

Legend

- Cadastre
- Desalination Plant Site Boundary
- Land Tenure
- New Site Access
- Seawater Transfer Pipeline
- Sewer Rising Main
- Saline Waste Transfer Pipeline

Marine Infrastructure

- Marine Outfall
- Raw Seawater Intake
- Marine Tunnel Portion

0 200 400
Metres

Coordinate system: GDA2020 MGA Zone 53

Scale ratio correct when printed at A3

1:9,000

Date: 23/05/2024

Data sources: WSP, DataSA, MetroMap WMS Services:

3 Proposed Development

As discussed above, the three main elements of the proposed Project are:

1. RO desalination plant and saline waste/seawater transfer pipelines
2. Marine intake and outfall pump station with associated marine intake and outfall pipelines
3. The desalinated water transfer pipeline (DWTP) to existing infrastructure at North Side Hill tanks.

Design outcomes

The RO desalination plant is conservatively designed and engineered to a capacity of 5.3 GL/annum, equating to 16 megalitres per day (ML/d).

The capacity of the marine intake and outfall pipelines, underground saline waste/seawater transfer pipelines, and DWTP are designed for eight GL/annum as ultimate potential capacity. This design is intended to future proof the development, with the marine environment and terrestrial vegetation protected from potential future works impacting ecosystems.

Note – a separate development application would be required for any expansion of the RO desalination plant up to an ultimate capacity of 24 ML/d (1,200 m^3/h) or eight GL/annum at 92 per cent availability.

The design for the Project is shown in Figure 3.1, with key components discussed in the sections below.

Preliminary design drawings for key components are provided in Appendix B. Design optimisation is in progress, and as such, SA Water expect a condition of authorisation requiring provision of final plans/drawings issued for construction prior to commencement of works.

Other supporting infrastructure

In addition to the RO desalination plant and associated infrastructure, this development application also seeks approval of temporary construction facilities including:

- construction fencing around the perimeter of the RO desalination plant site boundary
- ablutions male (with effluent storage)
- ablutions female (with effluent storage)
- site offices
- laydown and storage area
- workshop
- generators and fuel tanks
- drinking water tanks
- firefighting tanks
- lighting towers
- security building
- refuelling facilities.

Eyre Peninsula Desalination Plant Project

Figure 3.1
Site Layout

Legend

- Cadastre
- Desalination Plant Site Boundary
- Security Fence
- New Site Access
- Design Desalination Plant
- Pump Intake Station
- Saline Waste Transfer Pipeline
- Sewer Rising Main
- Seawater Transfer Pipeline

Marine Infrastructure

- Marine Outfall
- Raw Seawater Intake
- Marine Tunnel Portion

0 100 200
Metres

Coordinate system: GDA2020 MGA Zone 53

Scale ratio correct when printed at A3

1:6,000

Date: 23/05/2024

Data sources: WSP, DataSA, MetroMap WMS Services:

3.1 Proposed Elements

3.1.1 RO Desalination Process Plant and Supporting Infrastructure (Element 1)

The proposed built form of the RO desalination plant and supporting infrastructure consists of the following key elements:

RO Desalination Plant Site

- RO desalination plant building (80 m long x 22 m wide x 12.5 m tall) cladded with Colorbond Ultra in Surfmist, containing the following:
  - Ultra Filtration (UF) trains (10 trains)
  - Disc Filter backwash tank (20 cubic metres (m3)
  - Disc filter backwash pumps (two pumps)
  - UF Clean in Place (CIP) tank (15 m3)
  - UF CIP pumps (two pumps)
  - Pretreatment backwash balancing tank (333 m3)
  - UF Neutralisation tank (98 m3)
  - UF Neutralisation pumps (two pumps)
  - RO trains (four trains), each comprising of a seawater reverse osmosis train (60 pressure vessels), pressure exchanger, high pressure pump (four pump per train), two-stage brackish water reverse osmosis train (22 pressure vessels), brackish water feed pump (one pump per train), CIP equipment including tanks for permeate and CIP.
- Disc filters (6 trains).
- Three x calcite contactors (11 to 12 m tall), CO2 dosing, chlorine disinfection (using chlorine gas), fluro silicic acid dosing dimensions, colours and materials. *Note – any potential future expansion of the RO desalination plant up to an ultimate capacity of 24 ML/d (1,200 m3/h) or eight GL/annum at 92 per cent availability would require a fourth calcite contactor, which would be subject to a separate development application process.*
- Treated water pump station including surge vessels and low voltage electrical switchroom (12 m long x 3 m wide x 6 m tall, comprising a 4 m room height raised 2 m off the finished floor level (FFL)).
- Site office (25 m long x 4.5 m wide) constructed using Colorbond Ultra in Dover White.
- Storage shed (16 m long x 6 m wide) constructed using Colorbond Ultra in Surfmist.
- Gross solids trap.
- Chemical loading and storage bay.
- Carbon dioxide and chlorine storage and associated dosing systems.
- Chlorine dosing low voltage (LV) switchroom (7 m long x 2.4 m wide x 4 m tall) as an annex to the chlorine building.

Surge Vessels

- Treated water tank (4.9 m x 27 m internal diameter/2.5 Megalitre (ML)). The tank would have a concrete finish. A single tank would be constructed for Stage 1, with provision for future construction of the second tank to meet Stage 2 requirements. *Note – any potential future expansion of the RO desalination plant up to an ultimate capacity of 24 ML/d (1,200 m3/h) or eight GL/annum at 92 per cent availability would require a construction of a second tank, which would be subject to a separate development application process.*

Brine Tank

- LV switchroom for brine tank (7 m long x 3 m wide x 6 m tall, raised 2 m off the finished floor level).
- Six pad mount kiosk type transformers (3 m long x 2 m wide x 2 m tall).
- Temporary and two permanent generators (12 m long x 2.5 m wide x 2.5 m tall).
- High voltage (HV) switchroom (14 m long x 5 m wide x 6.5 m tall, comprising a 4.5 m roof height raised 2 m off the FFL). The HV switchroom would be cladded with Colorbond Utlra in Dover White.

- Main LV switchroom (22 m long x 7 m wide x 5 m tall, comprising a 4.5 m roof height raised 2 m off the FFL). The main LV switchroom would be cladded with Colorbond Ultra in Dover White.
- Pad mount kiosk type transformer (3 m long x 2 m wide x 2 m tall).
- Desalinated water pump station, and associated surge vessels and electrical switchroom.
- Concrete water tank for desalinated water (3.9 m x 27.9 m diameter) (2.5 ML) and associated transfer pumps, switchroom and high voltage transformer.
- Brine pit and associated switchroom and transformer.
- Stormwater basin (1,900 m3 capacity).
- Process lagoon (2,400 m3 capacity) and associated marine intake and outfall pump station.

General Site Arrangement and Elements within the RO Desalination Plant Site

- Site access and hard stands. Site access would be from St Andrews Drive.
- Five carparking spaces and one disability accessible parking space.
- Stock fencing to site boundary.
- A 3 m tall mesh security fence around critical infrastructure, with main gate access from St Andrews Drive.
- Directional signage.
- Entry signage and plantings.
- Earthworks, including concrete sleeper retaining walls.
- Easement corridor for the DWTP and electricity supply via the overhead transmission line.

3.1.2 Saline Waste/Seawater Transfer Pipelines between the RO Desalination Plant and Marine Intake and Outfall Pump Station

Underground pipelines between RO desalination plant and marine intake and outfall pump station (nominal diameter (DN) 900 saline waste outfall transfer pipeline and DN1000 raw seawater intake transfer pipeline). Pipelines are expected to be within an easement running adjacent St Andrews Drive.

3.1.3 Marine Intake and Outfall Pump Station (Element 2)

3.1.3.1 Marine Intake and Outfall Pump Station Site

Marine intake and outfall pump station would include:

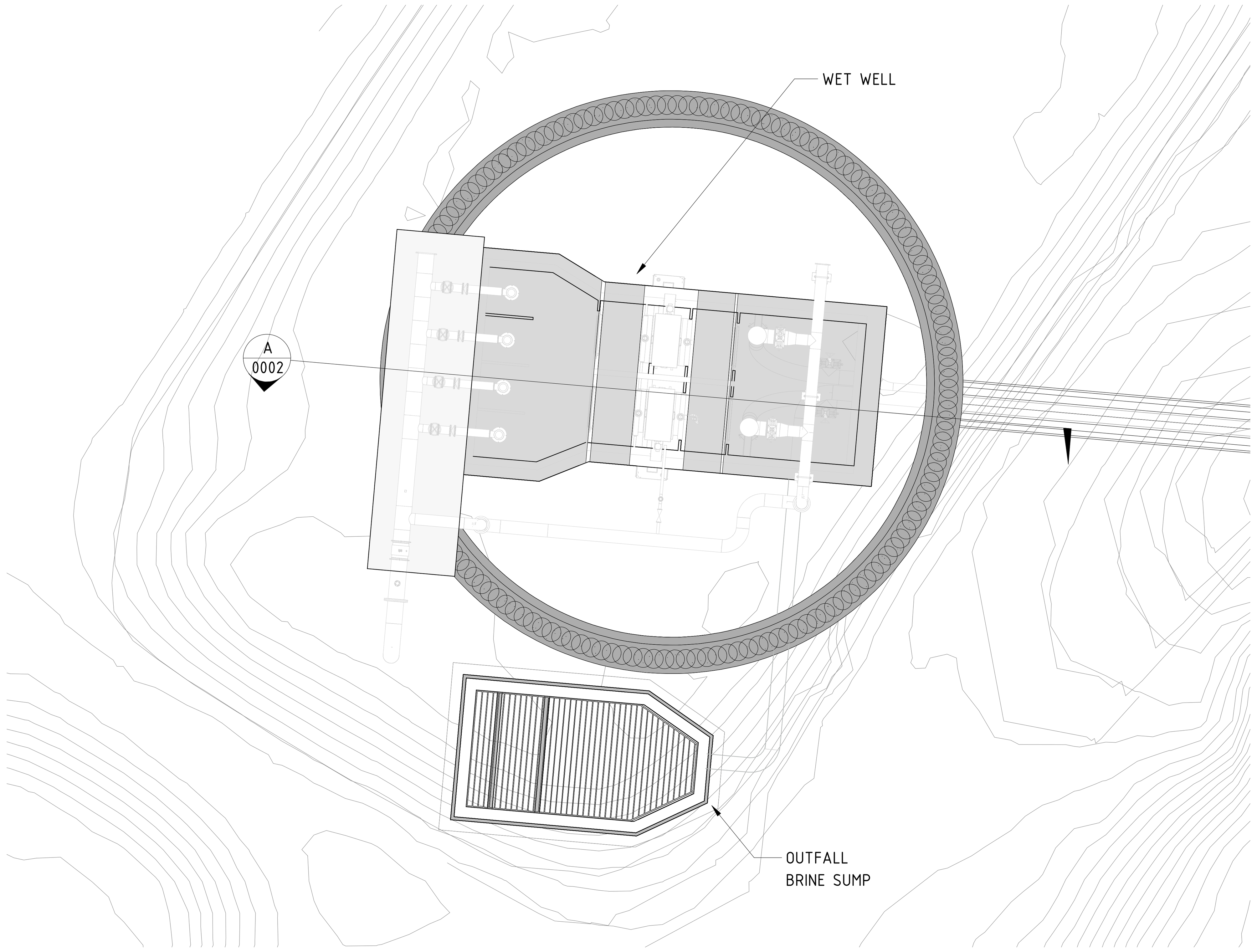
- Marine intake and outfall pump station consisting of a rectangular wet well pump chamber constructed within the TBM launch shaft (discussed further in Section 3.1.3.2). The vertical shaft would have a diameter of 26 m.
- Two (2) travelling band screens installed in the pump chamber upstream of the intake pumps.
- Pig launching stations at the marine intake and outfall pump station for pigging of the marine intake pipelines and the intake terrestrial pipelines.
- Switchgear room cladded in Colorbond Ultra (14 m long x 4 m wide x 6 m tall, comprising a 4 m roof height raised 2 m off the FFL.
- Flow meter chamber adjacent to marine intake and outfall pump station structure.
- Outfall brine sump adjacent to the marine intake and outfall pump station structure, with brine outfall pipe connecting to the pump station.
- Brine pit.
- A rising sewer main from the waste water pump station at the RO desalination plant laid adjacent to St Andrews Drive into the WWTP main access road and tying into the WWTPs inlet works.
- 'Pig' launching station and chamber (internal pipe cleaning).
- Filling of existing disused wastewater treatment lagoons to finished floor level.

The general arrangement for the wet well, brine sump and TBM launch shaft is provided in Figure 3.2.

WET WELL, BRINE SUMP & SHAFT - GENERAL ARRANGEMENT

SCALE 1 : 1000

SCALE 1:1000



WET WELL, BRINE SUMP & SHAFT- PLAN VIEW

SCALE 1 : 250

SCALE 1:500

NOT FOR CONSTRUCTION. PRELIMINARY DRAWING FOR INFORMATION ONLY

ISSUED FOR DEVELOPMENT APPLICATION

EPDP-300-AED-CIV-DRG-1001

REVISION PANEL

REV	DATE	DRN	DETAILS	APR'D
UR2	29.05.24	RCO	UPDATED TO CLIENT COMMENTS	
UR1	17.05.24	RCO	UNDER REVIEW	

CURRENT REVISION CONTRACTOR: CURRENT REV PROJECT:

CURRENT REV AUTHORISED

SIGNATURE

DESIGN PANEL

DESIGNED	AUTHORISED
DRAWN	SIGNATURE
REVIEWED	
CONTRACTOR:	

SA Water

This drawing is the property of the SOUTH AUSTRALIAN WATER CORPORATION and shall not be copied or modified in part or in whole without authorization.

EYRE PENINSULA DESALINATION PLANT
MARINE INTAKE PUMP STATION AND INLAND INTAKE PIPELINE
CIVIL
WET WELL
GENERAL ARRANGEMENT

A1 SHT SIZE

TOTAL SHEETS: X

PROJECT No:

UR2 REVISION

MAXIMO ID:

SUPERSEDES:

DRAWING NUMBER

3.1.3.2 Marine Intake and Outfall Pipelines (Element 3)

Marine infrastructure is proposed to be constructed by micro tunnelling from obsolete lagoons within the WWTP, under the shoreline and into the marine environment. Tunnelling would be undertaken by a TBM from a depth of 12.9 mBGL at the TBM launch shaft location within the lagoons. Upon completion of the tunnelling, this shaft would be converted into the wet well for the marine intake and outfall pump station (discussed above in Section 3.1.3.1).

The tunnel is expected to run 500 m from the wet well to the marine environment. Upon exiting the tunnel, marine intake and outfall pipelines would be laid on the seabed and anchored in place with concrete collars.

The proposed built form within the adjacent the coastal and marine environments would include the following:

- Two raw seawater intake pipelines (DN900 millimetre (mm), existing 600 m and 660 m offshore). Pipelines would be constructed of high-density polyethylene. It is intended that one intake would be for duty and one intake for standby
- Two intake screens (copper-nickel) – one to be attached to each intake pipeline. Screens would have a 90 mm screening aperture and would support an intake velocity of 0.15 metres per section (m/s)
- Fouling control through chlorine or acid shock dosing at the beginning of each seawater intake pipeline
- One marine outfall pipeline (DN900 mm, 1,029m offshore). Pipeline would be constructed of high-density polyethylene
- One outfall pipe with 16 duck bill diffuser ports at 6 m intervals for ultimate capacity with 12 ports to be used for 5.3 GL/annum operation
- Pipeline mechanical cleaning (known as pigging) through a launching and retrieval mechanism.

The preliminary pipeline layout is shown in Figure 3.3.

MARINE INFRASTRUCTURE -LAYOUT PLAN

SCALE 1:2000

NOTES

1. BATHYMETRY AND GEOPHYSICAL SURVEY SUPPLIED BY MES AND RELATIVE TO AHD., REFERENCE 'SADesal23_GDA2020-53_AHD_2m_MA.xyz'. GEOPHYSICAL INTERPRETATION ON DRAWING IS ONLY SHOWN FOR INDICATIVE PURPOSES, TO BE CONFIRMED BY THE CONTRACTOR.
2. TERRESTRIAL INTAKE PIPELINE BETWEEN SEAWATER INTAKE PUMP STATION AND DESALINATION PLANT TO BE DN1000 HDPE SDR21 PE100.
3. FINAL EXTENT OF SHORE ZONE CROSSING TUNNEL TO BE DEFINED FROM NEW GEOTECHNICAL SURVEY DATA.
4. INTAKE TOWER STRUCTURES (2 NO.), ONE ON OFFSHORE END OF EACH SEAWATER INTAKE PIPELINE. REFER EPDP-200-AED-CIV-M3D-0001-INTAKE-TOWERS DRAWINGS
5. SEAWATER MARINE INTAKE PIPELINES (2 NO.) TO BE DN900 SDR21 HDPE PE100.
6. ALL PIPELINES SHALL BE ACCOMODATED- WITHIN THE TUNNEL THROUGH THE SHORE ZONE CROSSING. REFER SHEET EPDP-300-AED-CIV-SKT-2001.
7. FINAL ARRANGEMENT OF MARINE PIPELINE SYSTEMS IS BASED ON PIPELINES HYDRAULICS.
8. BRINE OUTFALL PIPELINE (1 NO.) TO BE DN900 SDR21 HDPE PE100.
9. OUTFALL DIFFUSER (1 NO.) ON OFFSHORE END OF BRINE DISCHARGE PIPELINE, REFER SHEET EPDP-500-AED-CIV-SKT-1002.
10. ALL DESIGN ASPECTS TO BE CONFIRMED DURING FUTURE STAGES OF DESIGN.
11. FOR VERTICAL LEVEL DATA REFER PIPELINE LONGITUDINAL SECTION DRAWINGS:
    MARINE INTAKE PIPELINE SYSTEM - PLAN & LONG SECTION (2 DRAWINGS)
    MARINE OUTFALL PIPELINE SYSTEM - PLAN & LONG SECTION (2 DRAWINGS)
12. THE GEOGRAPHYC COORDINATE SYSTEM IS GDA2020 UTM ZONE 53S
13. THE ALTIMETRIC SYSTEM IS REFERENCED TO THEAUSTRALIAN HEIGHT DATUM (AHD)
14. THESE DRAWINGS WILL HAVE TO BE REVIEWED IN ACCORDANCE WITH THE RESULTS OF THE ONGOING MARINE GEOTECHNICAL INVESTIGATION

NOT FOR CONSTRUCTION. PRELIMINARY DRAWING FOR INFORMATION ONLY

ISSUED FOR DEVELOPMENT APPLICATION

EPDP-200-AED-CIV-DRG-1001

0 20 40 80 120
1 : 2,000m (A1) - 1 : 4,000m (A3)

REVISION PANEL

REV	DATE	DRN	DETAILS	APR'D
UR3	29/05/24	PRL	UPDATE TO CLIENTS COMMENTS	THG
UR2	15/05/24	PRL	AS INDICATED	THG
UR1	12/04/24	PRL	AS INDICATED	THG

CURRENT REVISION CONTRACTOR:

CURRENT REV AUTHORISED

SIGNATURE

DESIGN PANEL

DESIGNED	AUTHORISED
DRAWN	SIGNATURE
REVIEWED	
CONTRACTOR:	

SA Water

Government of South Australia

EYRE PENINSULA DESALINATION PLANT
MARINE INTAKE PUMP STATION AND PIPELINES
MARINE
MARINE INFRASTRUCTURE
LAYOUT PLAN

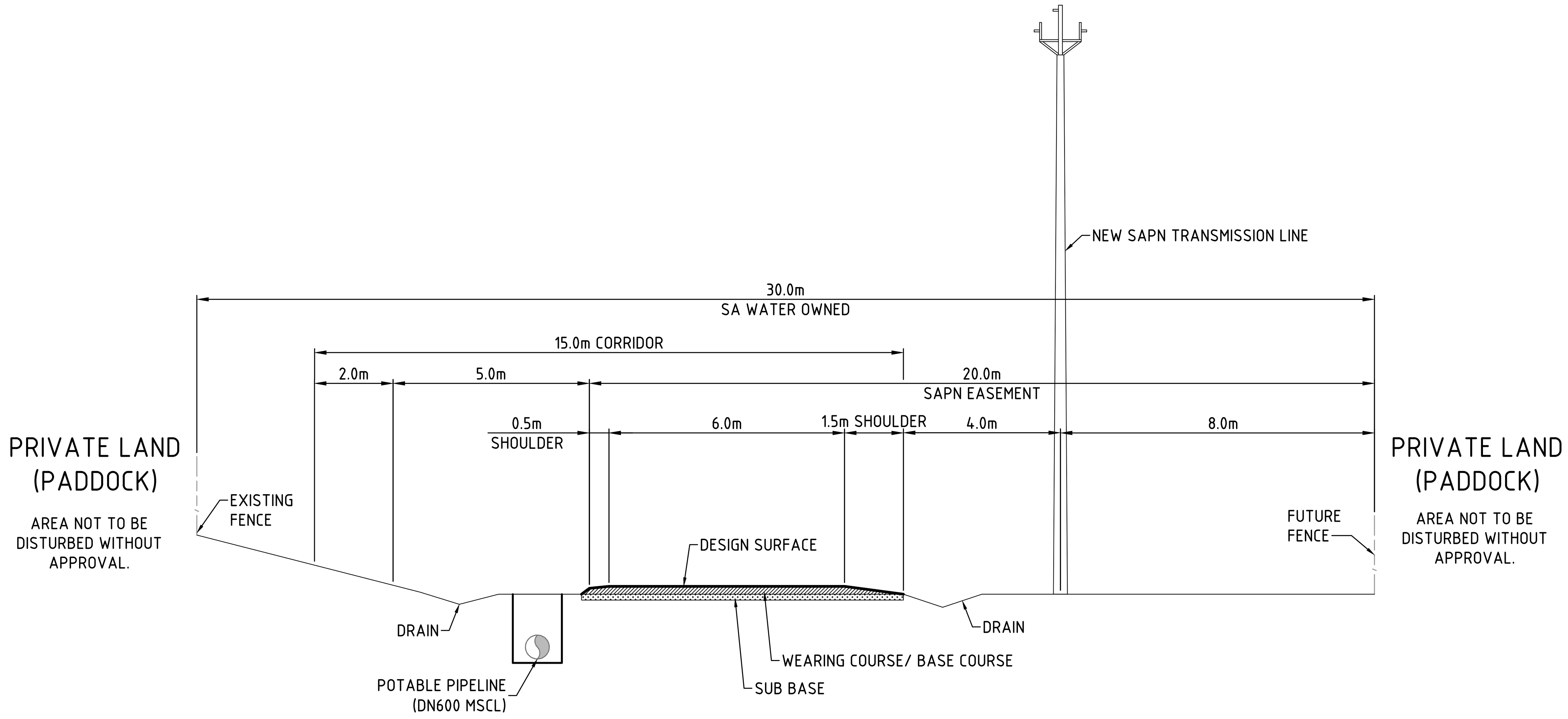
A1 SHT SIZE	MAXIMO ID:	UR3 REVISION
	PROJECT No:	
TOTAL SHEETS:	DISCIPLINE:	
SUPERSEDES:		
DRAWING NUMBER		
YEAR –	NUMBER –	SHEET

3.1.4 Desalinated Water Transfer Pipeline (DWTP)

Drinking water/water supplies would be transferred from the RO desalination plant to the SA Water network via a seven km long, DN600 mm underground pipeline (the DWTP) to the existing SA Water North Side Hill tanks on Blue Fin Road, Duck Ponds. From there, drinking water/water supplies would be distributed to customers via the existing SA Water network infrastructure.

The proposed DWTP has been designed to align with existing roadways where possible. Generally, the pipeline would be offset 0.5 m from the edge of the road and buried in a one m wide trench within the existing road shoulder. A typical cross section for the pipeline is show in Figure 3.4.

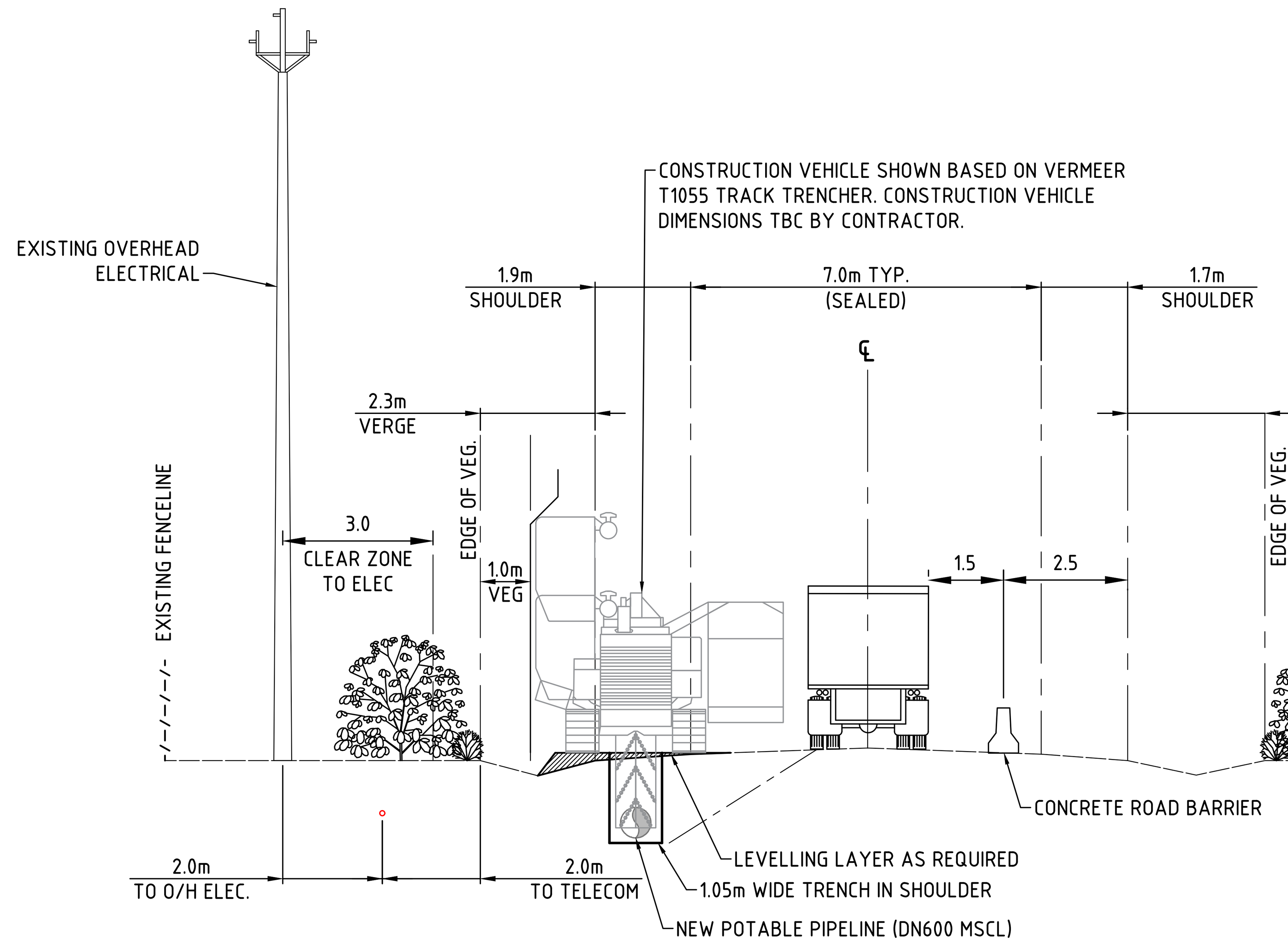
As the seven km of pipeline is largely underground, it therefore falls under a Schedule 13 exemption of the PDI Regulations and therefore does not require development approval under the PDI Act. The exemptions are outlined further in Section 4.8.



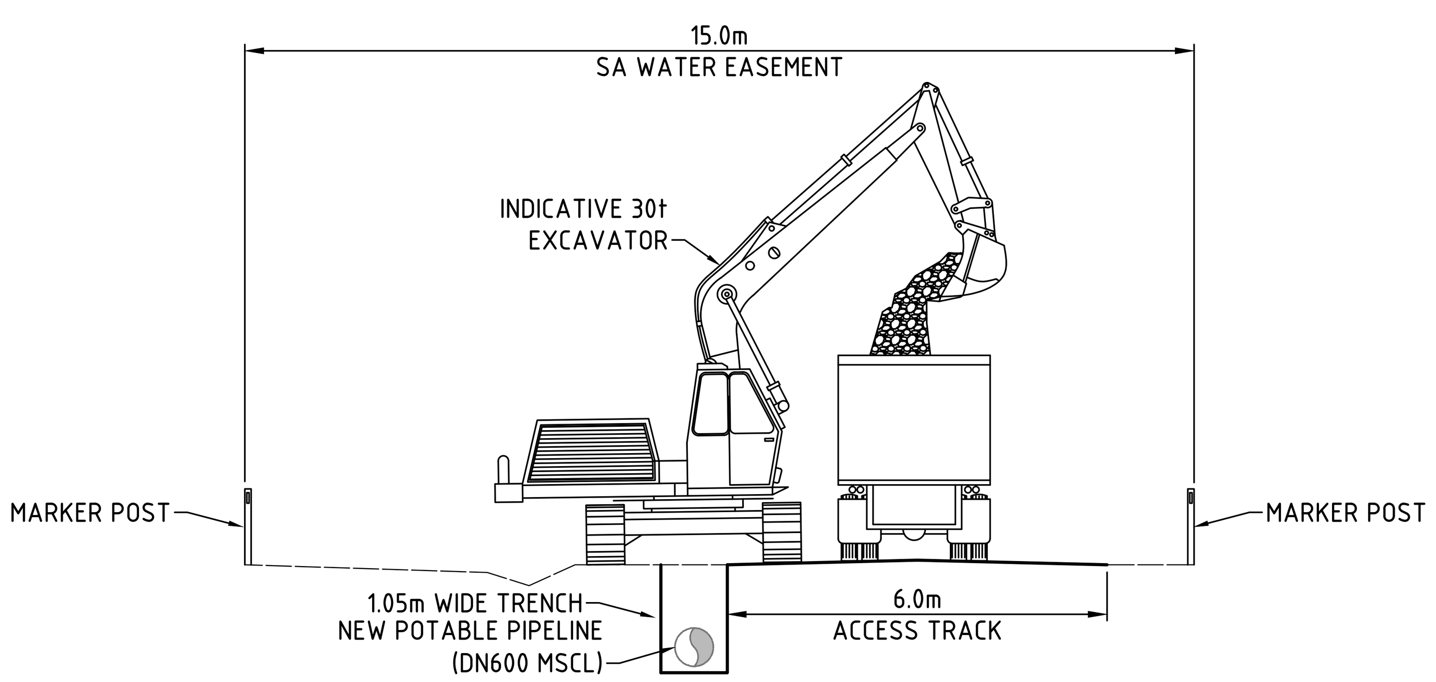
TYPICAL CROSS SECTION 'A'
DESALINATION PLANT ACCESS ROAD
SCALE 1:100

NOTES:

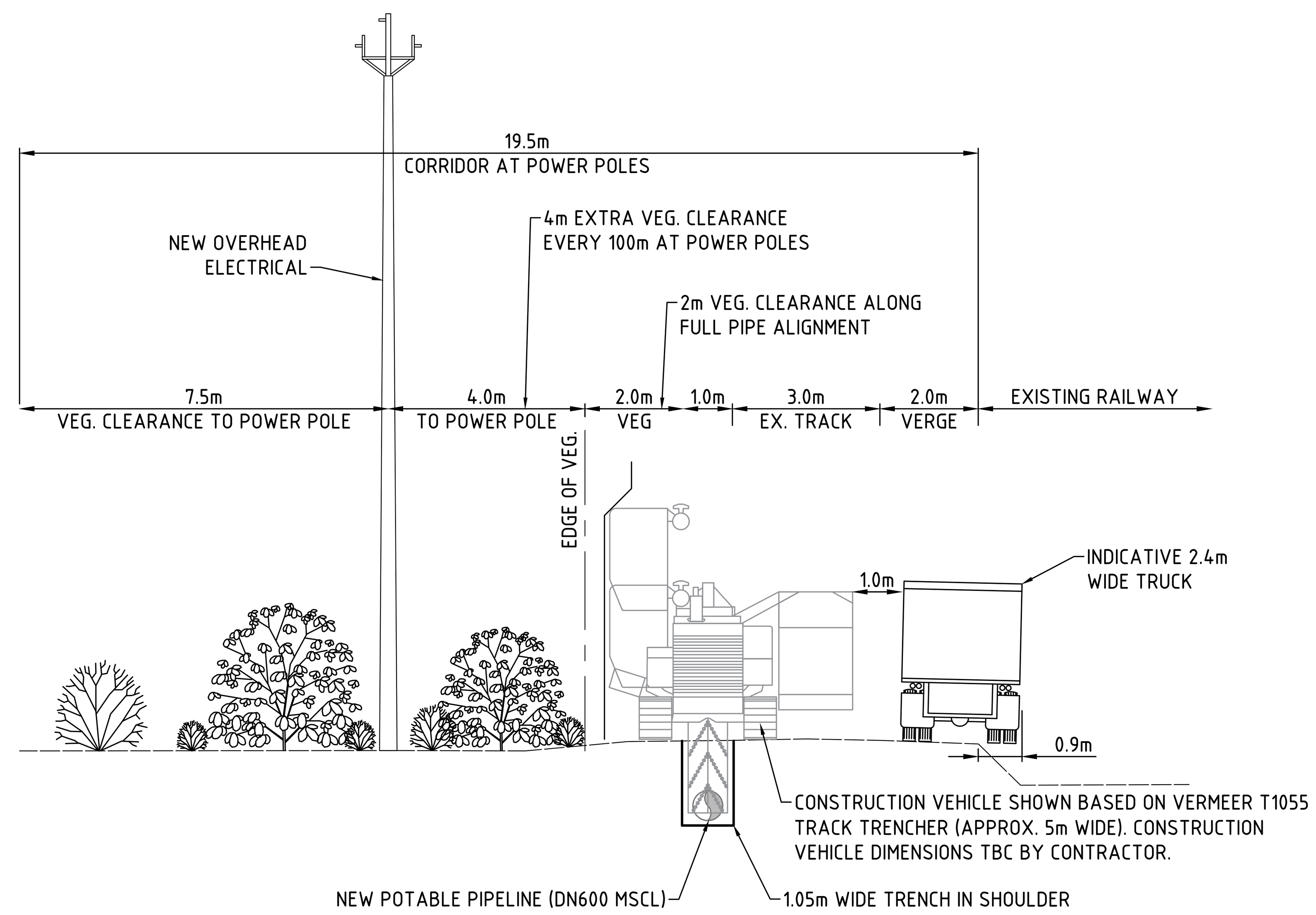
1. ALL DIMENSIONS ARE NOMINAL ONLY AND SUBJECT TO CONFIRMATION DURING THE DESIGN DEVELOPMENT..
2. DRAINAGE ASSETS ARE SHOWN AS ARE NOMINAL ONLY AND SUBJECT TO CONFIRMATION DURING THE DESIGN DEVELOPMENT.
3. DESIGN TO BE COMPLIANT WITH RELEVANT AUSTRALIAN STANDARDS AND SA WATER TECHNICAL STANDARDS, TECHNICAL GUIDELINES AND TECHNICAL SPECIFICATIONS.



TYPICAL CROSS SECTION 'C'
PIPELINE IN SEALED ROAD
SCALE 1:100
DIMENSIONS SHOWN MAY VARY ALONG EXISTING ROAD.



TYPICAL CROSS SECTION 'B'
PIPE IN EASEMENT (PRIVATE PROPERTY)
SCALE 1:100



TYPICAL CROSS SECTION 'D'
PIPELINE IN UNSEALED ROAD
SCALE 1:100
DIMENSIONS SHOWN MAY VARY ALONG EXISTING ROAD.

NOT FOR CONSTRUCTION

0 1 2 4 6
1 : 100m (A1) - 1 : 200m (A3)

REVISION PANEL

REV	DATE	DRN	DETAILS	APPR'D
0.1D	20.02.23	CSS	RE-ISSUED FOR CLIENT COMMENT	
0.1C	21.10.22	CSS	RE-ISSUED FOR INFORMATION	
0.1B	05.10.22	CSS	ISSUED FOR INFORMATION	
0.1A	08.09.22	CSS	ISSUED FOR STAKEHOLDER ENGAGEMENT	

CURRENT REV CONTRACTOR: TONKIN / WSP — CURRENT REV PROJECT: 220258

CURRENT REV AUTHORISED

SIGNATURE

DESIGN PANEL

DESIGNED	21.10.2022	L.HAYSMAN	AUTHORISED
DRAWN	21.10.2022	C.SUTCLIFFE	SIGNATURE
REVIEWED	21.10.2022	P.SWINCER	

CONTRACTOR: TONKIN / WSP

Government of South Australia — SA Water

EYRE PENINSULA DESALINATION PLANT

POTABLE WATER TRANSFER PIPELINE
CIVIL
TYPICAL CONSTRUCTION CORRIDOR DETAILS

SHT SIZE	A1
TOTAL SHEETS:	
REVISION	0.1D
PROJECT No:	A0012-0025
MAXIMO ID:	TBC BY SA WATER
SUPERSEDES:	
DRAWING NUMBER	A0012-0025-PKGC-DET-SKH-009

3.1.5 Electricity transmission Line

The RO desalination plant would be connected to the South Australian energy grid via a 11 kilovolt (kV) overhead transmission line, to be constructed by SA Water in an easement extending west of the RO desalination plant and terminating at Windsor Avenue. The overhead transmission line would be approximately 3.5 km in length and supported by 32 monopoles no greater than 13 m aboveground.

From Windsor Avenue, SAPN would continue the connection via two 11 kV overhead transmission lines; one connecting to the existing SAPN Port Lincoln City Substation on Sleaford Terrace and one connecting to an existing SAPN Port Lincoln Marina Substation on Wingard Terrace. These two SAPN transmission lines do not form part of this development application.

3.2 The Seawater Desalination Process

The proposed RO desalination plant is expected to operate as follows:

1. Intake and pre-treatment – seawater is drawn into the marine intake pipelines and pumped through installed intake screens and filters to remove particles, before passing through an ultrafiltration membrane and being sent to the RO desalination plant via the marine intake and outfall pump station and underground saline waste transfer pipeline.
2. Reverse osmosis – at the RO desalination plant, a reverse osmosis process occurs to desalinate the seawater; whereby the seawater is passed through semi-permeable membranes which allow the small water molecules to easily pass through but block larger salt molecules, resulting in the removal of impurities and salt in the water. The rejected salt and impurities result in a concentrated saline waste, which is transferred back to the marine intake and outfall pumpstation via the saline waste transfer pipeline, then returned to the ocean through the marine outfall pipe and diffusers to ensure it reaches the natural salinity levels of the receiving environment.
3. Post-treatment – the desalinated water is disinfected and re-mineralised to increase alkalinity to reduce the potential for corrosion in the SA Water network infrastructure and customers' plumbing. Water is treated to a safe drinking level; compliant with Australian Drinking Water Guidelines.
4. Storage – the clean drinking water is then stored within a treated water storage tank located within the RO desalination plant site, of quality ready to be supplied to homes and businesses.
5. Transfer – the clean drinking water is transferred to SA Waters North Side Hill tanks via the underground DWTP.
6. Distribution – clean, fresh water is then ready to be distributed through SA Waters existing network to customers.

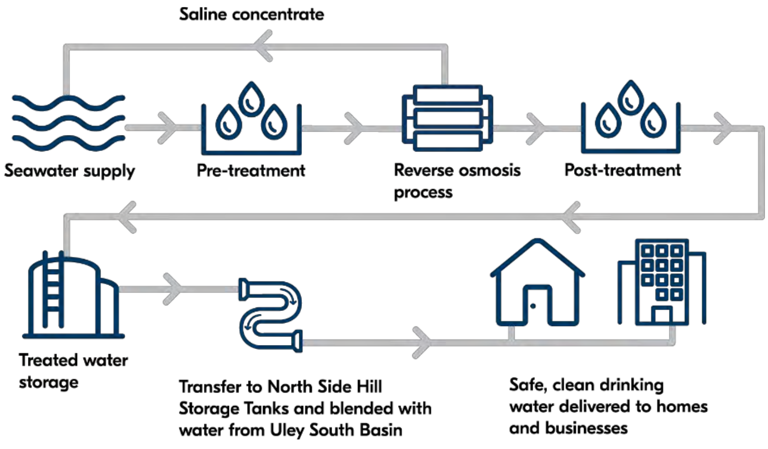


Figure 3.5 Desalination Process Diagram

4 Procedural Matters

4.1 Need for Development Approval

The PDI Act and PDI Regulations are the relevant legislative instruments facilitating planning and development in South Australia. The PDI Act requires that development approval must be sought and obtained prior to undertaking any form of development, generally defined as a change in the use of land, building work or the division of an allotment.

The proposed Project, consisting of both building work and a change in land use, is categorised as development and therefore requires approval pursuant to the PDI Act and associated regulations.

The DWTP between the proposed RO desalination plant and North Side Hill tanks is exempt from approval Under Schedule 13 (1)(c) of the PDI Regulations; which provides that State agency development, where the works involve the construction, reconstruction, alteration, repair or maintenance of any drain, pipe or underground cable, is exempt from requiring approval under the PDI Act. The overhead transmission line between the RO desalination plant and Windsor Avenue is also exempt from requiring approval under Schedule 13(2)(1)(n) of the PDI Regulations; which provides that State agency development, where the works involve the construction, reconstruction or alteration of an electricity power line, other than a transmission line of 33 000 volts or more, is exempt from requiring approval under the PDI Act. Despite these exemptions, due to these each of these components being linked to the RO desalination plant and that a native vegetation clearance application will be required to support their development, these components have been included within this development application for completeness.

Further to infrastructure proposed by SA Water under this development application, an overhead transmission line will be developed by SAPN to connect SA Water's overhead transmission line to the existing Port Lincoln City Substation and Port Lincoln Marine Substation. It is expected that these works will be considered exempt under Schedule 13 of the PDI Regulations, except if the final location of the cable alignment intersects the Heritage Adjacency Overlay (discussed further in Section 8.2.4); in which case a development application may be required for potential impacts to a State heritage place. If required, development approval would be sought under a separate application by SAPN or its contractors.

4.2 Overall Development Benefits

The benefits of the proposed development include:

- Providing secure, safe and reliable drinking water to the City of Port Lincoln and surrounds of Eyre Peninsula.
- Supporting ongoing operations of primary production, tourism and government facilities.
- Enabling sufficient water supplies to fight bushfires.
- Incorporating a design of marine works and pipeline infrastructure to accommodate potential future demands up to eight GL/annum.
- Providing for local industry participation and capacity building through the development and construction of the Project.
- Support future economic growth in the lower Eyre Peninsula region.

4.3 Development Cost

The proposed development is expected to cost up to $330 million.

4.4 Development Assessment Pathway

This development application is subject to assessment pursuant to the PDI Act and associated PDI Regulations.

As the Project proposes the development of essential infrastructure by a State agency, this development application seeks assessment through the Crown assessment pathway under Section 131 of the PDI Act. SA Water are not seeking assessment through an impact assessment declaration. The rationale for the development assessment pathway is provided in Section 4.4.1.

As part of the Crown assessment pathway, the development application should address the relevant policies of the P&D Code and State Planning Policy (SPP). When making a decision on the application, the decision maker, being the Minister for Planning (the Minister) should have regard to the P&D Code and all other relevant planning policy.

4.4.1 Alternative Assessment Pathways

As SA Water is a Crown agency, with Section 131 as the available assessment pathway, SA Water has not sought an impact assessment declaration by the Minister (pursuant to Sections 108(a),(b) or (c) and 111 of the PDI Act). The proposal is also not by Regulation 27(1) of the PDI Regulations an impact assessed development.

This development application has been prepared to address the nature, scale and extent of any impacts and the sensitivity of the receiving environment of the Project. The technical studies for the Project (discussed in Section 7) have been drivers of the design and engineering for the Project, in conjunction with feedback from regulatory agencies.

The impact assessments are comprehensive and include consideration of matters appropriate to those required if the proposal was subject to a formal declaration as an impact assessed development, as outlined in the principles prescribed by Section 108 (9) of the PDI Act and Regulation 27(2) of the PDI Regulations. These principles are addressed below in Table 4.1.

Table 4.1 Principles of Impact Assessed Development as per Section 108 (9) of the PDI Act and Regulation 27(2) of the PDI Regulations

Principle	Summary Response	Section Reference
The character of the receiving environment	The Project is proposed within the City of Port Lincoln on a brownfield coastal land parcel and existing SA Water site adjacent to the multi-user marine system and industries. The character of the receiving environment has been considered by the development proposal within this development application.	Section 7, in particular Section 7.9 (marine)
The potential social, economic and environmental impacts of the development or project	The potential social, economic and environmental impacts have been considered by the development proposal within this development application.	Social/ economic impacts: Section 9.2 and 9.3 Environmental impacts: Section 8.3
The resilience of the environment to cope with change	The resilience of the local environment has been considered within this development application.	Section 8.2 and 8.3

Principle	Summary Response	Section Reference
The degree of confidence in the prediction of impacts resulting from the development or project	Multiple studies have been undertaken to inform the impact assessment for the proposed development. This has allowed the impact assessment to be based upon robust and scientifically valid data, allow confidence in its conclusions, whilst also responding to the requirements of the regulators.	Section 8.2 and 8.3
The extent to which undesirable impacts which may occur are likely to be irreversible	The data collection and baseline studies have ensured that mitigation in the design process has been integral to the minimisation of impacts on the environment. Key high impact activities have been removed and/or reduced e.g. reducing the use of undisturbed areas and utilising construction methods such as tunnelling rather than trenching through sensitive habitats.	Section 8.2 and 8.3
The extent to which impacts, and requirements for monitoring and assessing impacts, will be ongoing;	The proposed development will be subject to ongoing monitoring and impact assessment, given that seawater supply is fundamental to provision of desalinated water. The ongoing monitoring program is discussed in further detail in Section 8.3.8 within this development application.	Section 8.2 and 8.3
The presence of other statutory assessment or policy frameworks which provide other procedures or processes to address any issues of concern	The P&D Code is best placed to assess the proposal, along with the expected social, economic and environmental requirements of regulators (e.g. referrals to other statutory authorities, including the EPA). Notwithstanding this, there are two matters which fall outside this application and which will be subject to separate parallel processes: • Aboriginal cultural heritage matters are being addressed by way of a Section 21 and Section 23 Authorisation request which SA Water has lodged under the *Aboriginal Heritage Act 1988* seeking authorisation of the Minister for Aboriginal Affairs to damage, disturb or interfere with any Aboriginal site or object, where this cannot be avoided by Project design or construction methodology; • The criteria for significant impacts to Matters of National Environmental Significance (MNES) have been applied to the Protected Matters identified within the assessment of the Project. Based on the targeted fauna and flora surveys and habitat assessments undertaken for the Project, the results indicate that the Project is not expected to significantly impact upon MNES. Regardless, SA Water out of an abundance of caution, will submit an EPBC Self-Referral to the Department of Climate Change, Energy, the Environment and Water (DCCEEW).	

4.5 Relevant Authority

The development application will be lodged with the State Commission Assessment Panel (SCAP) for assessment against the P&D Code and all other relevant matters (discussed in Section 8.1) in a Development Assessment Report prepared by PLUS.

SCAP would consider the development application and hold a public hearing.

SCAP then make a recommendation to the Minister or their delegate as the relevant authority for a decision on the proposed development.

4.6 Statutory Referrals

The development application is likely to be referred to the following bodies for comment, under P&D Code and Schedule 9 of the PDI Regulations as part of the development application process:

- Coast Protection Board (CPB)
- Native Vegetation Council (NVC)
- South Australian Environment Protection Authority (EPA)
- SA Country Fire Service (CFS)
- Department for Environment and Water (DEW)
- City of Port Lincoln (under Section 131(6) of the PDI Act)
- Lower Eyre Peninsula Council (under Section 131(6) of the PDI Act).

Other State government agencies expected to be given an informal referral as a whole of government assessment process include Primary Industries and Regions SA (PIRSA) relating to aquaculture licences within the bays adjacent to the proposal, and the EPLB in relation to the natural resources, water management and cultural heritage.

4.7 Ancillary Approvals

Other environmental approvals, authorisations and permits may be required in the construction and operational phases of the Project. Likely ancillary approvals are detailed in Table 4.2.

Table 4.2 Ancillary Approvals

Approval or Permit	Relevant Legislation	Statutory Authority	Relevance	Requirement
Assessment against the Building Rules	*Planning, Development and Infrastructure Act 2016*	Building Certifier (under the PDI Act)	Under the relevant planning legislation, development which constitutes 'building work' requires assessment against the Building Rules.	Required
Environment Authorisation to undertake a prescribed activity of environmental significance	*Environment Protection Act 1993* (EP Act)	Environment Protection Authority	Prescribed activities of environmental significance require a licence or exemption under the EP Act.	Required for the RO desalination plant, as well dredging and any concrete batching works that may be required during construction (though are not currently proposed under this development application).
Native vegetation clearance approval	*Native Vegetation Act 1991* (NV Act)	Native Vegetation Council	The removal of native vegetation, including marine vegetation, requires approval under the NV Act.	Required, as the Project involves the clearance of native vegetation protected under the NV Act.

Approval or Permit	Relevant Legislation	Statutory Authority	Relevance	Requirement
EPBC Referral	*Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)	Minister for the Environment (Commonwealth)	Required for potential significant impacts to Matters of National Environmental Significance.	May be required. Assessments have not identified that the Project is likely to result in significant impacts to MNES, however out of an abundance of caution, a Self-Referral will be sent to DCCEEW for formal review.
Water Affecting Activities Permit	*Landscape South Australia Act 2019* (LSA Act)	Department for Environment and Water	Required for obstructing or excavating a watercourse, or removal of vegetation in a watercourse.	May be required for construction of the DWTP across watercourses.
Section 21/23 authorisations	*Aboriginal Heritage Act 1988*	Minister for Aboriginal Affairs	Required for any damage, disturbance or interference with Aboriginal sites, objects or remains (where otherwise unavoidable).	Has been lodged – April 2024
Crown Land License or Easement	*Crown Land Management Act 2009*	Department for Environment and Water	Allows an organisation the right to use a specified portion of Crown land for a specific purpose (i.e. installation of jetties).	May be required for marine pipelines, as these are on land owned by a Minister. Flinders Ports have care and control.
Approval to use navigation channels	*Harbors and Navigation Act 1993*	Department for Infrastructure and Transport (DIT)	Allows an organisation the right to occupy navigation channels.	May be required for the placement of marine intake and outfall pipelines.
Oversize Overmass Permit	*Heavy Vehicle National Law (South Australia) Act 2013*	National Heavy Vehicle Regulator	Required if vehicles exceed the gazetted mass, dimension or operating requirements of roads.	May be required depending on final vehicle requirements for transport of components.
Dangerous Goods License	*Dangerous Substances Act 1979*	Safework SA	Required to keep, handle, transport, convey, use and dispose of dangerous substances.	May be required due to the volume of dangerous substances to be stored and transported for desalination works.

Approval or Permit	Relevant Legislation	Statutory Authority	Relevance	Requirement
Wastewater Works Approval	*South Australian Public Health Act 2011*	SA Health	For on-site wastewater systems	Required for any wastewater systems proposed as part of the Project.

The relevant construction contractor would be required to obtain all other work permits and approvals from relevant authorities required for construction, prior to commencing works. All operational permits will be sought by SA Water or its contractors.

4.8 Exempt Development

Schedule 13 of the PDI Regulations details exemptions for certain activities undertaken by a State agency, where development approval is not required, provided prescribed provisions are met.

Table 4.3 details components of the Project and supporting services that are exempt under Schedule 13 of the PDI Regulations

Table 4.3 Exempt Elements of the Proposed Development

Element	Schedule 13 exemption
Road alterations associated with the Project	Schedule 13, clause 2(1)(a)(i)[2]: '*the reconstruction (including widening), alteration, repair or maintenance of any road, bridge, railway, tramway, wharf, jetty or boat ramp (including pump-out facilities associated with a boat ramp)*'.
Any fully underground pump stations associated with the Project. Note that this does not apply to the main marine intake and outfall pump station, as pumps are open to the air.	Schedule 13, clause 2(1)(b)(xi)[3]: '*the construction, reconstruction or alteration of or addition to, a building which is to be located wholly underground*'.
Overhead transmission line between the RO desalination plant and Windsor Avenue	Schedule 13, clause 2(1)(n): '*the construction, reconstruction or alteration of an electricity power line, other than a transmission line of 33 000 volts or more*'.
Desalinated water transfer pipeline	Exempt – Schedule 13, clause 2(1)(c)[4]: '*the construction, reconstruction, alteration, repair or maintenance of any drain, pipe or underground cable*'.

2 *Where the proposed development is located under the Coastal Areas Overlay or land otherwise subjected to coastal processes, the exemption only applies where the CPB has authorised the relevant development (Schedule 13, clause 2(2)).*
3 *As above*
4 *As above*

5 Strategic Context

5.1 Legislative References

The PDI Act and associated PDI Regulations are the relevant legislation for assessment and approval of the proposed development.

SA Water is established as a corporation under the *South Australian Water Corporation Act 1994* and is a statutory corporation to which the provisions of the *Public Corporations Act 1993* apply. SA Waters operations, including the development and operation of the proposed Project are primarily managed under the *Water Industry Act 2012, Safe Drinking Water Act 2011, South Australian Public Health Act 2011* and the *Work, Health and Safety Act 2012.*

5.2 Development Application Rationale

SA Water is responsible for the water security, sustainability and management of existing water sources on Eyre Peninsula.

In 2007, SA Water began working with the Eyre Peninsula community to prepare a long-term water plan for the region; the Long Term Plan (2008)). The Long Term Plan identified seawater desalination as the preferred future supply option to ensure drinking water security for approximately 35,000 customers living and working in the region.

The profile of water usage on Eyre Peninsula is different to most of the other areas in South Australia, with approximately a third being industrial, a third being primary production and a third being residential and other users.

Drinking water on the Eyre Peninsula is currently sourced from groundwater (primarily the Uley South Basin), the River Murray, or a combination of both; as shown in Figure 5.1. In future, this would be largely replaced with water from the proposed RO desalination plant.

Figure 5.1 Current Drinking Water Sources on the Eyre Peninsula (SA Water, 2024)

The Eyre Peninsula's most important groundwater source and current primary source of drinking water – the Uley South Basin – is under stress, with water currently being drawn from the aquifer at unsustainable rates. The recharging of the Uley South Basin is reliant on direct rain to the area. If water extraction at current rates continues beyond the mid-2020s, forecast modelling shows there is an increasing risk of further decline and potential irreversible salinisation from seawater intrusion, meaning the basin would no longer be able to supply drinking water to the region.

The climate-independent supply from the proposed RO desalination plant would provide more water security for local residents, businesses and primary producers, and give the Uley South Basin opportunity to recharge.

Agricultural activity is reliant on water availability, with years of drought and low rainfall impacting regional areas. It is expected that the Project would make way for the provision of access to mains water for agricultural activities, to provide for climate change resilience and less reliance on southern groundwater basins. Furthermore, the desalination process is expected to provide better water quality in comparison to the hard water from groundwater basins, alone.

Revision of Eyre Peninsula Water Allocation Plan

This development proposal represents a response by SA Water to the water security concerns which have been raised by the EPLB.

On 10 April 2024, the EPLB decided to initiate the revision of the Water Allocation Plan for Eyre Peninsula. The EPLB stated this decision was based on scientific information provided by DEW on the health of the region's prescribed groundwater resources.

DEWs research highlighted decreasing long-term rainfall across the Uley South, Uley Wanilla and Lincoln Basins (shown in Figure 5.2), despite rainfall being well above the average in 2021/22.

Under the revised Water Allocation Plan, permitted extraction from the basins and the related allowance for SA Water extraction is expected to be significantly reduced, due to the basins being under significant stress. Further unsustainable extraction would not be appropriate management of the basins.

Figure 5.2 Southern Water Basins That Currently Supply the Eyre Peninsula (Landscape South Australia - Eyre Peninsula, 2024)

5.3 Development Application Objective

The key objective of this development application is to provide a climate independent water source for Port Lincoln and the wider Eyre Peninsula in a manner that minimises the impacts on the natural resources of the area.

In South Australia's changing and uncertain climate, the Project would support SA Water in building system resilience to face extreme weather events, whilst also supporting affordability and sufficient supply to meet ongoing water security needs.

5.4 Strategic Land Use Context

5.4.1 State Planning Policy

The SPP are a statutory instrument formed under the PDI Act, that outlines principles of good planning with long-term focus, sustainability, investment facilitation and integrated delivery underpinning the themes for development.

The following SPPs are relevant to the proposed development:

State Planning Policy 4: Biodiversity

The objective of SPP 4 seeks to 'maintain and improve our state's biodiversity and its life supporting functions'.

Relevant policies under SPP 4 include:

- 4.2. 'Recognise the value of modified landscapes and allow appropriately scaled development that can co-exist with and safeguard biodiversity values and critical functions'
- 4.5 'Where impacts to biodiversity cannot be avoided, these impacts should be minimised and where possible, offset'.

State Planning Policy 5: Climate Change

The objective SPP 5 is to 'provide for development that is climate ready so that our economy, communities and environment will be resilient to climate change impacts'.

Relevant policy under SPP 5 include:

- 5.4. 'Mitigate the impacts of rising temperatures by encouraging water sensitive urban design, green infrastructure and other design responses'.

State Planning Policy 7: Cultural Heritage

The objective of SPP 7 is to 'protect and conserve heritage places and areas for benefit of our present and future generations'.

Relevant policies under SPP 7 include:

- 7.1. 'The sensitive and respectful use of our culturally and historically significant places'
- 7.2. 'Recognise and protect Indigenous cultural heritage sites and areas of significance'
- 7.3. 'Recognise and protect places and areas of acknowledged heritage value for future generations'
- 7.5. 'Maintain the context of a place or area of heritage value through appropriate design guidelines that encourage compatible design solutions'
- 7.7. 'Provide certainty to landowners and the community about the planning processes for heritage identification, conservation and protection'.

State Planning Policy 13: Coastal Environment

The objective of SPP 13 is 'to protect and enhance the coastal and marine environment and ensure that development is not at risk from coastal hazards'.

Relevant policies under SPP 13 include:

- 13.3. 'Balance social and economic development outcomes in coastal areas with the protection of the environment'
- 13.4. 'Locate development and infrastructure in areas that are not subject to coastal hazards unless the development requires a coastal location and appropriate hazard mitigation strategies are in place, taking into account projected sea-level rise and coastal retreat'
- 13.5. 'Facilitate sustainable development that requires a coastal site, including eco-tourism, aquaculture, marinas, and ports, in areas adjoining the foreshore where environmental impacts can be avoided or mitigated'
- 13.6. 'Maintain or enhance the scenic amenity of important natural coastal landscapes, views, and vistas'
- 13.10. 'Support development that does not contribute to sediment, nutrients and contaminants entering the coast and marine environment'.

State Planning Policy 14: Water Security and Quality

The objective of SPP 14 is 'to ensure South Australia's water supply is able to support the needs of current and future generations'.

Relevant policies under SPP 14 include:

- 14.1. 'Protect the state's water supply to support a healthy environment, vibrant communities and a strong economy'
- 14.3. 'Safeguard our water supply and supporting infrastructure to meet the needs of a growing population and economy while maintaining a healthy environment and enabling safe access to alternative water sources for 'fit-for-purpose' use'.

State Planning Policy 15: Natural Hazards

The objective of SPP 15 is 'to build resilient communities, development and infrastructure from the adverse impacts of natural hazards'.

Relevant policies under SPP 15 include:

- 15.1. 'Identify and minimise the risk to people, property and the environment from exposure to natural hazards including extreme heat events; bushfire; terrestrial and coastal flooding; soil erosion; drought; dune drift; acid sulfate soils; including taking into account the impacts of climate change'
- 15.3. 'Avoid locating sensitive developments and communities in areas at high risk of hazards – namely hospitals, telecommunication towers, major transport infrastructure, energy base stations and water services – or ensure that these developments are subject to a higher level of assessment'
- 15.5. 'Protect key coastal areas and critical infrastructure at risk from sea-level rise, coastal erosion and storm surges'
- 15.5 'Avoid development in high or extreme hazard risk areas (such as bushfire risk areas) that will necessitate the removal of native vegetation'.

5.4.1.1 Response to State Planning Policies

The detail and intention of the SPPs are to underpin the policy objectives and performance outcomes of the P&D Code, addressed in Sections 8.1 and 8.3.1.

This development proposal represents the practical implementation of the policies through the P&D Code assessment process; with the proposed development having been influenced by technical assessments and other data gathered for the proposed locality and surrounds, over an extended period. Technical assessments are discussed in detail in Section 7.

5.4.2 Related Strategic Land Use policy

Planning for Climate Change – State Planning Commission – 2023

In 2023, the State Planning Commission (SPC) released a paper on climate change in South Australia and the role of the planning system in responding to the warming climate.

The paper states that South Australia would experience higher temperatures, drier weather and drought conditions with bushfire conditions as a result. Intense rain events and rising sea levels are also expected to occur as a result of climate change. The paper goes on to state that the planning system would use adaptation, mitigation and complementary approaches through planning interventions to 'deliver tangible climate change outcomes'.

The paper discusses a number of indicates that drought resilience through infrastructure is a planning system intervention which the proposed RO desalination plant is expected to be.

(Department for Trade and Investment, 2023)

Eyre and Western – country regional plan

The existing Eyre and Western Regional Plan (2012) identifies water security and alternative sources as issues to be addressed. Water resources in the region are noted as limited, with the Tod River as a permanent watercourse with little surface or run-off waters (Department of Planning, Transport and Infrastructure, 2012).

SPC undertook community engagement sessions in March 2023 to update the Eyre and Western Regional Plan. Some of the feedback and primary themes emerging from the engagement sessions were:

- population growth through migration
- increased food security
- sustainable agriculture
- circular economy.

An expected draft strategic land use plan for the Eyre and Western Region is due to the Minister in Q4 of 2024.

(Department for Trade and Investment, 2024)

5.4.3 Regional Water Supply Policy

Southern Eyre Subregional Description – Landscape Plan for Eyre Peninsula – Appendix C

The Southern Eyre Subregional Description is the EPLB's sub-regional landscape plan for Eyre Peninsula (Eyre Peninsula Landscape Board, 2021). The plan outlines the interrelationships between people, industries and natural resources; as reproduced in Figure 5.3.

The plan identifies water resources for townships and agriculture as critical to maintaining economic prosperity and social wellbeing of the community.

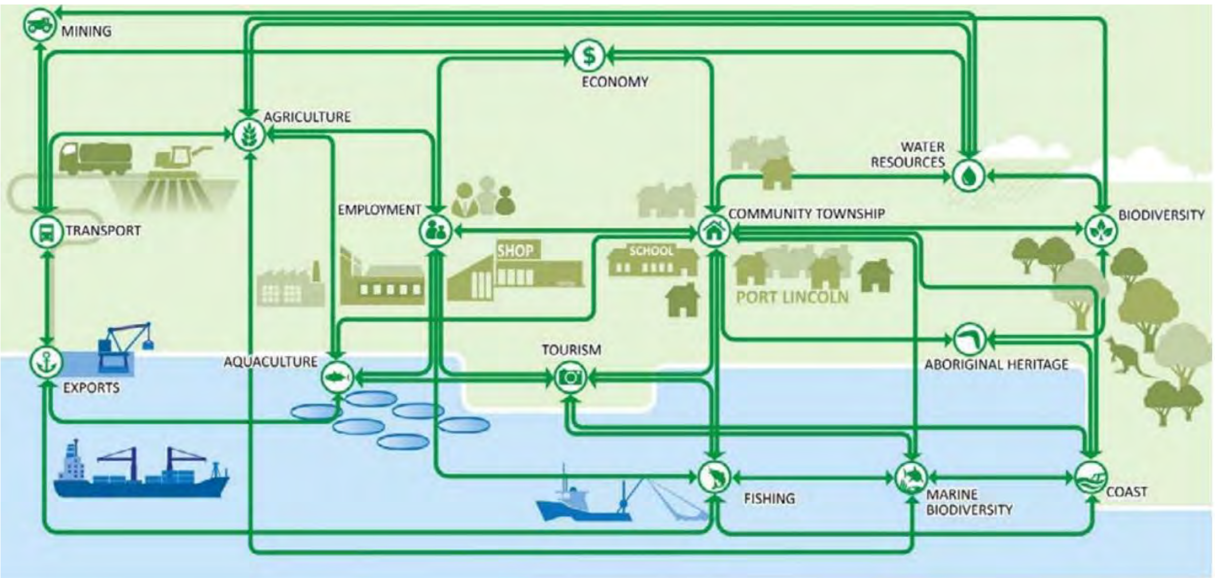


Figure 5.3 Interconnections of the Southern Eyre Region
(Eyre Peninsula Landscape Board, 2021)

The plan details the water cycle management in southern Eyre Peninsula from rain on wetlands and farmlands through groundwater, stock use, domestic use and stormwater through to the coast and marine environment (shown in Figure 5.4).

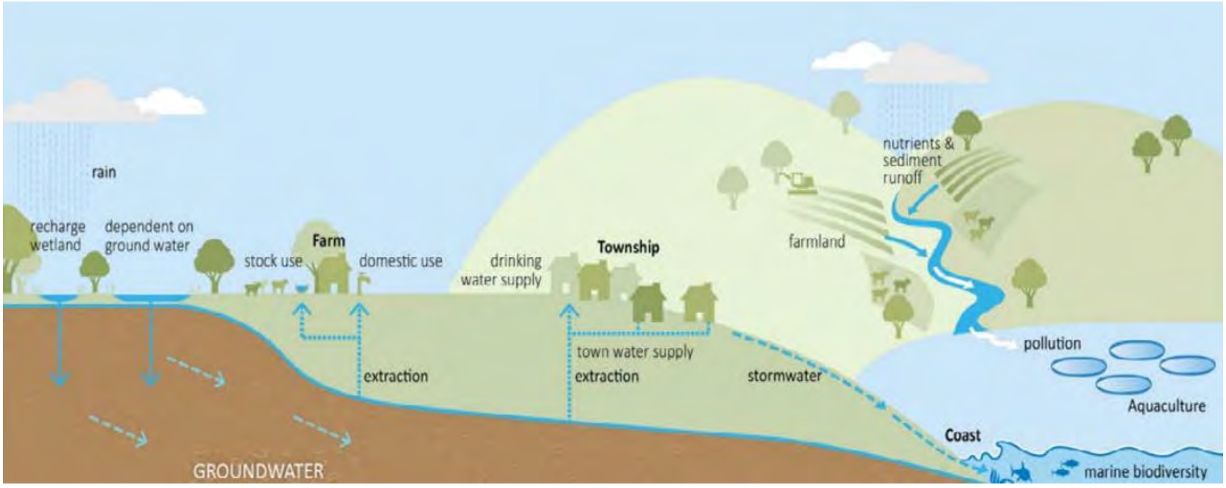


Figure 5.4 Water Cycle Management for Southern Eyre
(Eyre Peninsula Landscape Board, 2021)

Water Security Statement 2023 – Annual Water Security Update

In 2023, the Minister for Climate, Environment and Water released the Annual Water Security Update for South Australia detailing the regional water resources and challenges faced in the future under a changing climate, extreme weather events and the need to adapt to challenges.

The Water Security Statement 2023 states that climate resilience through adaptive management is fulfilled through regional water security strategies for the most at-risk resources in conjunction with the applicable Water Allocation Plans.

(Department for Environment and Water, 2023)

5.4.4 Regional Economic Development Policy

Regional Development South Australia

The Regional Blueprint 2023 by Regional Development South Australia identifies four priorities for South Australia's regions. These include:

1. Social capacity – workforce attraction, retention, training and support is expected to build a strong population base, local economy and a strong community
2. Infrastructure capability – seeking to enhance network infrastructure and maintain existing services
3. Economic prosperity – 80 per cent of South Australia's seafood and considerable amount of grain is exported from Eyre Peninsula
4. Environmental sustainability – nature based tourism, decarbonisation and responses to climate change through long-term management and mitigation.

The blueprint reports that since 2022, there has been an increase of 125 jobs and an increase in the value of pipeline projects by $14.02 billion.

(Regional Development South Australia, 2024)

City of Port Lincoln's Economic Development Strategy 2023–2026

The City of Port Lincoln adopted an Economic Development Strategy in February 2023 with five key themes:

- Building Partnerships
- Planning Growth
- Developing Capacity
- Growing Business
- Seeking Investment.

(City of Port Lincoln, 2023)

Main themes and findings within the strategy are as follows:

- While population growth has been relatively flat for over 10 years, the strategy acknowledges there has been an increase of seniors and retirees gravitating to the City of Port Lincoln; possibly due to the access to aged care facilities and services in the local area.
- Tuna fishing and aquaculture are significant drivers of the economy.
- A yearly average of 1.3 million tonnes of grain has been exported through the Port Lincoln wharf.
- The tourism drivers have been stronger given the need to holiday in Australia throughout the COVID-19 pandemic. Over 500 jobs and $50 million represented the tourism industry in the City of Port Lincoln council area economy.
- The landlocked nature of Port Lincoln; with residential development limited by the availability of greenfield land, an increased reliance on denser development is expected.
- Planning for growth (residential and business) is expected to be undertaken in conjunction with District Council of Lower Eyre Peninsula and District Council of Tumby Bay. Infrastructure planning for water security is part of the growth planning process.

5.4.5 Summary Response to Related Strategic Policies

The development proposal is expected to support the State and Local government policy intentions, whether related to climate change, strategic land use, landscape, water security or allocation and local economic development.

The provision of clean water supplies for households, businesses, primary production, schools, hospitals and prisons is essential to the ongoing sustainability of communities on the Eyre Peninsula.

6 Pre-lodgement Information Provision

The proposed development is expected to be publicly notified through the development assessment process by the SCAP. The notification period is expected to be at least 15 business days, given the scale and nature of the works within the local area.

Out of an abundance of caution, to provide information regarding the proposed works and expected process of desalination, SA Water has proactively provided information to the local community of Port Lincoln and the Eyre Peninsula. The detail of this work is summarised below and provided in Appendix A.

Government agencies

The development proposal must be assessed against several legislative requirements, with many State government agencies involved in the development assessment of the development application, and further through the EPA licensing application if granted development approval.

State government agencies have been involved in both pre-lodgement meetings at the officer level and a working group at the senior level.

Furthermore, to address Commonwealth legislation (MNES protected under the EPBC Act), SA Water have undertaken an EPBC self-assessment and will be preparing an EPBC Self-Referral for submission to DCCEEW for formal review.

First nations

The details of engagement with First Nations are described below in Section 8.2.3.

Locally interested parties

The City of Port Lincoln, being that the majority of works are located within this council area, have been involved as an active consultee during the pre-lodgement process. Furthermore, Council staff and elected members have been provided with briefings on the proposed development.

In addition, SA Water established a Project Reference Group (PRG) for the Project, which enabled eight local representatives to be briefed on milestones and design development for the Project.

General community

SA Water established the Port Lincoln Information Centre to provide a space for the community to learn about the proposed development. The office was staffed, to enable the community to speak face-to-face with SA Water and to ask questions about the Project.

The information centre was supplemented by SA Water's Water Talks website and electronic news updates.

The Minister responsible for SA Water most recently held a community information session on 8 May 2024 regarding the future water supply for Eyre Peninsula.

Marine Science Forum

SA Water convened a Marine Science Forum to complement the work undertaken by the MSRP (discussed further in Section 8.3.5), which addressed marine science matters as requested by the aquaculture and fishing industry groups.

Marine industry parties

Local businesses within Boston Bay and Proper Bay have raised concerns regarding the construction and operation of the RO desalination plant within the coastal and marine environment. SA Water continues to engage and respond as required.

The Department of Primary Industries and Regions has been involved in pre-lodgement meetings and is expected to be referred the development application for comment.

Local industry/construction and ancillary jobs

SA Water has convened several events for local industry, to support local industry in understanding the proposed development, and to discuss local industry involvement in the construction of the RO desalination plant and associated infrastructure.

7 Existing conditions

The proposed RO desalination plant would be located within an existing industrial brownfield site connected by the saline waste/seawater transfer outfall pipelines in an easement adjacent to the road corridor to the marine intake and outfall pump station and pipelines within the boundaries of the SA Water WWTP.

The marine intake and outfall pipelines would be constructed and operated within the marine waters of Boston Bay and Proper Bay. The area hosts multiple industries including aquaculture, ship repair, WWTP, Port operations, recreational / pleasure craft and tourism.

The DWTP from the RO desalination plant runs alongside a defunct rail corridor access track before transitioning into the road verge of local roads to the SA Water North Side Hill tanks.

The locality is both privately and publicly well used and further description of the uses is within the Social and Community section of this report (Section 9.2).

7.1 Flora and Fauna

This section summarises the existing flora and fauna identified within the Project site and surrounds.

The Project site is in a previously disturbed industrial area. However, it's surrounding area includes the Port Lincoln National Park, Kathai Conservation Park and other undisturbed areas which contain high value Mallee vegetation communities.

Murrays Point is also within the Project area and is connected by a low-lying marshy area between Porter Bay and the Murrays Point Wetlands. Part of this area has been developed for the Port Lincoln Marina and a former waste disposal site (dump) in Section 507.

7.1.1 Flora

A vegetation survey was conducted in July 2021 to identify plant communities, compile plant species lists and evaluate risks to fauna within the study area (T&M Ecologists, 2021). Additional surveys were undertaken to assess coastal vegetation near the WWTP in July 2023 (Ecological Associates, 2024). In addition, targeted surveys for spring-flowering threatened flora, particularly orchids, were conducted in October 2023 (Ecological Associates, 2024).

Mallee was found to be the dominant vegetation across the Project site.

7.1.1.1 RO Desalination Plant Site

As a result of the previous land use of the RO desalination plant site and surrounds by BHP for sand transfer, a number of internal access tracks and structures remain on the land; including an outbuilding with transfer dock to the remaining jetty on an adjacent site. SA Water does not expect to use these structures, rather they would remain on the Project site with security fencing to prevent unauthorised access.

Vegetation within the proposed RO desalination plant site occurs in:

- Highly disturbed areas where existing tracks and infrastructure occur
- Areas where previous clearance has occurred, but natural regeneration is occurring
- Areas where some planting has been undertaken with non-indigenous species but there is natural regeneration occurring underneath
- Coastal shrublands
- Areas of mallee, generally in good condition, albeit with some disturbance around the edges.

Despite having been partially disturbed by its previous land use, the RO desalination plant site still contains large areas of remnant and regenerating native vegetation, primarily:

- Port Lincoln Mallee (*Eucalyptus (E.) conglobata*), Coastal White Mallee *(E. diversifolia)*, White Mallee (*E. rugosa*) ± Coast Ridge-fruited Mallee (*E. angulosa*), *E. leptophylla* mallee over a shrubby understorey
- Coast Ridge-fruited Mallee (*E. angulosa*), Coastal White Mallee *(E. diversifolia)*, Port Lincoln Mallee (*E. conglobata*) open mallee over heath
- Coast Ridge-fruited Mallee (*E. angulosa*), Coastal White Mallee *(E. diversifolia)* ± Port Lincoln Mallee (*E. conglobata*) mallee over *Melaleuca uncinate* in excellent condition
- Coast Ridge-fruited Mallee (*E. angulosa*), Coastal White Mallee *(E. diversifolia)* mallee (burnt) over *Lasiopetalum* spp. in very good condition
- Recovering Coastal White Mallee *(E. diversifolia)* open mallee in poor to moderate condition
- Highly degraded *Acacia cyclops*, *Pinus halepensis* shrubland/woodland.

The photographs in Figure 7.1 to Figure 7.3 depict the existing environment of the RO desalination plant site.

Figure 7.1 Existing access tracks and remnant / regenerating native vegetation within proposed RO desalination plant site

Figure 7.2 Existing environment

Figure 7.3 Existing environment

7.1.1.2 Marine Intake and Outfall Pump Station / Marine Intake and Outfall Pipelines

The marine intake and outfall pump station would be located within the existing SA Water WWTP. The existing environment comprise significant areas of infrastructure, with remnant vegetation principally around the edges of the WWTP. While most of the area has clearly seen previous disturbance from the installation of the WWTP and St Andrews Drive, the vegetation has generally recovered well and is in a moderate to good condition.

The site of the marine intake and outfall pipelines saline w outfall pipelines comprise a tunnel under the shore and the marine environment. The shore environment is vegetated, consisting of the State listed vegetation association of Port Lincoln Mallee (*Eucalyptus conglobate*) +/- Coastal White Mallee *(E. diversifolia)* over dense understorey of Common Boobialla (*Myoporum insulare*)*, Olearia axillaris* and *Tetragonia implexicoma*. This shore environment has been avoided by the Project, through the design proposing the construction of a (micro) tunnel between the marine intake and outfall pump station and the marine environment. Once crossing under the shore through the tunnel, the marine intake and outfall pipelines would extend into Boston Bay. The pipelines have been located sited to minimise impacts to seagrasses.

In the south of the area, where soils are shallower adjoining the coast, the overstorey becomes Coast Ridge-fruited Mallee (*E. angulosa*), Port Lincoln Mallee (*E. conglobata ssp. conglobata*) and Coastal White Mallee *(E. diversifolia ssp. diversifolia*), with Dryland Tea-tree (*Melaleuca lanceolata*) and Common Boobialla (*Myoporum insulare*) prominent medium-large shrubs. The most abundant small shrubs are Sea-berry Saltbush (*Rhagodia candolleana ssp. candolleana*) and Prickly Ground-berry (*Acrotriche patula*).

The photographs in Figure 7.4 to Figure 7.6 depict the existing environment of the marine intake and outfall pump station and associated marine intake and outfall pipelines.

Figure 7.4 Marine intake and outfall pump station site in disused lagoon at the WWTP

Figure 7.5 Indicative example of shore environment above proposed marine intake and outfall pipelines tunnel

Figure 7.6 Indicative example of marine environment in proximity to marine intake and outfall pipelines

7.1.1.3 Desalinated Water Transfer Pipeline (DWTP) and Overhead Transmission Line

The desalinated water transfer pipeline (DWTP) and overhead electricity transmission line would be within and adjacent to an existing disused rail corridor between the RO desalination plant site and Greyhound Road, depending on requirements. This disused rail corridor is previously disturbed through rail activities and contains remnant and regenerating native mallee species (Ecological Associates Pty Ltd, 2023). Once reaching Greyhound Road, the co-located infrastructure corridor follows the road alignment for approximately 550 m; at which point the transmission line diverts northward along a partially disturbed property boundary until reaching Windsor Avenue and terminating to a transmission line to be developed by SAPN.

The DWTP would continue to follow the road corridor of Greyhound Road, Proper Bay Road and Blue Fin Road with two small sections requiring directional drilling (or alternative method) at a stormwater crossing near Greyhound Road and at the rail crossing intersect of Blue Fin Road. Before diverting into a previously cleared and regenerating easement on an allotment adjacent to the North Side Hill tanks on Blue Fin Road. It then crosses Blue Fin Road to connect to the North Side Hill tanks. The alignment runs adjacent to a combination of sealed and unsealed roads; with roadside vegetation comprised of various species and conditions, including eucalyptus, mallee, coastal shrubland species and planted amenity vegetation (Ecological Associates Pty Ltd, 2023).

Vegetation within the rail corridor was surveyed in three sections: the eastern section, the western section and North Side Hill tanks.

7.1.1.3.1 Eastern Section

The eastern section follows a cleared track with a width of around three m, and an old rail corridor which is of similar width and disturbance. This section passes through a large patch of mallee with broad sections of mallee that are in good to excellent condition, with little disturbance and very few weeds present. The mallee varies, and include:

- Port Lincoln Mallee (*E. conglobata ssp. conglobata*) and Coastal White Mallee *(E. diversifolia ssp. Diversifolia)* are dominant with low shrubs prominent in the understorey
- Yorrell (*E. gracilis*), Red Mallee (*E. oleosa ssp. ampliata*) and White Mallee *(E. rugosa*) are dominant, generally with a dense mid-shrub understorey of Tea-trees (*Melaleuca spp.*) over a dense leaf litter layer
- Purple-flowered Mallee Box (*E. albopurpurea*) dominant in patches towards the western end of this section that have been disturbed by rubbish dumping and track clearances
- Coastal White Mallee *(E diversifolia ssp. diversifolia*) dominates over dense cover of low and medium shrubs and sedges on the south side of the existing rail corridor.

There are also disturbed areas associated with past clearances, rubbish dumping, and cuttings associated with the rail corridor where mallee was recovering well, but there was greater incursion of weed species and open bare areas.

7.1.1.3.2 Western Section

The western section also follows an existing rail corridor around three metres wide and is elevated above the samphire/saltmarsh wetland communities to the south. Vegetation in this section ranges in condition from very poor in disturbed areas through to good in sections of saltmarsh and coastal shrublands. Vegetation generally comprises:

- Typical coastal shrubland vegetation, with the overstorey principally composed of Coast Wallowa (*Acacia nematophylla*), Coast Beard-heath (*Leucopogon parviflorus*) and Coast Daisy-bush (*Olearia axillaris*) to the west
- Coastal saltmarsh community appears influenced by the tide that comprises of a low shrub/sedge overstorey dominated by Austral Seablite (*Suaeda australis*), Samphire (*Salicornia sp.*) and patches of the introduced species Sharp Rush (**Juncus acutus*), along with scattered emergent Swamp Paper-bark (*Melaleuca halmaturorum*).
- Second wetland system, although less likely to be tidally influenced, in patches on the northern side of the existing rail corridor comprised of Swamp Paper-bark (*Melaleuca halmaturorum*) over Emu-grass (*Distichlis distichophylla*), Sea-berry Saltbush *(Rhagodia candolleana ssp. candolleana)* and Coast Bonefruit (*Threlkeldia diffusa*)
- Several highly threatening weeds, including Sharp Rush (**Juncus acutus*), Bridal Creeper (**Asparagus asparagoides f. asparagoides*) and African Boxthorn (**Lycium ferocissimum*)
- Broad sections of highly disturbed habitat north of the rail corridor, where there is only very scattered colonising native shrubland species, with African Boxthorn (**Lycium ferocissimum*) prominent (although treated in some areas), and the understorey dominated by introduced grasses and herbs.

The overhead transmission line is proposed to be placed on a spur that comprises a disturbed low dune that is considered likely to have been a coastal mallee community but is now dominated by Kangaroo Thorn (*Acacia paradoxa*), with the introduced Golden Wreath Wattle (**Acacia saligna*) and Aleppo Pine (**Pinus halepensis*). The area also contains highly disturbed Purple-flowered Mallee Box (*E. albopurpurea*) and Coastal White Mallee *(E diversifolia ssp. Diversifolia*) community generally in good condition within the overhead transmission line location that has a highly disturbed understory generally dominated by introduced grass, herb and climber weeds.

7.1.1.3.3 North Side Hill Tanks

Vegetation in this section ranges in condition from poor in disturbed areas through to good in the mallee at the northern end.

At the northern end, there is Coastal White Mallee (*E. diversifolia ssp. diversifolia*) with co-dominant, Purple-flowered Mallee Box (*E. albopurpurea*) and some emergent Drooping She-oak (*Allocasuarina verticillata*) over a highly diverse heathy shrub understorey. On the northern side of the road, there is a section where this community is regularly slashed for fire risk mitigation, but a highly diverse understorey remains, albeit with some small disturbed patches from what may be previous digging in the area.

To the south, there is a broad section of mallee where the overstorey becomes more open, but is still principally Coastal White Mallee (*E. diversifolia ssp. diversifolia*) and Purple-flowered Mallee Box (*E. albopurpurea*), but there is a dense mid-shrub layer of Kangaroo Thorn (*Acacia paradoxa*), and a lower diversity and cover of native heath species, likely as a result of previous disturbance, including clearance and fire. There are also sections that are in recovery, where there is regeneration of native shrub species, with a moderate diversity, but generally very low cover. This regenerating vegetation occurs along the road reserve, but also appears to extend into adjoining properties. These areas would formerly have been mallee, and so are highly disturbed.

The photographs in Figure 7.7 to Figure 7.8 depict the existing environment of the DWTP easement adjacent to the North Side Hill tanks site.

Figure 7.7 Regenerating vegetation within SA Water easement on land adjacent to North Side Hill tank

Figure 7.8 North Side Hill Tank site

7.1.2 Fauna

In July 2021, a bird survey was undertaken in four plant community types within the proposed DO desalination plant site, in mallee woodlands along the rail corridor, and in open water and adjacent saltmarsh communities at Murray Point Wetlands along Greyhound Rd (T&M Ecologists, 2021).

Further bird surveys were conducted in December 2023 for the broader Project site (Ecological Associates, 2024). Woodland birds were surveyed along the rail corridor from Billy Lights Point west to the coast on the bay on Greyhound Road, and along Blue Fin Road on the north-eastern side of Kathai Conservation Park. Shore birds were surveyed within the bay area south of Greyhound Road. A night-time survey of the mallee woodland along the rail corridor west of Billy Lights Point was undertaken to target nocturnal bird species. Opportunistic sightings of significant or less commonly encountered species encountered across the entire study area were also recorded.

7.2 Meteorological conditions

This section summarises the existing air quality and sources of air emissions in the study area.

Meteorological conditions are important for determining the direction and rate at which emissions from a source disperses. The key meteorological parameters for air dispersion include wind speed, wind direction, temperature, rainfall, and relative humidity. Historical meteorological data in the vicinity of the Project site was reviewed to characterise the existing local meteorological conditions.

The closest Bureau of Meteorology (BoM) station to the Project site is located at North Shields (Port Lincoln) Automatic Weather Station (AWS) [site number: 018192]. This station is located approximately 16.6 km north of the Project site at the Port Lincoln Airport (34.60^{0}S, 135.88^{o}E) at an elevation of 9 m AHD. The station opened in 1992 and is currently operational.

Table 7.1 summarises the climatology data between 2017 and 2022 at Port Lincoln Airport.

Table 7.1 Summary Statistics of the Climate at Port Lincoln Airport (2017-2022) by Season

Parameter	Units	Summer (DJF)	Autumn (MAM)	Winter (JJA)	Spring (SON)
Maximum Temperature	°C	24.1	22.0	15.8	19.6
Minimum Temperature	°C	15.8	13.4	7.9	10.2
Relative Humidity (9am)	%	69.3	72.4	79.6	69.6
Relative Humidity (3pm)	%	54.4	55.4	65.8	58.5
Monthly Rainfall	mm	7.2	10.3	21.0	14.9
Days of rain	#	1	3	6	3
Wind Speed	m/s	5.1	4.5	4.2	4.1

7.2.1 Temperature

Figure 7.9 presents the mean temperature at Port Lincoln Airport over a year. The area is characterised by mild winters and warm summers, typical for this region in South Australia. The mean maximum temperature is around 24°C and 16°C for summer and winter, respectively.

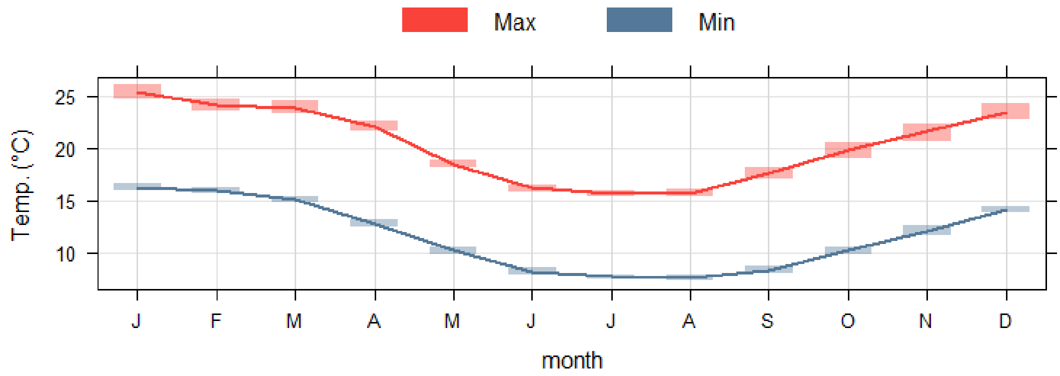


Figure 7.9 Mean monthly maximum and minimum temperature for 2017-2022 at Port Lincoln Airport Station (shaded bars indicate 95% confidence intervals)

7.2.2 Relative Humidity

Figure 7.10 presents the mean monthly relative humidity at Port Lincoln Airport and demonstrates the humid climate throughout the year, with the highest humidity observed in the winter months.

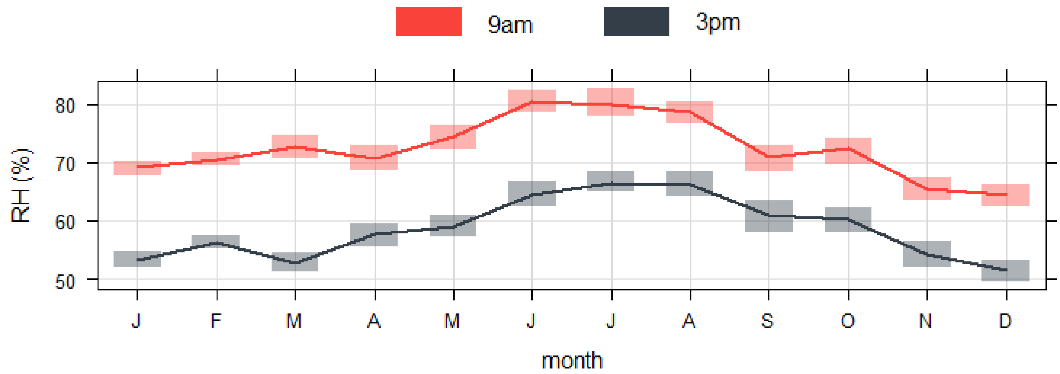


Figure 7.10 Mean monthly relative humidity for 2017-2022 at Port Lincoln Airport (the shaded bars represent 95% confidence intervals)

7.2.3 Precipitation

The mean monthly precipitation at Port Lincoln Airport is presented in Figure 7.11 and Figure 7.12 indicates the dry climate typical of the region. The majority of the rain falls in the winter months, with only a few (<3) significant rain events during the summer period.

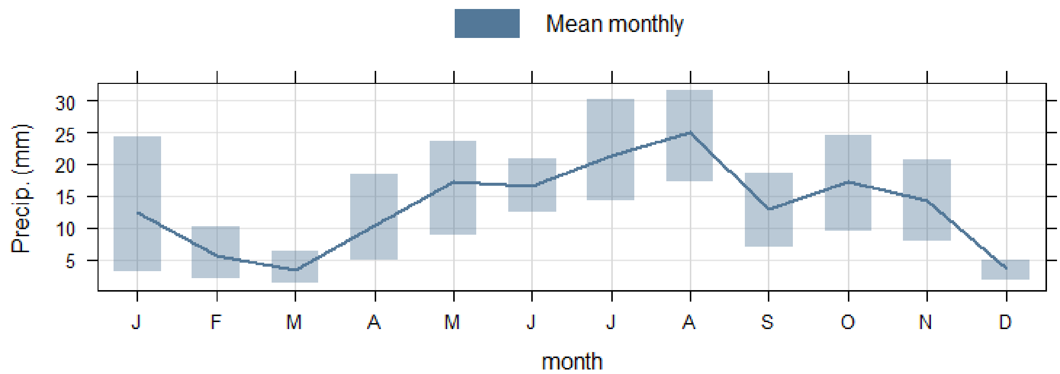


Figure 7.11 Mean monthly precipitation (mm) for 2017-2022 at Port Lincoln Airport (the shaded bars represent 95% confidence intervals)

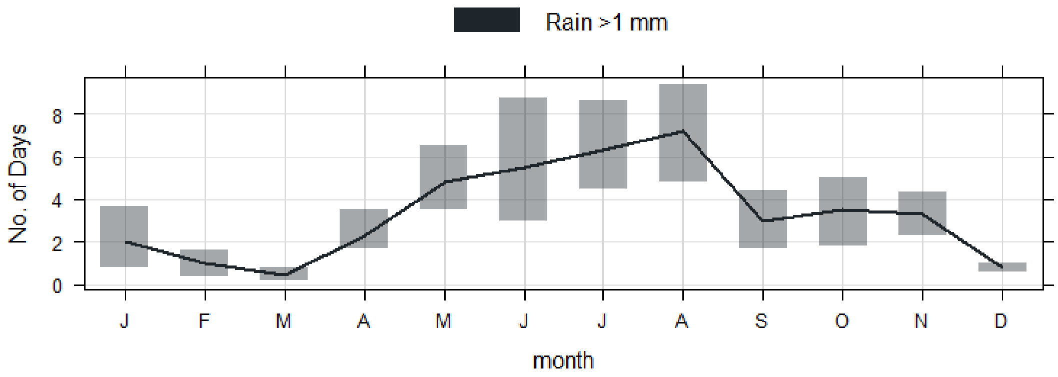


Figure 7.12 Mean number of days per month when rainfall was greater than 1 mm for 2017–2022 at Port Lincoln Airport (the shaded bars represent 95% confidence intervals)

7.2.4 Typical Wind Conditions

The wind direction and wind speed, during construction activities, can influence the extent and magnitude of dust impacts. Adverse impacts are more likely to occur downwind of the prevailing wind direction and in proximity to the Project site.

Wind rose plots between 2017 and 2022 are shown in Figure 7.13 for Port Lincoln Airport, as well as for each season (Figure 7.14). As this BoM station is at an airport, there should be minimal interference from large buildings and the wind rose plots should therefore be broadly representative of the regional wind speed and direction.

Figure 7.13 indicates that the predominant wind direction is from the west to northwest and southeast for all seasons. Figure 7.14 indicates that there is seasonal variability in the predominant wind direction, being southeast in the summer and shifting to the northwest in the winter. Figure 7.15 also shows that lower wind speeds are typically observed in the winter, while wind speeds are typically the highest in summer.

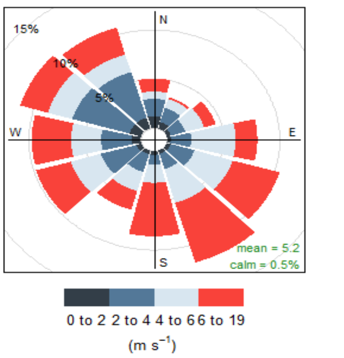


Figure 7.13 Annual Average Wind Rose Plot at Port Lincoln Airport for 2017–2022

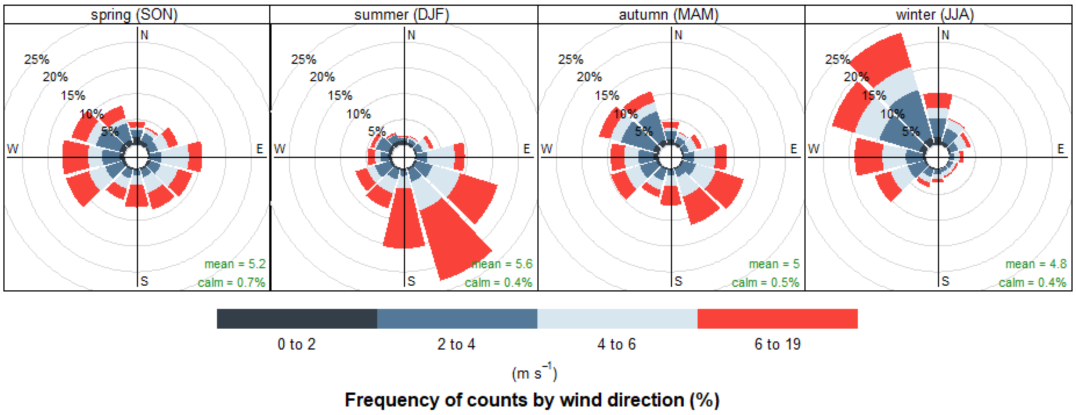


Figure 7.14 Seasonal Average Wind Rose Plots at Port Lincoln Airport for 2017–2022

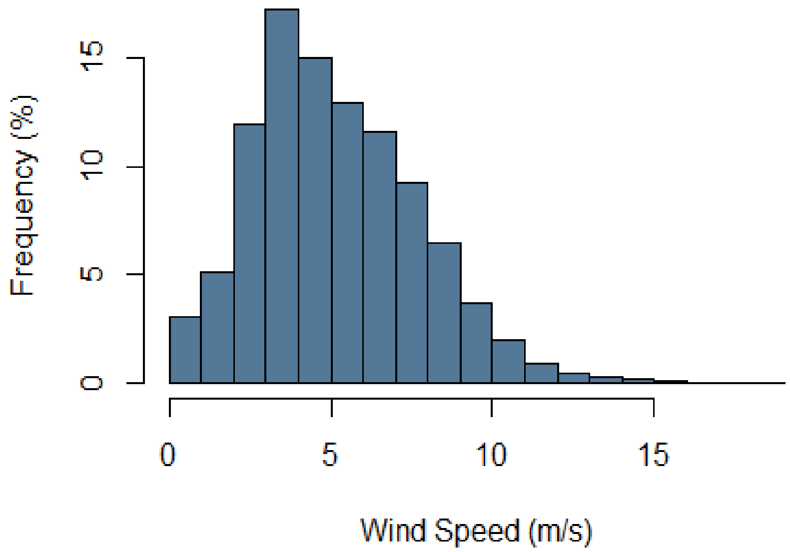


Figure 7.15 Histogram of Wind Speed Observations Frequency from 2017–2022 at Port Lincoln Airport

7.2.5 Topography and Land Use

Port Lincoln is a coastal city on the Eyre Peninsula, on the shore of Boston Bay. The Project site lies to the south of Port Lincoln, on the shore of Boston Bay, near Billy Light Point. Proper Bay lies southwest of the Project site.

Land use immediately surrounding the Project site is currently industrial, as the Project site was formerly utilised by BHP as a sand mine. The surrounding area is largely vegetated and there is a railway line that is no longer in use. Land uses to the west and northwest comprise a mix of light industrial (the WWTP and marine activities) and recreational facilities including the Billy Light Point boat ramp. Currently, the closest residential is 250 m from the Project site boundary.

A topographical map of the Project site and surrounds is provided in Figure 7.16.

Eyre Peninsula Desalination Plant Project

Figure 7.16
Site Topography

Legend

- Cadastre
- Desalination Plant Site Boundary
- Security Fence
- New Site Access
- Pump Intake Station
- Seawater Transfer Pipeline
- Sewer Rising Main
- Saline Waste Transfer Pipeline

Marine Infrastructure

- Marine Outfall
- Raw Seawater Intake
- Marine Tunnel Portion

Topography (mAHD)

High : 25

Low : 0

0 100 200
Metres

Coordinate system: GDA2020 MGA Zone 53

Scale ratio correct when printed at A3

1:6,600

Date: 23/05/2024

Data sources: WSP, DataSA, MetroMap WMS Services:

7.2.6 Local Ambient Air Quality

7.2.6.1 Existing Air Emission Sources

The Project is located in a coastal setting surrounded by native vegetation and an industrial area. The main existing emissions are likely wind-blown dust from vacant unvegetated land, traffic using the local road network, industrial emissions, sea salt and shipping emissions.

A National Pollutant Inventory (NPI) database review was conducted to identify existing emission sources in the vicinity of the Project study area. The closest facility that reported emissions to the NPI for 2020/2021 reporting period was the WWTP. This facility reported emissions of ammonia of 6,900 kg/year, would host the marine intake and outfall pump station and associated pipelines and is located in to the east of the RO desalination plant site. The ambient concentrations of ammonia at the Project site/s are likely to be affected by the emissions from the operation of this facility.

There were four facilities that reported emissions to the NPI for 2020/2021 reporting period located in the industrial area near the Project site boundary and included three petroleum product wholesalers: Elgas Port Lincoln, Hunt Fuel, and Mogas Port Lincoln Depot and Viva Energy Port Lincoln Terminal (a hydrocarbon storage and distribution facility). The following emissions were reported:

- Elgas Port Lincoln facility, located 3 km west of the Project site – total VOC emissions of 51 kg/year
- Hunt fuel facility, located 3 km north-west of the Project site – total VOC emissions of 1,700 kg/year including benzene, toluene, ethylbenzene and xylene (collectively known as BTEX)
- Mogas Port Lincoln Depot facility, located 3 km north of the Project site – total VOC emissions of 11,000 kg/year including BTEX and 0.0024 kg/year of lead (Pb) emissions.
- Viva Energy Port Lincoln Terminal facility – total VOC emissions of 15,000 kg/year including BTEX emissions.

The ambient concentrations of VOC's are likely to be affected by the emissions from the operation of these four facilities.

7.2.6.2 Background Air Quality

To comply with the requirements of the Air NEPM, the SA EPA has established an air quality monitoring network across metropolitan Adelaide, Whyalla, Port Augusta, and Port Pirie to conduct long-term ambient air monitoring of key air pollutants including PM_{10}, $PM_{2.5}$, NO_x, CO, SO_2 and ozone (O_3). Data presented in this report was downloaded from the SA EPA website (https://data.sa.gov.au/).

There are no ambient air quality monitoring stations (AAQMS) within a 100 km radius of the Project site. The nearest AAQMS to the Project site is located at Christie Downs approximately 240 km to the east across Spencer Gulf and St Vincent Gulf. It is located at Peregrine Park in the residential suburb of Christie Downs, approximately 2.3 km east of the St Vincent Gulf, 1 km south of the industrial suburb of Lonsdale, 24 km to the south-west of Adelaide Central Business District.

The Project site and the Christie Downs AAQMS are located in similar environments. Both are coastal and are situated within or adjacent to urban areas with emissions from vehicular traffic being a large contributor to the local air shed. The Project site is likely to be less influenced by traffic emissions being further away from the urban areas of Port Lincoln (approximately 800 m from Port Lincoln Marina) and adjacent to bushland. The nearby marine facilities and the Port Lincoln WWTP are not expected to contribute significantly to the concentrations of pollutants in the local airshed. The Christie Downs AAQMS is considered an appropriate source of information on ambient concentrations of pollutants in lieu of a permanent local monitoring station.

The Christie Downs AAQMS continuously monitors for PM_{10}, NO_x and O_3 and data recorded over the past 5 years (2018 to 2022) were collected. The ambient air quality data at the Christie Downs AAQMS is presented in this section to provide indicative air quality concentrations that may be experienced at the Project site. Overall, the air quality at the Project site is expected to be similar or better than that collected at the Christie Downs AAQMS.

The results of this analysis are summarised in Table 7.2, Figure 7.17, and Figure 7.18.

From 2018-2022, the 70th percentile 24-hr average concentrations of PM_{10} were 18.3 µg/m³, which is below the 24-hr SA standards (PM_{10} = 50 µg/m³). During 2018-2022, there were only 15 exceedance days for PM_{10} and were primarily in 2018 and 2020 (Table 7.2). The cause of the exceedances in 2018 were dust storms and nearby controlled burns (*SA EPA Air Quality quarterly summary reports 2018*).

The results presented in Table 7.2, Figure 7.17, and Figure 7.18 indicate that air quality in the Project study area is likely typical of rural Australia and rated good to very good. The local study area is likely occasionally impacted by regional scale air quality events, such as dust storms, similar to Christie Downs.

Table 7.2 Summary Statistics for PM_{10} and NO_2 Observations at Christie Downs Station from 2018–-2022

Averaging period	Statistic	PM_{10}	NO_2
24-hr (PM_{10})/ 1-hr (NO_2)	Data Coverage (%)	98	94
	Maximum Conc.	101.5 µg/m³	0.039 ppm
	70th Percentile	18.3 µg/m³	0.004 ppm
	Criteria	50 µg/m³	0.08 ppm
	Exceedances (days)	15	0
Annual	Average Conc.	17.8 µg/m³	0.004 ppm
	Criteria	25 µg/m³[5]	0.015

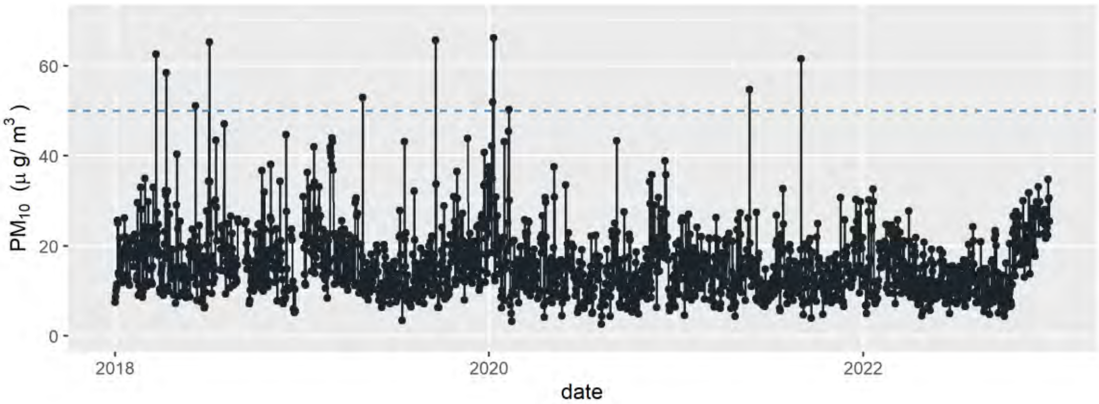


Figure 7.17 Time Series of 24-hr PM_{10} Mass Concentrations at Christie Downs station in 2018–2022 (the dashed line indicates the 24-hr average standard [50 µg/m³]).

[5] *Annual PM10 criteria from Air NEPM (2022) shown as a guide*

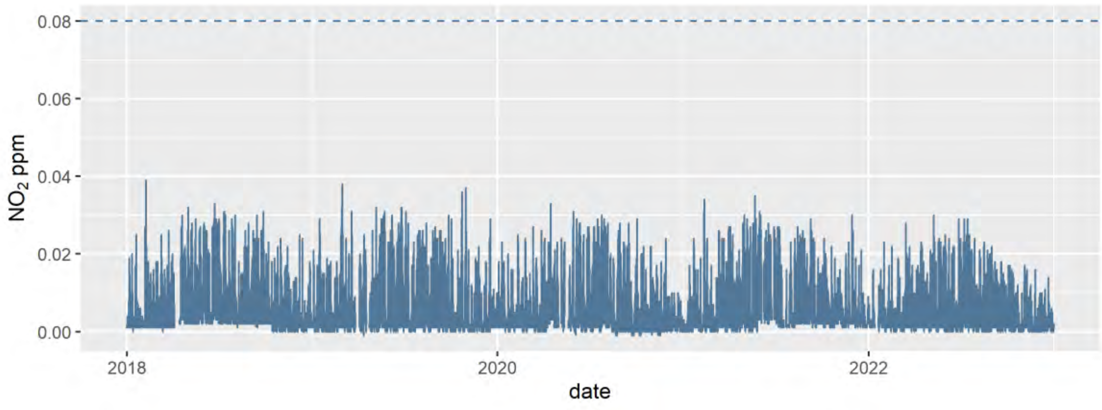


Figure 7.18 Time Series of 1-hr NO2 Levels at Christie Downs Station in 2018–2022 (the dashed line indicates the 1-hr average standard [0.08 ppm])

7.2.7 Sensitive Receptors

The AAQA guideline describes a sensitive receptor as:

'Fixed location such as a house, building, other premises or open area where health, property or amenity is affected by emissions that increase the concentration of the emitted parameter above background levels'.

The closest residential properties to the Project site are located within a housing development, with the nearest existing dwelling approximately 250 m from the proposed Project site. Several additional dwellings in this housing development are currently under assessment and are proposed approximately 250 m from the Project site.

Sensitive receptors identified in the vicinity of the Project site are listed in Table 7.3 and displayed in Figure 7.19.

Table 7.3 Nearest Sensitive Receptors to the Project Site

Sensitive receptor ID	Approximate distance from the Project (m)	Direction from the Project	Address	Type
R1	250	North	St Andrews Drive	Residential
R2 (proposed)	250	North	St Andrews Drive	Residential
R3	Adjacent to Project site access boundary	North	St Andrews Drive	Beach/recreation al area/RV Park

Eyre Peninsula Desalination Plant Project

Figure 7.19
Sensitive Receptors

Legend

- Sensitive Receptor
- Cadastre
- Desalination Plant Site Boundary
- 250m Buffer
- Design Desalination Plant
- Security Fence
- New Site Access
- Seawater Transfer Pipeline
- Sewer Rising Main
- Saline Waste Transfer Pipeline

Marine Infrastructure

- Marine Outfall
- Raw Seawater Intake
- Marine Tunnel Portion

0 100 200
Metres

Coordinate system: GDA2020 MGA Zone 53

Scale ratio correct when printed at A3

1:7,000

Date: 23/05/2024

Data sources: WSP, DataSA, MetroMap WMS Services:

7.3 Noise

This section summarises the work undertaken to understand the existing noise conditions within the Port Lincoln area, particularly in relation to the Project sites.

7.3.1 Background noise

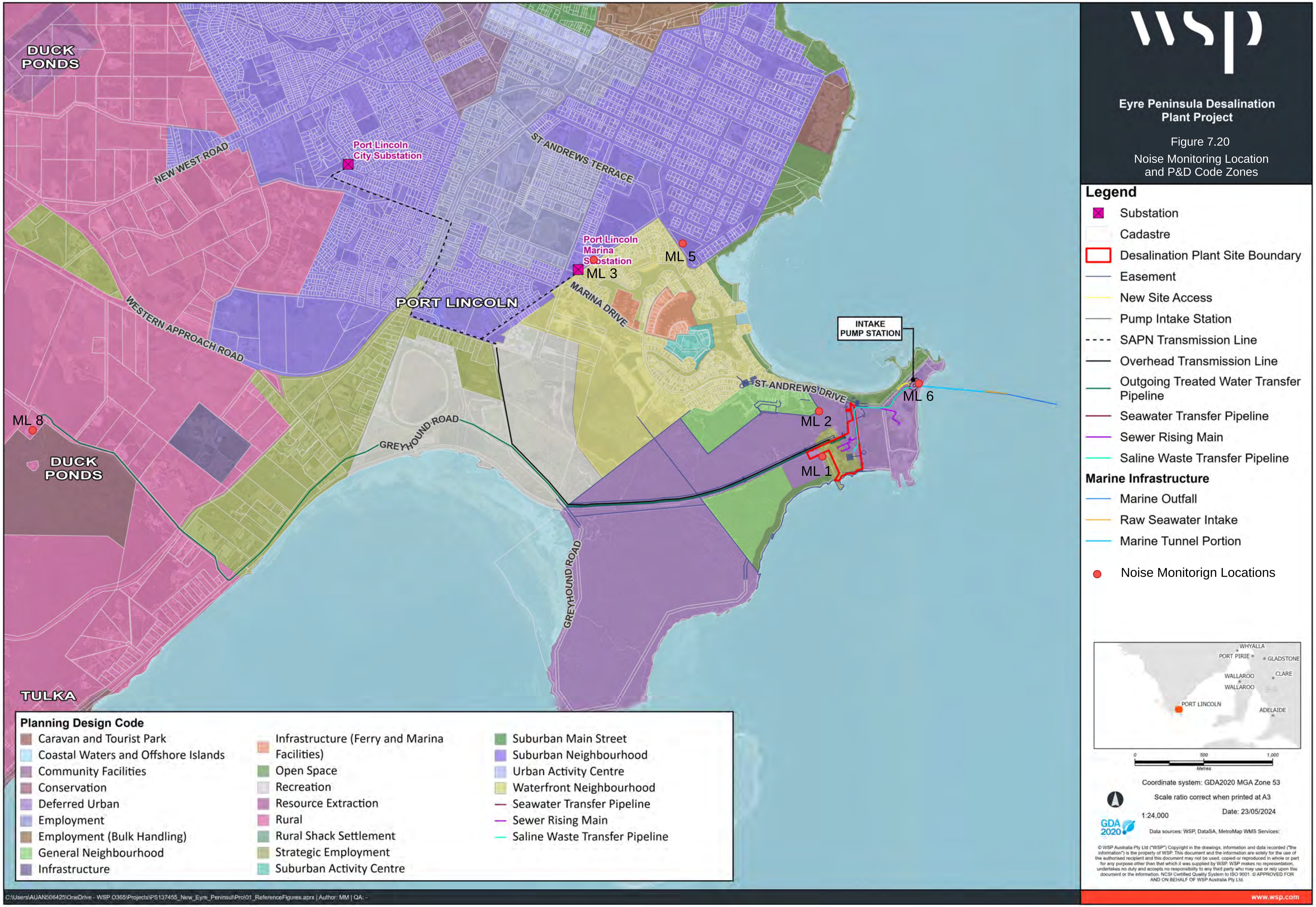
The Project site is located south of Port Lincoln, which mainly comprises scrub land and existing industrial buildings. There are residential receptors within southern areas of Port Lincoln. Background noise was measured within unoccupied areas of scrub within suburban areas in the vicinity of the Project, at six monitoring locations (ML). .

The existing environment is anticipated to generally experience low background noise levels, particularly during night-time hours. Primary influences on the existing background noise levels are natural noise sources (such as birds or insects and wind-blown vegetation) and traffic on the local road network. Maximum background noise levels were highest at the WWTP, including higher average noise events during daytime and night-time conditions (with daytime conditions expected to have been from natural sources). Existing background noise from traffic on the local road network was highest at ML 2, ML 3 and ML 5. Noise monitoring locations and their baseline noise conditions are summarised in Table 7.4 and shown in Figure 7.20.

The proposed development is considered in terms of the expected noise and mitigation measures in the relevant section below (Section 8.2.1).

Table 7.4 Background noise logger locations

Monitoring Location (ML)	Location description
ML 1	Noise monitoring equipment was installed within the Project site. Background noise was generally influenced by birds, insects and wind-blown vegetation.
ML 2	Noise monitoring equipment was installed southeast of existing residential properties 120 m from St Andrews Drive. Background noise from the existing road was audible with other noise influenced by birds, insects and wind-blown vegetation.
ML 3	Noise monitoring equipment was installed within a green area north of Wingard Terrace, directly across from Laguna Drive. Background noise was influence by proximity to the road, including cars on Wingard Terrace and additional vehicle noise from commercial and light vehicles on Ravendale Road.
ML 5	Noise monitoring equipment installed within parkland by St Andrews Terrace, Lipson Place and Adelphi Terrace. Background noise was generally influenced by birds, insects and wind-blown vegetation.
ML 6	Noise monitoring equipment was installed in the WWTP. Background noise was influenced by ocean noise, wind-blown vegetation, birds and insects and vehicle movements within the WWTP, St Andrews Road and the boat ramp car park.
ML 8	Noise monitoring equipment was installed within Kathai Conservation Park. Background noise was influenced by birds, insects, infrequent local road use and wind-blown vegetation.



Eyre Peninsula Desalination Plant Project
Figure 7.20
Noise Monitoring Location and P&D Code Zones
Legend
Substation
Cadastre
Desalination Plant Site Boundary
Easement
New Site Access
Pump Intake Station
SAPN Transmission Line
Overhead Transmission Line
Outgoing Treated Water Transfer Pipeline
Seawater Transfer Pipeline
Sewer Rising Main
Saline Waste Transfer Pipeline
Marine Infrastructure
Marine Outfall
Raw Seawater Intake
Marine Tunnel Portion
Noise Monitorign Locations
DUCK PONDS
PORT LINCOLN
TULKA
NEW WEST ROAD
ST ANDREWS TERRACE
WESTERN APPROACH ROAD
MARINA DRIVE
ST ANDREWS DRIVE
GREYHOUND ROAD
Port Lincoln City Substation
Port Lincoln Marina Substation
INTAKE PUMP STATION
ML 1
ML 2
ML 3
ML 5
ML 6
ML 8
Planning Design Code
Caravan and Tourist Park
Coastal Waters and Offshore Islands
Community Facilities
Conservation
Deferred Urban
Employment
Employment (Bulk Handling)
General Neighbourhood
Infrastructure
Infrastructure (Ferry and Marina Facilities)
Open Space
Recreation
Resource Extraction
Rural
Rural Shack Settlement
Strategic Employment
Suburban Activity Centre
Suburban Main Street
Suburban Neighbourhood
Urban Activity Centre
Waterfront Neighbourhood
Seawater Transfer Pipeline
Sewer Rising Main
Saline Waste Transfer Pipeline
WHYALLA
PORT PIRIE
GLADSTONE
CLARE
WALLAROO
PORT LINCOLN
ADELAIDE
0
500
1,000
Metres
Coordinate system: GDA2020 MGA Zone 53
Scale ratio correct when printed at A3
1:24,000
Date: 23/05/2024
GDA 2020
Data sources: WSP, DataSA, MetroMap WMS Services:
www.wsp.com

7.4 Traffic and Access

This section summarises the existing traffic and access conditions for the Project. The assessment was based on desktop assessment of publicly available data, site inspection and discussions with DIT and the City of Port Lincoln Council.

The Project is located approximately four km southeast of the town of Port Lincoln at Billy Lights Point, South Australia. The Project site can be accessed via St Andrews Drive which also provides access to the adjacent WWTP and terminates at a public boat ramp, carpark and picnic area. The Project RO desalination plant site was previously utilised for sand transfer by BHP and is adjacent to a rail corridor which is no longer in operation but is not formally closed.

The Traffic Impact Assessment (TIA) identified the following key roads in the locality:

- St Andrews Drive – a local sealed road approximately 2.5 km long with a single carriageway divided with centrelines (seven m wide). The first 1.5 km provides access to residential areas and the remaining one km section provides access to Billy Lights Point. A total of nine streets connect to or terminate at St Andrews Drive. The access into the Project site is currently unsealed.
- Greyhound Road – approximately two km long and provides access to Murray Point. It is a curvilinear but flat unsealed road varying in width and condition with no shoulders and native vegetation predominantly along the northern side. It forms a T-junction with Proper Bay Road. The proposed DWTP between the RO desalination plant site and the existing North Side Hill tanks would be in the road reserves on Greyhound Road, Proper Bay Road and Blue Fin Road.
- Proper Bay Road – links the township with Sleaford Conservation Park. The 1.2 km section of interest is a wide two-lane undivided road, is generally straight and follows the coastline. It is marked with centrelines and edge-lines and is delineated at junctions and provides access too several light industrial and commercial properties.
- Blue Fin Road – is approximately two km long and forms a T-junction with Proper Bay Road. The southern section is 500 m long, is a two-lane undivided road, partly sealed with kerb and gutter and terminates at the junction with the railway line. The road continues on the northern side of the line as an unsealed narrow road and providing access to the North Side Hill tanks.

The TIA also identified the following key junctions in the locality:

- Le Brun – Luke – St Andrews – a four-way priority-controlled intersection controlled by stop signs on Le Brun Street and St Andrews Terrace. The City of Port Lincoln advised that this intersection can be congested 'at times'. Long vehicles over 10 m are prevented from using Le Brun Street at the southern end. It is presumed this was imposed when the former rail line was in operation.
- Dublin – Porter – a priority controlled T-junction. with a long dedicated right turn lane on Porter Street. Vehicles turning right into Dublin Street must give way to oncoming traffic on Porter Street. This allows potential for queues in the turn lane to extent back into the adjacent through lane.
- Dublin – Luke Street – a priority controlled junction 90 m from the junction of Dublin Street and Porter Street. The intersection presents a risk that vehicles standing to turn right into Luke Street may queue back into the adjacent through lane and even back to Porter Street.
- Marina Drive – St Andrews Drive – a four-way intersection with give way signs on St Andrews Drive and Monterey Drive. There are no turning lanes at the junctions, however there is land in the road corridor that could provide for any future widening or realignment to cater for larger turning vehicles.

- Marina Drive – Stamford Terrace – Ravendale Road – a T-junction with dedicated right turn lane on Ravendale Road into Stamford Terrace. Movement through the T-junction from Marina Drive to Ravendale Road is delineated with warning signs to reduce traffic speeds. There is substantial land in the road corridor to improve the T-junction alignment if required.

The TIA identified that there are overall very few crashes recorded in the local road network. Casualty crashes have been recorded on Stamford Terrace and at four intersections with right angle crashes being the most prominent crash type.

7.5 Aboriginal Cultural heritage

The Project site is within the Barngarla Determination Area. Under the Determination, which took effect on 6 April 2018, Native Title is recognised as existing in large parts of the Eyre Peninsula, including lands and waters adjacent to the project area. Native Title was found not to exist on the basis of extinguishment in the Project area. The Barngarla Determination Aboriginal Corporation RNTBC (BDAC) is the registered Native Title body corporate appointed to manage the Barngarla Determination. Even though Native Title is extinguished over the Project area, SA Water acknowledges that Barngarla people maintain a connection to that area under their traditional laws and customs and acknowledges them as Traditional Owners for the Project site.

SA Water also acknowledges that the Traditional Owners of the western Eyre Peninsula region; the Nauo (Tribunal file no. SCD2023/003; Federal Court Number SAD65/2022, SAD185/2021), also maintain connections to the Project site.

Relevant legislation, engagement and assessment is outlined in Section 8.2.3.

Native Title and Aboriginal cultural heritage are key considerations in the planning, design and construction of this Project.

7.6 Non-Aboriginal heritage

This section summarises the non-Aboriginal heritage conditions for the Project site and surrounds.

Six State heritage places have been identified within two km of the Project site. The nearest being located adjacent to the proposed overhead transmission line arrangement on Windsor Avenue.

No Local, National, Commonwealth or World heritage places were identified within two km of the Project site.

Details of the identified non-Aboriginal heritage places within two km of the Project site are provided in Table 7.6. Details have been sourced from the South Australian Heritage Places Database (2023) and the Heritage Survey of the Eyre Peninsula and West Coast – City of Port Lincoln (1987).

One shipwreck has been identified within two km of the Project site. It should be noted that the location of this shipwreck is approximate only, and has not been verified, (i.e. the wreck has not yet been found) and no details were noted pertaining to a wreck during the Project marine geophysical survey for production of bathymetric contour mapping. This location is the only likely location as recorded on the Australasian Underwater Cultural Heritage Database dataset. This has been confirmed via correspondence between SA Water and Heritage South Australia (Polzer, 2023).

Details of the listed shipwreck within two km of the Project site are provided in Table 7.5.

Table 7.5 Shipwrecks within two km of the Project site

Location	Description	Wreck Number	Type	Distance from site
Between Port Lincoln and Grantham Island	Unnamed wooden vessel – 4.3 m in length. Sank in 1932.	440	State	Approximately one km south of the marine intake and outfall pipelines, 1.4 km southeast of the marine intake and outfall pump station and 1.5 km west of RO desalination plant site.

The locations of identified non-Aboriginal heritage places and shipwrecks are shown in Figure 7.21.

Table 7.6 Non-Aboriginal Heritage Places within two km of the Project site

Location	Name	Heritage No.	State heritage ID.	Type	Description (Danvers Architects, 1987)	Historical summary (Danvers Architects, 1987)	Significance (Danvers Architects, 1987)	Image	Distance from Site
20 Windsor Ave, Port Lincoln	Dwelling ('Ravendale House')	16587	10914	State	'Random coursed sandstone house with dressed stone quoins. Gable ended corrugated galvanised iron roof with stone chimneys. Rendered kitchen building has gable ended corrugated galvanised iron roof and stone chimney'.	'The house was built as the private residence of the Resident Magistrate of Port Lincoln and was one of the early large houses in the area. Governor MacDonnell stayed there in 1857 on his official visit to the Port Lincoln district. Thomas Spalding also built Poonindie Mission Church'.	'A rare example of early residential architecture in Port Lincoln'.	 (Danvers Architects, 1987)	Adjacent to proposed overhead transmission line on Windsor Avenue.
152 Proper Bay Road, Port Lincoln	'Arrandale' (Dwelling, cottage and stables)	16588	14217	State	'Group of buildings comprising house, cottage and stables built of random rubble granite with rendered surrounds. The house has a hipped corrugated galvanised iron roof with rendered ornamental chimneys. The cottage and stables have gable ended roofs clad with corrugated galvanised iron. The house has a concaved verandah with simple timber poses and brackets under eves. Windows for the house are double hung sash with casement sash	'Named "Arrandale" after the Isle of Arran, off Scotland. It is believed to be once part of an 80-acre section belonging to James Sinclair, who also owned "Green Patch". It was from "Green Patch" that he retired to this property in the late 1880s'.	'Associated with James Sinclair. A good example of a substantial house'.	 (Danvers Architects, 1987)	Approximately 350 m southwest of DWTP at the junction of Blue Fin Road and Proper Bay Road.

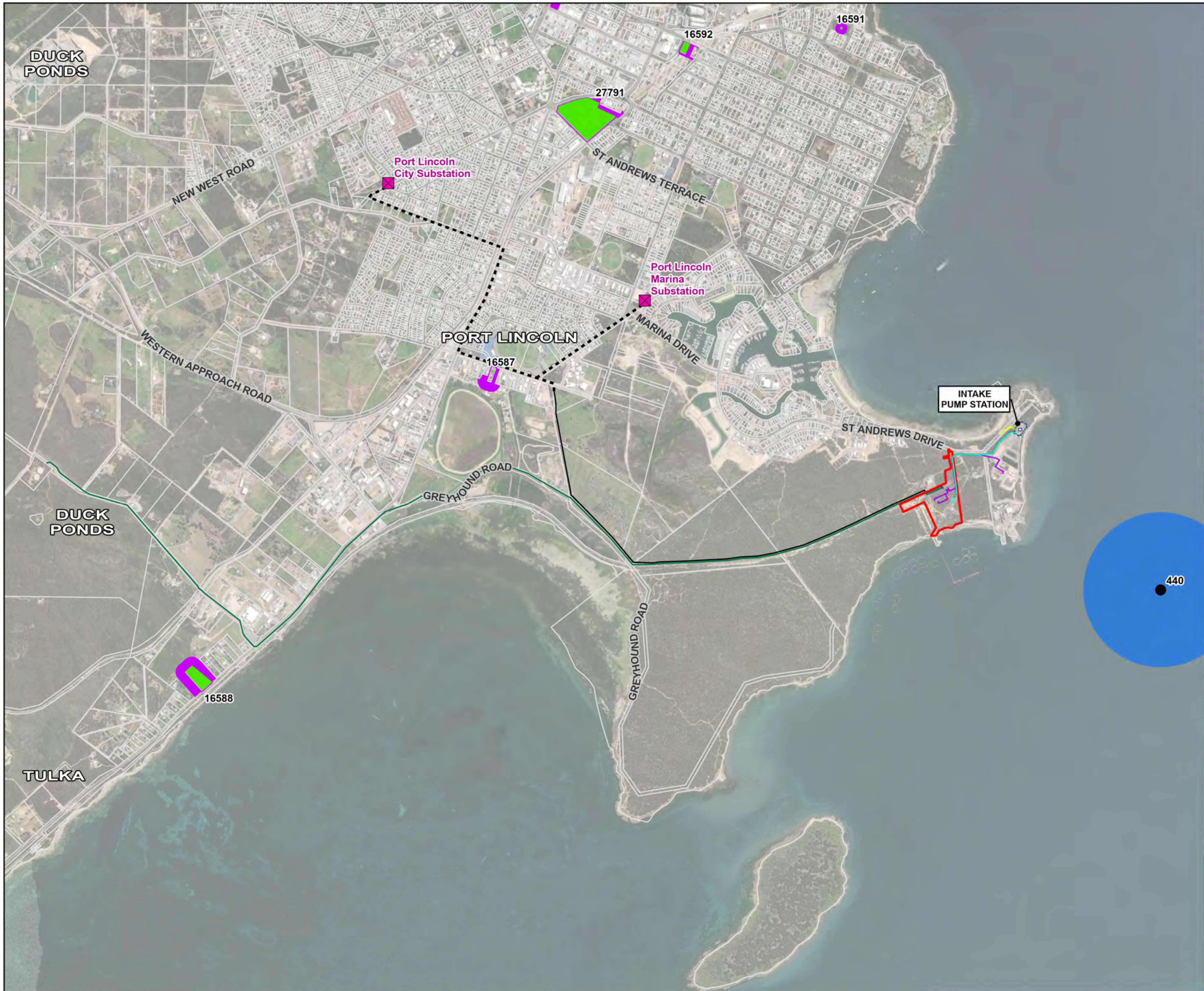
Location	Name	Heritage No.	State heritage ID.	Type	Description (Danvers Architects, 1987)	Historical summary (Danvers Architects, 1987)	Significance (Danvers Architects, 1987)	Image	Distance from Site
					windows on the cottage and stable'.				
Corner of Le Brun St and Luke St, Port Lincoln	Port Lincoln Locomotive Depot and Workshops	27791	26501	State	Not available.	Not available.	Not available.	Not available.	Approximately 900 m northeast of proposed overhead transmission line.
Railway Place, Port Lincoln (F216761 A92 and F213683 A114)	Port Lincoln Railway Station	16592	14608	State	'Random coursed stonework with rusticated surrounds. Hipped and multi-gabled roof of corrugated galvanised iron decorated with half timbering, gablet and skylight in west roof. Raked cantilevered verandah. Double hung sash and hopper windows'.	'Substantially built to replace the former station which would have been built at the time of the railway line's opening in 1907'.	Not available.	 (Danvers Architects, 1987)	Approximately 1,600 m northeast of proposed overhead transmission line.
36 Washington Street, Port Lincoln	Port Lincoln Police Station and Courthouse	16589	10219	State	'Random coursed stonework building with rendered quoins. Gable ended roof clad with terracotta tiles. Rendered chimneys. Multi-paned double hung sash windows'.	'This is the second Police Station and Courthouse building. The tender of Birtwhistle and Francis for £1,088 was accepted in March 1862. The contract was completed by September 1862. The building is identical to the one built at Melrose'.	'This building represented the Government's authority in the region'.	 (Danvers Architects, 1987)	Approximately 1,600 m northeast of proposed overhead transmission line.

Location	Name	Heritage No.	State heritage ID.	Type	Description (Danvers Architects, 1987)	Historical summary (Danvers Architects, 1987)	Significance (Danvers Architects, 1987)	Image	Distance from Site
Dorset Place, Port Lincoln (D4018 A82)	Former Windmill Base (sometime Pioneer Mill Museum)	16590	14219	State	'Random coursed limestone windmill base with exterior metal spiral staircase leading to roof. Small paned windows'.	'The Mill is Port Lincoln's oldest remaining building. The Mill was never completed to be used as such and construction did not proceed beyond the existing stone structure. The structure was set aside by Miss Amy Bishop, grand-daughter of Captain John Bishop, a pioneer of Port Lincoln'.	'The oldest known structure in Port Lincoln'.	 (Danvers Architects, 1987)	Approximately 1,800 m north of proposed overhead transmission line.

Eyre Peninsula Desalination Plant Project

Figure 7.21

Non-Aboriginal Heritage



Legend

- Substation
- Shipwreck
- Cadastre
- Planning and Design Code - Historic Shipwreck
- Planning and Design Code - Heritage Adjacency
- Planning and Design Code - State Heritage Place
- Desalination Plant Site Boundary
- New Site Access
- Pump Intake Station
- SAPN Transmission Line
- Overhead Transmission Line
- Outgoing Treated Water Transfer Pipeline
- Seawater Transfer Pipeline
- Sewer Rising Main
- Saline Waste Transfer Pipeline

0 500 1,000
Metres

Coordinate system: GDA2020 MGA Zone 53

Scale ratio correct when printed at A3

1:24,000

Date: 23/05/2024

Data sources: WSP, DataSA, World Imagery: Earthstar Geographics

7.7 Contamination

This section summarised the existing contamination conditions of the Project site/s.

The Preliminary Site Investigation (PSI) update (Appendix G) considered the DO desalination plant site and the adjacent land parcel containing the overhead transmission line and DWTP easement; located on CT 6275/757 and CT 6275/756, respectively (the study area).

The assessment included a review of previous assessments undertaken within the study area, an EPA Section 7 search, an EPA public register search, reviews of relevant public databases, review of current and historical Certificates of Title, review of historical photographs, and site walkover in May 2022.

Adjacent land uses were identified as:

- residential and Porter Bay to the north
- commercial (aquaculture and WWTP) to the east and Billy Lights Point northeast
- jetty, aquaculture (ocean cages/ranching sites) to the south (from 100 m from Project site)
- vacant and undeveloped land with some internal roads to the west.

The Port Lincoln Marina, located approximately 250 m north of the study area, was identified to contain the nearest residential sensitive receptor. A wetland area approximately 300 m northwest of the study area was also identified as a sensitive use.

A review of historical aerial imagery 1950 to 2021 was undertaken. A summary of the observed land use changes across the study area is presented in Table 7.7.

Table 7.7 Aerial Photograph Review

Year	Description
1950	The study area was vacant and undeveloped with vegetation spread across the area. Northwest of the site an inlet or creek was evident.
1958	The study area appeared unchanged from the 1950 aerial photograph.
1967	Several internal roads (unsealed) had been constructed through the study area and several sheds were present in the eastern portion of the study area as per the present-day configuration. A jetty had also been constructed extending from the southern boundary as per the present-day layout. A general east-west orientated cleared corridor coinciding with the rail corridor which serviced the loading dock for transport of sand from the study area was present. Numerous small rectangular objects lined the rail corridor just west of the sheds, likely to be train carriages. St Andrews Drive was present immediately north of the study area, and some residential dwellings had been constructed north and north-west of the study area.
1973	The study area appeared unchanged from the 1967 aerial photograph.
1986	The study area appeared unchanged from the 1973 aerial photograph except there were numerous train carriages north and northwest of the larger shed (associated with the transport of sand). North and northwest of the study area had been cleared, and some roads were constructed as part of residential development; a large and smaller building were evident in this area.
1995	The study area appeared relatively unchanged from the 1986 aerial photograph. At the edge of the photograph extent to the east, a building was present, and north and northwest of the site there was significant residential development, with construction of a marina.
2008	The study area appeared relatively unchanged from the 1995 aerial photograph. Additional residential dwellings had been constructed in the southern portion of the marina area (south of St Andrews Drive) north and north-west of the study area.
2015	The study area appeared relatively unchanged from the 2008 aerial photograph except for additional construction of residential dwellings north and northwest of the study area.

Year	Description
2021	The study area appeared relatively unchanged from the 2015 aerial photograph except for the clearing of land immediately north of the study area (south of St Andrews Drive) and northwest of the study area (west of St Andrews Drive) for residential development.

The study area has historically been used for the transfer and transport of sand by ship, having been transported to site from the Coffin Bay area via rail. A metal fabrication business was also identified as having historically operated within the study area, for boat repairs and boat construction.

Previous investigations cited a diesel above ground storage tank (AST) of unknown volume, having historically been located adjacent the southeast corner of the metal fabrication building.

Previous soil investigations (FMG Engineering, 2021) reviewed as part of the assessment identified elevated concentrations of heavy metals (hexavalent chromium, copper, zinc) and PAHs at some locations within the study area, however, these were not found in concentrations above human health guidelines for commercial/industrial land use.

A search of the SA EPA Site Contamination Index indicated that the study area is not currently registered on the list of sites notified to the SA EPA, or currently regulated by the SA EPA as a contaminated site. The Section 7 search identified that part of the study area was previously subject to an EPA licence for a prescribed activity of environmental significance (abrasive blasting). The licence is no longer in effect.

A review of regional hydrology was undertaken via a search of the WaterConnect bore database (Department for Environment and Water, 2021), identified no groundwater bores within the study area. The nearest bore was identified 50 metres west of the study area. The bore was drilled to five metres and indicated a standing water level of 2.7 metres below top of casting.

Based on information reviewed, the assessment identified the following Potentially Contaminating Activities (PCAs), as defined by the *Environment Protection Regulations 2009,* to be associated with the past of current use of the study area (CT 6275/757 and CT 6275/756):

- rail operations
- bulk shipping facilities
- abrasive blasting
- fill or soil importation
- liquid organic chemical substances – organic.

7.8 Geology and Groundwater

This section summarises the existing terrestrial geology and groundwater conditions for the Project. A desktop study to identify potential subsurface conditions including, regional geology and expected subsurface materials, groundwater levels and likelihood of encountering acid sulphate soils and rock was undertaken for the study area that comprised the:

- RO desalination plant site
- DWTP.

The following elements of the Project were outside the scope of the desktop study:

- marine intake and outfall pump station and associated marine infrastructure
- saline waste/seawater transfer pipelines
- overhead transmission line.

This assessment of existing conditions regarding geology and groundwater makes reference geotechnical reports in the appendices.

7.8.1 Regional Geology

South Australia Resource Gateway (SARIG) (n.d.) 1:100,000 geology layers indicate the geology of the study area comprises the following geological formations:

- RO desalination plant site:
    - Bridgewater Formation (Unit Qpcb): Bioclastic barrier shoreline deposits, silica rich, with heavy minerals, shallow sub-tidal. Coastal, cross bedded Aeolian calcarenite and capped by calcrete
    - Pleistocene regolith/colluvial unit 4 (Unit Qpr4): Pleistocene gravel, clay, silt and sand with soft carbonate, overlying nodular tabular calcrete
    - Tertiary Fericrete (Unit T\fe): Undifferentiated Tertiary ferricrete
    - Wanna Megacrystic Granite Gneiss (Unit Ldw+Ldc+L-u+Ldj): Granite-gneiss, weakly to strongly foliated, mafic rich, coarse-grained
    - Quaternary Lacustrine/playa unit 1 (Unit Ql1): this material generally comprises fine grained unconsolidated sediments
    - Colbert Granite (Unit Ldc): Granitic-gneiss.
- DWTP:
    - Saint Kilda Formation (Unit Qchk8): Shelley/quartz muddy sand of intertidal flats. Veneered by cobbles and gravel in western upper Spencer Gulf.

The geology information from SARIG is presented in Figure 7.22, with the approximate alignment of the DWTP for reference.

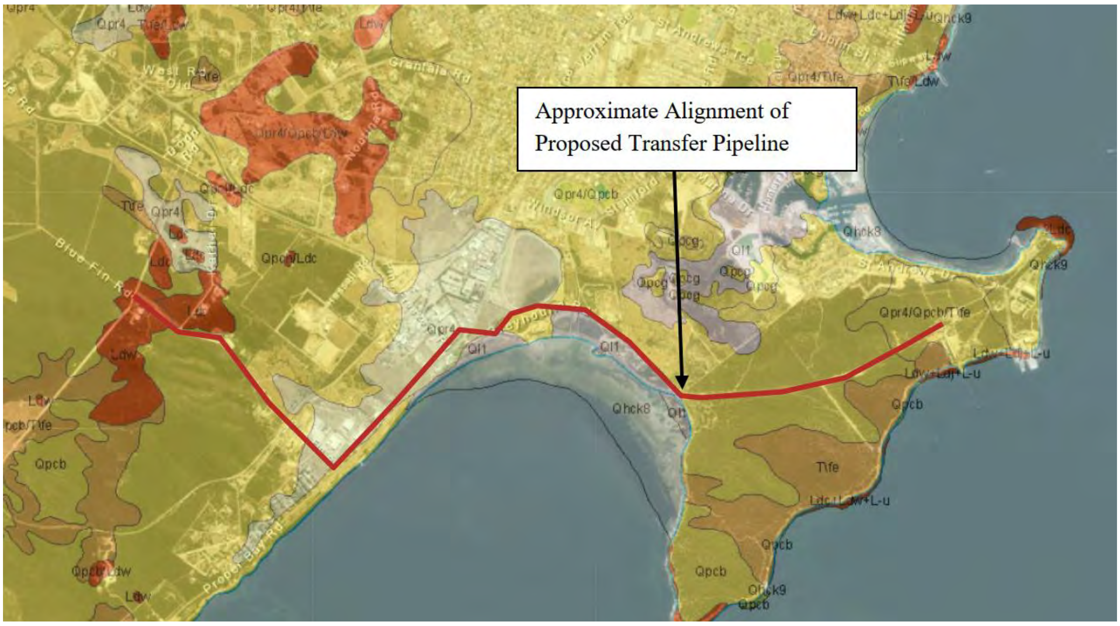


Figure 7.22 Expected Geology (South Australian Research Gateway , n.d.)

7.8.2 Project Geology

Previous geotechnical investigations at the RO desalination plant site and DWTP alignment and included:

- FMG 2021 investigation (FMG Engineering, 2021):
  - 17 boreholes to a maximum of 15 metres below ground level (mBGL) and 19 test pits to a maximum of 2.7 mBGL within the RO desalination plant site
  - 15 boreholes to a maximum of three mBGL along the DWTP
- WSP 2023 investigation (WSP, 2023):
  - Two boreholes to a maximum of 1.1 mBGL within the RO desalination plant site
  - 22 boreholes to a maximum of three mBGL along the DWTP.

A summary of the subsurface profiles encountered during these investigations within the RO desalination plant site are presented in Table 7.8.

Table 7.8 Summary of Subsurface Profile – RO Desalination Plant Site

Investigation	Subsurface profile summary
FMG (2021)[6]	RO desalination plant site: • Fill material was encountered overlying calcrete (recovered as sandy gravel), overlying very stiff to hard clay that ranged from low to high plasticity. The clay material was generally overlying dense clayey/silty sand or clayey gravel material. • Possible rock strength material (granite or limestone/ sandstone/ siltstone) was encountered underlying the dense clayey silty sand/ clayey gravel layers. This possible rock strength material was encountered from depths as shallow as 1.4 mBGL and recovered as gravel. Due to the drilling technique used (rotary air blasting) there was no information available on rock strength or weathering. DWTP within RO desalination plant site: • Topsoil overlying inferred low strength limestone/calcrete (recovered as sand/ gravelly sand/ silty sand/ sandy gravel).
WSP (2023)[7]	DWTP within RO desalination plant site: • Topsoil material was encountered overlying very stiff to hard clay of low plasticity. • Push tube refusal at 0.8 to 1.1 mBGL.

A summary of the subsurface profiles encountered during investigation of the DWTP are presented in Table 7.9.

Table 7.9 Summary of Subsurface Profile – DWTP

Investigation	Subsurface profile summary[8]
FMG (2021)	Greyhound Road: • Topsoil overlying very loose to loose sand/ silty sand/ gravelly sand/ clayey sand. Proper Bay Road: • Topsoil overlying loose to medium dense clayey sand/ silty sand/ silty gravelly sand. Blue Fin Road: • Topsoil overlying inferred low strength limestone/calcrete (recovered as sand/ gravelly sand/ silty sand/ sandy gravel).

6 Subsurface profile discussed excludes boreholes drilled in the breakwater area to the south of the RO desalination plant site.
7 Only two boreholes were drilled as part of the WSP 2023 investigation in the Site.
8 *Excludes section of the transfer pipeline alignment within the Site, refer to* Table 7.8 *for this information.*

Investigation	Subsurface profile summary[8]
WSP (2023)	Greyhound Road: • Topsoil overlying medium dense to dense gravelly sand, overlying loose to medium dense gravelly sand. In one borehole (BH04A) fill material was encountered to 2.3 mBGL (push tube refusal was met at this depth). Proper Bay Road: • Fill material was encountered overlying loose to medium dense clayey sand/sand (with some intersecting sandy clay layers). Blue Fin Road: • Topsoil overlying medium dense to dense gravelly sand. Push tube refusal at 0.2 to one mBGL. North Side Hill Tanks: • Fill overlying medium dense to dense gravelly sand/silty gravelly sand. Push tube refusal was met in two of the three boreholes drilled in this area at depths of 2.3 mBGL and 2.5 mBGL.

7.8.3 Groundwater

A review of the South Australian Government's WaterConnect database (2021) indicates:

- groundwater as shallow as two mBGL may be encountered within the RO desalination plant site
- groundwater levels ranging from 0.4 mBGL to 24 mBGL along the DWTP.

Groundwater levels are subject to seasonal, climatic and tidal variations. There is also the potential for perched water to be encountered within the study area.

During the 2021 geotechnical investigations, groundwater was encountered at:

- 3.1 mBGL within the breakwater to the south of the RO desalination plant site
- 9.8 mBGL (rising to 7.3 mBGL upon completion of borehole) within other areas of the RO desalination plant site
- 1.2 to 2.9 mBGL along the Greyhound Road portion of the DWTP.

No groundwater was encountered during the 2023 investigation.

7.8.4 Acid Sulphate Soils

A review of Australian Soil Resource Information System (ASRIS) (Australian Soil Resource Information System, n.d) indicates that the probability for encountering acid sulphate soil within the RO desalination plant site is extremely low with very low confidence. Likewise, it indicates that the probability of encountering acid sulphate soil within the DWTP is extremely low to low with very low to moderate confidence along the majority of the DWTP alignment (refer to Figure 7.23).

Figure 7.23 Potential Acid Sulphate Soil (Australian Soil Resource Information System, n.d)

Saint Kilda Formation (Unit Q_{chk8}) and Quaternary Playa sediments (Unit Q_{l1}) may be associated with the presence of acid sulphate soils. These formations could be encountered in the section of the DWTP that runs along Greyhound Road and Proper Bay Road.

Testing undertaken on samples collected during the WSP (2023) indicated that there is a low potential of acidifying ability in soils sampled.

7.9 Marine

This section provides an overview of the physical and biological characteristics of the marine and coastal environment in Boston Bay, Proper Bay and surrounds. The marine intake and outfall pump station is to be located within the SA Water Port Lincoln WWTP. The marine intake and outfall pipelines would run through a tunnel below ground to approximately 500 m offshore of the marine intake and outfall pump station, into the marine waters of Boston Bay and Proper Bay.

Port Lincoln and the marine environment of Boston Bay and Proper Bay hosts multiple industries including aquaculture, fishing, ship repair, WWTP, Port operations, recreational / pleasure vessels and tourism. The Jussieu biounit, which contains Boston Bay and Proper Bay, has recently been classified by the EPA as being in Fair condition (EPA, 2022), having previously been classified as Good (EPA, 2016).

Given the multiple existing pressures, a series of marine studies were undertaken to define the characteristics of the marine and coastal environment. This is required both to assess the water quality of the intake waters into the RO desalination plant and the condition of the receiving environment in which the discharge would be released. The study area for the marine studies is shown in Figure 7.24.

7.9.1 Physical Environment

The Project site is located at Billy Lights Point within Boston Bay. Boston Bay, and the adjoining Proper Bay, are coastal embayments at the southwestern boundary of the Spencer Gulf. Boston Bay is a large and shallow natural harbour created by the presence of the five km long Boston Island which lies six km off Port Lincoln. Proper Bay opens to the southern end of Boston Bay and is relatively shallower.

7.9.1.1 Hydrodynamics

Water movement within Spencer Gulf is influenced by multiple oceanographic processes, including tidal streams, thermohaline (density driven) circulation and wind forced circulation. These processes are important in structuring the environment around Billy Lights Point and are discussed further in the section below.

Oceanographic mooring locations used to inform this section are shown in Figure 7.25.

7.9.1.1.1 Currents and Tides

Spencer Gulf

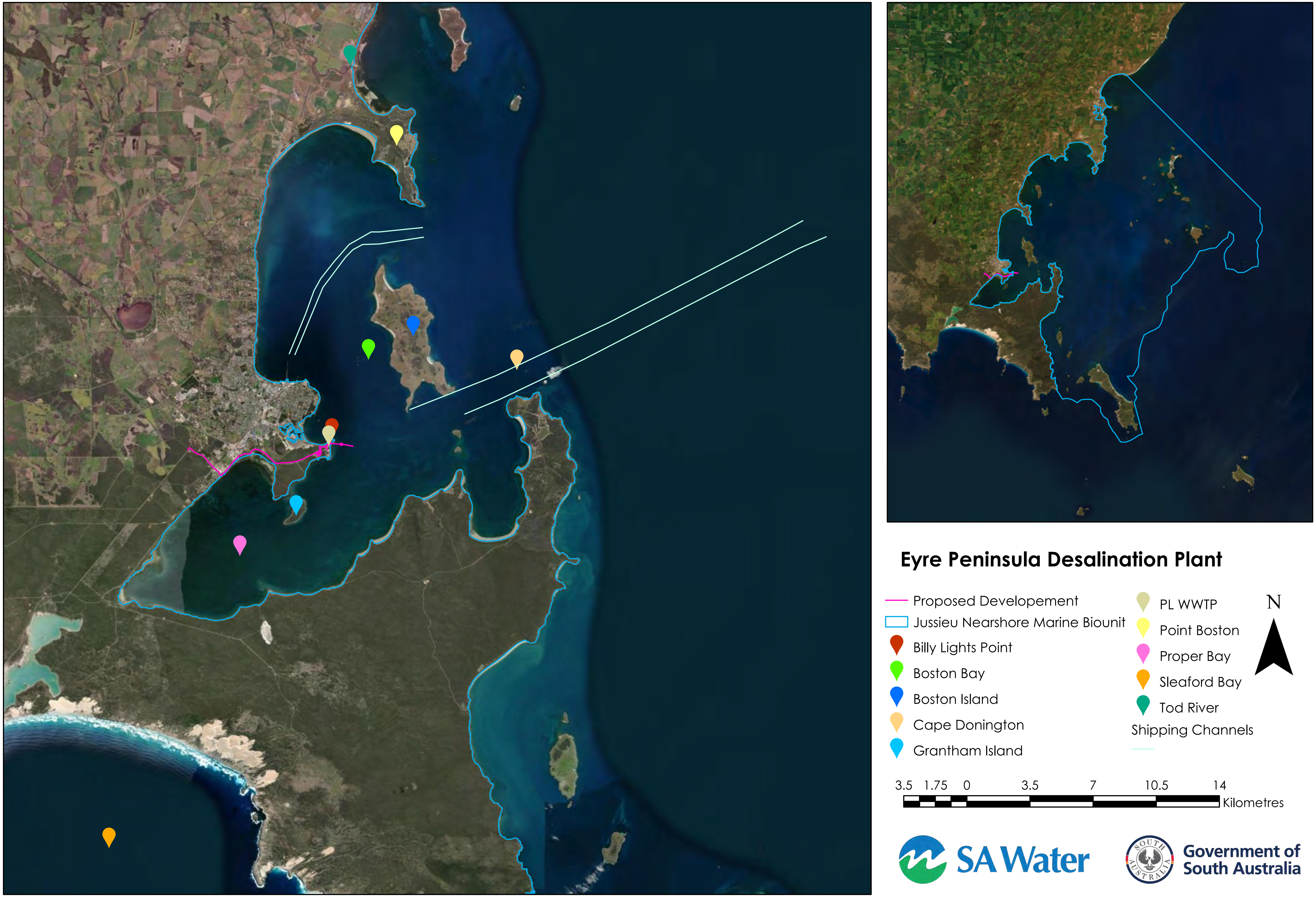
The tidal range within Spencer Gulf reaches over three metres at the head of the Spencer Gulf, with the maximum spring tide around two m ADD (mAHD) at Port Lincoln (BOM, 2024). Tidal streams are strong (0.5 to 1.5ms^{-1}) and are an important mechanism for promoting mixing and flushing within the Spencer Gulf (Easton, 1978; Doubell, *et al.*, 2015).

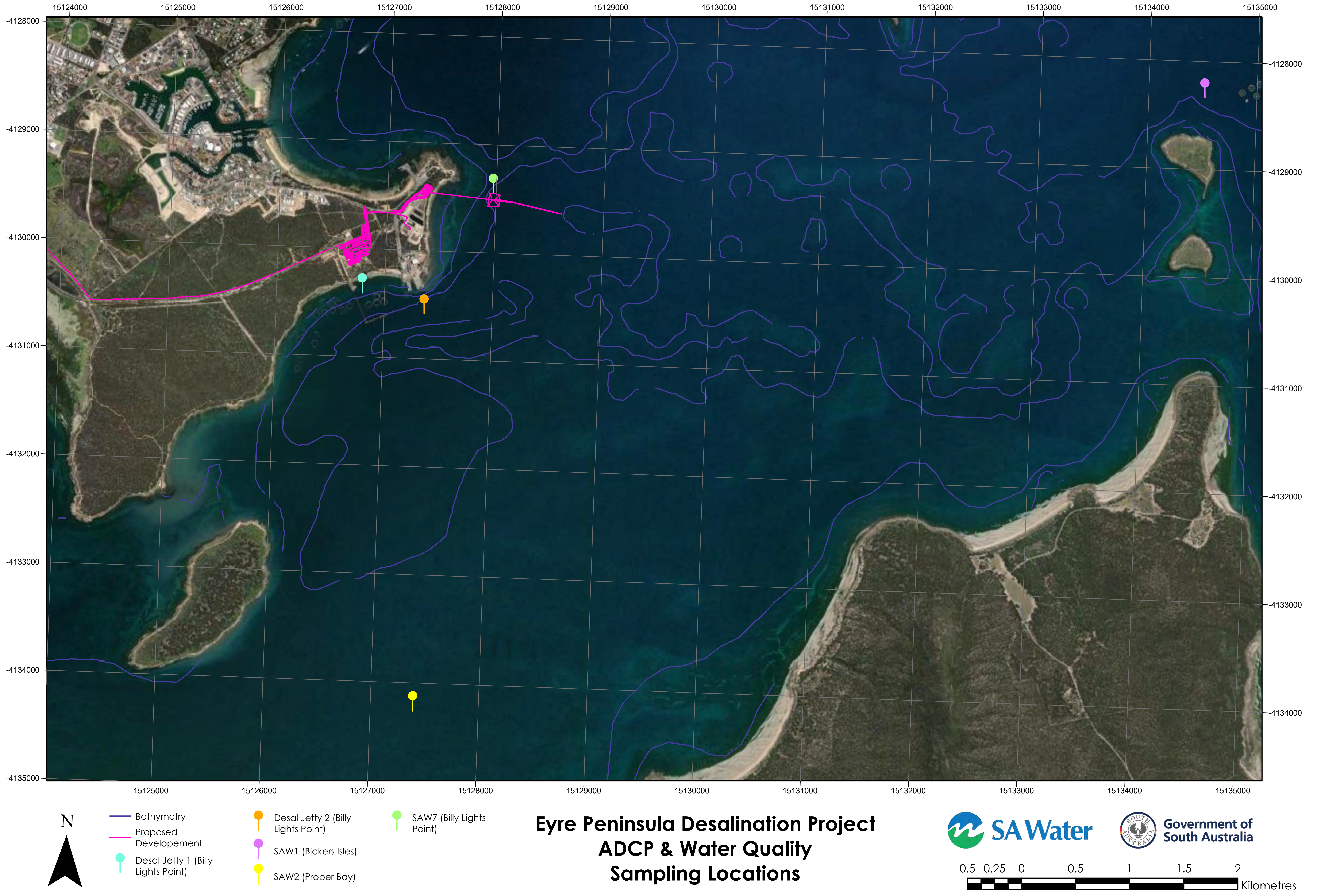
Spencer Gulf is classed as an 'inverse estuary', as it has higher salinity water towards the head of the Spencer Gulf compared to the mouth, especially in the summer months. The lack of significant freshwater input to the Spencer Gulf, in combination with the general climate in the region, leads to a significant net loss of freshwater as the rate of evaporation exceeds the input from rivers and precipitation (Nunes, *et al.*, 1990). The lower rainfall levels, higher temperatures and reduced input from rivers also results in higher rates of evaporation in the shallow nearshore margins in addition to the shallower upper Spencer Gulf. The north to south salinity (and density) gradients alongside the prevailing westerly winds, drive a clockwise circulation pattern during winter and autumn, when the high salinity water sinks as it cools and flows out of the Spencer Gulf while less dense water flows in off the continental shelf on the surface (Doubell, *et al.*, 2015).

This 'thermohaline' current results in nutrient-rich offshore continental shelf water entering along the western side of the Spencer Gulf (including into the Port Lincoln region) and an outflow of dense water exiting the Spencer Gulf past Kangaroo Island along the eastern side. During the warmer months the extent of water exchange between the Spencer Gulf and the shelf is limited by barrier of dense water blocking water exchange (Nunes, *et al.*, 1990; Petrusevics, 1993)(Nunes, *et al.*, 1990, Petrusevics, 1993, Petrusevics, *et al.*, 2011).

A characteristic feature of the coast of South Australia is the presence of neap tides with minimal rise and falls over the course of a day or two, known in South Australia as 'dodge' tides (Easton, 1978). These occur in Spencer Gulf for a period of a few days twice a month when the semi-diurnal element of the neap tide is virtually absent because the dominant tidal elements (solar and lunar) cancel themselves out and tidal movements cease or are very small. The clockwise circulation within Spencer Gulf is moderated by the fortnightly dodge tide when the current speed is near to zero.

Wind-forced currents driven by strong winds in the southern Spencer Gulf are weak in comparison with tidal circulation, although they can be important in the longer term and can be important in terms of flushing and nutrient transport (Doubell, *et al.*, 2015; Herzfeld, *et al.*, 2009 ; Tanner & Volkman, 2009).


Eyre Peninsula Desalination Plant
Proposed Developement
Jussieu Nearshore Marine Biounit
Billy Lights Point
Boston Bay
Boston Island
Cape Donington
Grantham Island
PL WWTP
Point Boston
Proper Bay
Sleaford Bay
Tod River
Shipping Channels
N
3.5 1.75 0 3.5 7 10.5 14
Kilometres
SA Water
Government of South Australia



Eyre Peninsula Desalination Project ADCP & Water Quality Sampling Locations

SA Water

Government of South Australia

Boston Bay and Proper Bay

The inshore waters of Boston Bay and adjacent embayments experience reduced tidal currents (and associated flushing rate) in comparison to the adjacent waters within Spencer Gulf (Middleton, *et al.*, 2013, Middleton, *et al.,* 2014, Herzfeld, *et al.*, 2009). Oceanographic data to inform hydrodynamic modelling has been collected by SA Water since 2021 at moorings placed within Boston Bay (see Figure 7.25). Oceanographic data to inform hydrodynamic modelling has been collected by SA Water since 2021 at moorings placed within Boston Bay (see Figure 7.25). The data indicates currents are predominantly tidally driven (up to 0.2-0.3m s^{-1}) with a weaker influence from wind currents (<0.05m s^{-1}) (see Appendix J) Measured currents are principally aligned with the shoreline; with an east to west axis south of Boston Island and northeast to southwest at the entrance of Proper Bay.

The hydrodynamic modelling completed by SARDI to inform the development application (see Appendix J) has provided patterns of seasonal circulation within the study area. During the cooler months seawater flows into Boston Bay from the north of Boston Island resulting in a clockwise circulation pattern in the north of the bay, with waters exiting beside Point Boston, and an anti-clockwise circulation pattern in the south of the bay, with waters exiting south of Boston Island (see Figure 7.26). During summer the circulation pattern changes with water flowing into the embayments from the south of Boston Island resulting in a clockwise circulation pattern throughout Boston Bay associated with currents moving along the north coast past Billy Lights Point (see Appendix J). The oceanographic conditions in Boston Bay are described in further detail in Appendix J.

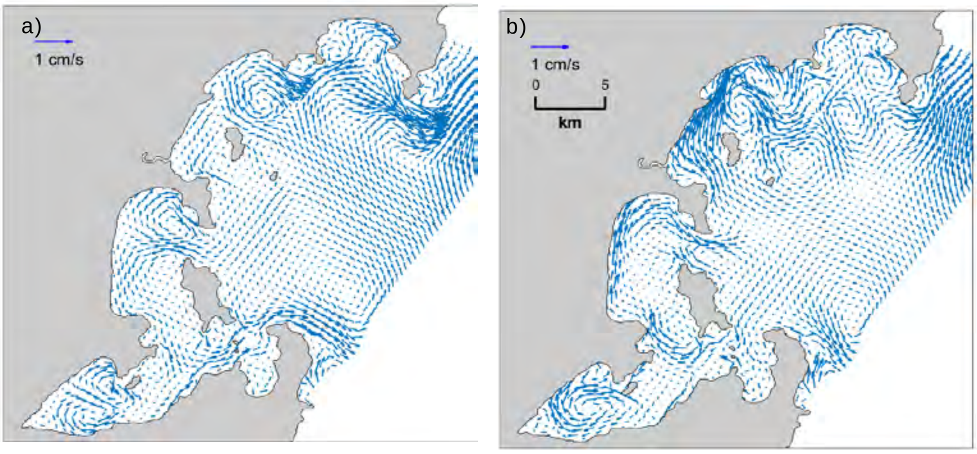


Figure 7.26 Seasonal Circulation Patterns in Boston and Proper Bays as Simulated in Oceanographic Modelling for Winter (a) and Summer (b)

7.9.1.1.2 Wave Regime

Wave energy within the Spencer Gulf is generally moderate in the lower gulf, and low to very low in the upper gulf (Edvayne, 1999). The wave climate in the southern gulf is influenced by local wind conditions and offshore waves entering the gulf from the south to southwest (Doubell, *et al.,* 2015). The area is protected from the high energy of the Southern Ocean by the Eyre Peninsula, including Thistle Island. Within Boston Bay the wave climate is characterised by reduced energy due to the additional protection by Boston Island and the arrangement of the coastline.

Wave measurements have been collected by SA Water at ADCP deployed at Billy Lights Point and the entrance to Proper Bay. A numerical wave modelling study has also been completed at Billy Lights Point to inform the design of the Project's marine works (see Appendix L). The measured and modelled data both illustrate that wave height at Billy Lights Point is very small, have short periods and are wind generated. Infrequent events of higher wave energy do occur, more notably in winter, but the wave environment can be characterised as generally benign.

7.9.1.1.3 Temperature, salinity and dissolved oxygen

Seasonal water temperature is highly variable across the Spencer Gulf, particularly in the shallower areas (including the coastal margins and northern gulf area). The region experiences a Mediterranean climate with warm summers and cool winters, and variation in water temperatures follow trends in air temperature.

SA Water have undertaken water quality monitoring at locations in Boston Bay and Proper Bay since 2021 (see Figure 7.25). Vertical temperature and salinity profiles have also been mapped at 106 sites throughout Boston and Proper Bays. Results illustrate both temporal and spatial trends in temperature, salinity and dissolved oxygen. Full details and results from the water quality monitoring program are presented in Appendix M.

Water temperature at Billy Lights Point during the period 2021 to 2024 ranged from 22.7°C in late summer to 12.4°C in winter. Measures of salinity were highest in summer with a value of 38.2 psu[9] and lowest in winter with a value of 36.2 psu.

The whole of bays sampling at 106 sites across Proper Bay and Boston Bay provides information on salinity variability within the bays at any one time. There are large differences (>0.2 psu) between the minimum value recorded and the maximum value recorded during a sampling period. Salinity varied by approximately one psu consistently in summer across 2021-24, and large differences were also recorded at other times of the year, e.g. June 2023 (see Figure 7.27).

The data collected at the water quality monitoring site located to the south of Boston Island, i.e. in waters more exposed than within the inner Proper Bay and Boston Bay, also shows that during the summer months variations of 0.1 psu occur on an hourly timescale, and variations of 0.5 psu on a weekly timescale (see Appendix J).

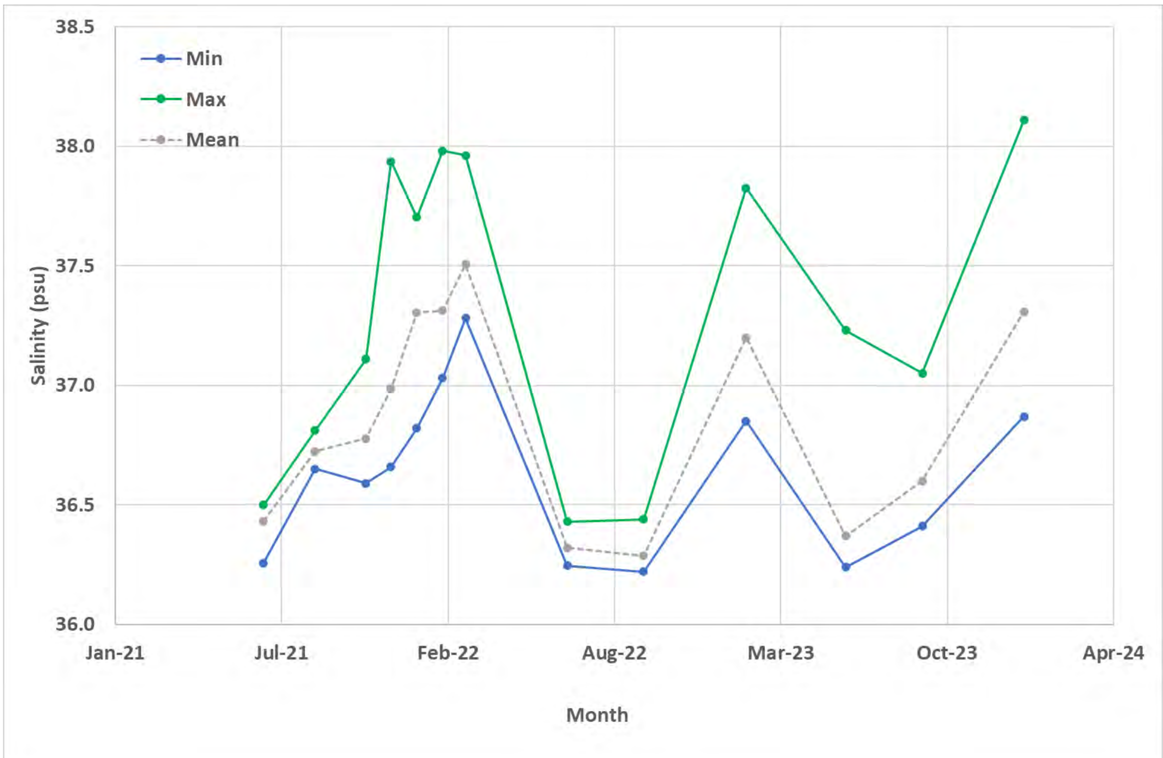


Figure 7.27 Minimum, Maximum and Mean Salinity Values Recorded Across 106 Sites in Proper and Boston Bays

[9] Salinity of seawater is usually expressed as the grams of salt per kilogram (1000g) of seawater. Where 36 g of salt is present in each 1 kg of seawater, the salinity is 36 parts per thousand (ppt). Salinity is also now expressed under the practical salinity scale, as practical salinity units (psu), where 1 PSU = 1 ppt. As salinity defined using the practical salinity scale is a ratio it is also an accepted convention to express the value as unitless.

Water temperature during spring and summer was warmest in the southern area of Proper Bay and the western shore of Boston Bay, while in autumn and winter water temperature was warmest on the eastern edges of Boston Bay and Spalding Cove. Salinity levels are consistently higher in Proper Bay in comparison with Boston Bay and surrounding. At BLP Jetty 2 (see Figure 7.25), higher saline water was observed at the sea floor in both in February 2022 and 2023.

A salinity stratification of the water column was observed in May 2023 at two sites (see Figure 3 in Appendix M), where saline water was present on the sea floor. At BLP Jetty 2 higher saline water was observed at the sea floor in both in February 2022 and 2023 (see Figure 3 in Appendix M).

Dissolved oxygen stratification (low dissolved oxygen levels on the seabed) was also observed in association with higher saline waters (see Figure 4 in Appendix M). The whole of bays sampling identified large differences (>2 mg/L) between the minimum value recorded and the maximum value recorded during a sampling period (Figure 7.28).

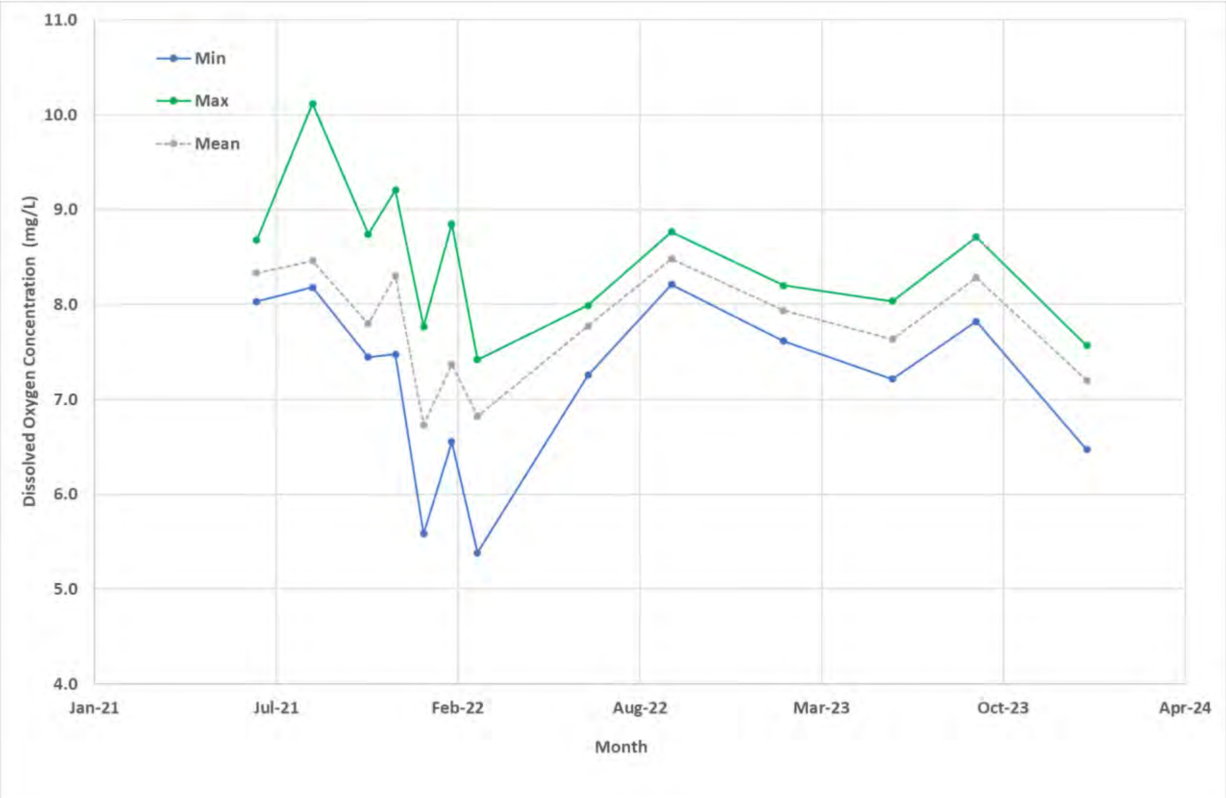


Figure 7.28 Minimum, maximum and Mean Dissolved Oxygen Values Recorded Across 106 Sites in Proper and Boston Bays

7.9.2 Water Quality

Boston Bay and adjacent embayments support a range of marine habitats and species, including extensive seagrass beds and diverse faunal and fish communities, as well as hosting economically valuable aquaculture resources (see Section 7.9.4 and 7.9.6 7.9.6). Water quality is a key influence on the health and functioning of marine ecosystems. Characterisation of the existing water quality and known water quality pressures in the study area is necessary to facilitate an understanding of the potential impacts of the Project on marine habitats and ecologically and economically important species. The sections below provide a summary of these aspects.

7.9.2.1.1 EPA monitoring

Boston Bay and Proper Bay are currently subject to several anthropogenic nutrient sources (EPA, 2022). The EPA monitors aquatic environments in South Australia to assess their condition based on criteria including water quality, changes in seagrass cover and seagrass epiphyte loads. The Jussieu biounit, which extends from Cape Catastrophe to Tumby Bay, has recently been classified by the EPA as being in Fair condition (EPA, 2022), having previously been classified as Good (EPA, 2016).

The EPA also undertook an ambient water quality monitoring program in Boston Bay and Proper Bay over an 11 year period to 2008 ((Gaylard, 2009) which provides historical data for comparison with recent baseline water quality monitoring data discussed in the section below.

7.9.2.1.2 Baseline Monitoring

A water quality sampling program commenced in 2021 to collect data on background water quality parameters to establish a baseline and to inform design of the desalination plant. Water samples have been regularly collected from the Boston Bay, Proper Bay and Louth Bay (see Figure 7.25). The monitoring program is ongoing in the Billy Lights Point area, building up a dataset to inform the baseline conditions for the proposed RO desalination plant site.

The water quality parameters used to characterise water quality are defined into three categories: physical (salinity, dissolved oxygen, pH, turbidity, temperature and suspended solids), chemical (nutrients and metals) and biological (chlorophyll *a,* faecal coliforms and *Escherichia coli*).

Water quality measurements were compared with the Australian and New Zealand Guidelines for Fresh and Marine Waters (ANZECC/ARMCAN, 2000; ANZG, 2018), which provide trigger values for the classification of water quality. Under the ANZECC/ARMCANZ guidelines trigger values can be derived using local reference data, which is the preferred approach, or using default guideline values when adequate data is not available. Trigger values for toxicants within this analysis are based on ANZECC/ARMCANZ guidelines of 95 per cent species protection for a 'slightly to moderately disturbed' system, where a toxicant water quality trigger value is set at a level that would protect 95 per cent of species (ANZECC/ARMCAN, 2000). This approach is consistent with the approach used by the EPA to classify the Jussieu biounit as being in Fair condition (EPA, 2022; Gaylard, 2009).

The National Health and Medical Research Council (NHMRC) Guidelines for Managing Risks in Recreational Water (NHMRC, 2008) are also used for the classification of microbial data for water quality. The full details and results of the water quality monitoring program at Billy Lights Point are presented in Appendix M.

Key findings of baseline monitoring include:

- The concentration of suspended solids was low for the entire monitoring period at all three locations, with an average of 0.543 mg/L . The highest measurement across all sites was 1.395 mg/L. Concentrations greater than 10 mg/L are considered to be detrimental to the marine environment (ANZECC/ARMCAN, 2000).
- Turbidity was generally low, with values below 0.5 NTU across all sites except for one value of 1.0 NTU at BLP Jetty 2 in February 2022.
- Metal and nutrient concentrations were all within the normal range observed for coastal waters - copper had 95th percentile values above the ANZECC/ARMCANZ guidelines for water quality at all sites.
- Biological characteristics of samples were generally within the normal range observed for coastal waters. The exception was chlorophyll *a*; the median concentration at SAW7 and SAW2 which exceed the ANZG (2018) guideline range. Maximum values recorded were during June 2023, which was the same period as a bloom of the dinoflagellate gymnodinoids (see also Section 7.9.4.1.5).

7.9.2.1.3 Water Quality Inputs

The water quality of Spencer Gulf is influenced by natural biochemical processes as well as anthropogenic inputs. Consideration of the current and likely future inputs to Boston Bay is required to understand potential water quality impacts associated with the construction or operation of the Project.

Nutrient inputs to Boston Bay and Proper Bay include those from freshwater inputs (e.g. Tod River), the existing Port Lincoln WWTP at Billy Lights Point and aquaculture within and near to Boston Bay and the nearby embayments. The shipping and fishing activities in the bays also result in inputs influencing baseline water quality. Port areas are associated with a range of activities which may result in discharges to water such as discharge of ballast water, use of antifouling pants, storage and use of chemicals, oil and other hydrocarbons (O'Brien, 2002).

The EPA identified in their updated 2022 Condition Report for the Jussieu biounit that both Boston Bay and Proper Bay are currently in an 'unnatural state and are under pressure from nutrient enrichment' (EPA, 2022). A discussion of the identified water quality pressures is provided below (refer to the Condition Report[10] for further detail).

Stormwater

The township of Port Lincoln is steep with a general gradient from west to east, with stormwater ultimately discharging to the sea (Tonkin, 2014). Parts of Port Lincoln are subject to significant stormwater flooding during high rainfall events. Poor quality stormwater can enter the marine environment within Boston Bay during these events.

The Tod River is the only permanently flowing waterway on the Lower Eyre Peninsula. The river flows into the southern end of Louth Bay, north of Boston Bay (see Figure 7.24), when there is sufficient rainfall. Annual rainfall on the Eyre Peninsula varies between 200 mm and 500 mm year, with rainfall generally falling mainly during winter (Rixon , *et al.*, 2002). The Tod catchment is composed largely of agricultural land. Elevated levels of nutrients and sediment (and associated agricultural pesticides/herbicides) within discharges from the Tod River have an impact on the marine ecosystem in Louth Bay and the wider area. The latest EPA condition assessment (EPA, 2015) indicates the sampling site at the Tod River, approximately 20 km from the discharge to Louth Bay, was in a Fair to Poor condition, with water quality at the mouth of the river expected to be of poor quality.

Port Lincoln Wastewater Treatment Plant

The Port Lincoln WWTP discharges treated wastewater via an outfall into Proper Bay. Upgrades to the plant over recent years have include diversion of some flow to a recycled water scheme, upgrade to aeration controls to reduce nitrogen concentrations and commissioning of an anerobic digestor. Modifications to the WWTP in 2016 (the plant was originally built in 1994), were required to allow the WWTP to accept additional waste streams such as fish processing effluent that was previously discharged into Proper Bay. The upgrades improved the WWTP's environmental performance and the water quality being discharged to the marine environment (see Figure 7.29). The wastewater discharge does provide inputs of ammonia, total nitrogen and total phosphorus to the marine environment. However, the annual WWTP nitrogen contribution to the marine system is very small (approx. <1 per cent) when compared to other industrial inputs such as sea cage aquaculture (Tanner, *et al.*, 2020).

[10] Jussieu Nearshore Marine Biounit 2022 Aquatic Ecosystem Condition Report | EPA

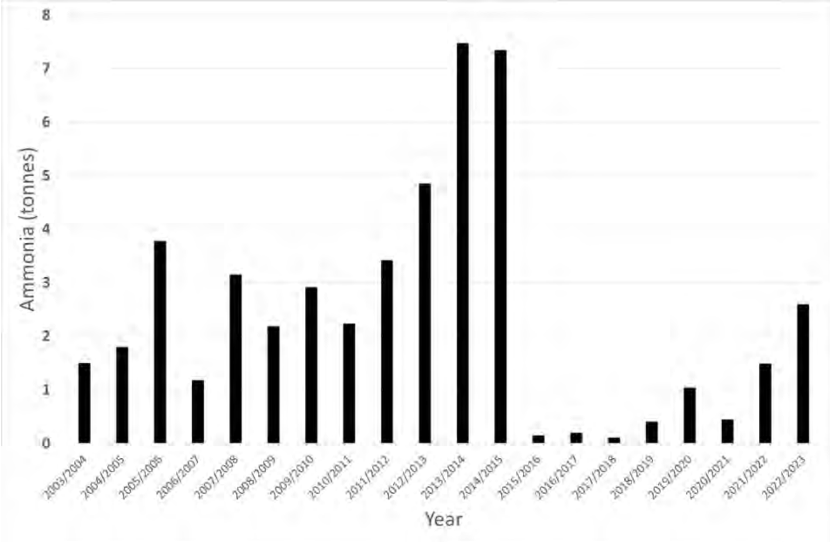


Figure 7.29 Emission of ammonia to water from Port Lincoln Wastewater Treatment Plant (tonnes per year)

Aquaculture industry water quality influences

The EPA has identified that the cumulative effect of intensive sea cage aquaculture contributes high nutrient loads into the nearshore marine waters in the Boston Bay area (EPA, 2022). Coastal and deeper water marine aquaculture industries, in particular those involving supplementary fed animals (e.g. finfish aquaculture), discharge a number of waste streams into the marine environment. Input of nutrients into the marine environment occurs via release of uneaten feed, faecal matter, metabolic products and dead fish etc. Other aquaculture sectors, such as mussel cultivation, do not result in such significant inputs to the environment, because they rely on the ambient environment to provide a food source for production.

Further information about the local aquaculture sector and regulation of the industry is presented in Section 7.9.6.

Ongoing annual monitoring is required under aquaculture lease conditions. A regional based environmental monitoring program conducted by SARDI has been ongoing since 2015 in the lower Spencer Gulf to monitor the impacts of aquaculture activity. The reporting for the 2015-2019 regional aquaculture environmental monitoring program (AEMP) indicates that aquaculture activity in the region is 'having a detectable impact on water quality and trophic state in both Boston and Louth Bay (Tanner, *et al.*, 2020). The 2015-2019 AEMP included pelagic and oceanographic monitoring (including water quality and plankton communities) as well as a benthic component (i.e. infauna monitoring).

The results of the 2015-2019 AEMP indicated significant spatial and temporal variations in the physical environment, circulation, water quality and planktonic ecosystem composition. Inshore sites within Boston Bay and Louth Bay differed significantly from offshore sites across several indicators, including nutrients, chlorophyll *a*, phytoplankton abundance and community composition, harmful algal bloom (HAB) species and planktonic community size, structure and composition. The report concludes these differences are consistent with impacts expected from anthropogenic nutrient enrichment. The majority of the anthropogenic nitrogen to the Port Lincoln region is derived from baitfish (83 per cent) and manufactured feed (16 per cent), associated with bluefin tuna and yellowtail kingfish aquaculture. It was noted that the Port Lincoln WWTP contributed less than one per cent of the annual nitrogen input to the region (Tanner, *et al.*, 2020).

The 2019-2023 AEMP (to be reported later in 2024) has been focussed on further detailed studies of the fate and consequences of nutrients added to the marine environment, including effects on seagrass communities within Boston Bay and Louth Bay.

Alongside nutrients, other inputs such as incidental pollution such as debris from the cages, accidental spills etc, and as part of normal operations within the aquaculture industry certain veterinarian medicines may impact on water quality (Tanner, *et al.*, 2020).

Algal Blooms

Boston Bay and the adjacent embayments such as Proper Bay are shallow and experience reduced flushing in comparison with the wider Spencer Gulf (Middleton, *et al.*, 2013). Combined with the warm waters in the region this provides favourable conditions for the phytoplankton community to respond to additional nutrient inputs. The concentration of dissolved inorganic nutrients in the waters of Spencer Gulf are relatively low, with the region considered oliogotropic (deficient in nutrients) ((Tanner & Volkman, 2009; Tanner, *et al.*, 2020). The growth of the phytoplankton community is likely to be limited by nutrient levels (see Section 7.9.4.1.5), meaning it is susceptible to additional anthropogenic inputs facilitating conditions for algal blooms (Tanner, *et al.*, 2020).

The 2015 to 2019 AEMP results showed the phytoplankton community structure responds to the shift in trophic status (increase in nutrients) particularly within inshore sites (Tanner, *et al.*, 2020). The analysis indicates that changes in ammonia concentration explained a large part of the variation. These changes included a shift in composition from diatoms to dinoflagellates and other flagellated species as well as an increase in the presence and frequency of HAB species.

Algal blooms (including HAB) have been frequently documented as occurring throughout Boston Bay and Proper Bay (e.g. see Section 7.9.2.1.3), with some associated with elevated temperatures and being attributed to fish kill events. A large-scale fish kill across the South Australian coast in summer 2013, including Port Lincoln, coincided with high nutrient concentrations and high concentrations of a harmful diatom species (*Chaetoceros coarctatus*) (Roberts, *et al.*, 2019). An unusually high mortality event associated with two tuna licences in 2021/22 was attributed to an algal bloom (PIRSA, 2023). The PIRSA water quality sampling as part of the South Australian Shellfish Quality Assurance Program also frequently detects high abundance of phytoplankton both in summer and winter periods (e.g. 580,000 cells/L of *Karenia mikimotoi* reported in June 2023) (personal communication from SASQAP to SA Water 20th June 2023).

7.9.3 Geology and Sediment

Geology of the Project site is described in Section 7.8.2.

A sediment sampling and analysis program has been conducted to characterise the physical and chemical properties of the sediment in the Project site. Full results and analysis are provided in Appendix N and are summarised in Section 7.9.3.1 and Section 7.9.3.2.

7.9.3.1 Sediment Particle Size

Twelve sediment core samples were collected from the Project site. The particle size distribution (PSD) results show that sediment samples were dominated by sand and gravel fractions (see Figure 7.30). Sand dominated the composition of the samples (47 to 100 per cent) and fine sediment (clay and silt fractions) made up a smaller proportion (0 to 27 per cent).

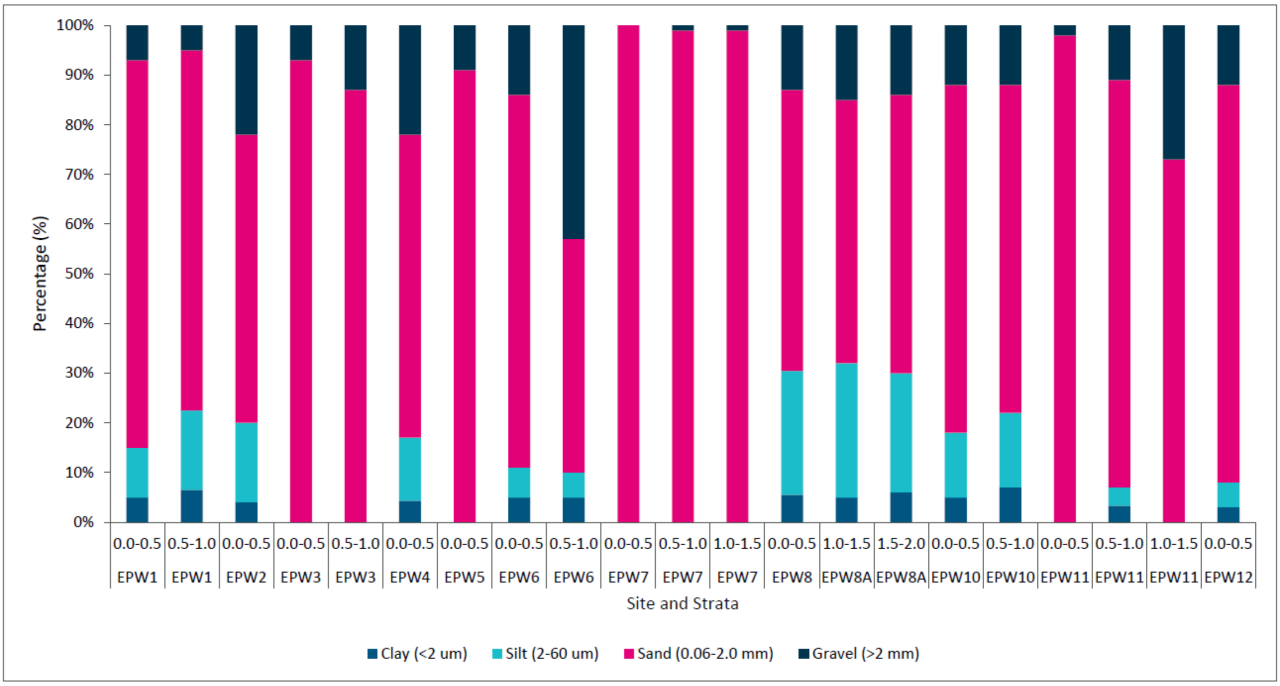


Figure 7.30 Particle size distribution of 12 sediment core samples collected off Billy Lights Point

7.9.3.2 Sediment quality

The sediment contaminant testing identified metals and metalloids in all samples. Silver was the only metal which was not detected in any sample. However, the concentrations of metals were all below the National Assessment Guidelines for Dredging[11] (NAGD) except for arsenic. The concentration of arsenic exceeded the NAGD screening level in one sample however the 95th percentile level was below the screening level and under the NAGD does not require further assessment. For many sites the concentration of metals/metalloids were below the limit of reporting.

Most other contaminants, including hydrocarbons, were not detected at levels above the laboratory limits of reporting, except for low levels of tributyltin and two synthetic pyrethroids.

7.9.4 Marine Ecosystems

Nearshore Australian coastal and marine environments are classified into 60 distinct marine biogeographical regions, each with distinct physical and biological characteristics (DCCEEW, 2024). Boston Bay and surrounds are located within the Eyre marine bioregion which stretches from Cape Bauer on the west coast to Cape Willoughby on Kangaroo Island and extends up to Port Neill on the Eyre Peninsula (DEW, 2024). Coastal and marine habitats found within the Eyre marine bioregion include cliffs, rocky shores, reefs, seagrass meadows, mangroves and sand and mud tidal deltas. The bioregion is divided into biounits which contain similar marine habitats. The habitats and species found within Boston Bay and Proper Bay, which are located within the Jussieu biounit, are representative of much of the diversity within the bioregion and are described in further detail in the review of the existing environment below.

The following sections have a focus on specific components of the marine ecosystem relevant to the Project in terms of potential impacts from the construction and operation of a desalination plant and include:

- seagrass meadows in shallow, sandy areas
- macroalgal (seaweed) communities on areas of rocky reef and hard substratum
- marine invertebrates
- fish
- plankton (including larvae and eggs).

[11] https://www.dcceew.gov.au/sites/default/files/documents/guidelines09.pdf

7.9.4.1 Benthic environment

7.9.4.1.1 Seagrass

Seagrass meadows play an important role in coastal ecosystems, including provision of nursery habitat, improved water quality, coastal protection, and carbon sequestration (Larkum, *et al.*, 2018). Seagrass meadows are under threat across the globe, including those found in Australian waters, from pressures such as urban, industrial, and agricultural run-off, coastal development, dredging, fishing and boating activities, and climate change. In South Australia, seagrass is protected under the *Native Vegetation Act 1991*.

Seagrass provides important habitat for many species in the coastal waters of the region, including habitat for commercially and recreationally important fisheries species such as King George whiting, *Penaeus latisulcatus* (western king prawns) as well as ecologically important species such as *Phycodurus eques* (leafy seadragon).

The sheltered coast and bays in the Eyre bioregion provide sheltered conditions for extensive seagrass meadows to develop on areas of soft sediment. Twelve species of seagrass are found across South Australia and the majority are found within the Eyre bioregion, including six species of *Posidonia*, two species of *Amphibolis*, *Zostera*, two species of *Heterozostera*, and *Halophila australis* (EPA, 2013; Appendix P and Appendix Q). The distribution and abundances of these species are affected by numerous factors, including wave energy, tidal velocity, sediment stability, salinity, and light availability as each species exhibits varying tolerance to variations in each factor (Cambridge, *et al.*, 2019; Shepherd & Robertson, 1989).

A review of historic habitat mapping by CSIRO, the EPA and University of Adelaide is included in Appendix P. The review found Proper Bay was dominated by dense seagrass (with a dense cover of epiphytes), and that Boston Bay contained dense seagrass cover to the north of the Bay, along the northern and western coastlines of the Bay and near Boston Island, with bare substrate in deeper areas.

The EPA monitors seagrass cover and ephiphyte loads (filamentous brown macroalgae that grow on seagrass and other species) as part of their program of aquatic ecosystem monitoring, evaluation and reporting (AECR). The 2022 monitoring results indicate that seagrass cover had remained constant to that recorded in the 2016, however epiphyte cover had increased by 39 per cent compared to the 2016 results (EPA, 2022). At the Billy Lights Point corresponding epiphyte cover had increased from 47 to 73 per cent. The report concludes that the high epiphyte loads, in combination with changes in the phytoplankton community (see Section 7.9.2.1.3), are indicative of a system under pressure from nutrient enrichment (EPA, 2022). At Rotten Bay, located at the south of Boston Bay, the seagrass habitat (24 per cent cover) noted in 2010 had completely disappeared and was dominated by nutrient tolerant epifaunal species such as ascidians, invasive European fan worms (*Sabella spallanzanii*), holothurians (sea cucumbers) and microphytobenthos.

Epiphytic algae can respond rapidly to available nutrient loads. Increased growth of epiphytes on seagrass blades reduces the light available to for photosynthesis and therefore restricts growth, as well as potentially facilitating breakage of seagrass blades. The 2015 to 2019 AEMP (the regional aquaculture monitoring program, see Section 7.9.2.1.3) has identified that nutrient input from aquaculture may be influencing water quality in the Boston Bay region. Therefore, the 2019 to 2023 program has included an assessment of the status of seagrasses at key sites inside and outside aquaculture nutrient plumes in the Port Lincoln region. The study is using a suite of biomarkers to investigate if seagrass or epiphytes in the area are using aquaculture derived nutrients (Tanner, *et al.*, 2020).

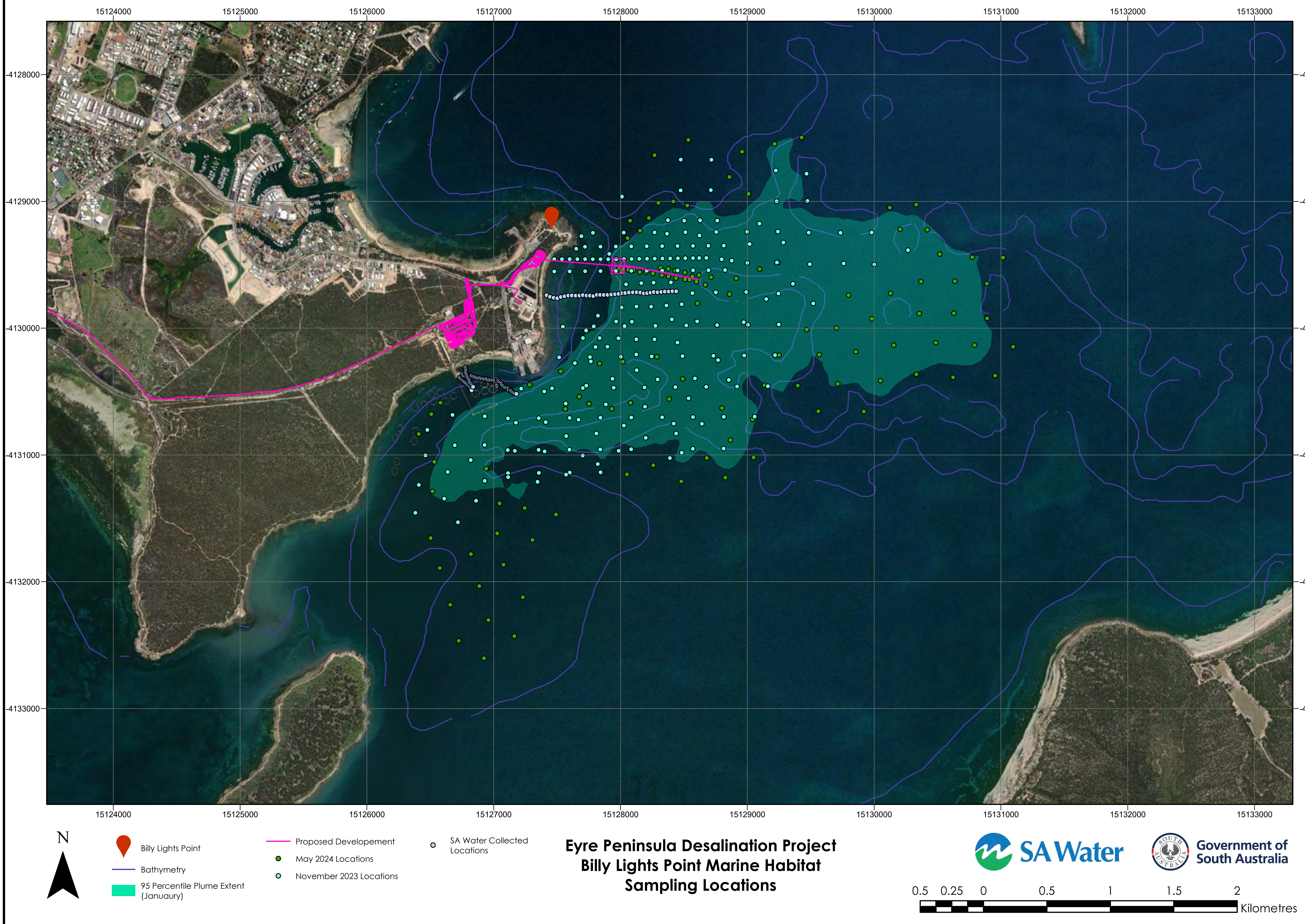
Habitat mapping has been completed by J Diversity Pty Ltd on behalf of SA Water using data collected via towed camera surveys (see Appendix P and Appendix R). Habitat data was collected by a submersible camera towed along a set distance at each location. Earlier surveys in 2021 and 2022 covered 106 transect locations encompassing the wider Bay area, and more recent surveys in late 2023 and early 2024 focussed on the proposed intake and outfall locations Billy Lights Point area. The surveys included locations within the zone potentially impacted by the saline waste plume dispersion.

The analysis identified the following habitat features:

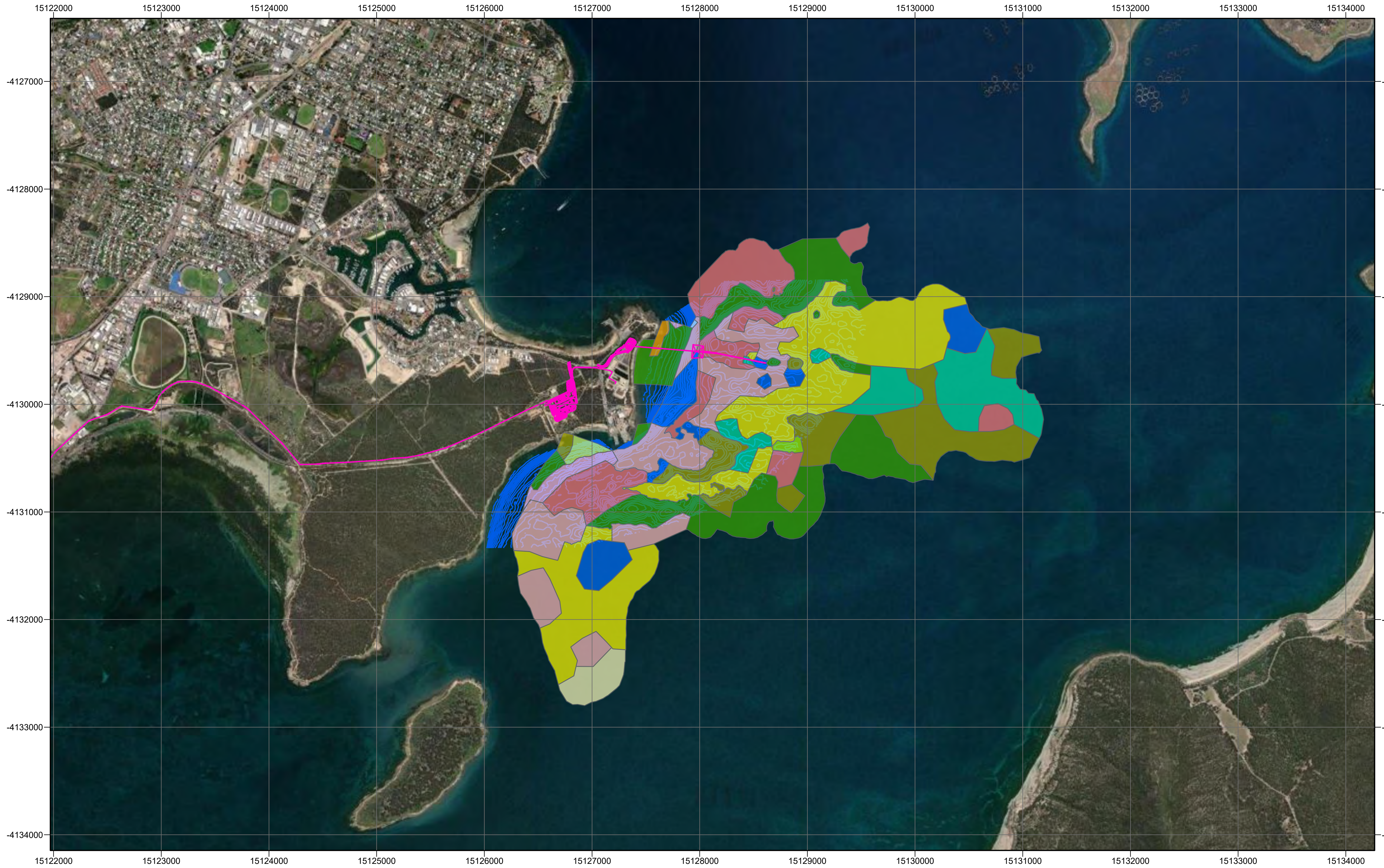
- Bare sand (substrate)
- Reef (substrate)
- Bivalve beds (substrate)
- Seagrass
    - *Posidonia* ("strapweed"), mainly *P. australis*, of varying densities and sometimes with dense epiphytes
    - *Halophila* ("paddleweed")
    - *Zostera* ("eelgrass")
- Macroalgae of varying densities
- Turf mats
- Mixed habitats with two or more of the above components.

The mapping illustrates that *Posidonia* was generally restricted to the shallow areas (<12 mAHD) (see Appendix P and Appendix Q). North of the WWTP site, the inshore (<10 mAHD) *Posidonia* beds were dense and free of epiphytes and west of the existing BHP jetty the beds were classed as sparse. Limited seagrass was recorded towards the tip of Billy Lights Point where small areas of reef were recorded likely contiguous with the intertidal calcrete geology. Sparse *Zostera* was recorded in association with *Posidonia* at the inshore sites east of Billy Lights Point. The deeper beds of *Posidonia* were generally covered with epiphytes and/or were interspersed with macroalgae. Beyond 12 metres AHD the dominant seagrass was *Halophila*.

These findings were consistent with the habitat mapping based on the earlier 2021 to 2022 transects which also found *Posidonia* the dominant habitat with areas of dense cover restricted to inshore sites and *Halophila* and *Zostera* in relatively deep areas (see Appendix Q).



Eyre Peninsula Desalination Project
Billy Lights Point Marine Habitat
Sampling Locations



N

Bathymetry
Proposed Developement
Bivalves
Halophila/ macroalgae
Macroalgae
Macroalgae sparse/ turf
Posidonia
Posidonia mixed
Posidonia sparse
Posidonia/ macroalgae
Reef
Sand
Seagrass mixed
Zostera sparse
Zostera/macroalgae

Eyre Peninsula Desalination Project
Habitat Mapping May 2024

SA Water

Government of South Australia

0.450.23 0 0.45 0.9 1.35 1.8
Kilometres

7.9.4.1.2 Macroalgae

Areas of hard substratum in Boston Bay and Proper Bay present suitable habitat to support macroalgal communities, which provide an important contribution to the productivity of coastal systems as well as complex habitat and refuge for fish and invertebrates. In addition to rocky reef, in areas with lower wave action smaller macroalgal species can attach to boulders as well as other macroalgae and seagrass blades.

The habitat mapping identifies that macroalgae, often interspersed with algal turf mats, was present throughout most of the study area. The most inshore areas north of the WWTP were characterised by reef with sparse red (Rhodophyta) and brown (Phaeophyta) macroalgae, becoming dense near Billy Lights Point. In the northeast corner of the study area, macroalgae was in association with *Halophila*, and near the southeast corner, it was in association with *Posidonia*.

Limited data regarding the composition of the local macroalgal community is available. While identification of seagrass to at least genera level is often possible using video transect data, except for some large brown species, it is less possible for macroalgae. Historic records available on NatureMaps (dating from 1975) indicate that Rhodophyta (red algae) present may be foliose species from genera such as *Ceramium, Champia, Gigartina, Lomentaria and Polysiphonia.* Phaeophyta (brown algae) species present in the historic records include representatives from the genera *Cutleria*, *Scaberia*, *Dictyota*, *Lobophora*, *Stictyosiphon* and *Colpomenia*.

7.9.4.1.3 Sessile Invertebrates

Marine invertebrates present in the region include infaunal species, which utilise the benthic sediment as habitat, and epifaunal species which live above the sediment surface. Infaunal communities are often used as indicators of ecosystem health as they remain stationary and respond to stressors in the environment.

Information on the infaunal community in the area is provided by the 2015 to 2019 regional environmental monitoring of aquaculture leases in Boston Bay which included a benthic infaunal component and an earlier study based on quantitative analysis of DNA from select taxa (covering the period 2005 to 2014) (both described in (Tanner, *et al.*, 2020; Shepherd & Baker, 2014)The studies found a degree of spatial and temporal variation in the community, which consisted of organisms such as polychaetes, copepods, amphipods and bivalves. A consistent finding across both studies was a north to south gradient in community structure detected across all sites, including reference sites and sites within and adjacent tuna farming zones. Despite the shallower more sheltered nature of the inshore sites within Boston Bay the analysis did not detect significant differences with the infaunal assemblages found at the sites further offshore.

Epifaunal species include filter feeding organisms such as sponges, ascidians, echinoderms, razor clams, oysters, scallops, mussels and bryozoans. Within the Boston Bay area the recent habitat mapping survey indicates the epifaunal community includes razor clams (*Pinna bicolor*) and reef forming bivalve beds comprised of razor clams, hammer oysters (*Malleus meridianis*) and occasional scallops and mussels. Ascidians are also present in the area, such as the mauve-mouthed ascidian (*Polycarpa viridis*) and several introduced species (*Ascidiella aspersa, Botrylloides leachii, Botryllus schlosseri, Ciona intestinalis* and *Styela plicata*).

7.9.4.1.4 Fish and mobile invertebrates

The variety of benthic habitats in Spencer Gulf, including seagrass meadows and rocky reefs, support a diverse range of fish species (Shepherd & Baker, 2014) and mobile invertebrates such as crabs, sea stars and urchins. The seagrass areas provide nursery and spawning areas for commercially and recreationally important prawn and fisheries species as well as protected species (EPA, 2023).

The reef fish assemblages within the Spencer Gulf are less well known but the limited information available indicates that abundances are higher on the west side of the Spencer Gulf than the east side. Common species in the southwest of the Spencer Gulf include blue throated wrasse (*Notolabrus tetricus*), common bullseye (*Pempheris multiradiata*), barber perch (*Caesioperca rasor*), western blue groper (*Achoerodus gouldii*) and senator wrasse (*Pictilabrus laticlavius*) (Shepherd & Baker, 2014).

Spencer Gulf supports large numbers of shark, ray and skate species which are comprehensively described in (Rodda, *et al.*, 2014). Shark species recorded within the Spencer Gulf include the threatened white sharks (*Carcharodon carcharias*) and school sharks (*Galeorhinus galeus*).

A range of syngnathid species (seadragon, seahorses and pipefish) are also present in the Spencer Gulf, including tiger pipefish (*Filicampus tigris*), potbelly seahorse (*Hippocampus bleekeri*), rhino pipefish (*Histiogamphelus cristatus*), brushtail pipefish (*Leptoichthys fistularius*), leafy seadragon (*Phycodurus eques*), common seadragon (*Phyllopteryx taeniolatus*) and spotted pipefish (*Stigmatopora argus*) (Sorokin, *et al.*, 2009). Leafy seadragon were recorded during the marine habitat mapping in 2023.

Fish species of relevance to the local aquaculture industry are discussed in Section 7.9.6.

An assessment of fish abundance and diversity in Proper Bay and Boston Bay were carried out by Flinders University on behalf of SA Water in 2021 to 2022 and repeated in March 2024. The study included sampling at sites in the vicinity of the marine intake and outfall pump station and saline waste and seawater transfer pipelines as well as control sites to the north and south (see Figure 7.33). Fish assemblages were assessed using Baited Remote Underwater Video Stations (BRUVS). BRUVS are a frequent method for assessing fish communities (Langlois, *et al.*, 2020; Whitmarsh, *et al.*, 2017) and have previously been applied to a wide range of studies. This has included the assessment of the efficacy of marine protected areas, effects of anthropogenic impacts, or spatial variation in fish communities (Clarke, *et al.*, 2019; Folpp, *et al.*, 2000; Whitmarsh, *et al.*, 2017; Whitmarsh , *et al.*, 2021). While the BRUVS method is well suited to sampling mobile species it may under-represent smaller, cryptic species.

A total of 38 species were observed across sampling periods. Species of conservation or fisheries note recorded during the surveys included:

- Southern calamari (*Sepioteuthis australis*)
- Blue swimmer crab (*Portunus armatus*)
- Australian herring/tommy ruff (*Arripis georgianus*)
- Western Australian salmon (*Arripis truttaceus*)
- Trevally (*Pseudocaranx* sp.)
- Southern Sand Flathead (*Platycephalus bassensis*)
- Longspine Flathead (*Platycephalus grandispinis*)
- Southern Bluespotted Flathead (*Platycephalus speculator*)
- King George whiting (*Sillaginodes punctatus*)
- Elongate Flounder (*Ammotretis elongatus*)
- Snook (*Sphyraena novaehollandiae*)
- Bottlenose dolphin (*Tursiops* sp.).

Significant differences in the fish assemblages were observed across the sampling periods at all sites. In 2024, the fish assemblages had a higher abundance of blue fin leatherjacket (*Thamnaconus degeni*) and yellowtail scad (*Trachurus novaezelandiae*) in comparison to previous years. Statistical differences were also apparent between the northern control site and the outfall and southern control sites. Diversity was significantly lower at the northern control site.

Baited Fish Sample Locations

- Outfall
- Intake South
- Intake North

- Bathymetry
- Proposed Developement
- Plankton Sampling Locations

N

Eyre Peninsula Desalination Project
Baited Fish and Plankton Sampling Locations

SA Water

Government of South Australia

0.75 0.38 0 0.75 1.5 2.25 3
Kilometres

7.9.4.1.5 Plankton

In common with all marine and coastal systems, the environment in Spencer Gulf incorporates phytoplankton and zooplankton communities.

Phytoplankton, derived from the Greek words *phyto* (plant) and *plankton* (made to wander or drift), are a diverse group of organisms and include dinoflagellates, diatoms and cyanobacteria ('blue-green algae'), as well as other major groupings. Dinoflagellates move by means of two flagella and are mostly photosynthetic organisms. The lifecycle of some dinoflagellates includes a dormant cyst stage which can 'rest' in the sediment for long periods until germination is triggered by factors such as changes in temperature and nutrient level. Diatoms are also generally photosynthetic and have a siliceous skeleton called a frustule. They can be solitary cells or colonial, attached to each other by organic threads, mucilage pads or silicate structures. Cyanobacteria are small photosynthetic bacteria, which are usually unicellular but can also often grow in colonies.

Phytoplankton are important primary producers in marine systems, and when available light and temperature conditions are adequate they can quickly respond to the availability of nutrients, with growth rates potentially resulting in bloom concentrations. Phytoplankton require nutrients such as nitrogen, phosphorus and iron for photosynthesis and growth. Diatoms require silica to be able to form cell walls. The structure and composition of the phytoplankton community can therefore be used as a valuable indicator of water quality status. The 2015 to 2019 AEMP included analysis of several indicators based on the planktonic ecosystem to detect possible anthropogenic nutrient enrichment in the Boston Bay area.

The primary productivity of Spencer Gulf is thought to be generally low, due to nutrient limitation on phytoplankton growth (van Ruth and Doubell 2013). Overall productivity is likely to be restricted by phosphorous concentrations and seasonal variability in nitrogen drives variability in phytoplankton biomass, abundance and primary productivity. A strong seasonal pattern in primary productivity and phytoplankton biomass has been observed both in the wider Spencer Gulf and Boston Bay, with the highest productivity in summer and autumn and lower productivity in winter and spring (van Ruth 2014; van Ruth and Doubell 2013).

The phytoplankton community in Spencer Gulf is dominated by three main taxa; diatoms, cyanobacteria and haptophytes (van Ruth and Doubell 2013). Total phytoplankton biomass within the Spencer Gulf is generally low in common with other oligotrophic (low nutrient) waters of southern Australia (van Ruth, 2014). Peaks in total phytoplankton abundance are driven by peaks in diatom abundance and to a lesser extent flagellate abundance (van Ruth and Doubell 2013, van Ruth *et al* 2009).

Previous studies have documented the presence of harmful algal bloom species in Spencer Gulf, including the Boston and Proper Bays area. Algal blooms can occur under natural conditions and in response to human-induced changes (Hallegraeff, *et al.*, 2004). Harmful algal bloom result from excessive growth of bloom forming phytoplankton. Harmful algal bloom species can be toxic to humans and/or marine organisms and blooms composed of non-toxic species can also occur. Regardless of the species composition, algal blooms have effects on water quality (e.g. resulting in low dissolved oxygen levels), which can be deleterious for marine organisms and present a risk or nuisance (e.g. odour) to humans (Hallegraeff, *et al.*, 2004).

Algal blooms have been previously recorded in the Boston Bay. Harmful algal bloom species recorded in Spencer Gulf have been generally recorded in low densities (van Ruth, 2014)and include diatoms (e.g. *Pseudo-nitzschia* spp.) and dinoflagellates (e.g. *Dinophysis* spp. and *Prorocentrum* spp.) species which produce compounds toxic to shellfish and/or fish and other marine organisms (e.g. *Alexandrium* spp., *Karenia spp.*, *Chattonella* spp., gymnodinium dinoflagellates). Other non-toxic species which have also been recorded also result in harm to fish even in low densities via the presence of spikes and barbs (e.g. *Chaetoceros* sp.) (van Ruth, *et al.*, 2009). A widespread fish kill event across the South Australian coastline in 2013, including in the southwest Spencer Gulf, coincided with high densities of the abrasive diatom *Chaetoceros coarctatus* (Roberts, *et al.*, 2019).

Of the approximately 2000 species of dinoflagellate species existing in marine ecosystems, its estimated that 10 per cent of these species form resting cysts as part of their life cycle (Jung, *et al.*, 2018). This dormant cyst stage within their lifecycle allows them to persist in sediment as well as providing an effective dispersal mechanism. Cysts of harmful algal blooms dinoflagellates (*Gymnodinium catenatum*) have historically been identified being widespread in the sediments of Boston Bay (Bolch, 1997). Cysts resembling toxic *Chattonella* cysts were also present in the sediments of the bay.

Zooplankton (from the Greek 'zoion' meaning an animal and 'plankton' being wander or drift) comprise egg, larval and young stages of fish and larger crustaceans as well as species which remain planktonic throughout their life cycle such as small crustaceans (e.g. krill, copepods, amphipods, isopods and cumaceans), pelagic sea snails and salps. The zooplankton community in Spencer Gulf includes early life-stages of important commercial species such as prawns and rock lobster (van Ruth, 2014).

A program of seasonal plankton surveying is being undertaken in support of this Development Application, with sites surveyed in Proper Bay and Boston Bay, including a site at Billy Lights Point. Data from the spring 2023 sampling is discussed below. The ongoing water quality monitoring summarised in Section 7.9.2 also include an analysis of plankton species and abundance in samples collected weekly. Phytoplankton from all key groups, diatoms, dinoflagellates and other flagellates have been recorded in the sampling. Flagellate phytoplankton, including dinoflagellates, showed high abundance across the 2021 to 2024 water quality sampling at all sites (see Appendix M).

During spring 2023 abundance of phytoplankton was significantly higher in Proper Bay in comparison to other sites within Boston Bay (Figure 7.34). The elevated numbers were driven by the contribution of dinoflagellates and other flagellates in the water column at that site. Gymnodinoid species abundance at Proper Bay was approximately 29,000 cells/L in comparison with 11-16, 000 cells/L at the other sites. This result is consistent with the water quality sampling which found that across the entire 2021 to 2024 sampling period gymnodinoids showed a positive significant correlation to chlorophyll *a* concentration i.e. they dominated the samples. Maximum chlorophyll *a* levels (in June 2023) coincided with a gymnodinoid bloom of up to 1100 cells/mL. Elevated levels, although not in bloom concentrations, of *Karenia mikimotoi* (toxic to marine life), *Nitzschia* and phytoflagellates were also observed across the sampling period, some at consistently high levels for months at a time.

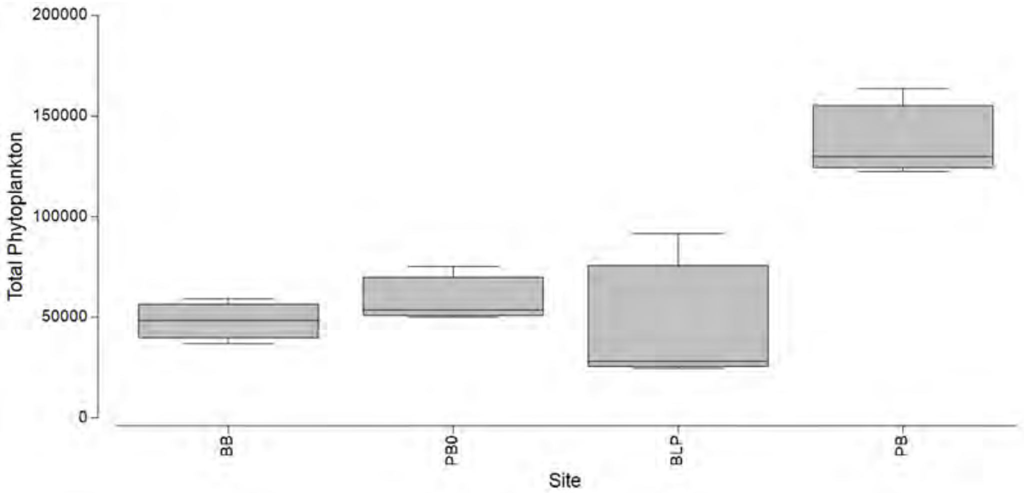


Figure 7.34 Total phytoplankton (cells/ L) between the four sites in Port Lincoln; Boston Bay (BB), Proper Bay Outer (PBO), Billy Lights Point (BLP), and Proper Bay (PB) during the spring 2023 plankton survey

7.9.4.1.6 Marine mammals and reptiles

Records exist of 18 cetacean species in Spencer Gulf; all whales and dolphins. Many of the whale species visit only occasionally and none permanently reside in the gulf (Izzo & Gillanders, 2015). Southern right whales (*Eubalaena australis*) and humpback whales (*Megaptera novaeangliae*) are the most commonly recorded whale species (Gibbs & Kemper , 2014) and seasonal visits are assumed to be related to migration from summer feeding grounds in the Southern Ocean to mating and calving grounds, including a major calving area at the Head of the Bight (Izzo & Gillanders, 2015). Sleaford Bay, located off the southern tip of the Eyre Peninsula (see Figure 7.24), is also known as a regular calving ground for southern right whales (DCCEEW, 2024). Sleaford Bay is a sanctuary zone within the Thorny Passage Marine Park with its inclusion designated for Southern Right Whales and recognised for its emerging importance for this species. Pygmy Right Whales are frequently recorded near Port Lincoln, with the majority of records relating to floating or washed up carcasses (Gibbs & Kemper , 2014).

Bottlenose dolphin species are known to breed within the Spencer Gulf, including the common bottlenose dolphin (*Tursiops truncatus*) and the Indo-Pacific bottlenose dolphin (*Tursiops aduncus*), as well as a potential third newly described species the Burrunan dolphin (*Tursiops australis*) (Bilgmann, *et al.*, 2019). The short beaked common dolphin (*Delphinus delphis*) also occupy nearby offshore waters (DCCEEW, 2024) and occasionally visit near-shore areas (Butterfield & Gaylard, 2005).

Spencer Gulf sits within the breeding range of both the Australian sea lion (*Neophoca cinerea*) and the long-nosed (New Zealand) fur seal (*Arctocephalus forsteri*) (DCCEEW, 2024). The Australian sea lion is endemic to Southern Australia, occurring only in Western Australia and South Australia. Multiple seal colonies are present in the lower Spencer Gulf region (Goldsworthy, *et al.*, 2014; Goldsworthy, 2020; Shaughnessy, *et al.*, 2014), including colonies of both species in nearby Louth Bay, adjacent to Boston Bay (DEW, 2024b). Donington Island, located approximately 10 km from Billy Lights Point also hosts a long-nosed fur seal colony (Shaughnessy, *et al.*, 2014).

The Australian fur seal (*A. pusillus doriferus*) is also known to occur in Spencer Gulf although no breeding colonies are reported in South Australia and the closest haul out sites are on Kangaroo Island (DEW, 2024b).

Migratory marine turtles generally inhabit tropical waters and are not known to breed or nest within South Australia, although records of occasional sightings of individuals in Spencer Gulf and/or records of dead turtles washed up on shore indicate that the green turtle (*Chelonia mydas*), loggerhead turtle (*Caretta caretta*) and in particular the leatherback turtle (*Dermochelys coriacea*) may occasionally forage in the Boston Bay area (ALA, 2024).

7.9.4.1.7 Listed threatened and migratory species

A range of species potentially occurring in Spencer Gulf are listed as threatened (endangered or vulnerable) and/or migratory under the EPBC Act and/or the NPW Act. Those species, which occur or potentially occur, in the Boston Bay and Proper Bay region (DCCEEW, 2024a) are listed in Table 7.10. In addition, a number of listed marine species under the EPBC Act may be present in the area, including seadragons and pipefish (see Section 7.9.4.1.4).

Potential impacts to migratory and coastal bird species are addressed in the assessment within Section 8.2.7.

Table 7.10 Listed Species that may occur in the Boston Bay and Proper Bay region

Species	EPBC Act Status	NPW Act Status
Southern Right Whale (*Eubalaena australis*)	Endangered	Vulnerable
Humpback Whale (*Megaptera novaeangliae*)	Vulnerable	Vulnerable
Killer whale (*Orcinus orca*)	Migratory marine	N/A
Bryde's Whale (Balaenoptera edeni)	Migratory marine	Rare
Pygmy Right Whale (Caperea marginata)	Migratory marine	Rare
Dusky Dolphin (Lagenorhynchus obscurus)	Migratory marine	N/A
Australian Sea-lion (Neophoca cinerea)	Endangered	Vulnerable
Long-nosed (New Zealand) fur-seal (Arctocephalus forsteri)	Listed marine	N/A
Australian (Brown) fur seal (Arctocephalus pusillus)	Listed marine	N/A
White Shark / Great White Shark (Carcharodon carcharias)	Vulnerable	N/A
Porbeagle, Mackerel Shark (Lamna nasus)	Migratory marine	N/A
Oceanic Whitetip Shark (Carcharhinus longimanus)	Migratory marine	N/A
Southern Bluefin Tuna (Thunnus maccoyii)		Conservation dependent
Blue Warehou (Seriolella brama)		Conservation dependent
Loggerhead Turtle (Caretta caretta	Endangered	Endangered
Green Turtle (Chelonia mydas)	Endangered	Vulnerable
Leatherback Turtle (Dermochelys coriacea)	Endangered	Vulnerable

7.9.4.1.8 Introduced species

At least 28 pest species have been previously identified in Boston Bay and Proper Bay as well as adjacent Louth Bay, including six microalgae, a brown macroalga, two hydroids, six polychaete worms, a barnacle, two molluscs (both farmed species), five bryozoans and five ascidians (see Table 7.11 and Appendix P).

Table 7.11 Introduced species previously recorded in Proper, Boston and Louth Bays (see Appendix P)

Group	Species
Microalgae	*Alexandrium catenella*
	Alexandrium minutum
	Chattonella marina
	Gymnodinium catenatum
	Heterosigma akashiwo
	Vicicitus globosus
Macroalgae	*Stictyosiphon soriferus*
Hydroids	*Coryne eximia*
	Halecium delicatulum
Polychaetes	*Boccardia chilensis*
	Hydroides elegans
	Myxicola infundibulum
	Polydora ciliata
	Pseudopolydora paucibranchiata
	Sabella spallanzanii
Barnacles	*Megabalanus tintinnabulum*
Molluscs	*Crassostrea gigas*
	Mytilus galloprovincialis
Bryozoans	*Bugulina flabellata*
	Bugula neritina
	Schizoporella unicornis
	Watersipora arcuata
	Watersipora subtorquata
Ascidians	*Ascidiella aspersa*
	Botrylloides leachii
	Ciona intestinalis
	Styela plicata

Introduced species observed during analysis of the video transects of the wider Boston Bay and Proper Bay area included the European fan worm *Sabella spallanzanii*, which was present with a dense cover at sites in the southern area of Boston Bay and a sparse cover in Proper Bay. The cryptogenic species feather-duster worm (*Myxicola infundibulum*) was also observed south of Billy Lights Point.

7.9.5 Commercial and recreational fisheries

The lower Spencer Gulf supports a wide range of recreational and commercial fisheries, including those for crustacean species (e.g. western king prawns (*Melicertus latisulcatus*), southern rock lobster (*Jasus edwardsii*)), finfish species (e.g. King George whiting (*Sillaginodes punctatus*) and greenlip and blacklip abalone (*Haliotis laevigata* and *Haliotis rubra*).

The Spencer Gulf is also home to the southern bluefin tuna (*Thunnus maccoyi*) industry, which comprises the largest aquaculture sector in the state, as well as the blue mussel (*Mytilus galloprovincialis*)) and yellowtail kingfish (*Seriola lalandi)*. Further discussion of the local aquaculture industry is provided in Section 7.9.6.

Recreational fishing is a popular activity in Boston Bay, Proper Bay and the wider coastal area. Beach and rock fishing locations are found in close proximity to Port Lincoln and six boat ramps are accessible to recreational fishers, including a popular ramp at Billy Lights Point. Several species are caught all year round and others are present on a seasonal basis with many of these species utilising seagrass beds during adult and/or juvenile life stages (see Table 7.12).

Table 7.12 Species caught via recreational fishing in Boston Bay and Proper Bay

Species	Fishing Calendar
Australian herring / tommy ruff (*Arripis georgianus*)	All year
Blue swimmer crabs (*Portunus armatus*)	November-April
Bluefin tuna (*Thunnus maccoyii*)	December - May
Bronze whaler sharks (*Carcharhinus brachyurus*)	October-May
Flathead (multiple species)	All year
Gummy shark (*Mustelus antarcticus*)	All year
King George whiting (*Sillaginodes punctatus*)	All year
Nannygai (*Centroberyx gerrardi*)	All year
Samsonfish (*Seriola hippos*)	All year
School shark (*Galeorhinus galeus*)	All year
Snapper (*Chrysophrys auratus*)	All year (*NB: fishery closed until at least 2026*)
Snook (*Sphyraena novaehollandiae*)	All year
Southern Garfish (*Hyporhamphus melanochir*)	All year
Southern rock lobster (*Jasus edwardsii*)	November-May
Squid / Southern Calamari (*Sepioteuthis australis*)	All year
Western Australian salmon (*Arripis truttacea*)	All year
Yellowfin whiting (*Sillago schomburgkii*)	All year
Yellowtail kingfish (*Seriola lalandi*)	October-May

The Spencer Gulf prawn fishery is a single-species prawn fishery, based on the capture of the western king prawn and currently includes 39 commercial fishery licences (Heldt & Hooper, 2023). Juvenile prawns are found on intertidal sand and mudflats often located in proximity to intertidal seagrass beds and/or mangrove forests. However adult western king prawns prefer sandy habitat to vegetated areas and tend to be found at depths below 10 metres, which is the specified depth below which fishing by licence holders is permitted (Heldt & Hooper, 2023). The port of Port Lincoln is a major home port for the existing commercial trawling fleet.

King George whiting are highly sought after, and the species supports a valuable commercial fishery in South Australia. The commercial catch for King George whiting in the Spencer Gulf fishing zone represents a significant proportion (64 per cent in 2021 and 2022) of total catch across SA (Smart, *et al.*, 2023). In the 2021 and 2022 season the commercial catch was a total of 71 tonnes, which while significant represents a decline in comparison to previous years, consistent with an ongoing decline in catch and effort over recent years (Smart, *et al.*, 2023; Fowler, *et al.*, 2014).

The northern region and sheltered bays within Spencer Gulf, including the Boston Bay, provides extensive nursery habitat for King George whiting to develop before the older fish then move to offshore spawning grounds (Fowler, *et al.*, 2000; Drew, *et al.*, 2020). The fisheries survey conducted in support of this development application recorded King George whiting in Proper Bay during the 2021 survey.

The Eyre Peninsula sits within the Western Zone of the South Australian Abalone Fishery, and within this Boston Bay supports substantial population of wild greenlip and blacklip abalone (Stobart, *et al.*, 2017). The fishery allows capture of abalone by divers using hand methods.

Boston Bay sits within the Northern Zone of the southern rock lobster fishery, although it is not an area subject of focused effort within the commercial fishery (Linnane, *et al.*, 2021). Southern rock lobsters are found within reefs in shallow coastal areas to depths of approximately 200 metres (PIRSA, 2021). These area types are limited in Boston Bay and Proper Bay. The larval stage develops in offshore waters for up to two years and once metamorphosed to the settlement stage they swim to inshore reef habitat (PIRSA, 2021). While the rocky reef habitat around Billy Lights Point is likely to represent suitable habitat for southern rock lobster juveniles, it is limited in the required depth and area.

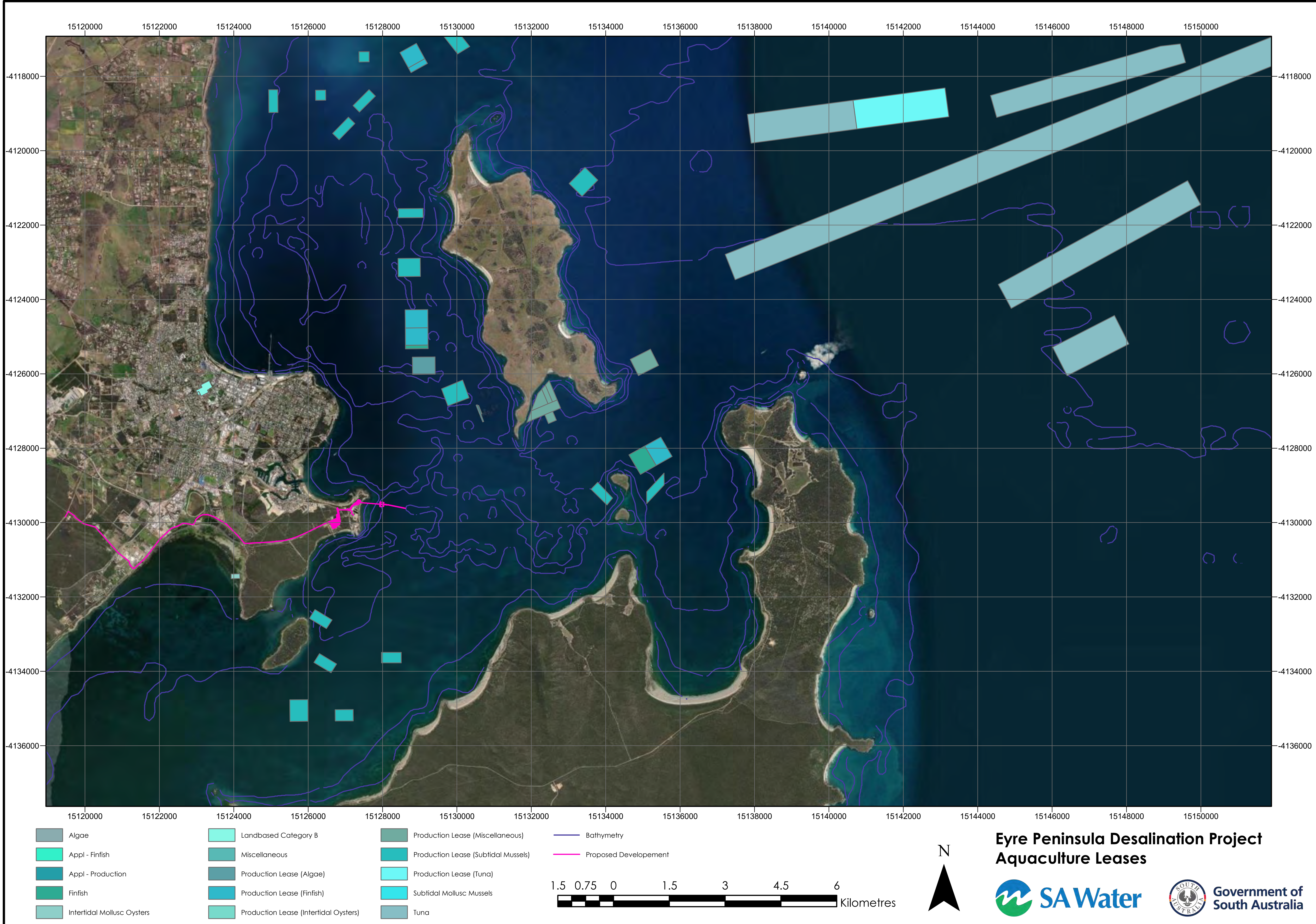
7.9.6 Aquaculture Industry

The *Aquaculture Act 2001* (Aquaculture Act) provides the regulatory framework for aquaculture in SA. Several polices are established under the Aquaculture Act which identify areas defined as suitable for aquaculture development ('aquaculture zones') and provide limits on the leasable area within each zone and the maximum biomass that can be grown within each zone. There are seven aquaculture zones and four aquaculture exclusion zones designated under the Aquaculture (Zones – Lower Eyre Peninsula) Policy 2023 (the Aquaculture Policy) (see Section 7.3.2).

Aquaculture in the vicinity of Billy Lights Point includes active leases in the Proper Bay aquaculture zone and the Boston Bay aquaculture zone for the production of blue mussels (*Mytilus galloprovincialis*). One lease for Pacific oysters (*Magallana gigas*[12]) is allocated in the Murray Point aquaculture zone, located just to the west of Murray Point. Aquaculture operations for both southern bluefin tuna (*Thunnus maccoyii*) and yellowtail kingfish (*Seriola lalandi*) operate multiple aquaculture lease sites within the aquaculture zones in Boston Bay and Louth Bay as well as in zones further offshore (see Figure 7.35). Marine based abalone aquaculture off the Lower Eyre Peninsula is restricted to Louth Bay and does not occur in Boston or Proper Bays (see Figure 7.35).

The Aquaculture Policy also allows for farming of algae (seaweed) in several of the aquaculture zones including those in Boston Bay and Proper Bay. Seaweed aquaculture has the potential to remove and utilise waste (dissolved in organic nutrients) from tuna and finfish aquaculture and is currently being trialled in SA although commercial production is yet to commence (PIRSA, 2023). Dedicated seaweed aquaculture leases for the farming of a red macroalgal species (*Asparagopsis sp.*) have recently been granted within both the Louth Bay and the Boston Bay and aquaculture zones (PIRSA, 2023). The lease area within Boston Bay is located approximately three km north of Billly Lights Point (see Figure 7.35).

[12] Note this species was previously known as *Crassostrea gigas*


15120000
15122000
15124000
15126000
15128000
15130000
15132000
15134000
15136000
15138000
15140000
15142000
15144000
15146000
15148000
15150000
-4118000
-4120000
-4122000
-4124000
-4126000
-4128000
-4130000
-4132000
-4134000
-4136000
Algae
Appl - Finfish
Appl - Production
Finfish
Intertidal Mollusc Oysters
Landbased Category B
Miscellaneous
Production Lease (Algae)
Production Lease (Finfish)
Production Lease (Intertidal Oysters)
Production Lease (Miscellaneous)
Production Lease (Subtidal Mussels)
Production Lease (Tuna)
Subtidal Mollusc Mussels
Tuna
Bathymetry
Proposed Developement
1.5 0.75 0 1.5 3 4.5 6
Kilometres
N
Eyre Peninsula Desalination Project
Aquaculture Leases
SA Water
Government of South Australia

The biomass limits within each aquaculture zone have been determined by Primary Industries and Regions SA (PIRSA) through consideration of the predicted flushing timescales in each zone (based on SARDI modelling) and the requirement to limit nutrient input to manage water quality within guideline trigger values (PIRSA, 2023). Licencing conditions for each lease include the requirement for environmental monitoring.

Discussion of the ongoing water quality and biological monitoring under the regional aquaculture environmental monitoring program (AEMP) is provided above in Section 7.9.2. Recent monitoring results have identified effects related to the industry consistent with those associated with anthropogenic nutrient enrichment.

7.9.6.1 Blue mussels

The majority of the SA mussel industry (28 out of 32 farms) is based in Boston Bay and adjacent Louth Bay (PIRSA, 2023). A sector-based aquaculture strategy has been developed and approved under regulation 19 of the Aquaculture Regulations 2016. This strategy applies to all current and future licence holders and sets out several mandatory requirements and best practice approaches to promote ecologically sustainable operation of the industry (PIRSA, 2022). There are numerous mussel aquaculture leases within Boston Bay and Proper Bay (see Figure 7.35), including five to the south of Billy Lights Point approximately 2.8 km from the marine intake and outfall pump station, and one approximately 2.5 km to the north.

The blue mussel (*M. galloprovincialis*) in SA are also known as the Mediterranean mussel and are closely related to other species within the *Mytilus* genus. *Mytilus* is a filter feeding organism which depends upon phytoplankton, organic detritus, bacteria as sources of food (Riisgård, 2011). As filter feeders, mussels do not require supplementary feed and their growth rate is therefore dependent on the relevant conditions of the surrounding environment, such as food availability, salinity and water temperature.

While mussel farms need to be located in relatively sheltered environments to avoid loss of stock (Bell & Gosline, 1997), the local water movement also needs to be sufficiently active to provide an adequate source of food for the filter feeding mussels (Pecl, *et al.*, 2011). The growth rate and therefore length of time to reach commercial market size relates, amongst other factors, to the health of the phytoplankton community which provides the necessary nutrition for the mussels (Campanati, *et al.*, 2023; Clausen & Riisgård, 1996)

Adult mussels settle on all types of hard substrate which can result in them becoming a fouling problem on boats and other marine infrastructure. Blue mussels are a common fouling organism within Boston Bay and Proper Bay.

7.9.6.2 Bluefin tuna

The southern bluefin tuna industry is the most valuable sector in South Australia's aquaculture sector, worth $110.40 million during 2021 and 2022 (PIRSA, 2023). Most tuna farms are located to the west of Boston Island and are associated with 14 licences (see Figure 7.35). The closest aquaculture lease for blue fin tuna is located 8.9 km from the marine intake and outfall pump station and saline waste and seawater transfer pipelines. Tuna cages have historically been situated within Boston Bay in shallower water but following mass fish deaths in the 1990s the farms were relocated to deeper offshore water.

Between December and March, juvenile wild tuna (two to four years) are caught using purse seine nets in the Great Australian Bight within the Southern Ocean migratory tuna path . Southern bluefin tuna are migratory and the fishery is managed in Australia under quotas set by an international management body. The majority of Australia's quota (85 per cent) is used for tuna farming within SA, and the remainder for wild caught/long-line fishing and charter/recreational fishing (PIRSA, 2023). Caught tuna are transferred to floating pontoons and towed back to the lease locations off Boston Island. The fish are then provided a supplementary food source for several months until they are harvested when at market size. The food source is typically wild caught sardines.

Under-utilised food and dissolved waste from fish and faeces contribute to the inputs from tuna farms to the wider environment. Results of the regional AEMP provided evidence for anthropogenic nutrient enrichment from these sources, and further monitoring is focussed on the potential impacts to nearby marine environment, including seagrass communities.

7.9.6.3 Yellowtail kingfish

The yellowtail kingfish aquaculture sector within SA is based in Spencer Gulf (PIRSA, 2023). The species is hatched within land-based facilities at Arno Bay and transferred to sea cages to mature. The closest finfish aquaculture lease for the production of yellowtail kingfish is located approximately 2.6 km from the marine intake and outfall pump station and saline waste and seawater transfer pipelines, and numerous other leases are located in the Boston Bay and Louth Bay (see Figure 7.35). Farming of yellowtail kingfish has also been carried out at Fitzgerald Bay in the north of Spencer Gulf, although activities were temporarily paused in 2022 (PIRSA, 2023). Wild yellowtail kingfish are also found throughout the Spencer Gulf.

The young juveniles (fingerlings) are transferred to the offshore sea cages at around two months where they are fed on manufactured food formulated to provide necessary energy and nutrients to allow the fish to grow to the target market weight of around 3.5 kg. The juvenile fish are weaned onto the pellet diet prior to transfer to the sea cages. The fish are aged around 18 to 24 months when they reach market size (Pecl, *et al.*, 2011).

Fish health is dependent on good water flow throughout the cage, and nets are changed regularly to remove fouling organisms such as mussels and ascidians which can affect flow. If flow is reduced this can affect dissolved oxygen levels due to the reduction in flushing within the cage which can affect fish health (Bowyer, *et al.*, 2014).

7.9.7 Shipping and navigation

Port Lincoln (the port) is a natural, deep-water harbour within Boston Bay which is used for handling dry and liquid bulk goods including export of grain and seeds and import of fertiliser and petroleum products. The port has eight main berths and can accommodate tanker and cargo vessels up to an overall length of 270 metres as well as fishing fleet and recreational vessels.

Flinders Ports has recently reported in the local media that shipping numbers at the port are increasing, with a reported 116 vessels entering Port Lincoln in 2023. This was compared with 82 in 2022, 74 in 2021, 82 in 2020 and 96 in the pre-Covid year of 2019. The increased shipping was attributed to a return to cruise ship normal routines and a bumper grain season which resulted in increased fertiliser shipments (Martin, 2024)).

The Kirton Point Jetty which handles imports of petroleum products is located to the east of the main Jetty. The approach to the port is Boston Bay via the waters to the north of Boston Island and an additional navigation channel provides access to Boston Bay and Proper Bay via the south of Boston Island. Shipping access is restricted by the Boston Bay Channel which has a maintained depth of 14.6 metres and the South Channel which is 8.5 metres deep.

Lincoln Cove marina is located off Porter Bay to the north of Billy Lights Point. The marina is host to a large commercial fishing fleet and is also a popular destination for recreational vessels as well as providing a launch location for emergency services vessels. The approach channel to the marina runs to the north from the proposed intake and outfall pipe alignments.

8 Impact Assessment

8.1 The Planning and Design Code

The following section provides an assessment of the Project against the relevant provisions of the P&D Code, consolidated 18 April 2024.

8.1.1 Legislative and Policy Requirements

8.1.1.1 Planning, Development and Infrastructure Act 2016

The relevant legislation guiding planning and land use for the Project is the PDI Act. Under this Act, all activities constituting development, including but not limited to building work or a change in land use, requires development approval under the Act, unless otherwise exempted.

8.1.1.2 Planning, Development and Infrastructure (General) Regulations 2017

The PDI Regulations support matters under the PDI Act, including defining additions to and exclusions from the definition of development, as well as defining development that is excluded from requiring Approval under the PDI Act; among other matters.

Further, the PDI Regulations provide additional guidance for assessment under the PDI Act.

8.1.1.3 Planning and Design Code

The P&D Code is established under the PDI Act and aims to establish comprehensive policies for the assessment of development in South Australia.

The P&D Code structure includes Zones, Subzones, Overlays and General Development Policies; with the Zone being the principal organising layer which establishes the type of development that is envisaged within a particular location.

8.1.1.4 State Planning Policies

South Australia's SPPs are established under the PDI Act and provide umbrella policies that address land use planning and development across the State; aiming to enhance liveability, sustainability and prosperity.

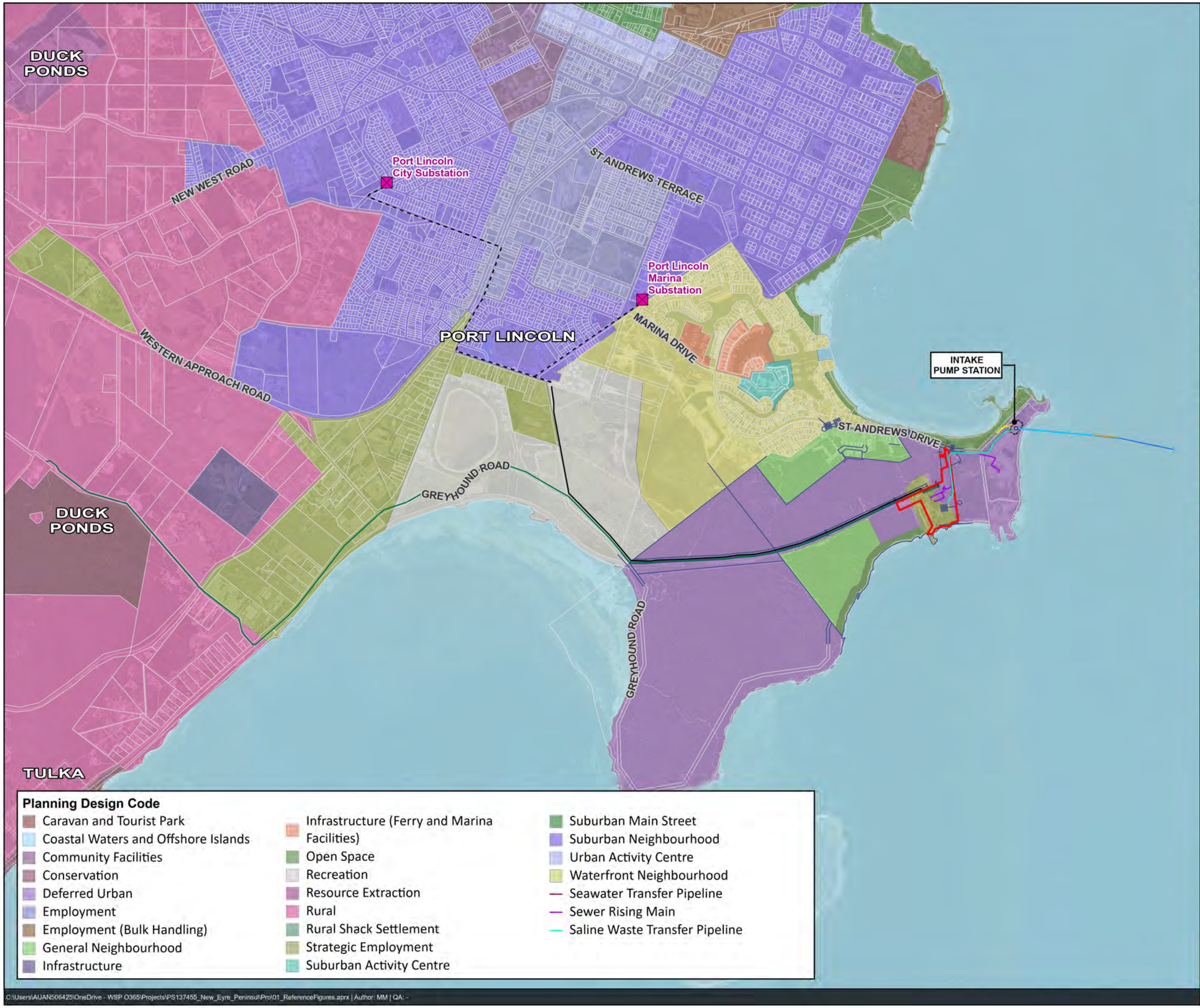
8.1.2 Planning assessment

The Project site is located primarily within the City of Port Lincoln council area; with the exception of a portion of the DWTP located on Blue Fin Road, located within the District Council of Lower Eyre Peninsula, and the marine pipelines, not within the area of a council.

Table 8.1 details the applicable Zones, Subzones and Overlays under the P&D Code for key components of the Project. P&D Code Zones across the Project are displayed below in Figure 8.1.

Table 8.1 Applicable P&D Code Zones, Subzones and Overlays for key Project components.

Project component	Applicable Zones	Applicable Subzones	Applicable Overlays	Technical and numerical variations
RO desalination plant	Strategic Employment Deferred Urban	Nil	Hazards (Bushfire – Medium Risk) Hazards (Flooding – Evidence Required) Coastal Areas Native Vegetation	Concept Plan (107) Minimum Site Area (1,000 sqm)
Marine Intake and outfall pump station	Deferred Urban	Nil	Hazards (Bushfire – Medium Risk) Hazards (Flooding – Evidence Required) Coastal Areas Native Vegetation	Concept Plan (107) Minimum Site Area (1,000 sqm)
Maine intake and outfall pipelines	Coastal Waters and Offshore Islands	Nil	Coastal Areas Native Vegetation	Nil
DWTP	Deferred Urban Recreation Rural Strategic Employment (small potion)	Nil	Hazards (Bushfire – High Risk) Hazards (Bushfire – Medium Risk) Hazards (Bushfire – General Risk) Hazards (Flooding – Evidence Required) Coastal Areas Native Vegetation Significant Landscape & Native Vegetation Protection (western portion) Water Protection Area (western portion) Water Resources (small portion) Limited Land Division (western portion)	Concept Plan (107) Finished Ground and Floor Levels (Minimum finished ground level is 2.55 m AHD; Minimum finished floor level is 2.8 m AHD) (small portion) Minimum Frontage (small portion) Minimum Site Area
Overhead transmission line	Deferred Urban Recreation Strategic Employment (small potion)	Nil	Hazards (Bushfire – Medium Risk) Hazards (Bushfire – General Risk) Hazards (Flooding – Evidence Required) Coastal Areas (small portion) Native Vegetation Water Resources (small portion)	Concept Plan (107) Finished Ground and Floor Levels (Minimum finished ground level is 2.55 m AHD; Minimum finished floor level is 2.8 m AHD) (small portion) Minimum Frontage (north-east portion) Minimum Site Area



WSP

Eyre Peninsula Desalination Plant Project

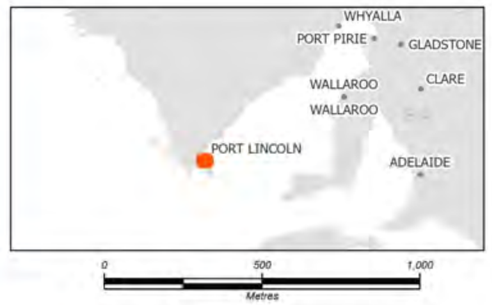
Figure 8.1
Planning and Design Code Zones

Legend

- Substation
- Cadastre
- Desalination Plant Site Boundary
- Easement
- New Site Access
- Pump Intake Station
- SAPN Transmission Line
- Overhead Transmission Line
- Outgoing Treated Water Transfer Pipeline
- Seawater Transfer Pipeline
- Sewer Rising Main
- Saline Waste Transfer Pipeline

Marine Infrastructure

- Marine Outfall
- Raw Seawater Intake
- Marine Tunnel Portion



Coordinate system: GDA2020 MGA Zone 53

Scale ratio correct when printed at A3

1:24,000

Date: 23/05/2024

GDA 2020

Data sources: WSP, DataSA, MetroMap WMS Services:

www.wsp.com

8.1.2.1 Assessment pathway under the PDI Act

The Project comprises both building work and a change in land use, and therefore requires approval under the PDI Act.

The Project is proposed by a State agency, being SA Water, so falls under the Crown development assessment pathway established under Section 131 of the PDI Act.

8.1.2.2 Categorisation

A desalination plant (and ancillary infrastructure) is not classified under the Strategic Employment Zone or Deferred Urban Zone – nor are intake and outfall pipelines, pump stations, water pipelines and electrical transmission infrastructure classified under their respective Zones. As such, all components of the Project default to performance assessed against the relevant policies.

Development applications lodged under Section 131 of the PDI Act are assessed on their merits against the relevant policies.

8.1.2.3 Schedule 13 exemptions

Schedule 13 of the PDI Regulations details exemptions for certain activities undertaken by a State Agency, where development approval is not required provided prescribed provisions are met.

The following works associated with the Project may be exempt from requiring approval as per Schedule 13 of the PDI Regulations:

- Road alterations (Schedule 13, clause 2(1)(a)(i)), where not located under the Coastal Areas Overlay under the P&D Code unless approved by the CPB.
- The construction or alterations of pipes and underground cables (Schedule 13, clause 2(1)(c)), where not located under the Coastal Areas Overlay under the P&D Code unless approved by the CPB.
- The construction of a transmission under 33,000 volts (Schedule 13, clause 2(1)(n)).

8.1.2.4 Referrals

The Project is likely to be referred to the following bodies for comment, under Schedule 9 of the PDI Regulations or for informal referral:

- Coast Protection Board (CPB)
- Environment Protection Authority (EPA)
- City of Port Lincoln (under Section 131(6) of the PDI Act)
- District Council of Lower Eyre Peninsula (under Section 131(6) of the PDI Act)
- Native Vegetation Council (NVC)
- South Australian Country Fire Service (CFS)
- Minister responsible for the administration of the *Historic Shipwrecks Act 1981*
- Commissioner of Highways / Department for Infrastructure and Transport (DIT) traffic
- PIRSA
- Department for Infrastructure and Transport (DIT) Marine
- Eyre Peninsula Landscape Board (EPLB).

8.1.2.5 Key P&D Code Policies

The following sections detail relevant policies from the applicable P&D Code Zone, Overlays and General Development Policies, that may be considered in the assessment of the development application for the Project. While the Project would be assessed on its merits against the relevant policies, it is expected that the application of these policies would be considered during the assessment process.

Table 8.2 assesses the Project against she relevant objectives and principles of Development Control of the appliable P&D Code Zones.

Table 8.2 Assessment of the Project against the relevant Assessment Provisions of the applicable P&D Code Zones

P&D Code section	Assessment
Strategic Employment Zone (RO desalination plant site – part, overhead transmission line – part, DWTP – part)	
DO 1 and DO 3 PO 1.1, 1.2, 6.1, 8.1	The RO desalination plant site is located mostly within the Strategic Employment Zone. The RO desalination site has previously been used for industrial development and the surrounds are identified as deferred urban land for potential rezoning for residential use (discussed below). The Desired Outcome (DO) of the Strategic Employment Zone seeks: 'A range of industrial, logistical, warehousing, storage, research and training land uses together with compatible business activities generating wealth and employment for the state' (DO 1) [that] 'Employment-generating uses are arranged to: a) support the efficient movement of goods and materials on land in the vicinity of major transport infrastructure such as ports and intermodal freight facilities b) maintain access to waterfront areas for uses that benefit from direct water access including harbour facilities, port related industry and warehousing, ship building and related support industries c) create new and enhance existing business clusters d) support opportunities for the convenient co-location of rural related industries and allied businesses that may detract from scenic rural landscapes e) be compatible with its location and setting to manage adverse impacts on the amenity of land in adjacent zones' (DO 2) and 'A pleasant visual amenity from adjacent arterial roads, adjoining zones and entrance ways to cities, towns and settlements' (DO 3). The Project supports the DO 1 of the Zone, given that the key objective of the Project is to provide water security for the area. This in-turn would support industry and other business generating activities across the region. Project infrastructure would be well set back from the adjacent road (St Andrews Drive) and would be mostly shielded from view from the road and sensitive receptor locations. A Landscape Character and Visual Impact Assessment (LCVIA) undertake for the Project (discussed in 8.2.5) recommended that the Project would not have a significant impact to the visual amenity of the area (DO 3). The RO desalination plant is located on a former BHP sand mine site and is located adjacent to existing high-impacting land use, ship repairs and construction activities directly to the east of the Site. The Project would not impact this continuing land use (Performance Outcome - PO 1.1). Furthermore, assessments have been undertaken, including noise and air quality impact assessments (refer to Section 8.2.1 and 8.2.2) that demonstrate that the interface with sensitive land uses, primarily to the north of the Site, can be appropriately managed such that they do not cause unreasonable impacts (PO 1.2). RO desalination plant and associated infrastructure would be contained with a fenced area, taking up only a portion of the wider land parcel. Fencing would comprise a 3 m tall mesh security fence around critical infrastructure, with main gate access from St Andrews Drive, as shown on the Geneal Arrangement shown in Appendix B. The fence would mostly be shielded from public view behind existing vegetation (PO 6.1). The Project site is located within the boundary of the Proper Bay Concept Plan 107. PO 8.1 of the Zone seeks that development is compatible with the outcomes sought by any relevant Concept Plan to support the orderly development of land through staging of development and provision of infrastructure. The Concept Plan envisages that the site should not be developed until a Western Link road has been developed. The previous planning policy within the Port Lincoln Council Development Plan (Consolidated 6 February 2018) states that the Eastern Policy Area 10 within the Industry Zone anticipates a high-quality industrial precinct in association with the redevelopment of the former BHP Wharf. At the time of the then Development Plan, the Project site was expected to provide for Australia's largest commercial fishing fleet

P&D Code section	Assessment
	as part of an Eyre Peninsula Ports Master Plan. Council has considered the Project site to be an important strategic outcome for the City of Port Lincoln. The P&D Code for this locality was based on the Port Lincoln Council Development Plan (Consolidated 6 February 2018). Given the transition to the digital code represented a significant departure from the existing Council development plans (through consolidation of 68 development plans and the digitisation), there was no scope to rezone the land the Western Link road remained in the Concept Plan. As a Crown development, the Minister has regard for the P&D Code and therefore assessment against the Concept Plan is not required. The Concept Plan expects a land use that is not proposed, nor are there any plans to relocate the fishing fleet for which the policy was envisaged. The previous owner had an agreement with the Port Lincoln Council to construct the Western Link road, which SA Water is not a party to. Given the change in ownership of the Project site and change in proposed land use, development of the Link Road is not considered relevant to the development of this Project.
Deferred Urban (RO desalination plant site – part, marine intake and outfall pump station – all, saline waste and seawater transfer pipelines, DWTP – part, overhead transmission line)	
DO 1 PO 1.1, 2.2, 4.1	Part of the RO desalination plant site, all of the marine intake and outfall pump station site, and part of the linear terrestrial infrastructure are located within the Deferred Urban Zone. The DO of the Deferred Urban Zone is 'to safeguard land for future urban growth'. The expectation is this land would be residential in nature with associated built form and character. The proposed works within the Deferred Urban Zone are not expected by the planning policy with pipes and pumping stations regarded as infrastructure land uses. The Project indirectly supports DO 1 by: • Locating the marine intake and outfall pump station entirely within the existing WWTP boundary • Locating the RO desalination plant on a site previously used for industrial use, and grouping infrastructure adjacent to existing industrial building • Future-proofing the drinking water resources for the region, which would support future urban growth. The Project is intended to be a permanent structure, and land for the Project site would not be converted to support urban growth in future. The Project, however, is a critical infrastructure and would indirectly support urban growth (PO 1.1). The Project comprises public infrastructure. The selection of the Project site has been subject to a detailed site selection process, as discussed in Section 1.2. The proposed saline waste/seawater transfer pipelines would be located in an easement adjacent to St Andres Drive, minimising impacts to impacts to land parcels. The marine intake and outfall pump station would be located within an already industrialised site, and the RO desalination plant site is compact and grouped with existing industrial buildings (PO 2.2).
Coastal Waters and Offshore Islands Zone (marine intake and outfall pipelines)	
DO 1, DO 2 PO 3.1, 3.2, 3.3, 3.4 DTS/DPF 3.5	The proposed marine intake and outfall pipeline are wholly located within the Coastal Waters and Offshore Islands (CWOI) Zone. DO 1 of this Zone seeks the 'protection and enhancement of the natural marine and coastal environment and recognition of it as an important ecological, commercial, tourism and recreational resource and passage for safe watercraft navigation' and DO 2 of the Zone allows for 'a limited number of small-scale, low-impact developments supporting conservation, navigation, science, recreation, tourism, aquaculture or carbon storage'. Industry within the Zone is expected with jetties, navigational structures and agricultural buildings envisaged under Deemed-to-Satisfy Criteria / Designated Performance Feature (DTS/DPF) 1.1. Recognising the importance of the coastal area, extensive technical assessments have been undertaken to assess the impacts of the proposed Project, including the impacts of the proposed marine intake and outfall pipelines on the receiving marine environment (refer to Section 8.3).

P&D Code section	Assessment
	Construction of the pipelines would involve micro tunnelling under to shoreline, which would avoid impacts to nesting and breeding areas in proximity to the Project (PO 3.3, PO 3.4). Some impacts would be unavoidable, such as disturbance of the seabed, clearance of marine vegetation to accommodate construction of the pipelines and increased turbidity during construction works, as well as localised impacts to habitat. It is deemed that given the critical nature of the Project, the proposed level of impacts should be considered acceptable, provided that all measures are taken to minimise impacts where possible (PO 3.1, PO 3.2). The marine intake and outfall pipelines are greater than three km from the boundary of any NPW Reserve (DTS/DPF 3.5), the nearest being the Lincoln National Park, three km south of the marine intake and outfall pipelines. The boundary of the nearest Marine Park is approximately 17 km east of the Project site.
Recreation Zone (DWTP – part, overhead transmission line – part)	
DO 1 PO 1.1	A portion of both the DWTP and overhead transmission line alignments are located within the Recreation Zone. DO 1 of the Recreation Zone seeks the 'provision of a range of accessible recreational facilities, and PO 1.1 of the Zone seeks that 'development is associated with or ancillary to the primary purpose of structured, unstructured, active and / or passive recreational facilities. The proposed design of linear infrastructure within this Zone would avoid detrimental impacts to existing and future recreational land uses by placing infrastructure in or adjacent to the road reserve of Greyhound Road, avoiding fragmentation of land parcels.
Rural Zone (DWTP – part)	
DO 1, 2 PO 1.1 DTS/DPF 14.1	Part of the DWTP alignment sits within the Rural Zone. DO 1 of the Rural Zone seeks to support the 'economic prosperity of South Australia primarily through the production, processing, storage and distribution of primary produce, forestry and the generation of energy from renewable sources' and DO 2 seeks to support the 'diversification of existing businesses that promote value-adding such as industry, storage and warehousing activities, the sale and consumption of primary produce, tourist development and accommodation' (DO 2). It is considered that the Project supports the DO of the Zone, given that the key objective of the Project is to provide water security to the region, by developing a climate-independent source of drinking water. This in turn would support primary production activities directly my increasing the security and availability of water resources and could also be expected to support other existing and future activities in the Zone including tourism and accommodation. A key function of the Rural Zone is to protect the land from encroachment of unsuitable activities which may compromise the use of land for primary production activities (PO 1.1). The portion of the DWTP within the Zone would be located within the road reserve of Blue Fin Road as well as a portion within an existing SA Water easement opposite the North Site Hill tanks. The placement of this infrastructure would not detract from the availability of land for primary production purposes. Further, the Project would not limit the ability of adjacent land to be utilised for primary production purposes (i.e. there are no anticipated impacts that would require a large buffer area). The DWTP is not within the boundary of any concept plan (DTS/DPF 14.1).

Table 8.3 assesses the Project against she relevant Objectives and principles of Development Control of the appliable P&D Code Overlay across the Project.

Table 8.3 Assessment of the Project against the relevant Assessment Provisions of the applicable P&D Code Overlays

P&D Code section	Assessment
Coastal Areas Overlay (parts of all infrastructure)	
DO 1, 2 PO 2.2, 2.3, 2.4, 4,1, 4.2, 4.6	Portions of the Project intersect the Coastal Areas Overlay, which provides the planning policy to conserve and enhance the natural coastal environment (DO 1). Developments are expected to provide for natural coastal processes and potential sea level rise (DO 2). PO 2.1 states that flood protection measures should be enacted for the standard sea level risk of 1 metre. PO 2.3 states that development should not create or aggravate coastal erosion or require coast protection works with development set back to provide an erosion buffer (PO 2.4). Proposed infrastructure would either be set back from the coast or situated within developed land. No coast protection works are required or proposed as part of this development. Development is not expected to unreasonably impact the marine and onshore coastal environment by pollution, erosion, damage or depletion of physical or biological resources; interference with natural coastal processes; or the introduction of and spread of marine pests and diseases or any other means; as presenting in the impact assessment discussion in Section 8.2 and 8.3 (PO 4.1). In addition, development should avoid delicate or environmentally sensitive coastal areas such as sand dunes, cliff tops, estuaries, wetlands or substantially intact strata of native vegetation (PO 4.2). The on-land portion of the development would be designed so that stormwater runoff is detained and/or disposed of in a manner that avoids pollution or other detrimental impacts on the marine and on-shore environment of coastal areas (discussed in Section 8.2.10) (PO 4.6).
Hazards (Bushfire – High Risk) Overlay (DWTP – part) / Hazards (Bushfire – General Risk) Overlay (DWTP – part, overhead transmission line – part)	
High risk DO 1 PO 2.1, 3.1 General risk DO 1 PO 1.1, 2.1	The DO of the Hazards (Bushfire – High Risk) Overlay and Hazards (Bushfire – General Risk) Overlay seek the development responds appropriately to the respective level of bushfire risk posed by an area (DO 1/DO 1) The DWTP within these Overlays would be buried underground, significantly reducing the risk posed by bushfire by removing surfaces that may trap burning debris (PO 3.1/2.1), and also creating a buffer between infrastructure and roadside vegetation (PO 2.1/PO 1.1).
Hazards (Bushfire – Medium Risk) Overlay (RO desalination plant site, marine intake and outfall pipelines, terrestrial pipelines – part, overhead transmission line – part)	
DO 1 and DO 2 PO 1.1, 2.1, 5.1	The Desired Outcome of the Hazards (Bushfire – Medium Risk) Overlay is for development to respond to the medium level of bushfire risk presented by the area, as well as the potential for ember attack and radiant heat, by siting and designing buildings in a manner that mitigates the threat and impact of bushfires on life and property taking into account the increased frequency and intensity of bushfires as a result of climate change (DO 1) and to 'facilitate access for emergency service vehicles to aid the protection of lives and assets from bushfire danger should be facilitated by development' (DO 2). The design and siting of the Project has been developed to reduce the risk presented by bushfires. Buildings and roads have been sited to provide access for emergency services (DO 1, DO 2, PO 5.1). Vegetation clearance buffers would be provided around proposed infrastructure and developed in consultation with the CFS (PO 1.1). Where possible, structures have been designed in a manner that reduces the risk of trapping burning debris (PO 3.1). Most buildings have been designed at finished floor level, with some needing to be raised for functionality, including pump stations and switchrooms. While this may increase the risk of burning debris underneath the structures, this is limited within the site. The radiant heat expected within the medium

P&D Code section	Assessment
	bushfire risk location is expected to be mitigated by the materials of most structures being either concrete or Colorbond Ultra which are less flammable when subject to bushfire conditions.
Hazards (Flooding – Evidence Required) Overlay (RO desalination plant, marine intake and outfall pump station, overhead transmission line – part, terrestrial pipelines – part)	
DO 1 PO 1.1, PO 2.1	All terrestrial components (part or whole) of the Project are located under the Hazards (Flooding -Evidence Required) Overlay. DO 1 of the Overlay seeks that 'development adopts a precautionary approach to mitigate potential impacts on people, property, infrastructure and the environment from potential flood risk through the appropriate siting and design of development'. A Stormwater, Erosion and Erosion Report has been undertaken for the project (summarised in Section 8.2.10. The report did not identify records of flooding within the RO desalination plant site, but recommends that building levels adopt a floor level at least 0.55 m above standard sea-flood risk level as per CPB requirements to mitigation the risk of coastal flooding, and furthermore, be designed to ensure that 1% AEP overland flow does not inundate buildings (PO 1.1). Operation of the Project would require the storage of hazardous materials, including chlorine and other chemicals. These chemicals, and other hazardous and dangerous goods required onsite, would be secured in purpose built storge areas; bunded (or equivalent) as required, to prevent spills and leaks from leaving the confines of the site (PO 2.1).
Native Vegetation Overlay (whole of Site)	
DO 1 PO 1.1 and PO 1.2	The Desired Outcome of the Native Vegetation Overlay seeks that areas of native vegetation are protected, retained and restored in order to sustain biodiversity, threatened species and vegetation communities, fauna habitat, ecosystem services, carbon storage and amenity values (DO 1). The Project would involve the clearance of approximately 23.39 ha of native vegetation protected under the NV Act (discussed further in 8.2.7). Clearance is considered to be a Level 4 risk, and the application would be considered by the NVC for assessment and approval. The largest impact areas would be the RO desalination plant, DWTP and overhead transmission line. The Project design has minimised impacts to native vegetation by implementing the following (PO 1.1): • Locating the RO desalination plant within the most degraded part of the Project site • Minimising the width of the access corridor between the RO desalination plant and St Andrews Drive • Locating the marine intake and outfall pump station within cleared areas in the WWTP • Aligning the DWTP with an existing cleared track next to the rail corridor between the RO desalination plant and Greyhound Road • Co-locating, as far as possible, infrastructure and access requirements to SAPN sites with the DWTP disturbance corridor • Locating the DWTP within the bed of Greyhound Road and Blue Fin Road as much as possible to reduce disturbance to roadside vegetation. The ecology surveys and EPBC self-assessment undertaken for the Project identified impacts may be experienced by the following significant flora and fauna: • *Eucalyptus conglobulata* low woodland on fertile loams over limestone Threatened Ecological Community (EPBC Act - Rare) • Alcock's Wattle (*Acacia alcockii*) (NPW Act – Rare) • Port Lincoln Mallee (*Eucalyptus conglobulata* ssp. *conglobulata*) (NPW Act – Rare) • Tate's Grasstree (*Xanthorrhoea semiplana* ssp. *tateana*) (NPW Act – Rare) • Spoon-leaved Spyridium (*Spyridium spathulatum*) (NPW Act – Rare) • White-bellied Sea-eagle (*Haliaeetus leucogaster*) (NPW Act – Endangered) • Eastern Osprey (*Pandion haliaetus*) (NPW Act – Endangered).

P&D Code section	Assessment
	While impacts to significant flora and fauna have been avoided and minimised as far as practical, the residual impacts of the Project would be offset by the rehabilitation of vegetation on SA Water land at Uley. The offset would rehabilitate an area of the EPBC Critically Endangered Ecological Community - Drooping Sheoak Grassy Woodland on Calcrete of the Eyre Yorke Block Bioregion; and would contribute to habitat of threatened fauna known to occur at the site including Southern Emu-wren and White-bellied Whipbird (PO 1.2). An EPBC self-assessment was undertaken for the Project. Out of an abundance of caution, an EPBC Self-Referral will be submitted to DCCEEW for formal review of potential impacts to MNES.
Significant Landscape Protection Overlay (DWTP - part)	
DO 1 PO 2.1 DTS/DPF 1.2	DO 1 of the Significant Landscape Protection Overlay seeks the 'Conservation of the natural and rural character and scenic and cultural qualities of significant landscapes'. A small section of the proposed DWTP is located within the Overlay. The proposed section of pipeline within this Overlay would be buried in the road reserve and is not likely to have a significant impact on the amenity of the area, though some vegetation impacts may occur (PO 2.1). The Project does not propose a renewable energy facility; large-scale industry, storage distribution or warehousing; nor intensive animal husbandry (DTS/DPF 1.2).
State Significant Native Vegetation Overlay (DWTP – part)	
DO 1	The western most portion of the DWTP on Blue Fin Road would be located within the State Significant Native Vegetation Overlay. DO 1 of this overlay seeks to 'protect, retain and restore significant areas of native vegetation'. This portion of the DWTP within the overlay would be either buried within the existing road reserve or within an existing SA Water easement which has previously be subject to native vegetation clearance and comprises regenerating vegetation only.
Water Protection Area Overlay (DWTP – part)	
DO 1 DTS/DPF 1.1	The western most portion of the DWTP on Blue Fin Road would be located within the Water Protection Overlay. DO 1 of this Overlay seeks to 'safeguard South Australia's public water supplies and ecologically significant areas by protecting regionally and locally significant surface and underground water resources in Water Protection Areas from pollution. This includes considering adverse water quality impacts associated with projected reductions in rainfall and warmer air temperatures as a result of climate change'. The Project does not propose a fuel depot, intensive animal husbandry, special industry, stock slaughter works of timber preservation works (DTS/DPF 1.1).
Water Resources Overlay (DWTP – part, overhead transmission line - part)	
DO 2 PO 1.1	Small portions of the DWTP and overhead transmission line are located within the Water Resources Overlay. The Project would have minimal impact on water resources, given that he DWTP would be undergrounded and the transmission pole footings would have minimal impact on water resources. A Soils, Drainage and Erosion Assessment has been undertaken for the Project and has recommended mitigation and management measures to be implemented during construction, to minimise impacts to water resources (see section 8.2.10).

Table 8.4 assesses the Project against she relevant Objectives and principles of Development Control of the appliable General Development Policies for the Project.

Table 8.4 Assessment of the Project against the relevant Assessment Provisions of the applicable General Development Policies of the P&D Code

General Development Policies	
Clearance from Overhead Powerlines	
DO 1 DTS/DPF 1.1	There are no overhead powerlines traversing the RO desalination plant site. Transport routes would pass beneath areas with overhead lines, and consideration would need to be given for any over-dimensional vehicles required during construction and maintenance activities (DO 1). No structures will be erected in close proximity to power lines and setbacks would comply with the requirements under the *Electricity Act 1996;* a declaration would be provided to accompany the development application (DTS/DPF 1.1). A connecting 11 kV power line and supporting poles would be constructed to connect the Project to mains electricity. This would be placed within an easement to the west of the RO desalination plant site, connecting to a proposed SAPN line on Windsor Avenue.
Design	
DO 1 PO 1.4, 2.2, 5.1 7.2, 9.2	The RO desalination plant and marine intake and outfall pump station would be contained within existing industrial/infrastructure sites and set back from public recreation or residential areas; with native vegetation in and surrounding the Project site to be retained as far as practical, to maintain visual screening (DO 1, PO 1.4). The LCVIA undertaken for the Project (refer to Section 8.2.5) identified that the buildings and structures associated with the Project are not likely significantly impact the visual amenity of the area. New fencing is proposed around the RO desalination plant site, which would differentiate the private area from surrounding public land (PO 2.2). The new fencing would be up to 3 m high mesh security fencing and would be setback from public roads and screened behind existing vegetation to avoid amenity impacts to public places (PO 9.1). The marine intake and outfall pump station would be contained within the existing fenced area of the WWTP. A stormwater, erosion, and utility services report undertaken for the Project (refer to Section 8.2.10) identified that earthworks during construction may increase surface runoff due to a proposed increase in impermeable surface areas. These potential impacts would be considered through the refinement of the design and construction management measures (PO 5.1). The Project would be designed so as to avoid the risk polluted runoff from site. It is likely that a Stormwater Management Plan would be developed for the Site to ensure that no runoff is generated that has physical, chemical, or biological contaminants. There is a requirement for onsite effluent storage and disposal (e.g. septic system) for connection to the site amenities. Vehicle parking for the operation of the Project would be provided wholly within the RO desalination plant site (PO 7.2).
Infrastructure and Renewable Energy Facilities	
DO 1 PO 2.3, PO 3.1 and PO 4.1	A suite of technical studies, as presented in Section 8.2 and 8.3, have been developed to help inform the design and development of the Project avoid and minimise impacts to environmentally and culturally sensitive areas, while also minimising impacts to the surrounding natural and rural landscape, and residential amenity (DO 1 and PO 1.1). Disturbed areas should be rehabilitated progressively, depending on availability of the sites (PO 2.3 and PO 3.1) in order to minimise visual impacts and also suppress dust. The proposed new marine intake and outfall pipelines would be a combination of buried and placed on the seabed. Given the location of this infrastructure, it is not anticipated that there would be any impacts to maritime transport safety, through safety marking may be required (PO 4.1).

General Development Policies	
Interface Between Land Uses	
DO 1 PO 2.1, 5.1 DTS/DPF 4.1	The key interface issues with the Project would be noise and air quality. It is intended that these will be suitably managed to reduce the impacts to adjacent land uses (DO 1, PO 2.1). A noise assessment was undertaken for the Project (refer to Section 8.2.1). Five representative noise sensitive receptors were identified in the area surrounding the Project site, falling within the nearby General Neighbourhood Zone and the Waterfront Neighbourhood Zone. Anticipated noise generated from the operation of the Project was modelled and impacts on the identified sensitive receptors were assessed against the relevant environmental noise criteria under the *Environment Protection (Commercial and Industrial Noise) Policy 2023*. The outcomes of the assessment recommended that the Project development is expected to be compliant with the relevant criteria, with the application of achievable mitigation strategies, including application of enclosures or reduced fan speed on the evaporative coolers and at the RO desalination plant site building; and therefore, would meet the requirements of DTS/DPF 4.1. An air quality assessment undertaken for the Project (refer to Section 8.2.2) identified that air quality impacts for the Project construction may include dust impacts from stockpiles and odour due to possible excavation of marine sediments during tunnelling and dredging. During operation, air quality impacts may result from odour emissions from intake screeking structures or lagoons, or the venting of chemical vapours from chemicals stored on site. The assessment deemed that with the application of certain, achievable mitigation and management measures, the impacts can be appropriately managed such that they would not result in unreasonably impacts on nearby sensitive receives (PO 5.1). Measures include the implementation of management plant for the discovery of marine sediment spoil encountered during tunnelling and dredging activities, development of a stockpile management plan, appropriate storage of chemicals, and appropriate storage and disposal of organic marine waste that may be screened through the intake process.
Marinas and On-water Structures	
DO 1 PO 1.1, 1.3, 2.1	Currently, the Project site neither provides nor promotes public access to the waterfront. The Project is unlikely to result in changes to current access arrangements (PO 1.1). Marine intake and outfall pipelines would be below the seabed, in a tunnel before emerging and being placed on the seabed. They have been located so as not to impact navigation and access channels to the nearby Kirton Point Jetty and Lincoln Cove Marina (PO 1.3), as discussed in Section 7.9.7. The physical structure themselves would have a minimal impact on water circulation and exchange. The operation of the intake and outfall process has been investigated and carefully designed to ensure that circulation and exchange of saline plume is acceptable for the receiving environment (DO 1, PO 2.1).
Site Contamination	
DO 1 DTS/DTF 1.1	A PSI has been undertaken for the Project (refer to Section 8.2.8), in accordance with the requirements of Practice Direction 14 and the relevant Australian Standards and National Environmental Protection Council measures. The PSI identified that the following potentially contaminating activities associated with the past of current use of the site (being the wider parent title, prior to subdivision); including railway operations, bulk shipping facilities, abrasive blasting, fill or soil importation, and liquid organic chemical substances. Furthermore, soil investigations identified elevation concentration of certain metals and PHAs, however not in excess of human health guidelines for commercial/industrial land use (DO 1). The use of the site for a desalination plant is considered to be commercial/industrial use and not deemed to be a change in land use to a more sensitive use (DTS/DTF 1.1).

General Development Policies	
Transport, Access and Parking	
DO 1 PO 1.1, 1.2, 1.4, PO 2.1, 3.9, 5.1	The Project site would be accessible from public roads and is not likely to compromise the performance of the existing transport network in the area (DO 1, PO 1.1). Access to each the RO desalination plant site and marine intake and outfall pump station would be via St Andrews Drive (refer to Appendix F). During operation of the Project, access to the RO desalination plant site would be via a new access point and access to the marine intake and outfall pump station will be via the existing WWTP site access. Residential development exists along this road. Vehicle movements to and from the Site during operation would comprise of daily attendance by staff and occasional visits by maintenance personnel and delivery of deliver hazardous materials. Daily vehicle trips during operation would be relatively low (PO 1.2). Internal access roads have been designed such that loading areas and turning of vehicles would occur within the boundaries of the Site (PO 1.4). Vegetation at site access points may need to be cleared/trimmed to improve sightlines (PO 2.1). Internal access tracks would be developed to facilitate both construction and operation; to ensure that vehicle circulation around the site does not rely on the use of public roads (PO 3.9). Vehicle parking for the operation of the development would be provided within the RO desalination plant site and WWTP (PO 5.1).

8.1.2.6 Management and mitigation

The assessment of the Project against the P&D Code recommends that the Project is generally compliant with the relevant policies under the Zones, Overlays and General Development Provisions.

It is recommended that the Project warrants the granting of development approval under the PDI Act, in consideration that:

- It is generally compliant of the relevant policies under the applicable Zones, Overlays and General Development Provisions of the PDI Act
- It constitutes essential infrastructure under Section 131 of the PDI Act and would provide a necessary long-term solution to water security on the Eyre Peninsula
- It supports relevant State and local government guidelines and strategic directions
- Potential impacts have been in investigated in detail and can be appropriately managed (as presented in Section 8.2 and 8.3).

8.2 Land Elements

8.2.1 Noise

The following section summarises the outcomes of an Environmental Noise Assessment undertaken for the Project by WSP. The full Environmental Noise Assessment is provided in Appendix D.

8.2.1.1 Legislative and Policy Requirements

The noise requirements for the Project are managed under the following legislation and policies:

- *Environment Protection Act 1993*
- *Planning, Development and Infrastructure Act 2016*
- Planning and Design Code
- South Australian EPA *Environment Protection (Commercial and Industrial Noise) Policy 2023* (Noise Policy)
- *Guidelines for the Use of the Environmental Protection (Commercial and Industrial Noise) Policy 2023* (Policy Guidelines)
- Australian Standard AS 1055:2018 Acoustics – Description and Measurement of Environmental Noise
- *Bies and Hansen, Engineering Noise Control – Theory and Practice* (2009), Fourth Edition.

The Project is subject to Development Approval under the PDI Act. Under Section 65 of the PDI Act, the P&D Code is the designated instrument providing guidelines and criteria to which the proposed development is required to adhere.

The P&D Code contains noise-related Assessment Provisions in the Interfaces Between Land Uses section of *Part 4 – General Development Policies,* to support assessment of the development. These are outlined in Table 8.5.

Table 8.5 Noise-related Assessment Provisions under the P&D Code

Desired outcome	
DO 1: Development is located and designed to mitigate adverse effects on or from neighbouring and proximate land uses	
Performance outcome (PO)	Deemed-to-satisfy Criteria / Designated Performance feature (DTS/DPF)
PO 4.1: Development that emits noise (other than music) does not unreasonably impact the amenity of sensitive receivers	DTS/DPF 4.1: Noise that might affect sensitive receivers achieves the relevant Environment Protection (Noise) Policy criteria.

In accordance with DTS/DPF 4.1, an assessment of potential noise for the Project is required against the SA EPA Noise Policy.

The closest noise sensitive receptors to the Project are situated within the General Neighbourhood Zone and the Waterfront Neighbourhood Zone. The details of each sensitive receptors are detailed in Table 8.6.

Table 8.6 Representative Noise Sensitive Receptor Details

Receptor	Address	SA PDC Land Use Zone
NSR1	10 Sheoak Court, Port Lincoln SA 5606	General Neighbourhood
NSR2	2 Eucalyptus Drive, Port Lincoln SA 5606	General Neighbourhood
NSR3	14 Eucalyptus Drive, Port Lincoln SA 5606	General Neighbourhood
NSR4	4 Romas Way, Port Lincoln SA 5606	General Neighbourhood
NSR5	87 St Andrews Drive, Port Lincoln SA 5606	Waterfront Neighbourhood

The Noise Policy defines separate day and night-time assessment periods. Day periods are 7:00-22:00 and night period hours are 22:00-07:00. Relevant Criteria for the representative receptors are summarised in Table 8.7.

Table 8.7 Relevant Criteria for Representative Receptors

Receptor	Noise Criteria – dB(A)		
	Day ($L_{eq,15min}$)	Night ($L_{eq,15min}$)	Night ($L_{max,fast}$)
NSR1	51	43	60
NSR2	51	43	60
NSR3	51	43	60
NSR4	51	43	60
NSR5	51	43	60

Under the Noise Policy, if the noise source contains tonal, modulation, impulsive or low frequency characteristics, the noise level should be further adjusted as follows:

- if the noise from the noise source contains 1 characteristic, 5 dB(A) must be added to the source noise level
- if the noise from the noise source contains 2 characteristics, 8 dB(A) must be added to the source noise level
- if the noise from the noise source contains 3 or 4 characteristics, 10 dB(A) must be added to the source noise level.

The proposed RO desalination plant would operate 24-hours and noise is expected to be continuous and constant. The criteria for the nearest noise sensitive receptor is most stringent during the night-time period (10 pm to 7 am). As such, the night-time noise criteria is the controlling factor for the assessment.

8.2.1.2 Potential Impacts

Noise emissions have been modelled using the CONCAWE algorithm under Category 6 meteorological conditions, which is most conducive to noise propagation from the noise source to the noise affected premises, as required by the Policy Guidelines. The noise model has been constructed to represent night-time operation.

Predictive noise levels and potential characteristic penalties applied. Where noise levels exceed the environmental noise criteria they have been identified in bold.

Table 8.8 Noise Predictions Compared to Noise Policy Criteria

Receptor	Predicted Night-time Noise Level, dB(A)L_{eq} (including Character Penalty 5dB) RO Building – roller doors closed	Criteria dB(A) L_{eq}	Complies with Noise Policy
NSR1	39 (44)	43	No
NSR2	42 (47)	43	No
NSR3	39m (44)	43	No
NSR4	35 (40)	43	Yes
NSR5	31 (36)	43	Yes

Noise levels from the operation of the Project are modelled to be highest at the nearest locations within the Port Lincoln Residential Zone, buildings further west are less affected. This is impacted by:

- Open vs closed vehicle access roller doors to the RO desalination plant building (north facade) (roller doors to be constructed with a continuous, imperforate, profiled metal)
- Intake pump plant within building/enclosure or open-air.

Noise modelling results associated with the sensitivity analysis are summarised below.

Table 8.9 Noise Predictions Compared to Noise Policy Criteria

Receptor	Predicted Night-time Noise Level, dB(A)*Leq* (including Character Penalty 5dB)			
	Intake Pumps in Building		Open-air Intake Pumps	
	RO desalination plant building – roller doors closed	RO desalination plant building – roller doors open	RO desalination plant building – roller doors closed	RO desalination plant building – roller doors open
NSR1	33 (38)	37 (42)	32 (37)	37 (42)
NSR2	29	37	29	37
NSR3	27	35	27	35
NSR4	22	30	22	30
NSR5	31 (36)	31 (36)	29 (36)	29 (36)

Based on the results in Table 8.9 above, the change in intake pump station design upon noise emissions is negligible. Operation of the Project with the RO desalination plant building roller doors open results in higher noise levels at noise sensitive receptors.

In addition evaporative cooler mitigation has also been considered:

- Acoustic enclosures for evaporative cooling units (six units total) at the north façade of the RO desalination plant building
- Acoustic louvres to east and west facades of each enclosure, acoustically equivalent to Fantech Soundbar SB1
- Profiled metal sheet to north wall and roof of enclosure
- Sound absorbing finish to the internal face of all solid walls and roof of the enclosure, Minimum NRC 0.9, for example. 50 mm minimum thickness with density not less than 32 kg/m^3
  OR,
- Alternatively reduce the night-time fan speed of the evaporative cooling units to no more than 74 percent of the fan speed at 100 percent capacity.

Results of the modelled scenarios are summarised below:

Table 8.10 Predicted Noise Results Based on Evaporative Cooler Mitigation Options

Receptor	Predicted Night-time Noise Level, dB(A)*Leq* (including Character Penalty 5dB)		Criteria dB(A) *Leq*	Complies with Noise Policy
	Intake Pumps in Building			
	Evaporative cooler enclosure	Lowered fan speed		
NSR1	33	33	43	Yes
NSR2	32	35 (40)	43	Yes
NSR3	30	33 (38)	43	Yes
NSR4	25	28 (33)	43	Yes
NSR5	29 (34)	29 (34)	43	Yes

Both methods of noise mitigation meet the relevant Noise Policy criteria – this is higher for the lowered fan speed option, and this accrues a characteristic penalty of modulation in some locations.

8.2.1.3 Management and Mitigation Measures

Based on the noise source data and assumed spectra, modelling of noise emissions from the Project has determined that mitigation measures are required to prevent exceedance of the night-time Noise Policy criteria.

The main contributors to noise are the RO desalination plant building evaporative coolers and open roller doors. Both items are located on the north façade of the RO desalination plant building and there is no capacity to move the cooling equipment or roller doors to other areas. The preferred mitigation measures are enclosure of the coolers, reduction of fan speed and operation with the roller doors generally closed.

The modelling results of the evaporative cooler enclosures and the reduced fan speed can be summarised as:

- Both methods are predicted to reduce noise emission from the coolers such that the Project can meet the Noise Policy criteria
- The enclosure is more effective in reducing noise emissions. As such the enclosed cooler is less likely to be controlling and less likely to attract the 5 dB(A) characteristic noise penalty.

The assessment notes that the background noise in the areas around Port Lincoln are particularly low. Even though the desalination plant is anticipated to be compliant with the applicable environmental noise criteria, the Project would likely be audible outdoors during quiet periods, particularly at night, at noise sensitive receptors.

It is recommended that detailed acoustic design and assessment should be undertaken during later design stages of the Project to address final design selections and the following potential noise paths:

- Penetrations through the building envelope for natural and mechanical services ventilation
- Additional doors and access paths.

8.2.2 Air Quality and Odour

WSP was engaged to undertake an assessment of potential air quality impacts of the construction and operation phases of the Project.

The construction and operation of the Project is expected to generate dust from earth moving activities and movement of vehicles on unsealed surface. The combustion of engine fuel from vehicle movements, diesel generators and the operation of on-site plant and machinery have the potential to generate air pollutants. The dredging activities and the intake seawater screening process has the potential to generate odour. Overall, the following potential air pollutants were identified as relevant for the Project:

- Dust associated pollutants including:
  - Total suspended particulates (TSP)
  - Particulate matters with an aerodynamic diameter equal to or less than 10 micrometres in diameter (PM_{10})
  - Particulate matters with an aerodynamic diameter equal to or less than 2.5 micrometres in diameter ($PM_{2.5}$)
  - Deposited dust.
- Odour
- Carbon monoxide (CO)
- Oxides of nitrogen (NO_x)
- Sulphur dioxide (SO_2)
- Volatile organic compounds (VOCs) (e.g., benzene)
- Semi volatile VOCs (SVOCs) e.g., polycyclic aromatic hydrocarbons (PAHs)
- Combustion emissions mainly including PM_{10}, $PM_{2.5}$, CO, NO_x, SO_2, VOCs and PAHs.

8.2.2.1 Legislative and Policy Requirements

8.2.2.1.1 Commonwealth

National Environment Protection Council Act 1994

The National Environment Protection Council (NEPC) was established under the *National Environment Protection Council Act 1994* (NEPC Act). The primary functions of the NEPC is:

- To prepare National Environment Protection Measures (NEPMs)
- To assess and report on the implementation and effectiveness of the NEPMs in each state and territory.

NEPMs are a special set of national objectives designed to assist in protecting or managing aspects of the environment e.g., air quality. The NEPM relevant to air quality for the Project is:

- National Environment Protection (Ambient Air Quality) Measure 2021 (Air NEPM)

National Environment Protection (Air Quality) Measure 2021

The Air NEPM outlines standards and goals for key pollutants that are required to be achieved nationwide, with due regard to population exposure. The national environment protection standards of this measure are presented in Table 8.11.

In addition, Commonwealth, State and Territory Environment Ministers have flagged an objective to move to a $PM_{2.5}$ goal of 20 milligrams per cubic metre (µg/m^3) (1-day average) and 7µg/m^3 (1-year average) and a more stringent 1-hour SO_2 standard of 0.075 parts per million (ppm) by 2025.

The maximum concentration standards presented in Table 8.11 are not relevant to air emissions from individual sources, specific industries, or roadside locations. Air NEPM standards are intended to be applied at performance monitoring locations that represent air quality for a region or sub-region of 25,000 people or more. These performance monitoring stations are operated by the relevant environmental regulatory authority in each State and Territory.

Table 8.11 Air NEPM Maximum Concentration Standards

Pollutant	Averaging period	Maximum concentration standard[13, 14, 15]
PM_{10}	1 day	50 µg/m^3
	1 year	25 µg/m^3
$PM_{2.5}$	1 day	25 µg/m^3
	1 year	8 µg/m^3
NO_2	1 hour	0.08 ppm
	1 year	0.015 ppm
SO_2	1 hour	0.10 ppm
	1 day	0.02 ppm
CO	8 hours	9 ppm

[13] *Defined as a standard that consists of quantifiable characteristics of the environment against which environmental quality can be assessed*
[14] *µg/m3 – unit of measurement for particulate matter expressed as micrograms per cubic metre*
[15] *ppm – unit of measurement for gaseous species expressed as parts per million*

8.2.2.1.2 State

In South Australia, the EP Act and the PDI Act are the primary legislative instruments that govern protection of the environment. Pursuant to these Acts, the air quality environment is protected by the following subordinate policies and guidelines:

- Environment Protection (Air Quality) Policy 2016 (Air EPP)
- Ambient Air Quality Assessment Guidelines, SA EPA, 2016 (AAQA)
- Evaluation distances for effective air quality and noise management, SA EPA 2016.

Environment Protection (Air Quality) Policy 2016

The Air EPP is designed to protect air quality through a range of objectives and measures including the requirement to comply with maximum ground level concentrations (GLCs) or odour levels as per Schedule 2 and 3.

It also requires the occupier of premises to ensure that the emission of pollutants to air from its premises is not caused through any failure of the following to take reasonable and practicable measures:

1. 'To maintain fuel-burning equipment, control equipment or any other plant or equipment in an efficient condition; or
2. to operate fuel-burning equipment, control equipment or any other plant or equipment in a proper and efficient manner; or
3. to carry out maintenance of fuel-burning equipment, control equipment or any other plant or equipment in a proper and efficient manner; or
4. to process, handle, move or store goods or materials in or on the premises in a proper and efficient manner'.

Schedule 2 of the Air EPP prescribes maximum concentrations for a wide range of pollutants and Schedule 3 prescribes odour criteria depending on the number of people likely to be exposed. Pollutants likely to be emitted during construction and operation of the Project are presented in Table 8.12.

Table 8.12 Maximum Pollutant Ground Level Concentrations

Pollutant	Classification	Averaging period	Maximum concentration (mg/m^3)
Particles as PM_{10}	Toxicity	24-hours	0.05
Particles as $PM_{2.5}$	Toxicity	24-hours Annual	0.025 0.008
NO_2	Toxicity	1-hour	0.12
		Annual	0.03
CO	Toxicity	1-hour	31.24
		8-hours	11.25
Pollutant	Number of people	Averaging period	Odour units
Odour	2,000 or more	3 minutes average, 99.9% of time	2
	350 - 1999 (inclusive)		4
	60 - 349 (inclusive)		6
	12 - 59 (inclusive)		8
	Single residence (fewer than 12)		10

Ambient Air Quality Assessment Guideline 2016

The AAQA guideline was developed to support assessment of ambient air quality under the EP Act. It outlines approaches and methods for obtaining information that best facilitate the EPA's assessment of a Project.

This guideline defines environmental harm and environmental nuisance from an air quality perspective:

- Environmental harm is caused by air pollutants having toxic or adverse effects on human health or the environment. Effects may be long term (e.g., chronic cardio-respiratory conditions) or short term (e.g., irritation of eyes and nose and triggering of asthma)
- Environmental nuisance is often caused by odours or dust that interfere with the amenity of affected communities.

The guideline requires the owners/operators or proponents to demonstrate that *these maximum predicted ground level concentrations are less than the GLCs of pollutants specified in Schedule 2 or odour criteria in Schedule 3 of the Air EPP at sensitive receptor(s). The GLCs are levels of specific pollutants or odours, below which environmental risk can be considered to be acceptable.*

Nuisance dust has no specific concentration criteria as they generally create visible pollution or form deposits on surfaces or soiling clothes, rather than causing health effects. As they are so visible, they often cause complaint, and the focus is therefore on control and management systems that effectively prevent or mitigate offsite impacts.

Evaluation Distances for Effective Air Quality and Noise Management 2016

The evaluation distances guideline provides recommended evaluation distances from polluting activities, within which potential adverse impacts on sensitive receptors need to be assessed.

For dredging activities, a 300 m evaluation distance is recommended as presented in Table 8.13. Desalinisation plants are assessed on an individual assessment basis, with potential impact of odorous emissions from pre-treatment filters assessed in Section 8.2.2.4. No specific evaluation distances are recommended for other activities associated with the construction and operation of the Project.

Table 8.13 Recommended Evaluation Distance

Activity	Additional activity notes	Evaluation distance (m)	Description of typical activities and potential air impacts
Dredging Environment Protection Act, Schedule 1 7(4)	Excluding works carried out for the establishment of a visual aid to navigation and any lawful fishing or recreational activity,	300	Typically involves the removal of material either by excavation or by suction dredging. Dredging may be undertaken 24 hour per day. At the dredging site there would likely be odour issues. The dredging spoil would require either disposal or dewatering prior to disposal, and this may generate odours. This may occur adjacent to the dredging site or some distance from it, and so impacts from the dredging and spoil management need separate consideration.
Desalination plants		Individual Assessment	Storage of fine solids removed from pre-treatment filters may release odours if not managed appropriately,

8.2.2.1.3 Guidance on the Assessment of Dust from Construction

Guidance on the assessment of dust from construction Version 2.2, 2024, produced by the Institute of Air Quality Management (IAQM) [hereafter referred to as the IAQM guidance], provides guidance for defining the significance of air quality impacts due to construction of a new development based on the magnitude of change, i.e. the predicted increase or decrease in concentrations from the Project, and the sensitivity of the receptors.

This guidance is widely used for the semi-quantitative assessment of the risk of air quality (primarily particulate matter) impacts from construction works. Gaseous emissions from the construction works, and any construction works screened out by the IAQM guidance were assessed qualitatively. The *Good Practice Guide for the assessment and management of air pollution from road transport projects*, published by the Clean Air Society of Australia and New Zealand (CASANZ), was used to adapt the IAQM guidance to Australian conditions.

8.2.2.2 Assessment Methodology

8.2.2.2.1 Construction and Operation Impact Assessment

Land-based Construction

Land-based buildings that would be constructed for the Project include the RO desalination plant, marine intake and outfall pump station and new access road. The air quality impacts from the construction of these buildings would be qualitatively assessed based on the IAQM guidance.

As stated in the IAQM guidance, the risk of dust emissions from a construction site causing health impacts is related to the:

- activities being undertaken (earthmoving, number of vehicles and plant etc.)
- duration of these activities
- size of the site
- meteorological conditions (wind speed, direction and rainfall)
- proximity of receptors to the activities
- adequacy of the mitigation measures applied to reduce or eliminate dust
- sensitivity of the receptors to dust.

The quantity of dust emitted from construction operations is related to the area of land being worked, and the level of construction activity (nature, magnitude and duration).

The wind direction, wind speed and rainfall, at the time when a construction activity is taking place, would also influence whether there is likely to be dust impacts. Adverse impacts can occur in any direction from a site. They are, however, more likely to occur downwind of the prevailing wind direction and/or close to the site. In addition, local conditions, including topography and natural barriers (e.g. woodland), would reduce airborne concentrations due to impaction. Furthermore, the existing background concentrations can be used to determine whether ambient air quality standards are likely to be exceeded as a result of construction activities.

The air quality impact assessment undertaken for the construction phase adopted the following approach:

- Overview of the Project scope, study area and activities during construction
- Review the existing environmental conditions, including local topography, climate and existing ambient air quality.
- Identify sensitive receptors within 250 m of the Project and 250 m of the construction compound at the site.
- Conduct a qualitative assessment of potential dust impacts associated with the Project:
  - Risk-based assessment in accordance with the IAQM guidance:
    - Step 1: Screen the requirement for a more detailed assessment

  - Step 2: Assess the risk of dust impacts. This is done separately for each of three activities including earthwork, construction and track out
    - Step 2A: Determine the potential dust emission magnitude
    - Step 2B: Determine the sensitivity of the area
    - Step 2C: Assess the risk by combining the factors in Step 2A and Step 2B
  - Step 3: Determine the site-specific mitigation
  - Step 4: Examine the residual effects and determine whether or not these are significant.
- For construction works screened out for a detailed risk assessment (in Step 1), the IAQM guidance indicates that it can be concluded that the level of risk is 'negligible', and any effects would not be of significance. To minimise the impacts on the environment from the Project construction activities and implement best practices, the potential emissions from these construction site activities were qualitatively assessed

- Qualitatively address gaseous emissions generated from vehicles and fugitive sources
- Develop site-specific mitigation measures for the construction of the Project
- Assess the residual impacts after the implementation of mitigation measures.

Marine Construction

During the construction of the Project, there would be marine construction related to installing the marine intake and outfall pipelines. The main activities during the installation of pipeline that would lead to air emissions are expected to be shipping combustion emissions and dredging activities. Dredging activities can lead to odour and dust emissions, particularly if the waste is stockpiled on-land.

As the overall extent of marine construction activities is expected to be minor, a risk based qualitative assessment was considered appropriate to evaluate the potential risk of adverse air quality impacts.

A risk based qualitative assessment was also carried out as follows:

- Identification of potential emission sources based on proposed activities.
- Analysis of the likelihood and consequence of air emissions being generated using National Pollutant Inventory (NPI) emission inventories and relevant separation distances.
- Based on the likelihood and consequence criteria, designation of an initial risk rating (prior to mitigation measures) for the emission sources as presented in the Risk Rating Matrix.
- Following the implementation of mitigation measures, designation of a residual risk rating for each emission source.

Operation

The main air emissions generated during the operation of the Project are expected to be dust, combustion products and odour. Given the expected very low emissions likely to be generated during the operation phase, a risk based qualitative assessment was considered appropriate to evaluate the potential risk of adverse air quality impacts during operation.

A risk based qualitative assessment was carried out as follows:

- Identification potential emission sources based on proposed activities.
- Analysis of the likelihood and consequence of air emissions being generated.
- Based on the likelihood and consequence criteria, assign an initial risk rating (prior to mitigation measures) for the emission sources as presented in the Risk Rating Matrix.
- Following the implementation of mitigation measures, assign a residual risk rating for each emission source.

Likelihood categories, consequence descriptors and risk rating matrix

Table 8.14, Table 8.15 and Table 8.16 present the likelihood categories, consequence descriptors and risk rating matrix used for assessing the degree of risk associated with Project construction and operation.

Table 8.14 Likelihood Categories

Likelihood	Description
Certain	Expected to occur in most circumstances, or 100 per cent chance of recurrence during the course of an activity or the activity lasts years.
Likely	Expected to occur at some time, or 50 per cent chance of recurrence during the course of an activity, or the activity lasts months.
Possible	May happen at some time, or 30 per cent chance of recurrence during the course of an activity, or the activity lasts days to weeks.
Unlikely	May occur within the life of the Project or 10 per cent chance of recurrence during the course of an activity, or the activity lasts hours.
Rare	Highly unlikely to occur but theoretically possible, 5% chance of recurrence during the course of an activity.

Table 8.15 Consequence Descriptor

Consequence	Description
Severe	Permanent or long-term serious environmental harm/life threatening or long-term harm to health and wellbeing. Amenity of the regional area permanently negatively altered – functional recovery in greater than 10 years if at all.
Major	Serious environment harm/high-level harm to health and wellbeing. Impacts on amenity to the localised area or regional area that significantly negatively alter perceptions of the area – functional recovery within 5 to 10 years.
Moderate	Medium level of harm to health and wellbeing or the environment over an extended period of time. Impacts on amenity to the localised area or regional area that negatively alter perceptions of the area – functional recovery within 1 to 5 years.
Minor	Low environmental impact/low potential for health and wellbeing impacts. Short term impacts on amenity to the localised area or regional area – functional recovery within less than 1 year.
Insignificant	No or minimal environmental impact, or no health and wellbeing impacts. Temporary localised impacts on amenity – no lasting effects.

Table 8.16 Risk Rating Matrix

Likelihood	Consequence level				
	Insignificant	Minor	Moderate	Major	Severe
Certain	Low	Medium	High	Extreme	Extreme
Likely	Low	Medium	High	High	Extreme
Possible	Negligible	Low	Medium	High	High
Unlikely	Negligible	Low	Medium	Medium	High
Rare	Negligible	Negligible	Low	Medium	Medium

The impact assessment findings are detailed in Section 8.2.2.4.

8.2.2.3 Mitigation Measures

Site-specific mitigation measures have been developed for construction and operation of the Project. Risk assessments presented in this chapter provide both and Initial (non-mitigated) risk rating and a residual (mitigated) risk rating which consider the implementation of recommended mitigation measures.

Mitigation measures are presented in Section 8.2.2.5.

8.2.2.4 Potential Impacts

8.2.2.4.1 Land-based construction

It is anticipated that site mobilisation would commence in Q1 2025. During the mobilisation period, the Site would be established with the installation of security fencing, hoardings, stormwater management and facilities required to support the workforce.

Primary works would commence in mid-2025, with all areas (marine, terrestrial pipeline, plant) being under construction concurrently. Demobilisation would commence towards the completion of commissioning in late-2026; site reinstatement and reseeding will occur upon completion of demobilisation.

Proposed land-based construction activities include:

- Construction of marine intake and outfall pump station.
- Installation of below ground saline waste/seawater transfer pipelines from the marine intake and outfall pump station to the RO desalination plant.
- Preparation works for the RO desalination plant, including:
  - Civil works such as land clearing and grubbing as well as ground levelling
  - Installation of below ground services.
- Earthworks, including:
  - Construction of a process lagoon
  - Construction of a stormwater lagoon
  - Construction of site access roads.
- Construction of the RO desalination plant, including construction of the following structures and buildings:
  - RO building
  - Control room
  - Treated water tanks and pump station
  - Limestone contactors system,
  - Calcite storage tank
  - Calcite recuperation tank
  - CO_2 dosing system, CO_2 storage tank, RO flushing and RO neutralisation tanks
  - Maintenance shed
  - Inlet screening structure
  - Gaseous chlorine storage and dosing building
  - Brine pit and pump station
  - HV, Main and Treated Water Pump Station switch rooms and transformers.

There are no demolition activities expected for this Project.

Dust impacts depend on the quantity and drift potential of the particles in the atmosphere. Local ambient air quality conditions are discussed in Section 7.2. Larger particles (the larger particle fractions of TSP) settle out closer to the source due to their larger mass and aerodynamic diameter. The deposition of the particles can cause nuisance and aesthetic impacts on the receiving environment. Finer particles (PM_{10} and $PM_{2.5}$) remain entrained longer and therefore dispersed at greater distances from the source. The fine nature of these particles also has the potential for human health impacts if not adequately controlled.

This section assesses the potential dust impacts associated with the Project. The dust impact assessment approach outlined in the IAQM guidance was adopted in this assessment.

The following work has been included in this section:

- Risk assessment:
  - Step 1: Screen the requirement for a more detailed assessment
  - Step 2: Assess the risk of dust impacts. This is done separately for each of three activities including earthwork, construction and vehicle track out
    - Step 2A: Determine the potential dust emission magnitude
    - Step 2B: Determine the sensitivity of the area
    - Step 2C: Assess the risk by combining the factors in Step 2A and Step 2B
  - Step 3: Determine the site-specific mitigation
  - Step 4: Examine the residual effects and determine whether or not these are significant.

Risk Assessment

Step 1 – Screen the need for a detailed assessment

The IAQM guidance recommends that a risk assessment of potential dust impacts from construction activities is undertaken when sensitive receptors are located within:

- 250 m of the boundary of the Project site.
- 50 m of the routes used by construction vehicles on the public highway, up to 250 m from the Project site entrances.

In cases where no sensitive receptors are identified within these locations, the need for a more detailed assessment is 'screened out'. It can be concluded that the level of risk is negligible, and any impacts would not be of significance. The Project boundary, as shown in Figure 7.19 and discussed in Section 7.2.7, indicates that there are sensitive receptors near the Project boundary.

This assessment assumed there no crushing or batching plants will be on-site during construction.

The identified sensitive receptors within 250 m of the Project construction area are:

- Residential buildings.
- A detailed risk assessment was triggered for the construction of the Project and is discussed in the next section.

Step 2A – Determine the potential dust emission magnitude

The potential dust emission magnitudes for earthworks, construction and vehicle track out activities were evaluated in this section. Examples provided in the IAQM guidance have been used to classify potential large, medium or small dust emission magnitude, as shown in Table 8.17.

Table 8.17 Example Definitions for Large, Medium, and Small Dust Emission Magnitude

Activity	Large	Medium	Small
Earthworks	Total site area >110,000 square metres Potential dusty soil type (e.g., clay) >10 heavy earth moving vehicles active at any one time Formation of bounds >6 metres in height Total material moved >100,000 tonnes (t).	Total site area 18,000–110,000 square metres (m^2) Moderately dusty soil type (e.g., silt) 5–10 heavy earth moving vehicles active at any one time Formation of bounds 3–6 m in height Total material moved 20,000 t – 100,000 t.	Total site area <18,000 m^2 Soil type with large grain size (e.g., sand) <5 heavy earth moving vehicles active at any one time Formation of bounds <3 m in height Total material moved <20,000 t Earthworks during wetter months.
Construction	Total building volume >75,000m^3 On-site concrete batching Sandblasting.	Total building volume 12,000–75,000 m^3 On-site concrete batching Potentially dust construction material (e.g., concrete).	Total building volume <12,000 m^3 Construction material with low potential for dust release (e.g., metal cladding or timber).
Track out[16]	>50 heavy duty vehicles (HDV>3.5t) outward movements in any one day Potential dusty surface material (e.g., high clay content) Unsealed road length >100 m.	20–50 HDV (>3.5t) outward movements in any one day Moderately dusty surface material (e.g., high clay content) Unsealed road length 50–100 m.	<20 HDV (>3.5 t) outward movements in any one day Surface material with low potential for dust release Unsealed road length <50 m.

Earthworks

The main earthworks associated with the Project are expected to be related to land clearing and grubbing, levelling of the Site, and construction of site access roads, process lagoon and stormwater lagoon. For the main listed bulk earthworks, the preliminary cut and fill balance volumes are 22,200 and 14,900 m^3. Assuming a uniform soil density of 1.6 t per cubic metre (t/m^3), the total mass of material to be moved equates to 59,000 t. The total site area for the Project land-based construction is approximately 91,000 m^2.

Therefore, based on the Project land-based construction area and the total mass of material to be moved, the earthworks dust emission magnitude is conservatively assumed to be medium according to Table 8.17.

Construction

There are a number of buildings and structures to be constructed as part of the RO desalination plant. The structures include RO desalination plant building, control room, treated water tanks and associated pump station, limestone contactors system, calcite storage tank, calcite recuperation tank, CO_2 dosing system, CO_2 storage tank, RO flushing and RO neutralisation tanks, UF disc filters system, maintenance shed, inlet screening structure, gaseous chlorine storage and dosing building, brine pit and pump station, as well as HV, main and treated water pump station switch rooms and transformer.

The largest buildings to be constructed is the RO desalination plant building, which is expected to have a total floor area of approximately 3,000 m^2 and ceiling height of 12 m for a total building volume of 36,000 m^3. As there a number of buildings and structures to be

16 *Track out is dirt, mud or other materials tracked onto a paved public roadway by a vehicle leaving a construction site.*

constructed for this Project and their design for all buildings are not finalised, the construction dust emission magnitude is conservatively determined to be large according to Table 8.17.

Trackout

Track out is dirt, mud or other materials tracked onto a paved public roadway by a vehicle leaving a construction site. Heavy vehicles (gross weight greater than 3.5 t) involved in the construction could include excavators, compactors, cranes, loaders, and articulated dump trucks. However not all these vehicle types are expected to be utilised at the same time. The construction roads would be unsealed and capped with quarry rubble to minimise dust and mud drag out. A total of 10,000 heavy vehicle movements are expected during construction, which equates to approximately 27 vehicles movements per day, assuming construction takes one year.

The number of heavy vehicles movements construction area of the Project means that the dust emission magnitude for track out is considered to be in the medium category as on average 27 HGV are expected to be leaving the site onto a paved public roadway

Step 2B – Determine the sensitivity of the area

The sensitivity of the surrounding land uses takes account of several factors:

- The specific sensitivities of receptors.
- The number of receptors and their proximity to the Project site.
- Local background PM_{10} concentrations.
- Site-specific factors that may reduce the risk of wind-blown dust (e.g. trees).

Dust soiling and human health

The human sensitive receptors identified included:

- Residential buildings.

These receptors are considered to be 'high' sensitivity receptors to dust soiling and health effects as these are locations where the public are exposed for time period relevant to the air quality objective (24-hours).

The matrices for determining surrounding area sensitivity to dust soiling and human health are presented in Table 8.18 and Table 8.19,respectively.

From Table 8.18, the risk is low as there are less than 10 identified residential receptors whose property boundary are within 200-250 m of the Project boundary.

From Table 8.19, the risk remains low as the mean PM_{10} mass concentration at the site is expected to be 17.8 µg/m^3.

Table 8.18 Sensitivity of the Area to Dust Soiling

Receptor sensitivity	Number of receptors	Distance from the source (m)			
		<20	<50	<100	<250
High	100	High	High	Medium	Low
	10–100	High	Medium	Low	Low
	1–10	Medium	Low	Low	Low

Table 8.19 Sensitivity of the Area to Human Health Impacts

Receptor sensitivity	Annual mean PM10 concentration	Number of receptors	Distance from the source (m)			
			<20	<50	<100	<250
High	>20 µg/m³	>100	High	High	High	Medium
		10–100	High	High	Medium	Low
		1–10	High	Medium	Low	Low
	17.5–20 µg/m³	>100	High	High	Medium	Low
		10–100	High	Medium	Low	Low
		1–10	High	Medium	Low	Low
	15–17.5 µg/m³	>100	High	Medium	Low	Low
		10–100	High	Medium	Low	Low
		1–10	Medium	Low	Low	Low
	<15 µg/m³	>100	Medium	Low	Low	Low
		10–100	Low	Low	Low	Low
		1–10	Low	Low	Low	Low

Ecological

There were no sensitive ecological receptors identified within 250 m of the Project boundary.

Project land-based construction screening summary

In accordance with the IAQM guidance and Table 8.18, the areas surrounding the Project construction have a low sensitivity to dust soiling impacts.

In accordance with the IAQM guidance and Table 8.19, the areas surrounding the Project construction have a low sensitivity to human health impacts.

The outcome of defining the sensitivity of the surrounding areas to dust soiling, human health and ecological impacts is summarised in Table 8.20.

Table 8.20 Summary of Sensitivity of the Surrounding Areas to the Project Construction

Potential Impact	Sites	Determining Factors	Sensitivity of the surrounding areas
Dust Soiling	Residential buildings	Receptor sensitivity: <10 within 250 m	Low
Human Health	Residential buildings	Receptor sensitivity: <10 within 250 m	Low

Step 2C – Define the risk of impacts

The dust emission magnitudes for earthworks, construction and track out during the Project construction were combined with the sensitivity of the area to determine the risk of impacts. The matrices for the risk of dust impacts are presented in Table 8.21 and Table 8.22.

Table 8.21 Risk of Dust Impacts from Construction and Earthworks

Sensitivity of the area	Dust emission magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table 8.22 Risk of Fust Impacts from Trackout

Sensitivity of the area	Dust emission magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Based on the dust emission magnitudes determined in the previous section, the sensitivity of the surrounding areas in Table 8.20 and determining matrices in Table 8.23 and Table 8.24.

- Earthworks activities associated with the Project construction are considered to have a low risk of dust soiling and human health impacts
- Construction activities associated with the Project construction are considered to have a low risk of dust soiling and human health impacts
- Track out activities associated with the Project are considered to have a low risk of dust soiling and human health impacts.

A summary of dust risks at the sensitive receptor locations is presented in Table 8.23.

Table 8.23 Summary of Dust Risks for the Project Land Based Construction.

Potential Impact	Site	Risk		
		Earthworks	Construction	Trackout
Dust Soiling	Residential buildings	Low Risk	Low Risk	Low Risk
Human Health	Residential buildings	Low Risk	Low Risk	Low Risk

Step 3 – Site-specific mitigation

As stated in the previous section, risks are described in terms of there being a negligible, low, medium or high risk. Site-specific mitigation would be required when there are low, medium or high risks of an impact. For cases where the risk category is negligible, no mitigation measures are required beyond those required by legislation. For general mitigation measures, the highest risk category was applied. To minimise the dust impacts associated with the proposal, site-specific mitigation measures are presented in Section 8.2.2.5.

Step 4 – Determine the significance of residual impacts

For almost all construction activities, the aim is to prevent significant effects on receptors through the use of effective mitigation. According to the IAQM guidance, this is normally possible. Therefore, with the implementation of site-specific mitigation measures detailed in Section 8.2.2.5, the residual dust impacts would not be of significance.

8.2.2.4.2 Gaseous emissions during land-based construction

Gaseous emissions such as CO, NOx, SO2, volatile organic compounds (VOCs) and polycyclic aromatic hydrocarbons (PAHs) would be generated from vehicles and fugitive sources during the construction phase across the Project.

Vehicle emissions

Diesel fuel combustion from vehicle movements and on-site plant and machinery operation would generate CO, NO_x, SO_2 and trace amounts of non-combustible hydrocarbons (i.e. VOCs and PAHs). The emission rates and potential impact on surrounding areas would depend on the number and power output of the combustion engines, the quality of fuel used, the condition of the engines and the intensity of use. During the construction phase, equipment and material would be moved by HGV. Details of daily HGV movements are presented in Section 8.2.2.4.1. The plant and machinery involved in the construction of the Project could include excavators, loaders, graders, articulated dump trucks and dozers and are likely to be <10 HGV on site at any one time. Emissions would be adequately manageable through the implementation of mitigation measures (refer to Section 8.2.2.5).

Fugitive emissions

Petroleum, diesel, liquefied natural gas (LPG) and mineral oils stored in the storage and laydown areas have the potential to generate fugitive emissions. These hazardous and dangerous goods would be secured in purpose built bunded and secure areas. These emissions are expected to be minor and readily dispersed within the site. With appropriate handling and storage, air quality impacts from these fugitive sources are considered to be negligible.

8.2.2.4.3 Marine-based construction

The following is a summary of the preliminary marine construction methodology.

The shore crossing would be constructed by micro tunnelling with the launch shaft being constructed within the obsolete lagoons of the WWTP. Note that the launch shaft would eventually become the marine intake and outfall pump station.

A micro TBM located at the marine intake and outfall pump station area would be used to bore a tunnel for the pipeline. The total volume of 3,600 m^3 of tunnel slurry is expected to be generated. The tunnel slurry would be stored in permanent stockpiles in obsolete lagoons at the WWTP.

TBM recovery area would be excavated concurrently with the tunnelling works, and would involve the following:

- Would be performed using dredging vessels.
- The total volume of spoil (silt, clay, sand, gravel) used is expected to be 23,300 m^3.
- Spoil from the recovery area will be transferred to shore and disposed in an approved location.

Construction of the Intake structures would involve:

- Excavation by dredging. The dredging spoil is assumed to be disposed offshore.
- Laying of foundations using gravel placed using grab dredge. The expected volume of gravel is 1,200 m^3.
- Placement of structures using a barge and crane.

Marine pipeline installation would involve:

- Pipelines would being towed into position using a barge and winch through guides and along tunnel.
- Laying foundations of imported gravel (ca. 1,050 m^3) for pipeline collars using a dredging vessel.
- Excavation by dredging. The dredging spoil is assumed to be disposed offshore.
- Installation of pipeline collars using a barge and crane to lower the collars.

Backfilling with take place by side casting material picked up from seafloor and placing into position using grab dredge, imported material transferred via barge to location and placed on seafloor using grab dredge. The expected volume of material is 23,500 m^3.

Potential air emission during Project marine construction

Table 8.24 lists the potential air and odour emission sources identified during the Project marine construction.

For this assessment, the TBM and ancillary equipment were assumed to be powered by diesel generators, given the remote location, as a conservative worst-case scenario. These emissions would be minimised should the TBM be powered by grid electricity. The permanent stockpile for the spoil from the TBM slurry may contain marine sediment, potentially leading to odour emissions. The TBM spoil stockpile may also lead to dust emissions. The offshore construction activity has the potential to generate odour emissions from the dredging spoil, dust emissions during laying gravel foundations and combustion emissions from shipping vessels (Barges and dredges). All marine based construction was assumed to occur for planned onsite working hours of 6 am to 6 pm seven-days a week.

Table 8.24 Potential Air Emission Sources During the Project Marine Construction

Area	Equipment	Potential Emissions
Marine Intake Station	Tunnel boring machine	Combustion emissions
SA Water WWTP obsolete lagoons	Tunnel spoil stockpile	Dust and odour emissions
Off-shore	Ship and Barge	Combustion and dust emissions
	Dredging spoil	Odour emissions

Risk assessment of potential emission sources during project marine construction

The occurrence, likelihood and potential impact consequence of each emission during the marine based construction phases were assessed based on the definitions presented in Table 8.14, Table 8.15 and Table 8.16, and are presented in Table 8.25 prior to mitigation.

The SA EPA '*Evaluation distances for effective air quality and noise management*' guidelines provide recommended separation distances between emitters and sensitive land uses to minimise odour and air quality impacts for proposed new activities and developments. From the guidance, the most applicable to this assessment is dredging activities, due to the potential odour impacts from marine sediment spoil and the minimum distance recommended is 300 m.

The properties of the TBM spoil material are unknown at this stage of the assessment and were assumed to be similar to mixed construction or demolition waste and therefore low risk according to the SA EPA '*Guidelines for stockpile management*'. A potential air quality impact from the TBM spoil stockpile is the generation of windblown dust as the moisture content of the stockpiled material reduces. Some of the key factors that affect magnitude of windblown dust from a stockpile are the type and physical properties of the material (e.g., size of particles) being stored and the length of time.

The TBM spoil may contain also marine sediment, and the minimum distance from dredging activities (300 m) was conservatively applied when assessing the potential odour impacts from the TBM spoil stockpile. The closest sensitive receptor to the marine construction area is Billy Lights Point park, a recreation area, located approximately 100 m from the proposed location of the marine intake stations. According to the SA EPA '*Evaluation distances for effective air quality and noise management*' sensitive receptors are any fixed location where human health or loss of amenity may be caused by the proposed activity, with an important consideration being the length of potential exposure. As the identified sensitive receptor (Billy Lights Point park) is a location where there is likely transient exposure but would expect reasonable amenity, this was considered a medium sensitivity receptor (according to the IAQM guidance) when determining the consequence for each source. The transient nature of exposure at the closest sensitive receptors (Billy Lights Point Park) reduces the likelihood of exposure for sensitive receptors.

Table 8.25 Likelihood and consequence analysis of each marine construction emission source

Emission sources	Likelihood and Consequence
Tunnel boring machine	The TBM and equipment may be powered diesel generators and generate combustion emissions. The likelihood of occurring is possible with the consequence minor.
Spoil stockpile	There is potential for dust emissions due to windblown fine material from the stockpile. The likelihood of occurring is likely with the consequence minor. There is a potential for odour emissions due to disposal/storage of marine sediment in the stockpile. The likelihood of occurring is possible with the consequence minor.
Ship/barge	Combustion emission associated with ships and barges being used during the offshore construction. The number and size of ships to be used is expected to be small and the length of construction is also short. The likelihood of occurring is possible with the consequence minor.
Laying Gravel foundations	There is a potential for dust emissions during the laying of gravel foundations by grab dredge vessels. This activity would be located far sensitive receptors and therefore means the likelihood of emissions reaching them is rare. The length of the activity is expected to be short. The likelihood of occurring is rare with the consequence minor
Dredging	Dredging activities associated with installation of subsea intake structures will involve the removal of marine sediment. There is potential for odour emissions from the disposal and storage of the dredging spoil. The likelihood of occurring is possible with the consequence minor.

Risk rating for marine-based construction

Initial risk rating and residual risk rating post-mitigation of each emission source from marine-based construction are presented in Table 8.26.

In summary, with the proposed mitigation measures in place (refer to Section 8.2.2.5), the air quality and odour impacts due to the marine-based construction of the Project are manageable.

Management of permanent and any temporary stockpiles should follow the SA EPA '*Guidelines for stockpile management*'. Following the proposed mitigation measures outlined in Table 8.30 would reduce the likelihood of dust emissions to possible. To reduce the likelihood of odour emissions from the TBM stockpile, marine sediment should not be stored permanently in the TBM spoil stockpile, instead a contingency management plan for marine sediment from the TBM stockpile be developed that includes appropriate off-site disposal. Figure 7.14 indicates a strong seasonality to wind direction at the Project site and during summer months the predominant wind direction is southeasterly. Along with the warmer temperatures, this would increase the likelihood of odour emissions from marine organic material impacting nearby sensitive receptors and this should be incorporated in the contingency management plans for marine sediment.

For the dredging activities, with proper storage on-board the vessel and offshore disposal, the likelihood of emissions associated with odour emissions from dredging spoil are reduced to unlikely.

Table 8.26 Air Quality Risk Register for the Marine-based Construction

Source	Initial risk rating			Mitigation	Residual risk rating		
	Likelihood	Consequence	Risk Rating		Likelihood	Consequence	Risk Rating
Tunnel boring machine	Possible	Minor	Low	See Table 8.30	Possible	Minor	Low
Spoil stockpile	Likely	Minor	Medium		Possible	Minor	Low
Ship/ barge	Possible	Minor	Low		Possible	Minor	Low
Gravel foundation	Rare	Minor	Negligible		Rare	Minor	Negligible
Dredging	Possible	Minor	Low		Unlikely	Minor	Low

8.2.2.4.4 Potential operation emission sources

Table 8.27 lists the potential air and odour emission sources identified during the Project operation.

Table 8.27 Potential Air Emission Sources During the Project Marine-based Construction

Area	Equipment	Potential Emissions
On-site wastewater pump station (WWPS)	On-site wastewater pump station (WWPS)	Odour emissions
Inlet Screening Tank	Fine screens and coarse screening bin	Odour emissions from organic material prior to disposal
Gross Solids Trap	Gross Solids Trap	Odour emissions from organic material prior to disposal
Process Lagoon	Process Lagoon	Odour emissions from the lagoon
Chemical Dosing	Chemical storage tanks and dosing skids	Potential venting of chemical vapours from storage tanks Potential emissions during refuelling storage tanks
	Chlorine gas storage	Potential venting of chemical vapours from storage tanks Potential emissions during refuelling storage tanks
Calcite Contactor	Limestone hoppers	Dust emissions during manual loading in hoppers
Desalination Plant	Diesel Fire Pump	Nitrogen oxides, carbon monoxide and particle emissions from use of diesel pump
	Permanent and Temporary Genset	Nitrogen oxides, carbon monoxide and particle emissions from use of diesel pump
Site-wide	Delivery vehicles and on-site traffic	Dust emissions and combustion emissions from vehicles

Risk assessment of potential operation emission sources

Occurrence, likelihood and potential impact consequence of each emission during the construction and operation phases were assessed based on the definitions presented in Table 8.14, Table 8.15 and Table 8.16, and are presented in Table 8.28 prior to mitigation.

The SA EPA '*Evaluation distances for effective air quality and noise management*' guidelines provide recommended separation distances between emitters and sensitive land uses to minimise odour and air quality impacts for proposed new activities and developments. From the guidance, for desalination plants the main potential air impacts are odour arising from the storage of fine solids removed from pre-treatment filters and there are no recommended minimum evaluation distances. For chemical storage, the minimum evaluation distances are 100 m, within which there are no nearby sensitive receptors, and this was considered in consequence analysis for these sources.

Table 8.28 Likelihood and consequence analysis of each operation emission source

Emission sources	Likelihood and Consequence
WWPS	There is potential odour emission from the on-site WWPS. The likelihood of occurring is unlikely, with the minor.
Fine screens and coarse screening bin	The removed solids include larvae and plankton. If not appropriately stored on-site, there is the potential for odour generation. The likelihood of occurring is likely, with the moderate.
Gross Solids Trap	The main gross organic solids are likely seaweed. If stored mass increases due to storm events, seasonal conditions or other reasons, there is potential that it can become a significant odour source. The likelihood of occurring is likely with the consequence moderate.
Process Lagoon	There is potential for odour emissions from overflows from the IP tank, brine pit and treated water storage tank; Calcite contactor backwash water, sample drains from online analyser racks. The likelihood of venting would be possible, but the consequence is minor.
Chemical storage tanks and dosing skids	There is a potential for venting from chemical storage tank on-site, including Citric acid, hydrochloric acid, Sodium hypochlorite, sodium hydroxide. The likelihood of venting would be likely, but the consequence is minor.
Chlorine gas storage	There is a potential for venting from chlorine gas storage. The likelihood of venting would be likely, but the consequence is minor.
Limestone hoppers	Limestone manual loading on hoppers may result in emissions of dust. The likelihood of dust-generation would be likely, but the consequence is insignificant.
Diesel Fire Pump	A diesel-powered fire pump would be used in an emergency. The generator would need to be tested periodically to ensure it remains fit for purpose (approximately 10 minutes per month). Overall, it would be rare to run the generator and generate noticeable combustion emissions. The consequence would be insignificant.
Permanent and Temporary Genset	A diesel-powered generator would be used as a back-up in the event of a power outage. The generator would need to be tested periodically to ensure it remains fit for purpose (approximately 10 minutes per month). Overall, it would be rare to run the generator and generate noticeable combustion emissions. The consequence would be insignificant.
Delivery vehicles and on-site traffic	Vehicles involved during operation: • Operator traffic in a light vehicle • Chemical deliveries • Solid waste removal. The number and frequency of vehicles required during operation would be low. Dust and combustion emissions associated with operational vehicles would be possible, and the consequence is minor.

Risk rating for operation of the Project

Initial risk rating and residual risk rating post-mitigation of each emission source are presented in Table 8.29.

In summary, with proposed mitigation measures (refer to Section 8.2.2.5) in place, the air quality and odour impacts due to the operation of the Project are manageable. The potential organic material collected at the fine screens and coarse screening bin and gross solid traps represent the largest potential air impact due to odour emissions if not properly managed. The nearest sensitive receptor (Billy Lights Point park) is approximately 100 m from the proposed location of the screening section (marine intake and outfall pump station) indicating there is a risk of loss of amenity due to odour. This assessment also notes that the Project would be located next to an existing WWTP and there is a potential for cumulative impacts for odour emissions. However, with the implementation mitigation measures including proper storage to reduce anerobic decomposition of organic material and regular and appropriate disposal management plans, this reduces the overall residual risk rating to low.

The likelihood of venting chemical storage tanks causing air quality impacts is reduced to unlikely with the installation of scrubbers on the vents, reducing the risk to low. The risk associated with dust emission when loading limestone hopper are reduced with the implementation mitigation measures such as reducing drop height and telescopic chutes.

Table 8.29 Air Quality Risk Register for the Project Operation

Source	Initial risk rating			Mitigation	Residual risk rating		
	Likelihood	Consequence	Risk Rating		Likelihood	Consequence	Risk Rating
WWPS	Unlikely	Minor	Low	See Table 8.30	Unlikely	Minor	Low
Fine screens and coarse screening bin	Likely	Moderate	High		Possible	Minor	Low
Gross Solids Trap	Likely	Moderate	High		Possible	Minor	Low
Process Lagoon	Possible	Minor	Low		Possible	Minor	Low
Chemical storage tanks and dosing skids	Likely	Minor	Medium		Unlikely	Minor	Low
Chlorine gas storage	Likely	Minor	Medium		Unlikely	Minor	Low
Limestone hoppers	Likely	Minor	Medium		Possible	Minor	Negligible
Diesel Fire Pump	Rare	Insignificant	Negligible		Rare	Insignificant	Negligible
Permanent and Temporary Genset	Rare	Insignificant	Negligible		Rare	Insignificant	Negligible
Delivery vehicles and on-site traffic	Possible	Minor	Low		Possible	Minor	Low

8.2.2.5 Management and Mitigation Measures

Site-specific mitigation measures have been proposed to minimise air quality impacts associated with the construction and operation of the Project. Mitigation measures for the Project are presented in Table 8.30.

Table 8.30 Air Quality Mitigation Measures for the Construction of the Project

Reference	Mitigation measure	Timing	Applicable location(s)
AQ1	Construction air quality management measures are to be detailed in an Air Quality Management Plan and implemented during construction to minimise particulate and gaseous emissions as far as possible. Measures will include (but not limited to): • Use of water sprays or dust suppression surfactants as required for dust suppression • Adjusting the intensity of activities based on observed dust levels and weather forecasts • Minimising the amount of materials temporarily stockpiled and position stockpiles away from surrounding receptors • Vehicle movements are to be strictly limited to designated entry/exit routes and parking areas, and measures to minimise the tracking of material onto paved roads • Covering of loads • Stabilising disturbed areas as soon as practicable, including new access routes • Minimising the extent of disturbance as far as practicable • Regularly conduct visual inspections of dust emissions and apply additional controls as required.	Construction	Land-based and Marine construction
AQ2	Ensure that all vehicles and machinery are fitted with appropriate emission control equipment and maintained in a proper and efficient manner. No unnecessary idling vehicles	Construction	All locations
AQ3	Marine sediment management plans are to be detailed in the Air Quality Management Plan and implemented during construction to minimise odour emissions as far as possible. Measures will include (but not limited to): For dredging operations • Avoid overloading • comply with all regulatory requirements including EPA licence requirements • Keeping spoil under water • Disposal of dredging spoil off-shore as much as possible, dependent on approvals. For tunnelling operations • Development of a contingency management plan for marine sediment encountered during tunnelling, which could include keeping material wet to avoid decomposition and odour emissions until disposed appropriately. For TBM spoil stockpile • Implementation of stockpile management plan in accordance with SA EPA guidance • Installation of bunding to minimise wind erosion	Construction	Marine

Reference	Mitigation measure	Timing	Applicable location(s)
	• Dust management controls e.g., dust suppression sprays.		
AQ4	For organic waste material from the fine screens and coarse screening bin, and gross solids trap to be: • Stored as far as practicable from nearby sensitive receptors • Disposed appropriately and regularly • Ensure on-site storage are under aerobic conditions to reduce decomposition and odour.	Operation	Desalination plant
AQ5	Storage of chemicals in appropriate tanks with scrubbers installed on vents. During refuelling, trucks are to be fitted with vapour plume recovery devices.	Operation	Desalination plant
AQ6	To minimise dust emission during loading of limestone hoppers: • Reduce drop heights as much as practicable • Use telescopic chutes • Partially (3-side) enclose hoppers • Mechanical ventilation.	Operation	Desalination plant

8.2.2.6 Summary and Recommendations

This assessment considered the potential air quality impacts from the construction and operation of the Project. The background air quality in the study area, as discussed in Section 7.2, is likely typical of rural Australia and rated good to very good. The local study area is likely occasionally impacted by regional scale air quality events, such as dust storms.

The potential air quality impacts during land-based and marine-based construction of the Project were assessed separately. The land-based construction was assessed according to the IAQM guidance and from earthworks, construction and trackout activities during construction were determined to have a low risk of dust soiling and human health impacts. The marine-based construction, risk based qualitative assessment was carried out, and the identified major potential impacts were dust and odour impacts from TBM stockpile and dredging.

The potential air quality impacts during operation of the Project were assessed using a risk based qualitative approach, and the identified major potential air impacts were odour emissions from the fine screens and coarse screening bin, and gross solid traps.

The proposed mitigation measures include:

- Development of a construction air quality management plan to minimise particulate, gaseous and odour emissions, including:
  - management plans for marine sediment spoil encountered during tunnelling
  - management plans for marine sediment spoil during dredging activities.
- Ensure that all vehicles and machinery are fitted with appropriate emission control equipment and maintained.
- For organic marine waste material trap to be stored are under aerobic conditions as far as practicable from nearby sensitive receptors and disposed regularly.
- Development of a stockpile management plan for the permanent stockpiles, such as TBM spoil.
- Storage of chemicals in appropriate tanks with scrubbers installed on vents and refuelling trucks are to be fitted with vapour plume recovery devices.
- Minimise dust emission during loading of limestone hoppers by reducing drop heights.

With the implementation of site-specific proposed mitigation measures detailed in Section 8.2.2.5 the air quality and odour impact due to the construction and operation of the Project are likely manageable.

8.2.3 Aboriginal Cultural Heritage

8.2.3.1 Relevant Legislation

8.2.3.1.1 Aboriginal Heritage Act 1988

The *Aboriginal Heritage Act 1988* provides for the protection and preservation of Aboriginal heritage in South Australia. Under the Act, all Aboriginal sites, objects and remains that are of significance to Aboriginal tradition, archaeology, anthropology and/or history are protected; whether they are registered or not. Under Section 23 of the Act, a person must not, without the authority of the Minister for Aboriginal Affairs and Reconciliation, damage, disturb or interfere with an Aboriginal site, object or remains.

8.2.3.1.2 Commonwealth Aboriginal and Torres Strait Islander Heritage Protection Act 1984

The Commonwealth *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* provides a mechanism for the Minister for Environment to make declarations regarding the protection of a significant Aboriginal area or significant Aboriginal object when the Minister is satisfied that the area or object is under threat of injury or destruction. In practice declarations under this Act would only be made where State or Territory laws are considered to provide insufficient protection of the area from a threat of injury or desecration. Declarations made under this Act involve restricting activities and/or access to an Aboriginal site.

8.2.3.1.3 South Australia Native Title Act 1994 and Commonwealth Native Title Act 1993

Native title is recognised and protected in South Australia under the *Native Title Act 1993* (Cth) and the *Native Title (South Australia) Act 1994*. Native title is the recognition that Aboriginal people had a system of law and ownership of their lands before the arrival of Europeans. Native Title rights are pre existing rights held by Aboriginal people and groups in relation to land and waters, as derived from their traditional laws and customs. Native title rights can only be recognised over lands and waters where there has not been prior extinguishment of those rights by valid grant or creation of an inconsistent interest by State or Commonwealth governments.

8.2.3.2 Engagement and Assessment

SA Water has engaged with the Barngarla Determination Aboriginal Corporation (BDAC) over a number of years in relation to potential locations for an RO desalination plant on Eyre Peninsula.

SA Water has taken steps to assess cultural heritage risks associated with the Project site, including obtaining an independent desktop assessment and conducting a search of central archives (including the Register of Aboriginal Sites and Objects) managed by Aboriginal Affairs and Reconciliation. SA Water has also sought, unsuccessfully, to conduct a heritage survey of the Project site with BDAC and to seek feedback from BDAC on cultural heritage sites and values within and around the Project site to assist in informing project design and construction methodology.

Although no assessment of cultural heritage through a survey with the Barngarla people has yet been carried out, sites of cultural heritage significance identified through desktop assessments have been considered in the current design and construction methodology.

SA Water acknowledges the publicly stated heritage significance of Billy Lights Point to the Barngarla People including statements that the construction of a desalination plant at Billy Lights Point risks damage to Aboriginal heritage.

SA Water continues to seek constructive engagement with BDAC regarding measures to minimise any damage to their cultural heritage as a consequence of the Project.

However, due to the critical nature of the Project, SA Water has lodged a Section 21 and Section 23 Authorisation request under the *Aboriginal Heritage Act 1988* seeking authorisation of the Minister to damage, disturb or interfere with any Aboriginal site or object, where this cannot be avoided by Project design or construction methodology. Details of the results of site specific heritage investigations and engagement with the Traditional Owners have been provided to the Minister of Aboriginal Affairs and Reconciliation in support of that application.

Notwithstanding, the current design has removed the potential for impacts on coastal and intertidal areas adjacent to the RO desalination plant site and WWTP at Billy Lights Point. This includes restricting development on the RO desalination plant site to previous industrial areas and removing the requirement for trenching through the coastal and intertidal zones for the marine pipeline installation by utilising a tunnel out to approximately 500 m.

SA Water would ensure compliance with Native Title and Aboriginal heritage legislation in relation to this Project and acknowledges that an authorisation under the *Aboriginal Heritage Act 1998* (SA) would be required in relation to this Project.

8.2.4 Non-Aboriginal Heritage

WSP were engaged to undertake a Non-Aboriginal Heritage Assessment for the Project, as detailed in the following section.

8.2.4.1 Legislative and Policy Requirements

8.2.4.1.1 Heritage Places Act 1993

The *Heritage Places Act 1993* (Heritage Places Act) makes provision for the identification, recording and conservation of places and objects of non-Aboriginal heritage significance in South Australia. The Heritage Places Act establishes the South Australian Heritage Council and allows for the identification and protection of places of heritage significance listed in the South Australian Heritage Register.

8.2.4.1.2 Historic Shipwrecks Act 1981 and Underwater Cultural Heritage Act 2018

South Australia's *Historic Shipwrecks Act 1981* (Historic Shipwrecks Act) and the Commonwealth *Underwater Cultural Heritage Act 2018* (UCH Act) seek to protect historic shipwrecks and relics in South Australian and Commonwealth waters, respectively. The UCH Act also extends to aircraft and other declared underwater heritage. Shipwrecks become historic shipwrecks protected under these acts automatically after 75 years, or earlier if otherwise declared by the relevant Minister. Under these acts, it is illegal to damage, destroy, interfere with, or dispose of any historic shipwrecks or historic relics; or to undertake certain activities within a designated 'protected zone' that may lead to damage to items within this zone.

8.2.4.1.3 Planning, Development and Infrastructure Act 2016

Heritage places and historic shipwrecks and relics are also protected through South Australia's planning system under the PDI Act. During the development assessment process, where a proposed development is located within a State Heritage Place Overlay, State Heritage Area Overlay, Heritage Adjacency Overlay, or Historic Shipwrecks Overlay (established under the P&D Code), and where the proposed development is of a specified class under the P&D Code, Schedule 9 of the PDI Regulations directs that the development application be referred to the relevant Minister administering the Heritage Places Act, Historic Shipwrecks Act or UCH Act.

8.2.4.2 Assessment Methodology

The existing conditions of the Project site in relation to non-Aboriginal heritage were identified via a review of the following resources:

- South Australian Heritage Places Database and corresponding dataset – maintained by the DEW
- Australian Heritage Database and corresponding dataset – maintained by DCCEEW
- Australasian Underwater Cultural Heritage Database and corresponding dataset – maintained by DCCEEW
- An EPBC Act Protected Matters Search
- Planning and Design Code Overlays, under the P&D Code
- No field survey has been undertaken.

8.2.4.3 Potential Impacts

8.2.4.3.1 Construction

The Project site is not located with the boundaries of any identified non-Aboriginal heritage place. As such, direct impacts are not anticipated.

Consideration of potential vibration impacts during construction should be given to the State Heritage listed dwelling at 20 Windsor Avenue, Port Lincoln. Impacts could extend to this heritage place due to potential vibration from construction or transport activities. Generally, it can be considered that the risk from construction induced structural damage could extend to structures within 20 m of the works, and the risks from transport induced structural damage could extend up to 10 m; though the exact extent would depend on the proposed construction activities, and specifications of proposed plant and machinery. Generally, these risks are standard and manageable.

Depending on the final location of the proposed overhead transmission line on Windsor Avenue, the Project could intersect the Heritage Adjacency Overlay surrounding the State heritage listed dwelling at 20 Windsor Avenue, Port Lincoln. This Overlay extends approximately six m from the property boundary into the road reserve. The arrangement for this section of the overhead transmission line has not yet been finalised, however it is understood that the overhead transmission line is likely to follow the existing SAPN transmission line on the opposite side of the road, outside of this Overlay. It should be noted that while the proposed overhead transmission line is related to this Project, the works would be undertaken by SAPN and are not included as part of this development application. However, should the final location of the SAPN transmission line intersect the Heritage Adjacency Overlay, the transmission line may be subject to development approval.

The Project does not directly impact the anticipated location of the nearby shipwreck. Saline waste/seawater transfer pipelines would be located approximately one km from the expected site of the shipwreck, and approximately 500 m from the Historic Shipwrecks Overlay surrounding this point.

The preferred transport route for delivery of materials to the Project site has been identified as Lincoln Highway > Hallet Place > Liverpool Street > Porter Street > Dublin Street > Luke Street > Verran Terrace > Bel Air Drive > Ravendale Road > Marine Drive > St Andrews Drive. This preferred route passes directly by one State heritage place, the Port Lincoln Locomotive Depot and Workshops adjacent to Luke Street (State Heritage ID 26501). Heritage listed structures within the site are greater than 50 m from the road, and hence construction vibration impacts due to traffic are not anticipated. Impacts should be reassessed should any changes to this traffic route be made.

Temporary visual impacts may occur during construction works in the road reserve adjacent to 20 Windsor Avenue, Port Lincoln. These impacts would be short term and minor.

While the proposed marine works are located approximately one km from the expected site of wreck number 440, there is a risk that the recorded location of the shipwreck is not precise as historic records may be unreliable or coastal processes may have moved the location of the wreck and/or relics. Therefore, the risk of the Project impacting on a shipwreck or relic remains.

It should also be considered that shipwrecks and relics may become partially or fully buried in the seabed or shore, which may lead to the unexpected discovery of shipwrecks or relics during construction.

SA Water undertook consultation with Heritage South Australia (Heritage SA) regarding potential impacts to Shipwreck number 440. Heritage SA advised that based on the location of the marine pipelines at the time of consultation, no impact assessment for the shipwreck is required (Polzer, 2023).

8.2.4.3.2 Operation

It is not expected that the operational phase of the Project would result in impacts to non-Aboriginal heritage places.

Heritage SA identified that there is a risk that outflow from the desalination plant could impact Shipwreck number 440, depending on the discharge location and outflow velocity and volume (Polzer, 2023). As the distance of the outflow is approximately one km away, impacts are considered unlikely. This should be reconsidered upon completion of the hydrodynamic modelling.

8.2.4.4 Summary and Recommendations

The Project is not expected to result in direct impacts to any registered non-Aboriginal heritage places or shipwrecks.

As a risk mitigation strategy, heritage listed structures within 10 m of the preferred construction traffic route could be assessed for the risk of vibration damage – should any changes to the preferred construction route be made to bring it within this proximity. Consideration should also be given to the existing nature of use of the road, condition of the road surface, and condition of the heritage structure(s).

Heritage SA has raised the risk of shipwreck number 440 being impacted by the RO desalination plant outflow. The outflow discharge is located approximately one km away from the expected location of this shipwreck, and as such, risks are expected to be low. It is recommended that this is reviewed upon completion of the hydrodynamic modelling to confirm the risk profile does not change.

While no direct risks to shipwrecks are anticipated, contingency should be in place during construction to manage the unexpected discovery of shipwrecks or relics. This may include:

- During site preparation works, due care should be exercised during any ground disturbing works, including but not limited to excavation and pile driving, to avoid impacts to any potential historic shipwreck(s) or relics that may existing in the Project site.
- A discovery procedure should be in place during construction and should specify that if an article believed to be remains or a relic associated with a shipwreck is encountered during ground disturbing works, ground disturbing works in the vicinity should cease, and the DEW be notified.
- Where it is known, or reasonably suspected, in advance that a historic shipwreck or relic may be encountered or interfered with during construction works, the appropriate permit should be sought prior to undertaking the works.

8.2.5 Visual Amenity

The following section summarises the outcomes of a Landscape Character and Visual Impact Assessment (LCVIA) undertaken for the Project by Hemisphere Design to support the development application. The full assessment is provided in Appendix D. Existing conditions of the Project site are summarised in Section 7. The assessment included:

- A visual assessment from seven publicly accessible viewpoints within the wider contextual landscape
- An assessment of the character of the existing contextual landscape in accordance with the Guidelines for Landscape and Visual Impact Assessment (Third Edition)

- Identification of 'Sensitive Receptors/Sensitive Receptor Localities'
- Qualitative assessment of the likely visual impact of the proposed development within the contextual landscape from the identified 'Sensitive Receptors/Sensitive Receptor Localities'.

8.2.5.1 Legislative and Policy Requirements

The LCVIA was undertaken to support the relevant amenity provisions of the P&D Code.

8.2.5.2 Landscape Character

Landscape character was assessed based on 'scenic quality', using the following definitions:

- High scenic quality – areas and localities which exhibit an exceptionally strong positive character with valued features
- Moderate scenic quality – areas which exhibit a strong positive character with valued features with evidence of a visually acceptable level of alteration/ degradation/erosion resulting in a location of more mixed character
- Low scenic quality – areas with a generally positive character with fewer valued features with evidence of a visually acceptable level of alteration/ degradation/erosion resulting in a location of more mixed character
- No scenic quality – areas with a little or no positive character with few or no valued features with evidence of a visually unacceptable level of alteration/ degradation/erosion resulting in a highly modified location of little character.

The landscape character assessment also considers the landscape 'sensitivity to change' of both the wider contextual landscape and the locality. This is categorised as either high, medium, low or negligible, where for example, a landscape that displays a high 'sensitivity to change' would not be able to absorb a development of this nature without irreparable consequences and impacts on the inherent character and visual amenity.

8.2.5.3 Viewpoints

A desktop evaluation was undertaken for the Project using Google Earth aerial photography, and Google Earth 'street view' to identify the likely Zone of Theoretical Visual Influence (ZTVI) being a defined area where modification to the contextual landscape from the Project could be potentially discernible to the naked eye. A ZTVI of 2.5 km was established around the Project site.

Seven predetermined Viewpoints within this ZTVI were then determined for the purpose of further assessment. These are summarised in Table 8.31, with the locations shown in Figure 8.2.

Table 8.31 Viewpoints within the Project 2.5 km ZTVI

Viewpoint Locality (VP)	Vista	Considered sensitive receptor (SR) locality?
VPL01	Proper Bay Headland, centred on the Billy Lights Point Reserve car park and Parnkalla Trailhead.	Yes (SRL01)
VPL02	Residential development off St Andrews Drive. Properties facing southeast along both Romas Way and Cove View Drive.	No
VPL03 and VPL05	Port Lincoln Marina, views south across South Point Reserve, North Point Reserve and south from Mundy's Mooring.	No
VPL05	Views south from an elevated vantage point of Hindmarsh Street and commercial caravan park.	Yes (SRL02)
VPL06	Windsor Avenue, adjacent Navigator College.	Yes (SR03)
VPL07	At a point along Greyhound Road looking east along the redundant rail corridor.	Yes (SR04)

Figure 8.2 Location of Viewpoints within the Project 2.5 km ZTVI

As detailed in Table 8.31, four of these seven Viewpoints are also considered Sensitive Receptor (SR) localities for the purpose of visual impact. SR localities are shown below in Figure 8.3.

Figure 8.3 Sensitive Receptors and Visibility Shadow Map

8.2.5.4 Potential Impacts

8.2.5.4.1 Construction

During the construction phase, temporary changes to visual amenity would occur as a result of earthworks at SR03 and SR04. These changes would be due mainly, but not limited to, the presence of construction equipment (including a potential short-term use of a crane), earthworks and excavation activities and an overall increase in the number of people and vehicles at each site and at roadside locations.

The changing visual environment and activity during construction would be temporary and therefore is not considered in detail in the LCVIA.

8.2.5.4.2 Operation

The likely visual impacts of the Project at SR locations are described as resulting in the following impacts to existing views:

- substantial adverse impact (significant deterioration)
- moderate adverse impact (noticeable deterioration)
- slight adverse impact (barely perceptible deterioration)
- slight beneficial impact (barely perceptible improvement)
- moderate beneficial impact (noticeable improvement)
- substantial beneficial impact (significant improvement)
- no change.

The predicted visual impact for each sensitive receptor location is summarised in Table 8.32.

Table 8.32 Visual Impact Assessment at Sensitive Receptor Locations

Location	Predicted Visual Impact
SRL01 – Billy Lights Point Reserve at Proper Bay Headland	Within a modified contextual landscape of low to moderate scenic quality the likely visual impact would be no change.
SRL02 – elevated vantage point at Hindmarsh Street	In a landscape of low to moderate scenic quality the likely visual impact would be no change.
SR03 – Windsor Avenue, facing west	From this receptor the visual impact of the more immediate poles would be notable within the panorama across Proper Bay. However, as the poles recede from view and into the distance, they would be largely indiscernible against the skyline. In a low to moderate scenic quality landscape the likely visual impact of the 11 kV proposed powerline and poles would be slight adverse to no change.
SR04 – Greyhound Road, facing east	The likely visual impact at this infrequently visited locality would be moderate adverse in the immediate foreground. This would however diminish to slight adverse within the wider contextual landscape. The proposed RO desalination plant would be concealed and not a visual impact consideration within the wider contextual landscape.

8.2.5.4.3 Management and Mitigation Measures

The landscape assessment recommends the following measures to ensure potential glimpsed views will be inconsequential within the wider contextual landscape. These recommendations are consistent with the Concept Design:

- Use of muted colours that complement the tones and hues of the wider landscape when selecting materials and finishes for the RO desalination plant roof structure and marine intake and outfall pump station.
- Use of non-reflective finishes for power poles to ensure visual impact of distant poles diminishes.

The assessment notes that screen planting mitigation is not required at any SR/SR Locality. All potential light spill from after-hours maintenance activities will be managed to eliminate inconvenience to visitors, road users and wildlife.

8.2.6 Traffic and Access

The following sections summarise the outcomes of a Traffic Impact Assessment (TIA) that was undertaken for the Project by WSP. The full TIA is provided in Appendix F. The TIA undertaken to assess potential physical and operational impacts on the local road network that may be caused by traffic movements generated by construction of the Project. The assessment would also consider measures to mitigate these impacts.

8.2.6.1 Legislative and Policy Requirements

The following legislation and policy documents are relevant to the traffic and access requirements for the Project:

- *Road Traffic Act 1961*
- *Environment Protection Act 1993*
- *Heavy Vehicle National Law Act 2013*
- *PDI Act and PDI Code.*

8.2.6.2 Potential Impacts

Construction of the RO desalination plant and the marine intake and outfall pump station would generate traffic movements to and from the RO desalination plant and marine intake and outfall pump station and marine infrastructure at the WWTP.

The Project would also include seven km of buried pipeline, five km of which would be within public road reserves. These works in the road reserves would be undertaken next to live traffic, requiring suitable traffic controls to be put in place.

Mobilisation and construction of the Project is anticipated to commence in Q1 of 2025. During this period there would be a moderate level of traffic activity including passenger cars, utilities, small trucks, and some specialist earthmoving plant.

Primary works would commence in mid-2025 concurrently on the RO desalination plant, marine infrastructure and DWTP. During this period there would be frequent deliveries to the Site by large trucks and occasional oversize loads. There would also be visible works taking place on the public roads with the installation of the pipelines.

Terrestrial pipelines would be placed progressively in short sections in open trenches for their entire length and then buried. The process would involve clearing of vegetation, mechanically excavating the trench, placing temporary shoring and lowering pipes by crane, welding the pipes, backfilling the trench with sand and spoil, compacting the fill and then reinstating area. The process would involve only short sections however may occur concurrently at various sections along the route. Commissioning of the RO desalination plant would commence in late 2026. Traffic activity will reduce to much lower levels post construction during the on-going operational phase of the Project. Car parking may be provided.

8.2.6.2.1 Traffic during construction

The Project construction strategy includes remote and offsite prefabrication which is largely planned to occur in workshops across South Australia, including Adelaide, Port Lincoln and the Upper Spencer Gulf. Some specialist and proprietary components may be fabricated interstate or overseas. These would be transported to the Project site by trucks including over-size and over-mass vehicles for the larger components. Bulk civil materials would be sourced from the Port Lincoln area and transported to the Project site by truck. All materials, plant, components and equipment would be transported to the Site via existing roads.

Working hours would generally be between 6 am and 6 pm, 7 days a week. Some activities would require continuous work and involve multiple continuous shifts.

The peak traffic volumes estimated within the TIA may not necessarily coincide as each would peak at different times through the construction program. The volume of traffic movements generated by the Project would commence at a low rate in the mobilisation phase (comprising a small workforce travelling to and from side, transportation of plant to site and truck deliveries of materials). It is expected this would gradually increase as the construction activities become more intense (requiring a larger workforce and concentrated deliveries of concrete and materials as well as plant components) and then dropping off again as the construction moves into the commissioning and testing phase. It has been assumed that the most intense activity would be over an eight-month period following mobilisation.

Traffic Volumes

It is estimated that over the course of the Project there would be approximately 15,000 light vehicle movements to and from the Project site. This is largely due to the transport of construction personnel with a workforce of approximately 150 fly in/ fly out (FIFO) or drive in/ drive out (DIDO) workforce. Traffic movements may be augmented by a bus service as required (to transport FIFO for example). If buses are deployed the number of light vehicle movements could reduce to about 9,000 with 6,000 person trips by bus; with a maximum of three buses and up to 25 cars travelling to the Site in the morning and from the Project site in the afternoon.

Passenger car trips and buses and minibuses transporting construction personnel to and from the Site would occur daily, but would represent only a small proportional increase in daily traffic volumes on most roads. At Marina Drive and St Andrews Drive at most one per cent and two per cent of existing traffic volumes respectively. It is anticipated that these trips would generally be concentrated in one-hour periods at the start and end of the work shifts.

A range of construction plant and equipment would be required to travel to or be transported to site and would likely include for example:

- earthmoving plant such as truck and trailers, tandem tippers graders, backhoe excavators, dozers
- piling rigs, concrete trucks and pumps
- generators and air compressors
- finishing plant such as rollers and water trucks
- lifting equipment such as cranes and forklifts.

Plant items that are permitted to travel on public roads would travel to the Project site and only return to their trip origin when the task is completed. It is expected there will be about 10,000 heavy vehicle movements over the course of the Project (between 25-45 per day) divided approximately between:

- quarry material – 3,500
- concrete – 5,000
- plant mobilisation – 100
- deliveries – 1,000
- buses – 600.

Truck deliveries of concrete, materials and other items represent the largest volume of vehicle trips (30-80 per day). These would likely be distributed over the 12-hour day – 3-7 per hour. At Marina Drive and St Andrews Drive the extra (two-way) trips represent a percentage increase ranging from 1.2 – 2.4 per cent. Overall, the total traffic generation is only moderate and dispersed through the local road network. Traffic movements would be concentrated on Marina Drive and St Andrews Drive and may be noticed by local residents.

Route Selection

Vehicle trips to the Project site would have origins that are either local (within the town and on either side of the railway line), regional and outside of the township or more remote (including Port Augusta and Adelaide).

The majority of traffic movements generated by the Project would be general access vehicles (i.e. cars and trucks that are legally permitted to use any local road) and have local origins including workforce and delivery of materials and products. All traffic must use Marina Drive and St Andrews Drive to access the Project site.

The construction workforce is expected to reside temporarily or permanently in Port Lincoln and would have dispersed origins and use several local roads to access Marine Drive and St Andrews Drive. Truck movements would largely deliver concrete and quarry materials to site and trips are thought to have origins on the eastern side of the rail line (i.e. along Wingard Terrace and Pine Freezers Road).

Earthmoving and other plant may also be hired locally and most trips would have origins north of the Project site and would access it via Ravendale Road.

It is anticipated that there would be relatively few oversize/ over mass vehicle movements but these would likely be long distance trips with remote origins. Permits would be required to travel beyond the current gazetted routes to travel through the local road network.

To maximise the use of the existing gazetted routes (in bold) it is suggested that the preferred routes for over size over mass vehicles might be via:

- Dublin Street, Luke Street, Verran Terrace, Bel-Air Drive, Ravendale Road (for trips originating from the Adelaide and Port Augusta).
- Western Approach Road, Pine Freezer Road, Proper Bay Road/Verran Terrace, Bel-Air Road (part) and Ravendale Road (for trips originating from the west).

These would be subject to a route assessment for the specific vehicle proposed and trips would be scheduled to occur at times of low traffic activity on the local road network.

8.2.6.2.2 Traffic, access and parking during operation

The ongoing operation of the Project (post construction) would require daily attendance by staff and occasional visits by maintenance personnel. This would generate mainly passenger car trips with the occasional utility and small truck. The volume of traffic attending the Project site post-construction would be significantly less that that during the construction period.

8.2.6.3 Management and Mitigation Measures

The following actions might be taken to minimise the actual and perceived impacts of the construction traffic on the local road network and the community.

General

- Keep the local community informed of traffic conditions along Marina Drive and St Andrews Drive by providing advance notice of significant changes or periods of high and concentrated traffic use. Specifically, maintain regular contact and good relations with the residents of the two properties located on St Andrews Drive immediately adjacent to the intersection with Marina Drive, these being the most impacted of the sensitive receptors along the construction traffic route.
- Consult with Council regarding management of impacts on access to and use of the public boat ramp and other recreational facilities at Billy Lights Point for the community. Avoid wherever possible conducting major works at times when demands to use these facilities will be high (such as public holidays and weekends).
- Where it is within the control of the construction contractor, encourage regular truck operators to use the same local roads to access the Site so that the local community becomes familiar with the changed traffic conditions.
- Ensure truck drivers are aware of vehicle length limit on Le Brun Street.
- Minimise (if not avoid) traffic-generating activities at night-time so as to avoid noise nuisance and travel along the unlit sections of roads and junctions.
- Monitor the condition of the road pavement at the intersection of Marina Drive and St Andrews Drive and undertake periodic and ad hoc repairs as required to ensure the integrity of the riding surface.

8.2.6.3.1 Intersection improvements

- Investigate implementing right and left turn lanes on Marina Drive (west) and St Andrews Drive (south) respectively to reduce standing vehicle conflicts with vehicles travelling straight through.

8.2.6.3.2 WWTP and RO desalination plant site access

- Erect truck turning and junction warning signs on the St Andrews Drive road approaches to each of the three site access junctions.
- Deploy manual traffic control as required to manage potential conflicts between traffic travelling on St Andrews Drive and construction traffic turning at access junctions.
- Deploy measures along site access roads to minimise drag out of mud in St Andrews Drive.
- Subject to a more detailed assessment of the road condition, seal the shoulder on the northern side of St Andrews Drive in immediate proximity to the existing (WWTP) and proposed new (RO desalination plant site) junctions, long enough to accommodate a standing truck and to allow following vehicles to pass. This may need to be balanced with any native vegetation removal required. Alternatively, consider options for attended traffic management to manage any conflicts between through and turning traffic.
- Clear/trim vegetation (subject to approvals if protected) in the road corridor on both approaches to access junctions improve sight and stopping distances. Maximise sight and stopping distances at the junction of the new access road to the Project site.

- Avoid using junctions at night where possible.
- Be aware of the overhead power lines crossing St Andrews Terrace when operating lifting equipment.

8.2.6.3.3 Transfer pipeline construction

- Retain traffic flow along public roads wherever possible. Prepare traffic management plans and provide manual or automated traffic control when traffic is to be restricted to one lane. Consult with council and develop agreed detours when roads are to be closed.
- Maintain at least one serviceable traffic lane on Proper Bay Road.
- Provide lighting at nigh time around open excavations and deploy barriers and signage around material stockpiles and plant.

8.2.6.3.4 Over dimensional vehicles

- Conduct a heavy vehicle assessment along Stevenson Street, Ravendale Road and Bel-Air Drive as well as Marina Drive and St Andrews Drive and act on the assessment findings prior to submitting an application for permits to operate over dimensional vehicles along these routes.
- Where possible, schedule these vehicles to arrive during periods of low traffic flow (e.g., early mornings) to avoid conflicts with local traffic movements.

8.2.7 Flora and Fauna

8.2.7.1 Legislative and Policy Requirements

8.2.7.1.1 Native Vegetation Act 1991

The Project is located under the Native Vegetation Overlay under the P&D Code and would involve the clearance of native vegetation protected under the NV Act. As such, the Project requires approval to clear native vegetation under the NV Act. As the Project proposes the development of infrastructure in the public interest (where declared by the relevant Minister as such), the clearance is considered a prescribed circumstance in which native vegetation may be cleared (with appropriate approval, conditions and offset), as per under *Regulation 12(34) – Infrastructure* of the of the Native Vegetation Regulations 2017.

When assessing the information provided by an applicant to inform whether approval should be granted, the NVC assesses the level of risk to biodiversity in terms of both the clearance application size and the quality and type of habitat and vegetation present in the proposed clearance area. In this instance the level of risk is considered to be 'Level 4' (Refer to Appendix C). Level 4 clearance applications are made available to the public for comment and if the clearance has potential impacts on soil, water or other natural resources, the NVC may seek comment from other relevant agencies or bodies. The Draft NVC Report is attached at Appendix C.

The NVC also consider the measures taken by the proponent to avoid and minimise impacts on biodiversity and rare or threatened species or ecological communities within the Project site or immediate vicinity of the development. The proponent would need to have addressed and show evidence of adhering to the following 'Mitigation Hierarchy':

a) Avoidance – outline measures taken to avoid clearance of native vegetation such as making adjustments to the location, design, size or scale of the activity in order to reduce the impact.

b) Minimisation – if clearance cannot be avoided, outline measures taken to minimise the extent, duration and intensity of impacts of the clearance on biodiversity to the fullest possible extent.

c) Rehabilitation or restoration – outline measures taken to rehabilitate ecosystems that have been degraded, and to restore ecosystems that have been degraded, or destroyed by the impact of clearance that cannot be avoided or further minimised, such as allowing for the re-establishment of the vegetation.

d) Offset – any adverse impact on native vegetation that cannot be avoided or further minimised should be offset by the achievement of a significant environmental benefit that outweighs that impact.

The clearance proposal woule also need to consider Principles of Clearance b, c and d[17], namely does the vegetation:

b. have significance as a habitat for wildlife

c. include plants of a rare, vulnerable or endangered species

d. comprise the whole, or a part, of a plant community that is Rare, Vulnerable or Endangered.

The NVC would also consider whether there are any other alternatives that involve no clearance, less clearance or clearance of vegetation that is less significant (or has been degraded to a greater extent than the vegetation proposed to be cleared).

To offset vegetation clearance, the proponent is required to either set aside an appropriate area of native vegetation and develop a Significant Environmental Benefit (SEB) Management Plan that would be approved by the NVC for implementation or make a payment into the Native Vegetation Fund.

If approval is granted, clearance is only permitted once any conditions that apply to the approval are complied with, including in relation to the SEB. Conditions imposed in connection with an approval are binding and enforceable against the person to whom the approval is granted, and this includes any subsequent owners and occupiers of the land. Permitted clearance must be undertaken within two years of approval being granted, unless otherwise specified.

8.2.7.1.2 Matters of National Environmental Significance

The Project is subject to both state and Commonwealth environmental legislation, including the EPBC Act. Under the EPBC Act, any action that would, or is likely to have, a significant impact on a MNES requires approval from the minister. The instrument used to seek this approval is a referral under the EPBC Act.

The works potentially interact with MNES under the EPBC Act. MNES that potentially occur in the area comprise:

- one threatened ecological community
- two threatened plant species
- seven threatened fauna species
- ten migratory species.

The potential for a significant impact to these values has been investigated through targeted fauna survey and habitat assessment, flora survey and targeted survey for threatened plant species as discussed in Section 7.1 and Appendix C.

Criteria for significant impacts to MNES have been applied to the Protected Matters identified within the assessment of the Project. Based on the targeted fauna and flora surveys and habitat assessments, the results indicate that the Project is not expected to significantly impact upon MNES. Regardless, out of an abundance of caution, SA Water would submit an EPBC Self-Referral for submission to DCCEEW for formal review.

8.2.7.2 State conservation values

The Project is expected to impact on approximately 23.39 ha of native vegetation. The largest areas of impact are at the proposed RO desalination plant (5.0 ha) and along the corridor for the DWTP and SAPN transmission line between the proposed RO desalination plant and Greyhound Road (9.3 ha).

17 Under the *Native Vegetation Act 1991*

The Poject potentially interacts with one plant community listed as rare under the South *Australian Provisional List of Threatened Ecosystems:*

- *Eucalyptus conglobulata* low woodland on fertile loams over limestone.

This plant community is present along the DWTP and SAPN transmission line route between the RO desalination plant and Greyhound Road. The Project requires approximately 1.6 ha of clearance of this community.

The Project impacts on vegetation that supports plants classified as Rare under the NPW Act:

- Alcock's Wattle (*Acacia alcockii*)
- Port Lincoln Mallee (*Eucalyptus conglobulata ssp. conglobulata*)
- Tate's Grasstree (*Xanthorrhoea semiplana ssp. tateana*)
- Spoon-leaved Spyridium (*Spyridium spathulatum*).

These species occur in vegetation along the former rail corridor between the RO desalination plant, on Bluefin Road near North Side Hill tanks, at the RO desalination plant site and in the footprint of the works for the saline waste/seawater transfer pipelines.

The Project interacts with rare and threatened fauna listed under the NPW Act:

- A pair of White-bellied Sea-eagle (Endangered) have previously nested on the disused BHP jetty less than 500 m from the RO desalination plant site.
- Osprey nest (with successful clutch) in the vicinity of Lincoln Cove Marina, one km from the RO desalination plant site and have been recorded as sighted over wetlands near Greyhound Road.

8.2.7.3 Management and Mitigation Measures

The design of the Project has been optimised to avoid and minimise impacts to conservation values by adopting the following measures:

- Locating the RO desalination plant within the most degraded part of the Project site.
- Minimising the width of the access corridor between the RO desalination plant and St Andrews Drive.
- Locating the marine intake and outfall pump station within cleared areas in the WWTP.
- Aligning the DWTP with an existing cleared track next to the trainline between the RO desalination plant and Greyhound Road.
- Co-locating, as far as possible, infrastructure and access requirements to SAPN sites with the DWTP disturbance corridor.
- Locating the DWTP within the bed of Greyhound Road and Bluefin Road as much as possible to reduce disturbance to roadside vegetation.

Residual impacts of the Project would be offset by the rehabilitation of vegetation on SA Water land at Uley. The offset would rehabilitate an area of the EPBC Critically Endangered Ecological Community - Drooping Sheoak Grassy Woodland on Calcrete of the Eyre Yorke Block Bioregion[18] (note that no clearance of this ecological community is proposed under this Project). The offset would contribute to habitat of threatened fauna known to occur at the site including Southern Emu-wren and White-bellied Whipbird. The offset rehabilitates ecological corridors to Coffin Bay National Park and adjacent Heritage Agreements.

[18] No clearance to this ecological community is proposed by the Project.

8.2.8 Contamination

This section summarises the outcomes of a Preliminary Site Investigation (PSI) was undertaken for the Project. The current Project site conditions are discussed in Section 7.7 and the full memo is provided in Appendix G.

8.2.8.1 Legislative and Policy Requirements

The assessment was prepared in accordance with the following documents:

- National Environment Protection Council (NEPC 2013) *National Environment Protection (Assessment of Site Contamination) Measure 1999* as amended in 2013 (ASC NEPM).
- State Planning Commission (SPC, 2021) *Practice Direction 14 – Site Contamination Assessment 2021*.
- Standards Australia (2005) *Guide to the Sampling and Investigation of Potentially Contaminated Soil Part 1: Non-Volatile and Semi-Volatile Compounds*. AS4482.1-2005 Homebush NSW.

8.2.8.2 Potential Impacts

The assessment determined the significance of the identified known and potential contamination as follows:

- Based on previous investigations (FMG Engineering, 2021), it was considered that surficial soils may not meet Waste Fill classification.
- Further assessment of site soils is required to confirm waste classification of any excavated soil.
- Site soils in the area investigated by FMG (2021) were considered suitable under a commercial/industrial land use setting and are likely suitable to remain on-site in non-environmentally sensitive areas.
- No groundwater data is available for the Project site. As such, possible impacts to underlying groundwater from activities such as historical bulk fuel storage is unknown.
- The removal of all fuel infrastructure associated with the former diesel AST (e.g. product lines) has not been confirmed. Further assessment is required to determine if any contamination is present associated with the former fuel infrastructure.

8.2.8.3 Management and Mitigation Measures

The following management and mitigation measures are recommended as an outcome of the PSI update:

- Further assessment will be undertaken to determine if any contamination is present associated with the former fuel infrastructure.
- Waste classification will be undertaken prior to the removal of any soil from the Project site.
- Given that no groundwater data is available for the Project site, should any activities be proposed with a likelihood of impacting groundwater, further assessment will be undertaken to identify possible groundwater impacts from historic activities.

8.2.9 Geotechnical

8.2.9.1 Potential Impacts

The subsequent sections provide commentary relating to the following potential geotechnical hazards:

- reactive soils
- difficult excavation conditions
- presence of fill
- presence of erodible soils
- presence of acid sulfate soils
- shallow groundwater.

Existing site conditions are discussed in more detail in Section 7.8.

8.2.9.1.1 Reactive Soils

Based on a review of available information (refer to Section 7.7), it is anticipated that subsurface materials at the RO desalination plant site are likely to comprise clayey soils overlying rock. It is considered that the clayey soils present at the site are likely to undergo moisture related surface movements with changes in moisture regime. This potential for movement should be considered in design of the proposed development.

Subsurface materials anticipated along the DWTP alignment (in areas outside of the Project site), are expected to comprise predominantly granular soils (sand/gravel) with variable calcareous content. It is considered that these materials are likely to undergo relatively minor moisture related surface movements. Further guidance is presented in investigation reports referenced in Section 7.7.

8.2.9.1.2 Excavation Conditions

Based on available investigation data, it is expected that rock strength material (granite or limestone/siltstone/sandstone) is likely to be present within the RO desalination plant site boundary at relatively shallow depth (refer to Section 8.2.9.1.5).

Subsurface materials along the DWTP (beyond the RO desalination plant site boundary) are expected to comprise granular soils with variable zones of calcareous gravel, cobbles, boulders, and potential rock strength calcrete that could be present at shallow depth.

Excavations through these materials could result in higher excavation resistance compared to soil strength materials (i.e. sands and clays), and could require specialised rock-breaking methods/equipment such as ripping, hydraulic rock-breaker etc. However, it is important to note that the excavation resistance would be affected significantly by excavation type and depth, equipment, and methodology. For this reason, contractors would need to make an assessment of available subsurface information to inform potential construction methods. Further guidance is presented in investigation reports referenced in Section 7.7.

8.2.9.1.3 Fill Material

The investigation data indicates that fill was observed in the majority of boreholes undertaken within the 'site' boundary, as well as along the DWTP alignment; typically where boreholes were drilled at or adjacent areas of previous development. Further guidance is presented in investigation reports referenced in Section 7.7.

8.2.9.1.4 Erosive and Dispersive Soils

Based on the subsurface materials encountered in the boreholes, and surface observations noted from fieldwork, it is considered that there is a potential for erosion in near surface soils depending on existing condition, slope, management of surface water across the Project site etc.

Design measures to mitigate the risk of erosion may need to be considered (e.g. inclusion of vegetation, fill compaction on any proposed batters, crest drains, controlled discharge of collected water, dissipation structures, etc.); particularly around footings and access tracks that may intersect or concentrate the flow of surface water. Further guidance is presented in investigation reports referenced in Section 7.8 .

8.2.9.1.5 Shallow Groundwater

The available investigation data indicates that groundwater could be encountered at relatively shallow depth at some locations within the RO desalination plant site boundary, and along some segments of the DWTP alignment (e.g. section along Greyhound Road). The potential presence of groundwater should be considered in the design of infrastructure that may be in close proximity to anticipated groundwater levels. Further, excavations and earthworks activities should consider the potential to encounter groundwater during construction (e.g. footing excavations or trenching for transfer pipeline). Further guidance is presented in investigation reports referenced in Section 7.7.

8.2.9.1.6 Acid Sulfate Soils

Based on the information presented in the reports referenced in Section 7.7, testing undertaken on soil samples collected during the investigation indicates that there is a low potential of acidifying ability in soils sampled. Noting this, in addition to the presence of predominantly granular soils and rock observed in boreholes near coastal areas, it is considered that there is a low risk of encountered potential acid sulfate soils at the RO desalination plant 'site' and along the DWTP alignment.

8.2.10 Soils, Drainage, and Erosion

This section summarises the outcomes of a Soils, Drainage and Erosion Impact Assessment that was undertaken for the Project. The full assessment report is provided in Appendix H.

8.2.10.1 Legislative and Policy Requirements

The following legislative and policy requirements were referenced when developing the Soils, Drainage and Erosion Impact Assessment:

- *Environment Protection Act 1993* (EP Act).
- The Environment Protection (Water Quality) Policy 2015 (under the EP Act).
- Environmental Protection Agency Government of South Australia (EPA) 1999, Stormwater Pollution Prevention.
- Code of Practice for the Building and Construction Industry 1999.
- Environmental Protection Authority Government of South Australia 2021, EPA Water Quality: Environmental management of dewatering during construction activities.
- Environmental Protection Authority Government of South Australia 2021, EPA Industry: Construction environmental management plans (CEMP).
- DPTI Protecting Waterways Manual July 2016.
- Environmental Protection Agency's Handbook for Pollution Avoidance on Commercial and Residential Building Sites 2004.
- Port Lincoln Stormwater Management Plan 2014.
- Coastal Protection Board Development Plan 2016.

The design of access tracks and other engineering works are to be in accordance with the relevant Australian Standards, Austroads Guide to Road Design, and Port Lincoln Council development requirements.

8.2.10.2 Methodology

The RO desalination plant site drains away in all directions from the existing BHP building and drains back into the marine environment. Without any drainage infrastructure, overland flow travels north-east or south to the shoreline, as shown in Figure 8.4. During larger storm events it is possible flow would travel northwest via low lying regions that may eventually enter the saltmarsh and mangrove area ultimately ending up in the marina and out into the ocean.

The Project site is designed between four to 10 m above the coast and the risk of tail water effects of tide and sea level rise from climate change is considered to be low. As the Project site is located at a high point, it is anticipated that the contributing catchment to the Project site would be limited to the Site itself and potentially a small portion of the existing BHP site.

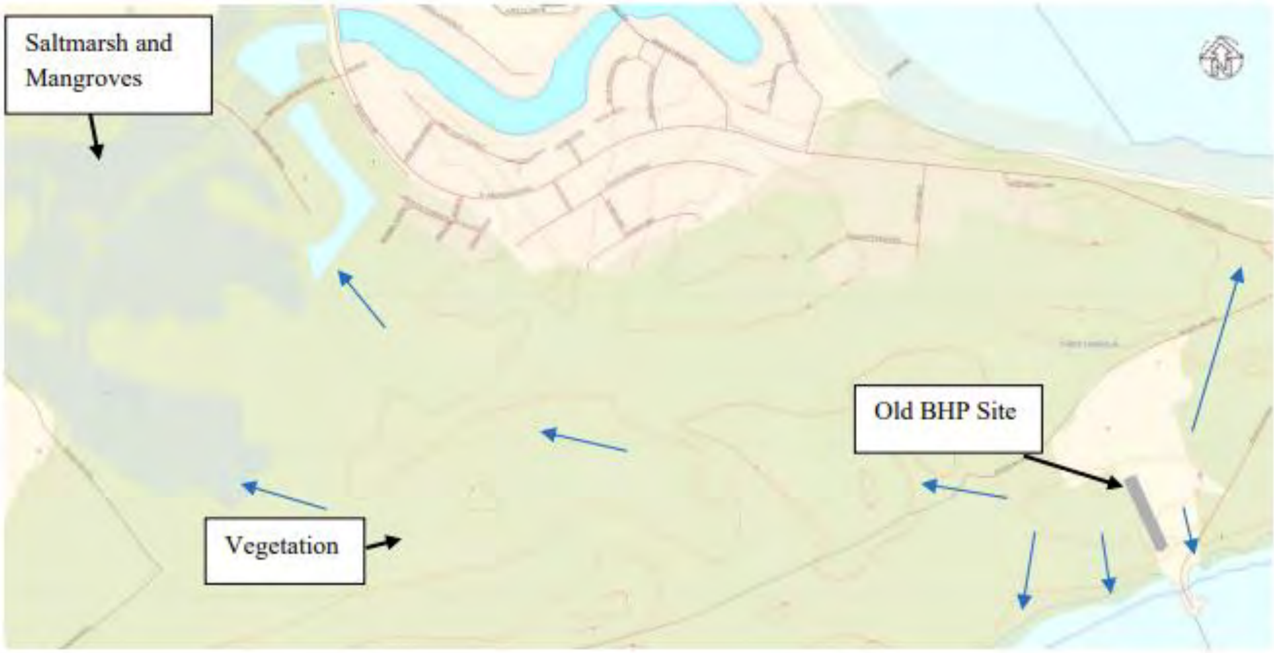


Figure 8.4 Contour Data of Site and Surrounding Area at two m Intervals (flow arrows in blue)

The existing sealed and unsealed access tracks and roads appear to have adequate crossfall conditions such that water does not pool on the road/track. Blue Fin Road (south of the rail corridor) is sealed with semi mountable kerbs draining stormwater towards Proper Bay Road. Proper Bay Road is sealed with semi mountable kerbs on the northwestern side of the road with a number of side entry pits provided to drain any ponding/captured stormwater.

Along the extent of the proposed DWTP, a combination of existing sealed and unsealed roads/tracks would be used to access and maintain the pipeline. Where an existing sealed or unsealed track or road is not available, one shall be proposed in the design. The remaining unsealed roads and access tracks are well built up with minimal ponding of water in the verge and do not appear to have formalised swales either side of the road. As the trenches for the DWTP and overhead/underground electrical infrastructure will be reinstated to existing ground levels, it is assumed that these works would have no material effect on the flooding, erosion and stormwater drainage of the site. The marine infrastructure is proposed to be located in northern lagoon in the WWTP. The existing lagoon would be filled with approved engineered fill to the top of bank level so it is flush with the surrounding access road. It is anticipated that stormwater would outfall to the ocean or included in the WWTP stormwater plan.

8.2.10.3 Potential Impacts

8.2.10.3.1 Construction

The following impacts have been identified during the construction phase:

- Construction of the RO desalination plant would involve earthmoving activities to form the access tracks and hardstands and may include benching or shoring depending on the depth of excavation.
- Civil works would include the stripping of topsoil and localised regrading to ensure the access road is trafficable and drains stormwater away from the access track and the Project site. Impacts to existing watercourses and catchments should be considered when undertaking any localised regrading.

- Trenching works are required for installation of the pipeline and services. Works include stripping of topsoil, excavation, backfill and replacing of topsoil. Excess excavated material shall be utilised in fill zones elsewhere on the site where possible. There is a potential for encountering groundwater during trenching works and deep excavations required at the marine intake and outfall pump station site and dewatering activities may be required. Storm events during construction may result in sediment damaging downstream watercourses. A CEMP should be developed to prevent the discharge of pollutants present during construction. During construction, standard operating procedures should be followed on Project site to ensure machinery is well maintained and prevent spills and leaks from construction vehicles may cause site contamination and enter waterways.

8.2.10.3.2 Operation

The following impacts have been identified during the operational phase:

- The RO desalination plant would increase the quantity of impervious surfaces across the Project site, due to the construction of hardstand zones, buildings, access tracks and removal of vegetation; and in turn would increase runoff and risk of erosion and pollutant contribution downstream and into the ocean.
- Small external surface flows would pass over the site and if not captured or diverted, would increase the risk of erosion and pollutant contribution downstream and into the ocean.
- An increase in traffic in the area may increase the vehicle related impacts such as spills, collisions, dust and an increase in pollutant loading.
- The Project site would introduce additional access roads and connections to the sealed access road currently located between St Andrews Drive and the existing BHP site. An access track is also proposed to follow the entire DWTP length by a combination of existing roads or proposed sealed and unsealed tracks. These access/site roads would likely be built in fill and would impact the existing flow regime of surface runoff in the area. The Project site would introduce potential new contaminants as part of the desalination processes. Pollutants from the Project site operation shall be managed such that they are prevented from entering surface flows and the stormwater network. Seasonal, tidal, and climate change fluctuations of ground water level may result in a high water table infiltrate into the basin making a portion of its operational capacity redundant if not accounted.

8.2.10.4 Management and Mitigation Measures

8.2.10.4.1 Design

The following steps should be completed during the design phase to manage and mitigate impacts during the design phase:

- Any stormwater runoff from the Project site is to meet Australian Runoff Quality Guidelines. This includes treatment of pollutants such as Total Nitrogen, Total Phosphorus, Total Suspended Solids, Gross Pollutants, and oils.
- Hydraulic modelling will be undertaken to ensure all drainage sites shall be designed for a Minor storm of 0.2EY (5-year ARI event). The modelling shall ensure project infrastructure has adequate protection from flooding.
- External flow paths and catchments are to be considered where applicable. Earthwork bunds and cut off swales may be specified to mitigate risks of flooding.
- The development will not adversely impact the pre-development flows of the existing Project site in both a minor and major design event.
- The Project site will limit runoff from the site to predevelopment levels, by providing an appropriately designed detention basin or equivalent.
- The final design of the Project will not impede the flow of a watercourse or overland flow, through the land or other surrounding land.

- The layout of the Project site and the drainage of structures and hardstand pavements will continue to follow the existing topography wherever possible.
- Council requirements regarding site development shall accommodate anticipated changes in sea level due to natural subsidence and probable climate change impacts. Project site levels are to be to be 0.3 m minimum above standard sea-flood risk level and building floor levels are to be 0.55 m minimum above standard sea-flood risk level as per the Coast Board Protection Policy Document 2016.
- New earth batters (in cut or fill) will be reseeded with native grasses following construction works. Exposed rock batters do not require revegetation works.
- The location, design and operation of the facilities will be completed such that the 'adverse impacts to the natural environment and other land uses' are minimised.

The following design considerations have been proposed to achieve the above:

- Rainwater tanks for collecting rainwater from the RO desalination plant building roof, and pump to reuse systems potentially to toilet flushing, area washdown, local irrigation.
- Underground drainage system to manage flows resulting from the design minor storm event (5% AEP) and connection to the stormwater system.
- A rock-lined diversion swale is proposed along the western extent of the Project site to protect the site from upstream overland stormwater flows during designated storm events, such as from the scrubland and existing infrastructure to the West of the Project site. An earth lined cut off swale is proposed along the southern edge of the process lagoon to divert external catchments around the Project site.
- A network of double side entry pits and reinforced concrete pipes is proposed to capture stormwater runoff from the impervious site surfaces including concrete slabs, concrete pavement, asphalt pavement and hardstands. Stormwater quality improvement devices such as a gross pollutant trap, combined sediment and oil interceptor device are proposed to improve stormwater quality prior to discharging into a stormwater basin.
- A detention basin is proposed to detain flows to pre-development conditions. It would be the lowest point of the site (north eastern corner) to utilise gravity to drain the underground drainage system and SEP and RCP network. The basin would include the following features: A standard RCP pipe with orifice plate has been nominated as the main outlet with an overflow weir to ensure a safe flow path away from the site in the event of blockages are larger events than the major design storm event.
- Biofiltration separated from the detention zone for up to 0.2EY events.
- A low-level outlet from the basin restricting flow to predevelopment levels has been provided and an appropriately sized spillway should be provided within the basin design. The outlet would discharge flows via a headwall with scour protection out to the ocean, north of the Project site.
- Low flow discharge direct to downstream pit has been provided to bypass the detention basin.
- The marine infrastructure includes a marine intake and outfall pump station and a brine outfall sump. Two OD900 intake pipelines and a OD900 brine outfall pipeline would run east out of the marine intake and outfall pump station and brine outfall sump out into the ocean. The marine intake and outfall pipelines would be located in a tunnel below the bathymetry for 500 m. At Ch500 an area of the bathymetry would be excavated to allow the saline waste outfall pipeline to continue for another 490 m above the bathymetry. The marine infrastructure is proposed to be located in northern lagoon in the WWTP.

8.2.10.5 Management and Mitigation Measures

8.2.10.5.1 Construction

Suitable erosion and sediment controls will be implemented during the construction phase. A Soil, Erosion and Drainage Management Plan (SEDMP) shall be prepared for the Project and include the following mitigation measures:

- Minimise the area of disturbance.
- Earth moving activities will be timed and staged to minimise the time and extent where soil is exposed to water and wind.
- Diversion of stormwater around the Project site by installing bunding and/or swale drains.
- Runoff will be captured on site and treated prior to discharge where required.
- Existing vegetation will be retained where feasible/possible construction vehicles should enter and leave the Project site by single entry/exit point.
- Where practical, upstream catchments will be diverted around the Project site onto stable areas and should not be diverted into neighbouring properties unless written permission is obtained from the landowner(s).
- All areas disturbed by construction will be promptly stabilised—for example, re-vegetated—so they can no longer act as a sediment source.
- If a significant rainfall event has been forecasted, all work may need to be temporarily halted until the storm has passed. Loose materials including construction waste and equipment, will be secured or alternatively removed from site.
- Any washing of site vehicles and equipment will be prohibited on-site to prevent stormwater contamination unless an appropriate facility is provided.
- The *Environment Protection (Water Quality) Policy 2015* will be complied with, in protecting waters and land from listed pollutants.
- If there is a risk that contaminants have entered the sea/waterways, then water quality testing will be undertaken immediately. If there is any trace of contamination, works should be suspended until an appropriate treatment is implemented.
- Exposed earth batters will be stabilised prior to reseeding.
- All exposed soil batters will be top dressed with topsoil and re-seeded with native grasses following completion of construction works, providing benefits to stormwater runoff quality. In locations of rock, no further surface works are required.
- Development boundaries within the tidal zones are unlikely to require protection from tidal flow and wave actions due to the height difference between the Project site and pipeline and sea level.
- Construction site will be kept secured at all times by providing temporary fencing during construction to prevent unauthorised access.
- Spills and leaks from construction vehicles may cause site contamination and enter waterways. Standard operating procedures should be followed on site to ensure machinery is well maintained and do not enter the site with any leaks present. A spills management plan will be included in the CEMP in the event of a spill occurring on site.

8.2.10.5.2 Operation

The following steps will be completed during the design phase to manage and mitigate impacts during the operational phase:

- Any stormwater drainage/diversion measures taken at the marine intake and outfall pump station site and RO desalination plant site shall require monitoring and maintenance to ensure the site is protected from overland stormwater flows.
- Any proposed and existing culverts pipes and pits should be monitored for blockages and maintenance completed if blockage is more than designed for.
- Any stormwater detention and sediment control measures implemented will require monitoring and maintenance to ensure the Environment Protection (Water Quality) Policy 2015 and EPA guidelines are met.
- Vehicles used onsite will be appropriately maintained, with access tracks to be designed in accordance with principles stipulated within accepted guidelines. Appropriate spill kits for vehicles will be required.

8.2.11 Easements and Services

An assessment of easements and services across the Project site was undertaken by WSP.

8.2.11.1 Assessment Methodology

The assessment aimed to identify existing authority services and easements and comment on any potential impact on the Project.

The assessment of existing easements and services has been developed using a desktop assessment approach drawing on data sources including:

- Before you Dig Australia (BYDA) (Enquiry No. 34781494, 34781508 and 34787552)
- Location SA Map Viewer.

BYDA and SA Viewer search results are attached in Appendix I.

8.2.11.2 Potential Impacts

Potential impacts on the Project are outlined below and presented in Figure 8.5.

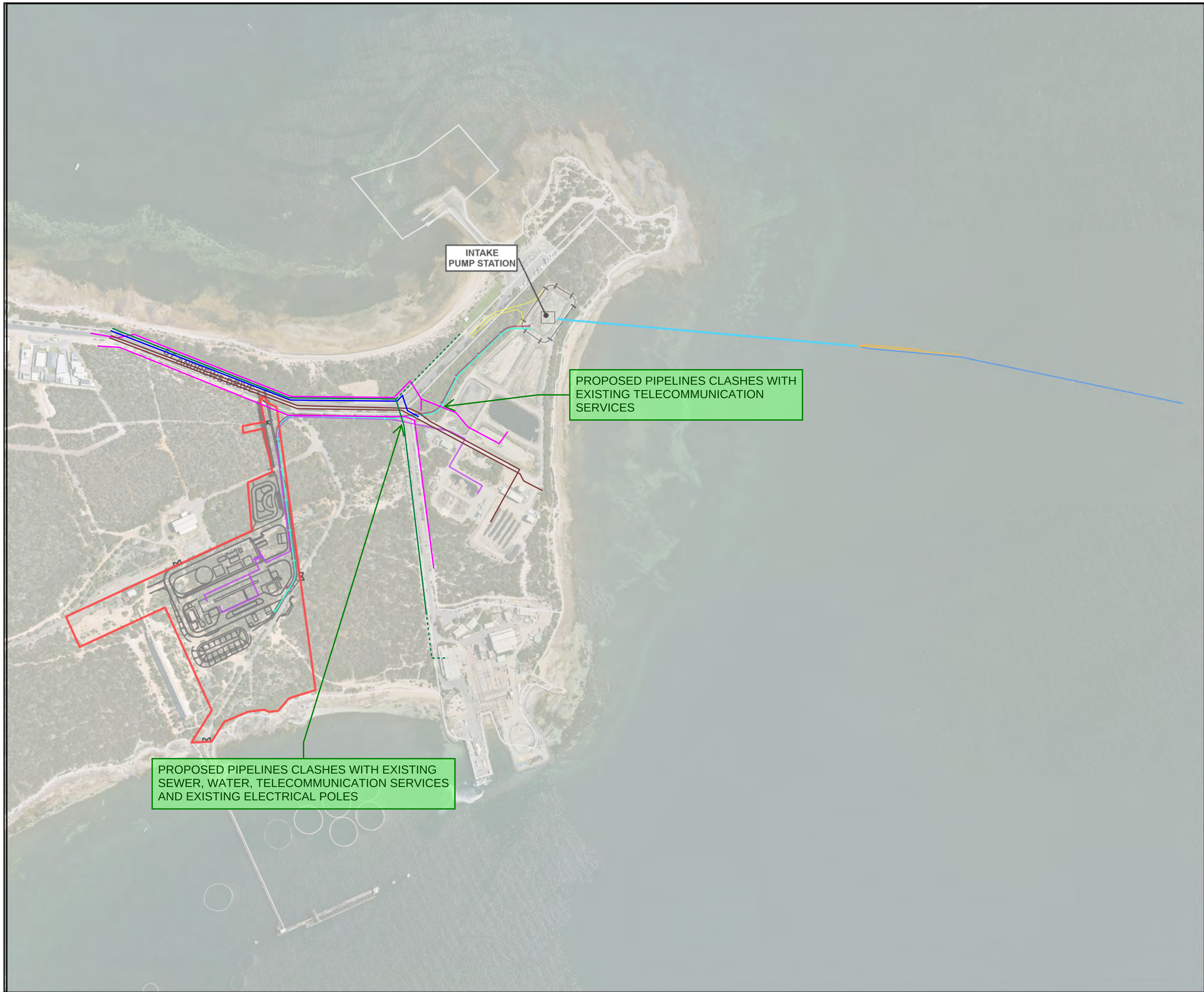
- The proposed pipelines crossing from the RO desalination plant adjacent St Andrews Drive are not expected to impact existing sewer lines. These existing services may require diversion in accordance with authority requirements if on ground works find otherwise.
- The proposed pipeline clashes with existing communications services at the crossing from the RO desalination plant into St Andrews Drive and on the east intersection of St Andrews Drive. This may require consultation with NBN and Telstra.

8.2.11.3 Summary and Recommendations

The proposed new saline waste/ seawater transfer pipelines linking the marine intake and outfall pump station to the proposed RO desalination plant would be installed underground within an easement south of St Andrews Drive within the parcel owned by Port Lincoln Marine Services Pty Ltd. The main impact associated with this infrastructure is within the intersections of this road, where proposed pipelines are expected to avoid existing services.

The following tasks should be undertaken in the next phase of design to better understand and mitigate the impacts of existing services on the proposed development.

- Risk mitigation measures are to be included in the CEMP prior to any construction activity taking place. SAPN guidelines would need to be followed for excavation or other site works near the existing overhead lines and underground lines. SAPN approval may be required for works in close proximity to SAPN assets.
- The design of the RO desalination plant and the saline waste/seawater transfer pipeline shall provide adequate clearance from existing utility services. Respective service authorities would need to be consulted to seek approval of the proposed changes and impacts to their respective assets.
- A detailed engineering survey and service location identifying cadastral information and all existing utility services would be required during the next design phase.
- Physically locating existing utility services would also be required prior to construction to confirm depth and location of existing utility services and further mitigate the risk of any clash and/or damage to existing underground utility services.



C:\Users\AUAN506425\OneDrive - WSP O365\Projects\PS137455_New_Eyre_Peninsul\Pro\01_ReferenceFigures.aprx | Author: AN

Eyre Peninsula Desalination Plant Project

Figure 8.5
Easements and Services

Legend

- Cadastre
- Desalination Plant Site Boundary
- Security Fence
- New Site Access
- Design Desalination Plant
- Pump Intake Station
- Saline Waste Transfer Pipeline
- Sewer Rising Main
- Seawater Transfer Pipeline

Marine Infrastructure

- Marine Outfall
- Raw Seawater Intake
- Marine Tunnel Portion

- EXISTING SEWER
- EXISTING WATER
- EXISTING OVERHEAD ELECTRICAL
- EXISTING UNDERGROUND ELECTRICAL
- EXISTING TELECOMMUNICATIONS

0 100 200
Metres

Coordinate system: GDA2020 MGA Zone 53

Scale ratio correct when printed at A3

1:6,000

Date: 23/05/2024

Data sources: WSP, DataSA, MetroMap WMS Services:

8.2.12 Bushfire Resilience and Asset Protection Planning

The RO desalination plant site is located under the Hazards (Bushfire – Medium Risk) Overlay under the P&D Code. This Overlay expects development to respond to medium bushfire risk and potential for ember attack and radiant heat through siting and design of buildings to mitigate threat and impact of bushfire. Access should be facilitated for emergency service vehicles to aid the protection of lives and assets from bushfire danger (DO 1, 2).

The POs of this Zone state that buildings and structures should be designed to reduce the impact of bushfire through reducing the potential for trapping debris against or underneath or between the ground and building floor level (PO 2.1).

The proposed development has been designed to conform to both the Hazards (Bushfire – General Risk) and Hazards (Bushfire – Medium Risk) Overlays. Buildings have been sited to provide access for emergency services to aid the protection of lives and assets from bushfire danger (DO 1, 2). Most buildings are at finished floor level, with some needing to be raised for functionality, including pump stations and switch rooms. While this may increase the risk of burning debris underneath the structures (PO 3.1), this is limited within the Project site. The radiant heat expected within the medium bushfire risk location is expected to be mitigated by the materials of most structures being either concrete or Colorbond Ultra which are less flammable when subject to bushfire conditions.

8.3 Marine Elements

8.3.1 Introduction

This section of the Report describes the legislative and policy framework for the locality and the existing environment in Boston Bay and Proper Bay.

It includes a summary of the marine studies carried out to inform the impact assessment and the resultant impact assessments.

8.3.2 Legislative and policy framework

The following legislation and policies are relevant to the Project from a marine perspective.

8.3.2.1 Aquaculture Act 2001

The *Aquaculture Act 2001* is an Act to regulate marine and inland aquaculture; and for other purposes.

8.3.2.2 Aquaculture Zone policies

Aquaculture Zone policies are developed under the *Aquaculture Act 2001* and promote orderly development of aquaculture by securing access and reducing red tape. They describe what type of aquaculture, how much and which species can be farmed in a particular area.

8.3.2.3 Aquaculture (Zones – Lower Eyre Peninsula) Policy 2023

The *Aquaculture (Zones – Lower Eyre Peninsula) Policy 2023* identifies aquaculture zones, exclusion zones, public call areas, licensing criteria, among other matters. An overview of aquaculture zones for the Lower Eyre Peninsula, as established under this policy, is provided in Figure 8.6.

8.3.2.4 Coast Protection Act 1972

The *Coast Protection Act 1972* imposes requirements for the protection of the coast from erosion, damage, deterioration, pollution and misuse.

8.3.2.5 Environment Protection Act 1993

The general duty of care established under the EP Act, for all persons undertaking an activity that pollutes or might pollute, the environment, and requiring that all reasonable and practicable measures be taken to prevent or minimise any resulting environmental harm, extends across the marine environment. The EP Act also regulates dredging in marine waters and defines desalination plants as prescribed activities of environmental significance.

8.3.2.6 Native Vegetation Act 1991

In addition to terrestrial native vegetation, the NV Act also protects native vegetation (including seagrass) in the marine environment.

8.3.2.7 Fisheries Management Act 2007

The *Fisheries Management Act 2007* establishes regulations and management strategies to ensure sustainable fishing practices and conservation of aquatic ecosystems and marine resources.

8.3.2.8 Environment Protection and Biodiversity Act 1999

The EPBC Act establishes approval requirements for activities that have the potential to impact matters of environmental significance at a national level; including where these activities may occur within the marine environment.

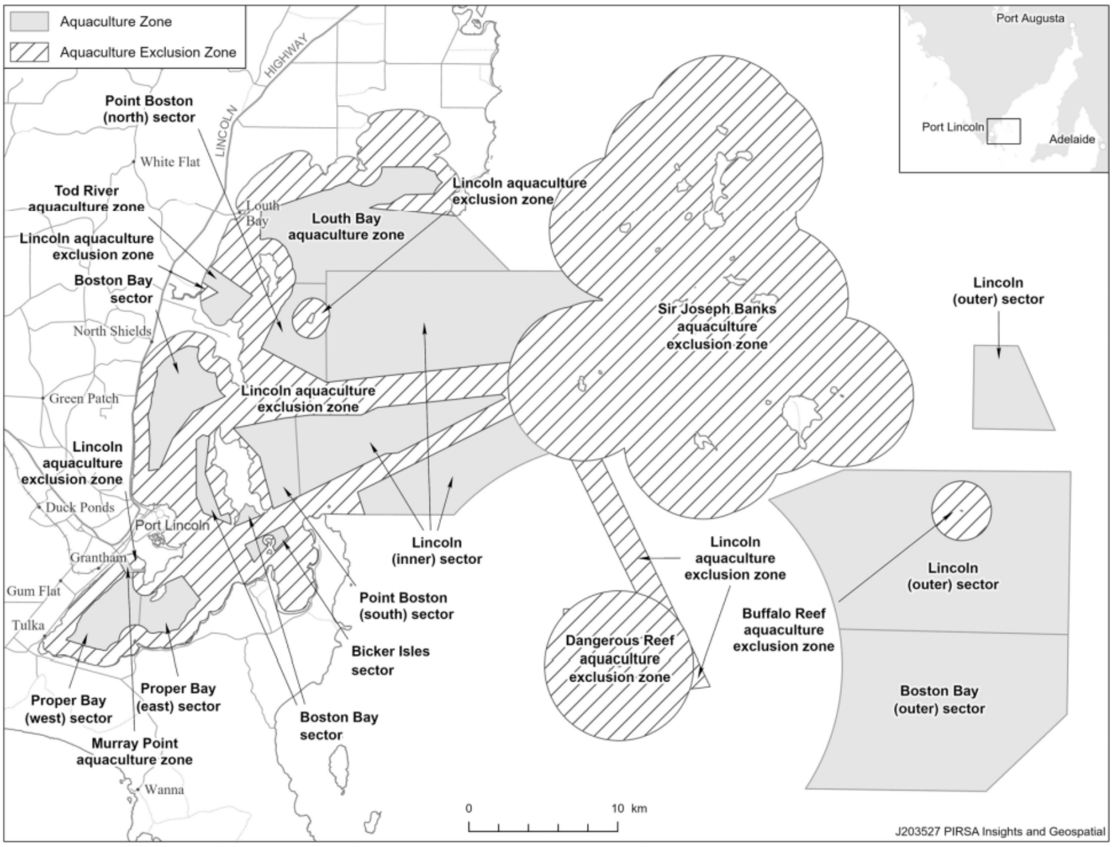


Figure 8.6 Aquaculture Zones of the Lower Eyre Peninsula (Source: Aquaculture (Zones – Lower Eyre Peninsula) Policy 2023)

8.3.3 Marine design progression

In early 2021, SA Water engaged SARDI to undertake preliminary hydrodynamic modelling on the feasibility of the Boston Bay and Proper Bay areas being developed for a RO desalination plant. This work examined several sites including Point Boston and the proposed Project site and concluded that provided the diffuser design met the specified dilution requirements, the dispersion was sufficient at the proposed Project site (Doubell & James, 2003) Reporting is provided in Appendix J.

In October 2023, SA Water presented an early Concept Design to State Government referral agencies and local councils at a Pre-Lodgement Panel facilitated by PLUS. The early Concept Design included trenching of the marine intake and outfall pipelines through the coastal and intertidal habitat. The early Concept Design consultation highlighted that potential trenching of the marine intake and outfall pipelines through the coastal and intertidal habitat was of concern due to the potential impacts on coastal cliffs and nearshore seagrass beds, as well as to amenity and cultural heritage values.

SA Water subsequently engaged engineering consultancy Acciona and their specialist hydrodynamic modelling team at BMT to further develop the Project into Detailed Design.

The design development incorporated feedback received during the initial referral agency and stakeholder consultation, as well as from the independent MSRP. The resultant design proposes a hybrid tunnel under the coastal and intertidal habitat with the marine intake and outfall pipelines lying on the seabed in the deeper water. This revised design prevents impacting the nearshore environment and reduces the amount of dredging offshore.

Further to the development of the tunnel alignment, the design team undertook a location and design optimisation analysis of the marine intake and outfall locations. This optimisation examined several potential locations around the Billy Lights Point with the subsequent shortlisted sites being modelled in the mid-field. The mid-field dispersion results were examined in conjunction with construction and operational constraints and a preferred location was then selected for more refined hydrodynamic modelling.

To satisfy regulatory requirements, the brine dilution assessments require detailed near-field and mid-field hydrodynamic modelling to rigorously assess the proposed design performance and potential impacts within Boston Bay and Proper Bay. The Early Contractor Involvement (ECI) phase hydrodynamic modelling study builds upon a substantial body of baseline data collection and preliminary impact assessments.

A high-resolution mid-field 3D hydrodynamic model was developed for a domain covering Boston Bay and Proper Bay. The model's performance at predicting water level, salinity, temperature and currents has been validated against metocean mooring datasets collected for the Project. Detailed Computational Fluid Dynamics (CFD) modelling has been undertaken for the proposed desalination plant outfall diffuser design and location.

The brine dispersion assessments were undertaken using a coupled near-field and mid-field model configuration that effectively resolves mixing at spatial scales from metres to kilometres. The assessments undertaken for the ECI phase include consideration of the risk of short-circuiting of the brine discharge with the proposed marine intake. The risk of connectivity between the existing WWTP outfall and the proposed marine intake was also considered.

8.3.4 Extreme events

Boston Bay and Proper Bay are subject to natural biochemical processes as well as several anthropogenic inputs (EPA, 2022). Natural events, such as oceanographic upwellings, also influence nearshore ecosystems, by pushing cold, nutrient rich water into the gulfs. Water quality data in 2024 appears to be picking up these type of events, which is reflected by an increase in phytoplankton abundance (refer to Appendix M) and schooling of fish species in numbers not previously recorded within Boston Bay and Proper Bay (Appendix R).

The CSIRO and Bureau of Meteorology (BoM) provide climate projections for Australia. The Eyre Peninsula is projected to experience an increase in average temperatures, across all seasons (Hope *et al.* 2015). Seawater temperatures within Spencer Gulf, and more widely across the region, are expected to increase at a similar rate to air temperature (Bureau of Meteorology and CSIRO, 2022). Higher than normal seawater temperatures can disrupt marine systems and be associated with events such as algal blooms and fish kills, as well as other mortalities if temperatures exceed the tolerance range of marine species.

Algal blooms (including harmful algal blooms) have been frequently documented as occurring throughout Boston Bay and Proper Bay (e.g. see Section 7.9.2.1.3). A large-scale fish kill across the South Australian coast in summer 2013, including Port Lincoln, coincided with high nutrient concentrations and high concentrations of a harmful diatom species (*Chaetoceros coarctatus*) (Roberts, *et al.*, 2019). An unusually high mortality event associated with two tuna licences in 2021/22 was also attributed to an algal bloom (PIRSA, 2023).

Climatic and system events have been reflected within the SARDI far-field modelling given the assessment covered a five year period (Appendix J). The assessment also modelled a 12 GL/annum plant, which while being overly conservative (given the proposed RO desalination plant size is 5.3 GL/annum), does allow an assessment of salinity inputs beyond those proposed which offers insights into future elevated salinity scenarios.

The RO desalination plant is able to modify and adapt to changes in water quality, regardless of climatic conditions, to maintain the objectives of minimising environmental impacts to local marine ecosystems and providing a consistent water supply to lower Eyre Peninsula.

8.3.5 Marine Science Review Panel (MSRP)

The independent MSRP panel members are internationally recognised experts with areas of expertise covering marine ecology, oceanographic modelling, discharge outfall dynamics, ecotoxicology, project management and environmental impact assessment.

The MSRP's role is to provide independent review and advice on the SA Water marine environmental studies commissioned as part of the Project approvals.

The role of each panel member is to provide independent technical feedback and advice to ensure the objectives of the environmental assessment process are achieved. This includes:

- Advising on the adequacy of environmental investigations and assessments, in terms of their nature, extent and scope, and ensuring that all areas of major environmental concern are addressed.
- Advising on the robustness of investigation and assessment methods to ensure the studies are scientifically and technically rigorous.
- Providing an expert review of investigation outcomes and advising whether the technical interpretation of outcomes can be supported by data presented.
- Providing feedback on assessment reports and documents (including design considerations) that have the potential to impact on the marine environment.
- Advising on actions to overcome any identified gaps in knowledge following the investigations including further investigation requirements.
- Providing an aggregation of expertise and information to ensure timely delivery of an appropriate environmental impact assessment.
- Providing a summary of the outcomes and recommendations from each meeting in the form of a meeting statement.

All marine studies and investigations undertaken to date for the Project have been reviewed, with the advice and recommendations from the MSRP incorporated. The MSRP also provided information and guidance to the independent SSC regarding the marine science relevant to the Project.

The MSRP would continue to review and provide oversight of the marine science informing the next stages of the Project. This would include review of relevant construction and operational compliance monitoring.

8.3.6 Summary of studies undertaken

The findings and outcomes of the following studies have been used to characterise the baseline marine environment and inform the assessment of potential impacts of the proposed Project.

Study	Output	Study Timescales	Relevant Appendix
Currents and Tides	Acoustic doppler current profiler (ADCP) deployed in Boston and Proper Bay. Continuous measurement of currents, turbulence, wave height and direction.	2021-ongoing	Data has informed: Appendix J: Doubell, M.J. and James, C.E. (2023) *Oceanographic monitoring and far-field modelling to inform desalination in Boston Bay*. Report to SA Water. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No F2022/000347-1. SARDI Research Report Series No. 1165. 71pp Appendix K Doubell, M.J. and James, C.E. (2024) *Particle tracking updated modelling report*. Report to SA Water. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. Appendix L: BMT (2024) *Eyre Peninsula Desalination Plant: Hydrodynamic Modelling Report.* v2 30 May 2024 Appendix M: Patterson, J. (2024) *Marine Characterisation of Water Quality at Billy Lights Point, Port Lincoln*. SA Water, V.02 May 2024.
Marine geophysics	Mapping of seabed characteristics and sub-surface geological layers in vicinity of Billy Lights Point	2023-2024	Data has informed: Appendix L: BMT (2024) *Eyre Peninsula Desalination Plant: Hydrodynamic Modelling Report.* v2 30 May 2024
Billy Lights Point and Proper Bay Water Quality (benthic and water column)	Benthic water quality and *in situ* water column profiling in the region of the proposed marine intake and outfall locations. Monthly-weekly sampling of a range of physical, chemical and biological parameters.	2021-ongoing	Appendix M: Patterson, J. (2024) *Marine Characterisation of Water Quality at Billy Lights Point, Port Lincoln*. SA Water, V.02 May 2024.
Boston Bay and Proper Bay Water Quality (vertical profiles)	Vertical water quality profiles across 106 sites in Boston Bay and Proper Bay.	2021-ongoing	Appendix M: Patterson, J. (2024) *Marine Characterisation of Water Quality at Billy Lights Point, Port Lincoln*. SA Water, V.02 May 2024.

Study	Output	Study Timescales	Relevant Appendix
Hydrodynamics (far field) and Particle tracking modelling	Modelling the far-field (regional) dispersion of brine from several locations in Boston Bay and Proper Bay.	2023-2024	Appendix J: Doubell, M.J. and James, C.E. (2023) *Oceanographic monitoring and far-field modelling to inform desalination in Boston Bay*. Report to SA Water. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No F2022/000347-1. SARDI Research Report Series No. 1165. 71pp Appendix K Doubell, M.J. and James, C.E. (2024) *Particle tracking updated modelling report.* Report to SA Water. South Australian Research and Development Institute (Aquatic Sciences), Adelaide.
Hydrodynamics (coupled near-field and mid-field)	Modelling of the near-field dispersion of brine from the proposed desalination plant outfall diffuser. Mid-field modelling of brine dispersal covering Boston and Proper Bays.	2024	Appendix L: BMT (2024) *Eyre Peninsula Desalination Plant: Hydrodynamic Modelling Report*. v2 30 May 2024
Wave modelling	Numerical wave modelling	2024	Appendix L: BMT (2024) *Eyre Peninsula Desalination Plant: Hydrodynamic Modelling Report.* v2 30 May 2024
Coastal processes study	Study of local coastal processes including sediment transport processes and shoreline erosion risk	2024	Appendix L: BMT (2024) *Eyre Peninsula Desalination Plant: Hydrodynamic Modelling Report*. v2 30 May 2024
Sediment analysis	Marine sediment sampling and analysis to characterise the physical and chemical properties of sites off Billy Lights Point. Description of physical properties of sediment and quantification of potential contaminants.	2023	Appendix N: BMT (2024) Eyre Peninsula Sediment Sampling and Analysis Plan Implementation Report, v00 Jan 2024
Review of environmental impacts of desalination plants	Independent literature review of potential impacts on the marine environment from the operation of desalination plants, with a focus on aquaculture.	2021	Appendix O: Tanner, J.E. and Drabsch, S. (2021). *Literature review of potential impacts of desalination discharges in Boston Bay, with particular reference to Aquaculture*. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2021/000299-1. SARDI Research Report Series No. 1105. 17pp
Boston Bay and Proper Bays marine benthic habitat mapping	Benthic communities – habitat mapping at 153 sites in Boston Bay and Proper Bays	2021-2022	Appendix P: J Diversity (2022) *Boston Bay Marine Habitat Video Analysis*. Report prepared for SA Water by J Diversity Pty Ltd Rev 3, 2 March 2023

Study	Output	Study Timescales	Relevant Appendix
Proposed site marine benthic habitat mapping	Benthic communities – habitat mapping at outfall and intake locations off Billy Lights Point	2023-ongoing	Appendix Q: J Diversity (2024) *Billy Lights Point Habitat Mapping Report*. Report for SA Water J Diversity Pty Ltd Rev 0, 26 May 2024
Fish surveys	Baited fish surveys using underwater remote video (BRUVS) at sites Boston Bay and Proper Bay	2021-ongoing	Appendix R: Clarke and Huveneers (2024) *Baseline assessment of fish diversity and abundance at the proposed Boston Bay desalination site*. Report Prepared by Flinders University for SA Water, April 2024
Plankton surveys	Field sampling of plankton in Boston Bay and Proper Bays=	2023-ongoing	Data is summarised in Section 7.9.4.1.5.
Ecotoxicology data review	Review of available literature and data on seawater desalination plant discharge ecotoxicology assessments	2022	Appendix S: Hydrobiology (2022) *Desalination ecotoxicity review: Eyre Peninsula Desalination Plant*. Report for SA Water. V3 December 2022
Ecotoxicity - mussel larvae assessment	Assessment of toxicity of desalination brine to the larvae of the mussel *Mytilus galloprovincialis*.	2024-ongoing	Appendix T: Hydrobiology (2024) *Toxicity Assessment of Adelaide Desalination Plant Brine.* Note for SA Water. V3 December 2022
Underwater noise modelling	Modelling of underwater noise and vibration during construction and operation of the desalination plant	2024	Appendix U Sonus (2024) *Eyre Peninsula Desalination Plant Underwater Noise Assessment*. Ref S8140C1. Report for SA Water, May 2024

8.3.7 Impact Assessment

The construction and operational phases of the Project have distinct activities which have the potential to result in impacts to the marine environment.

As marine systems are complex with interconnection and dependencies not as easily defined as terrestrial environments, the marine impact assessment is more holistic in its approach.

Planning and Design Code Assessment

The CWOI Zone does not anticipate infrastructure that is proposed by this development application.

In addition, the Coastal Areas Overlay places importance on conservation of the existing environment and natural processes (DO 1, 2), which the proposal is not.

The Crown development assessment pathway expects the Minister or their delegate to have regard to the P&D Code rather than being directed by the policy.

In this manner the marine impact assessments are outlined below through a holistic and integrated marine system approach.

8.3.7.1 Potential Impacts

Following a review of the sensitivity of the existing environment (see Section 7.9). the proposed construction strategy and design details for the Project (see Section 3.1 and 1.3), key risks and potential effect pathways have been identified.

Sections 8.3.7.2 and 8.3.7.3 present the results of a qualitative evaluation of the key risks to the marine environment from construction and operation of the Project against the likelihood and consequence ratings set out in Table 8.33 and Table 8.34.

The matrix used for derivation of the resulting risk ratings is presented in Table 8.35.

The risk assessment has included consideration of the relevant mitigation and management measures incorporated into the Project to avoid and/or minimise impacts to the marine environment.

Section 8.3.7.4 provides a summary of the residual risks associated with the construction and operation of the Project, as well as details of the proposed mitigation and management measures.

Table 8.33 Likelihood Categories

Likelihood	Description
Almost certain	The event is expected to occur in most circumstances
Likely	The event would probably occur in most circumstances
Possible	The event could occur
Unlikely	The event could occur but not expected
Rare	The event may occur only in exceptional circumstances

Table 8.34 Consequence Descriptor

Consequence	Adverse effects
Severe	Long-term and possible permanent impact on populations of listed threatened and/or economically significant marine species or their habitat outside the Project site. Significant change to community structure including loss of majority of species beyond the Project site.
	Long-term and possible permanent decrease in marine ecosystem health extending beyond the Project site.
Major	Substantial but reversible change to populations of listed threatened and/or economically significant marine species or their habitat outside the Project site, or reduced breeding capacity for greater than one season. Significant change to community structure including loss of multiple species beyond the Project site.
	Long term decrease in marine ecosystem health beyond the Project site
Moderate	Measurable but reversible change to populations of listed threatened and/or economically significant marine species or their habitat, or reduced breeding capacity for one season. Long term change in species abundance and diversity beyond the Project site.
	Measurable but reversible change in marine ecosystem health within the Project site.
Minor	Insignificant change to populations of listed threatened and/or economically significant marine species. No adverse effect on breeding capacity. Localised long-term change to species abundance.
	Measurable decrease in marine ecosystem health at a local scale.
Insignificant	No change in populations of listed threatened species and/or economically significant species. Localised and reversable reduction in species abundance.
	No measurable decrease in marine ecosystem health.

Table 8.35 Risk Rating Matrix

Likelihood	Consequence level				
	Severe	Major	Moderate	Minor	Insignificant
Almost certain	Extreme	Extreme	Very High	High	Medium
Likely	Extreme	Very High	High	Medium	Low
Possible	Very High	High	Medium	Medium	Low
Unlikely	High	Medium	Medium	Low	Low
Rare	Medium	Low	Low	Low	Very Low

8.3.7.2 Construction Phase

8.3.7.2.1 Habitat removal and/or disturbance during installation of intake/outfall

Dense seagrass beds cover the inshore area off Billy Lights Point (see Appendix P and Appendix Q). The design of the marine infrastructure has avoided impacts to the coastal, intertidal and nearshore zone through adopting tunnelled pipelines to 500 m offshore, from which point the remainder of the intake and outfall pipelines are proposed to be 'lay on bed' (see Appendix B). Tunnelling approximately the first 500 m The direct impacts to coastal vegetation, cliffs and dense *Posidonia* beds out to approximately 430 m via habitat removal/disturbance associated with the trenched preliminary design are removed through adoption of tunnelling for the first approximately 500 m of the pipeline alignment. The lesser impacts are now restricted to the offshore area in which the TBM is to be retrieved, the construction footprint of the lay on bed pipelines and construction footprints of the intake towers and diffuser structure.

To minimise the removal, damage and disturbance to the marine habitats and species during construction, the construction footprint would be reduced as far as practicable.

The TBM would reach the surface of the seabed in waters at a depth of approx. 12.0 mAHD at a location 500 m to the east of the tunnel entry point (see Section 3.1.3.2). A trapezoid area of substrate (approximately 0.8 ha) would require excavation to retrieve the TBM and to provide for the transition from tunnelled pipelines to the lay on bed pipelines. The benthic habitat in the retrieval/transition zone is characterised by macroalgae (0.35 ha), sparse macroalgae/turf habitat (0.23 ha) and macroalgae/*Zostera* habitat (0.21 ha) (see Figure 7.32and Appendix Q).

The two intake structures and the diffuser structure are also located within areas that have a majority of macroalgal habitat. The disturbance footprint of the intake structures would be around 0.05 ha each. Habitat disturbance would also occur via installation of the lay on bed pipelines; the design identifies the pipelines as being 900 mm in diameter and to be placed on site with preinstalled pre-concrete collars to secure the pipes in place. The construction disturbance footprint is expected to be contained within a 30 m buffer along the pipeline route. The lay on bed portion of the two proposed intake pipelines are 100 m and 150 m respectively. The total length of the lay on bed portion of the outfall pipeline is 530 m. Beyond the first 50 m of the pipeline route within the retrieval/transition zone, the remainder of the proposed pipeline route intersects predominantly macroalgal habitat (for approximately 313 m) with shorter sections intersecting mixed macroalgal and seagrass habitat (approximately 113 m through *Zostera*/macroalgae and *Halophila*/macroalgae habitat) and mixed seagrass habitat (through approximately 56 m) (see Figure 7.32).

The excavation of the retrieval/transition zone and small areas at the intake locations would be achieved via dredging which would involve additional disturbance of the seafloor at anchor points. The retrieval of the TBM would be accomplished via divers removing the drill head elements and floating these and would not require further disturbance outside the retrieval zone. Following completion of the construction the excavated area would be backfilled with material approved by the EPA to protect the pipeline transition area. The installation of the pipelines and the intake structures/diffuser structure would require floating vessels and anchored/spudded barges which would also result in some disturbance of the seabed.

The location of the marine infrastructure proposed in the design has been established with consideration of the habitat mapping and to avoid seagrass beds. As discussed above, on the basis of a 30 m wide construction disturbance footprint the construction of the Project would result in the loss of an area of up to 1.8 ha of macroalgal habitat, 0.3 ha of mixed macroalgae and seagrass (*Zostera* and *Halophila*) habitat and 0.2 ha of mixed seagrass habitat. The majority of the macroalgal habitat lost during construction would be within the retrieval/transition zone and this area would be replaced with approved backfill material. This area can be expected to be colonised by similar algal species over time.

Dredging activity and associated vessel movements/anchoring can only occur following approval of the Contractors Dredge Management Plan (DMP) by the EPA. During the assessment process the EPA assess DMPs against the Dredge Guideline (2020) which sets out expectations for prevention and minimising environmental harm during dredging activities. The DMP would identify potential environmental risks associated with proposed dredging work and includes all practical measures to avoid and minimise impacts, including measures such as avoiding sensitive habitat (e.g. seagrass and associated fauna communities) during anchoring and minimising movement of anchor points. The management measures and monitoring requirements within a DMP ensure impacts outside an approved construction footprint are avoided.

Further discussion of the potential water quality impacts associated with dredging is presented below in Section 8.3.7.2.2.

The removal of habitat required for construction of the Project would largely avoid sensitive seagrass habitat, and macroalgal species are expected to recolonise the hard substructure provided as backfill (to be approved with the EPA). On this basis the risk to the marine habitats and species from habitat disturbance and removal during construction is considered medium risk.

8.3.7.2.2 Sediment disturbance resulting in increased turbidity or concentration of suspended sediments

Marine construction activities often cause increased concentrations of suspended sediments, elevated turbidity and sedimentation effects. The Project's construction would involve several areas of dredging (see Section 8.3.7.2.1 above) and other construction activities on/adjacent the seabed with the potential to result in sediment disturbance and in turn indirect adverse effects on marine organisms. The marine environment within, and surrounding the construction area, contains benthic habitat with potential sensitivity to an increase in turbidity levels and/or sedimentation.

Light availability is one of the key environmental factors affecting the distribution of seagrass beds (Ralph, *et al.*, 2007; Dennison, 1987). The quality of the underwater light regime is affected by turbidity levels. Higher turbidity levels may alter the water depth to which light, for photosynthesis, can penetrate, potentially leading to an overall reduction in primary productivity and growth. Direct smothering of seagrass blades via sediment deposition could similarly reduce the light available for photosynthesis. Short term inputs to the coastal environment from increased sediment content and/or turbidity, such as influx of sediment from freshwater discharge after rainfall events, or sediment disturbance/resuspension during dredging operations, can therefore affect the health of seagrass communities. Coastal eutrophication and other long-term effects on water quality could also increase turbidity and reduce light availability, for example via increased phytoplankton density in the water column, and this is a major cause of seagrass loss globally (Walker & McComb, 1992; Duarte, 2002; Green & Short, 2003; McMahon, *et al.*, 2013; Ralph, *et al.*, 2006).

The sensitivity of each species to turbidity and sedimentation differs and is influenced by a range of factors. Large, slow growing species with larger carbohydrate reserves, such as *Posidonia* spp. are better able to tolerate a short-term reduction in photosynthetic capacity than smaller species, but may take longer to recover than smaller faster growing (colonising) species (Erftemeijer & Lewis, 2006; Collier, *et al.*, 2009). *Halophila* has been reported to survive for one month under low light conditions and *Zostera* for less than 20 days, whereas *P. sinuosa* can survive for over five months under low light conditions (Gordon, *et al.*, 1994; Ralph, *et al.*, 2006). Similarly, tolerance to burial by excess sediment is species specific; *P. australis* is more tolerant than other smaller species, and leaf size and rhizome diameter are good predictors of the ability to survive burial (Cabaco, *et al.*, 2008).

The health of macroalgal communities is also linked to light availability as they produce energy through photosynthesis and can therefore be affected in similar ways by anthropogenic and other factors which result in alterations of background water quality.

Environmental tolerances of mobile marine species vary but in general they are less sensitive to impacts such as sedimentation and/or localised water quality changes as they can move away from stressors and remove particles through movement.

Sessile invertebrates are unable to move to avoid environmental stressors, however the sensitivity of different taxa to environmental changes varies. Some taxa are less sensitive to sedimentation for example as they are able to filter out particles or avoid sedimentation due to their morphology (Fraser, *et al.*, 2017; Erftemeijer, *et al.*, 2012; Pineda, *et al.*, 2016). Adverse effects on filter feeders include potential clogging of ascidian siphons and mechanical abrasion (Naranjo, *et al.*, 1996), overloading filtration mechanisms in bivalves (Zardi, *et al.*, 2006) and canal stems in sponges (Pineda, *et al.*, 2016).

Different life history stages may also show varying tolerance. Fertilisation of coral has been shown in some studies to be unaffected by elevated levels of suspended sediments, although coral was sensitive to contaminated sediment at lower exposure levels (Humphrey, *et al.*, 2008)), with development of coral embryo and larval stages also showing limited sensitivity to the effects of elevated sediments (Jones, *et al.*, 2015). Reproductive strategy also influences sensitivity to sedimentation; where incidents of elevated suspended solid concentrations coincide with spawning events the population effects for taxa with single short duration spawning events, such as some coral species, can be significant (Jones, *et al.*, 2015).

In common with other sessile invertebrates, mussels can be adversely affected by sedimentation and smothering, including by anoxic conditions and the abrasive action of sand. Blue mussels can achieve some movement via adjusting the length of, or secreting new byssal threads, allowing them to avoid being smothered by accreting sediments (Seed & Suchanek, 1992; Humphrey, *et al.*, 2008). *Mytilus edulis* has been shown to be capable of resurfacing from a 6 cm increase in sediment level within one to two days (Widdows, *et al.*, 2002). Large variability in sedimentation can occur naturally within the coastal environment, e.g. following storms, and this ability provides mussels with an adaptive ability to survive changes in sediment levels (Hutchison, *et al.*, 2016). In areas where it has invaded, the ability to withstand sand inundation provides *Mytilus galloprovincialis* with a competitive advantage over indigenous species more sensitive to high levels of suspended sediments (Zardi, *et al.*, 2006; Zardi, *et al.*, 2008). High levels of sedimentation would cause mortality when mussels are buried with significant levels of sediment (e.g. depth of 10 to15 cm), however *M. galloprovincialis* is more tolerant of lower levels of sedimentation (Zardi, *et al.*, 2006) and *M. edulis* can survive burial for up to eight to 16 days (Hutchison, *et al.*, 2016).

If not managed correctly the dredging and other construction activities associated with the Project could have significant adverse effects on the marine habitats and species within Boston Bay and Proper Bay.

An indication of the volume of dredging required for the construction of marine works is set out in Table 8.36. The indicative volumes of dredging required, works duration and the composition of the sediment would be confirmed following completion of detailed geotechnical investigations. The tunnel construction would also result in the production of marine sediment (spoil), however this would be removed to land via the tunnel and would not impact on the marine environment (see Section 3).

The extent of increased turbidity from dredging activities is dependent on the sediment composition and the dredging methodology. Fine-sized particles (e.g. silt/clay) would remain suspended in the water column for longer than coarse-sized particles. In addition, particles released near the water surface tend to remain suspended for longer than similar particles released/disturbed near the bed. While particles remain suspended they are able to be transported by tides/currents and dispersed over larger areas. Therefore, an increase in the percentage of fine particles within sediment would increase the risk of elevated turbidity across a larger area. The extent of wave action/currents at a particular site is also a key consideration is the extent of impacts associated with dredging as this influences the extent to which disturbed sediment is resuspended, which can be a more important pathway to impacts on marine communities than the initial dredging event (Onuf, 1994).

Table 8.36 Indicative dredge volumes and composition of sediment

Activity	Estimated Dredge Volume and Likely Materials[19]	Conservative Approximate Duration of Works
Excavation of tunnel boring machine recovery and pipeline transition	Approx. 23,300m³ Silt – approx. 3% Clay- approx. 7% Sand – approx. 29% Gravel – approx. 11% Rock – approx. 50%	5-6 months work in this area, including retrieval of TBM, to complete pipeline transition and back fill
Excavation of foundation area for intake towers	Approx. 300m³ (both towers) Silt – approx. 5% Clay – approx.15% Sand – approx. 57% Gravel – approx. 23%	4-6 weeks to install intake structures
Excavation for foundation footings for lay on bed pipeline collars	Approx. 1000m³ (all pipelines) Silt – approx. 5% Clay – approx.15% Sand – approx. 57% Gravel – approx. 23%	2-3 months to install pipeline collars

Adverse impacts on light available for photosynthesis are also reduced when carbonate (marine) sediments are elevated in the water column in comparison to organic rich terrigenous sediments (i.e. originating from land) due to the potentially higher backscatter to absorbance ratios (Ralph, *et al.*, 2006).

The Contractors DMP (requiring EPA assessment and approval)(see Section 8.3.7.2.1) would detail the methodology to be utilised. The methodology would vary according to the type of sediment being excavated in order to reduce the extent of sediment plume dispersal and in consideration of the organisms within the local area sensitive to the impacts of elevated turbidity and increased sedimentation (e.g. seagrass and mussels). For example, dredging methods expected to be deployed for excavation of fine sediment (clay/silt) fractions (e.g. suction) would avoid agitation of seabed material, whereas excavation of coarse material is likely to utilise mechanical agitation (e.g. cutter suction dredge). The construction footprint would be reduced as far as practicable with dredging kept to a minimum. While it is likely to be much smaller, for the purposes of assessment, once the tunnel terminates and the pipelines are fed through, the impacts would be constrained to the tunnel retrieval/pipeline transition zone (approximately 0.8 ha) and an approximately 5300 m by 30 m marine zone of influence may be potentially affected during construction. This includes direct and indirect impacts from the construction.

Other water quality management measures to be considered in consultation with the EPA would include a Water Quality Monitoring Plan, including turbidity monitoring and triggers for pausing of works, visual monitoring of plume and the use of a 'silt curtain' for turbidity control in some circumstances. The DMP would also document the method of disposal for dredge spoil and the measures to protect the marine environment.

The tunnelling methodology to be used for the first 500 m of the pipeline has reduced the risk of impacts associated with the marine construction activities. The sediment composition in the Project site is comprised primarily of sand and coarse material (gravel/rock) with only low levels of fine sediment (silt/clay) (see Section 7.9.3), which would reduce the risk of particles remaining suspended in the water column for long periods. The dredge and construction footprint has also been proposed in less sensitive habitats with minimal *Posidonia* and other seagrass and no recorded reefs directly impacted. The Project site is characterised by low levels of wave action and currents and the sediment particles are expected to settle rapidly, reducing the possibility of resuspension of disturbed sediments.

[19] Indicative volumes and composition based on current information, to be confirmed following completion of detailed geotechnical studies and finalisation of detailed design

The construction of the lay on bed portion of the pipelines and the intake/outfall structures, particularly the dredging activities, would result in an increase in the risk of elevated turbidity and sedimentation from works over a period of months. This risk would be managed through standard dredge management measures, which would be documented within the DMP.

As discussed above, the benthic community within Proper Bay and Boston Bay include organisms which may be sensitive to elevated turbidity and/or sedimentation. Through avoidance of sensitive habitats such as dense seagrass beds, the characteristics of the material to be dredged, the existing hydrodynamic environment and the management of water quality risks through a DMP, the overall risks to the marine environment from sediment disturbance during construction of the Project are considered to be low risk.

8.3.7.2.3 Sediment disturbance resulting in release of nutrients, contaminants, or algal cysts

The disturbance of sediments can also result in the potential release of toxicants which may be present in the existing environment from previous activities / pollution events. For this reason the *National Assessment Guidelines for Dredging* (NAGD 2009), includes detailed requirements to characterise the quality of materials to be dredged including screening levels for relevant metals, metalloids and other contaminants. While no sea disposal is proposed for this Project, the sediment sampling and analysis undertaken in support of this development application has followed the NAGD and has not identified elevated levels of metals or other contaminants of concern within the existing environment. The dredging and other marine construction activities associated with the Project do not have the potential to result in elevations of toxicants in the water column.

Nutrients within the sediments may be released via dredging, resulting in potential effects on marine communities (e.g. increase in phytoplankton growth, see Section 7.9.2). The sediment sampling plan also included analysis of nutrient levels and found ammonia, nitrate and nitrite concentrations were below the level of reporting (i.e. below the levels of detection within the laboratory) (see Appendix N). The sampling indicated that nitrogen was present primarily in organic form (total Kjeldahl nitrogen) within the sediment samples. The risk of release of elevated levels of nutrients into the water column during construction of the Project resulting in adverse effects on the marine environment is therefore considered very low.

Nutrient enrichment is however considered one of the major causes for the increasing frequency of algal bloom events (including HABs) in coastal regions with shallow and restricted nearshore waters that are poorly flushed appearing to be most susceptible to nutrient-related algal problems. Nutrient enrichment of such systems often leads to excessive production of organic matter, a process known as eutrophication, and increased frequencies and magnitudes of phytoplankton blooms, including harmful algal blooms (Anderson, *et al.*, 2017). As outlined previously, some algal species have a dormant cyst life stage, and sediment disturbance may also result in the release of dormant life stages of marine organisms surviving within the sediment e.g. dinoflagellate cysts (see Section 7.9.4.1.5).

Algal cysts are formed as a protective mechanism by certain types of algae in response to adverse environmental conditions. When conditions become unfavourable for growth, often towards the end of a bloom cycle, such as a lack of nutrients, changes in temperature, or presence of toxins, some algae species form resting cysts which can remain viable within the sediment for decades (Anderson, *et al.*, 2003; Zonneveld, *et al.*, 2022). Temporary cysts can also form in response to sudden changes in environmental conditions and these can rapidly re-establish back to a motile vegetative form (Anderson, *et al.*, 2003).

The process of cyst formation varies depending on the species of algae, but generally, it involves the algae encasing themselves in a thick, protective wall, allowing them to remain dormant. Germination occurs when conditions are appropriate within the water column (Anderson, *et al.*, 2003; Anderson, 1997) releasing active algal cells that resume growth and reproduction. Temperature appears to be the most important environmental factor controlling dynamics of dormancy and germination and the controlling of the process of 'excystment' (transitioning to the vegetative stage), with light levels, nutrient and water chemistry considered to be less important (Anderson, *et al.*, 2003).

In addition to survival within the sediment environment, algal cysts are able to survive within ship ballast water, and this has provided an important mechanism for the worldwide spread of HAB species (Hallegraeff & Bolch, 1992). This is likely to be the case for the cysts of HAB species which have previously been identified in the sediments of Proper and Boston Bay (Hallegraeff, 1998).

Dinoflagellate cysts can be important as a 'seed bank' for initiation of blooms (including HABs) in situations where species do not persist within water column e.g. due to unfavourable seasonal temperatures (Anderson, 1997). The cysts can germinate when conditions improve and become favourable for growth.

Algal blooms periodically occur within Boston and Proper Bays (see Section 7.9.2), and conditions within the water column are therefore frequently conducive to phytoplankton growth. Blooms of the bio-luminescent *Noctiluca scintillans* were recorded during the project water sampling with the largest cell number recorded in December 2023 and reducing counts through to February 2024. Widely distributed throughout the world, *Noctiluca scintillans* is often found along the coast in shallow areas of the continental shelf (Harrison, *et al.*, 2011). *Noctiluca* blooms are also often seen in areas where pollution and nutrient enrichment due to human activities occur.

The presence of cysts of a known harmful algal bloom species (*Gymnodinium catenatum*) have been historically detected within the sediments of Boston Bay (see Section 7.9.4.1.5) and therefore sediment disturbance presents a potential source of bloom of this species. Several decades of regular resuspension by anchoring, movement of aquaculture infrastructure and frequent shipping movements in shallow port waters have not been previously linked with algal blooms.

Marine construction and upgrade work in 2023/2024 during the recent Axel Stenross boat ramp upgrades and the town jetty / foreshore works resulted in disturbance of sediments. Consultation with the PIRSA South Australian Shellfish Quality Assurance Program outlined that notifiable HABs (those of concern to the mussel industry) were not documented during this construction period and did not correlate with known elevated algal counts in the water quality monitoring. This is potentially due to low cysts density of harmful algal bloom species, lack of appropriate conditions for excystment, and/or a lack of competitive advantage over other existing phytoplankton species, including other Gymnodinoids species which are frequently detected in bloom quantities (see Appendix M).

Previous research has also demonstrated that mud/silt dominated sediments rather than coarser sand dominated sediments seem to support better algal cyst survival (Anderson, *et al.*, 2003; Al-Kharusi, *et al.*, 2020). The Project site has predominantly sand dominated sediments and therefore the likelihood of 'seed banks' of algal cysts being present is reduced. The sandy sediment composition is also likely linked to no toxicant exceedances recorded in the Project marine footprint as most contaminants preferentially bind to clay /silt particles and minerals due to their large specific surface area, surface charge, and high porosity (Yuan, *et al.*, 2013).

The potential impacts during the construction works would be managed through the implementation of the Contractors DMP (as outlined in Section 8.3.7.2.1), with key criteria being to reduce the potential impacts during the dredging works. The construction footprint would be reduced as far as practicable with dredging volumes and duration kept to a minimum. As such, construction related sediment disturbance resulting in adverse effects from release of toxicants, nutrients or additional blooms of HAB species is considered a low risk.

8.3.7.2.4 Noise and/or vibration from construction activities

The construction methodology is expected to require activities which would generate underwater noise and/or vibration including impact piling, dredging and tunnel boring. The detailed construction method would be finalised following completion of detailed geotechnical investigations. No blasting or use of explosives is anticipated.

Underwater noise and vibration have the potential to impact the behaviour and physiology of marine fauna, including mammals, fish and reptiles. Marine mammals rely on sound as their primary sense for communication, navigation, finding food and avoiding predators. Research on the hearing capabilities of cetaceans has shown there are major differences across marine mammal species (Southall, *et al.*, 2007).

Cetaceans (whales, dolphins and porpoises) are divided into three functional hearing groups (low, high and very high frequency) based on their frequency hearing ranges (Southall, *et al.*, 2019). Marine reptiles and fish also differ in their hearing capabilities. The majority of fish are 'hearing generalists' with relatively poor hearing (Amoser & Ladich, 2005). Fish which are 'hearing specialists' have developed hearing specialisations, such as use of swim bladders to extend hearing bandwidth (Li, *et al.*, 2024) which can render them vulnerable to intense sound vibrations.

There are a number of marine mammals, reptiles and fish which may be present either within Proper Bay and Boston Bay or in nearby offshore waters during the construction of the Project, including the potential for those listed under the EPBC Act (see Section 7.9.4.1.6 and 7.9.4.1.7). Therefore, an underwater noise assessment has been undertaken using the DIT Marine Fauna Noise Threshold Calculator[20] ('DIT underwater guidelines') which is used for underwater noise prediction from commonly used piling and dredging sources within South Australian waters (see Appendix U). Underwater noise from the TMB during construction and the intake pumps during operation has been predicted using the United States National Oceanic and Atmospheric Administration (NOAA) User Spreadsheet Tool (NOAA Threshold Calculator) which accompanies the NOAA 2018 Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0) (see Appendix U).

The underwater noise assessment uses criteria based on severity of impact, and these range from the most severe to least severe: organ damage/fatality, auditory threshold shift (temporary and permanent) and then behavioural responses. The criteria for permanent threshold shift (PTS) and temporary threshold shift (TTS) relate to a physiological response to exposure to noise levels of an intensity which results in a noise induced threshold shift (i.e. hearing loss) of an animals auditory system. A TTS does not represent a physical injury or permanent hearing loss, whereas PTS represents injury to the auditory system.

The DIT underwater guidelines provide applicable criteria for a range of species (including whales, dolphins, sea lions and seals, fish and reptiles (including sharks)) across different types of noise sources (see Appendix U). The noise modelling results are then represented as threshold distances to the noise source (i.e. in this case the Project construction area) within which an animal would need to be to be at risk of TTS/PTS or behavioural change.

Threshold distances are calculated for both a single strike (e.g. piling) event (termed 'L_{peak}') and also for the distance an animal would need to maintain, when exposed to the noise source over a 24 hour period, in order to avoid TTS/PTS (termed 'SEL_{24hr}'). The calculation of SEL_{24hr} requires inputs of piling strike rate (assumed to be 0.5 impacts/second) and the hours of operation (assumed to be an eight hour day), which for the current assessment equates to 14,400 pile drive impacts in a 24 hour period as a worst case scenario. The calculations for dredge related noise have also included a worst case scenario of 16 hours active dredging over a 24 hour period.

Two safety zones have been identified based on the outcomes of the assessment:

- Shutdown zones – where if a marine mammal is observed to enter a zone, piling or dredging activities must stop immediately.
- Observation zones – where if a marine mammal is observed to enter, the piling or dredging operator must be placed on stand-by to shut down equipment, and marine fauna observers should continuously monitor the movement of the marine mammal.

The shutdown zones and observation zones for the Project are set out in Appendix U for piling, dredging and tunnel boring. The modelling results indicate noise and vibration from piling activities are more significant than from tunnel boring and from dredging activities.

[20] https://www.dit.sa.gov.au/standards?a=955077

The relevant zones have been determined for piling, dredging and tunnel boring in accordance with the DIT underwater guidelines. They are based upon the TTS threshold distance for low frequency cetaceans, which is the largest threshold distance calculated for marine mammals in the assessment. Species within this group include southern right whale, which are migratory and not expected to be present in the vicinity of the construction area across the year, as the species is only seasonally present along the Australian coast (Charlton, *et al.*, 2019). There is a breeding ground at Head of Bight, on the western side of Eyre Peninsula and calving takes place from May to October; Sleaford Bay, located to the south of Port Lincoln, is an important calving area for the species outside the Project sites of influence. Should piling activities occur outside the migration and calving period the risk assessment for construction could consider the next largest threshold distance, which is based on exposure for Phocid Pinnipeds (i.e. seals) (see Appendix U).

The threshold distances are also calculated on the basis that an animal is within the identified zone for a full 24 hour period, which is a precautionary worst case scenario as it is very unlikely that an individual marine mammal would remain in the underwater environment in a restricted area for this period of time.

Given the inclusion of appropriate management measures such as Marine Fauna Observer, safety zones (shutdown zones and observation zones), based on relevant threshold distances for marina fauna likely to be in the construction area or in nearby offshore waters during the time of construction, as well as standard operating procedures included within the construction methodology and documented in the CEMP and DMP, the risk of activities generating underwater noise and/or vibration leading to adverse effects on marine organisms is considered low risk.

8.3.7.2.5 Hydrocarbon and chemical spills and disposal of waste from construction activities

There is the potential for spillage and leaks of chemicals and contaminants from construction equipment to the marine environment. The construction equipment, including vessels, would involve use of various hydrocarbons such as diesel fuel, oil and lubricants. This includes a very small risk associated with tunnelling from the use drilling fluids (such as bentonite) to lubricate and cool the drill cutting head which have the potential to be released during machine malfunction or through release in fissures and faults in the rock. Given the tunnelling machine would be under the sediment layer (and likely within rock) there is minimal risk of the bentonite interacting with the marine environment with specific risk reduction measures in relation to drilling muds at the tunnel termination point. Although there remains a potential risk during the use of drilling muds, this is considered minor as these water-based drilling fluids have low toxicity and only a small area of the seabed would be affected.

Standard best practice construction methodology, including hazardous material storage and spill management procedures would avoid adverse effects on the marine environment. The selected Contractor would have a Spill Management Plan and Emergency Response Plan containing contingency measures in the event of an accident. The Contractor would also have an active Waste Management Program which would seek to reduce, remove or reuse chemicals or waste from the site. On this basis the risk to the marine environment from spills and waste disposal is considered very low risk.

8.3.7.2.6 Introduction of marine pest species

Dredging and construction vessels coming into the Boston and Proper Bay area from other marine areas pose a risk of introducing additional marine pest species into the area. This is particularly true of vessels entering South Australia and Spencer Gulf from other States.

The use of seawater as ballast in ships presents an opportunity for marine organisms to transfer from one marine environment to another. Because many organisms are extremely small, they can be taken aboard a ship with its ballast water. If the organism survives the various physical and chemical changes and stresses that occur during the voyage and the transfer operations, it may be discharged and become established in the waters of the destination port (e.g. dinoflagellate cysts, see Section 8.3.7.2.3).

To manage the risk of introduction of invasive marine species through biofouling vessels on the Project would comply with Australian Ballast Water Management Requirements (Commonwealth of Australia, 2020) which outlines approved methods of ballast water management in line with the Ballast Water Convention.

Mitigation measures to prevent the translocation of pests in biofouling or entrained in seawater may also include (depending on the origin of the vessel):

- Slipping or dry docking and removal of all biofouling growth from the hull and hull niches.
- Ensure all wetted areas and hull recesses (e.g. sea chests, anchor lockers, deck wells, and internal pipework) are drained, any sediments and biological material removed, and the areas allowed to dry out.
- Diver inspection and cleaning.
- Cleaning and sterilising techniques applied to all equipment.
- To minimise the risk of spreading marine pests in South Australia, the quarantine protocol would be followed for all barges, tugs and other vessels.

The local environment is currently host to a range of invasive marine species (see Section 7.9.4.1.8). Work vessels are prone to biofouling due to a variety of reasons including extended periods spent inactive in harbours or sheltered waters; antifouling protection not being critical to vessel performance; antifouling systems prone to mechanical damage; complex hull forms; and ancillary immersed or submersible equipment. Management measures need to be undertaken to ensure that Project vessels do not bring or further spread marine pests in South Australia. On this basis the risk to the marine environment from introduction or spread of marine pests is considered very low risk.

8.3.7.2.7 Temporary construction exclusion zone restricting access for recreational and commercial fishing operations

A temporary exclusion zone may be considered for the retrieval of the TMB and the installation of the intake and outfall structures during the construction phase of the Project. Vessels with limited manoeuvrability would be on site and normal maritime regulations would be in place.

The Contractors DMP would contain a Community and Stakeholder Engagement Plan to outline communication measures in relation to marine construction. Mitigation measures would include notification of likely construction periods for marine works in the local paper, on the Council website and on the local boat ramps (e.g. at Billy Lights Point).

Risks to other vessels and marine users from construction are considered very low risk.

8.3.7.3 Operational Phase

8.3.7.3.1 Elevated salinity due to discharge of saline waste from outfall diffusers

The saline waste and backwash flows produced at the RO desalination plant would accumulate in a brine pit and then pass through a brine sump, adjacent to the marine intake and outfall pump station, prior to discharge to ocean via a 900 m length outfall pipeline, through a seabed mounted diffuser structure (see Section 3.1.3.2 and Appendix B). The saline waste discharged through the diffuser structure is predicted to be characterised by a salinity concentration roughly double the ambient salinity; the discharge is as high as 39.1 ppt,[21] greater than the ambient seawater off Billy Lights Point (ambient conditions are described in Section 7.9.1.1, 7.9.2.1.2 and Appendix M). The design of the diffuser structure has therefore been driven by the need to facilitate effective and rapid mixing of this salty water to avoid impacts to the marine environment.

[21] This is the maximum salinity difference predicted during operation and assumes only the pure saline waste is discharged; the salinity anomaly will be less when other waste streams (e.g. backwash flows) are present in the discharge.

The diffuser is required to achieve dispersion of the saline waste within the initial mixing zone to a minimum dilution of 40:1, which equates to a salinity concentration of 0.987 ppt (or less) above background concentrations. This dilution has been conservatively recommended as providing a safe dilution level following review of previous relevant ecotoxicology studies (see Appendix S) and a bespoke ecotoxicology assessment carried out in support of this development application (see Appendix T).

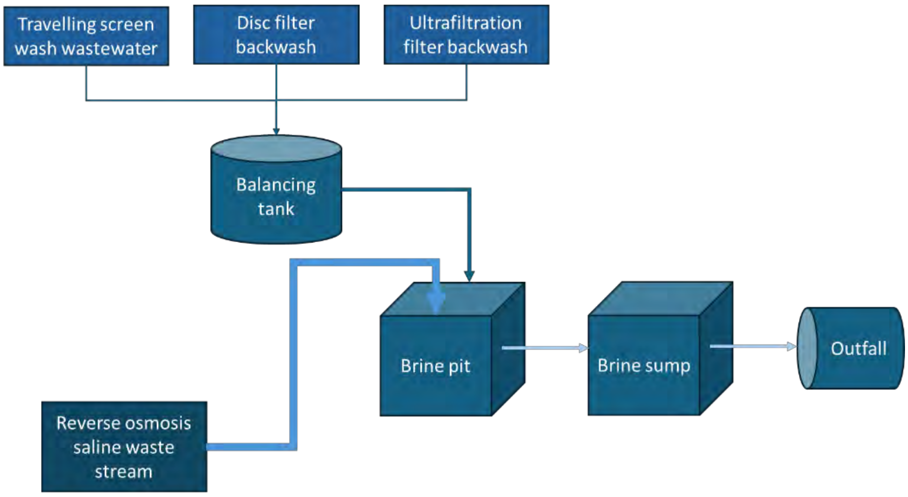


Figure 8.7 Flow diagram of saline waste and other operational discharge from the desalination plant (see Appendix L)

Hydrodynamic modelling has been carried out throughout the design process to inform the placement of the outfall diffusers and to understand the design performance of refinements on mixing in the near-field zone (see Figure 8.8, Figure 8.9 and Appendix L). Near-field model results predict that under the proposed design the diffusers would achieve a dilution of 59:1 under worst case conditions which is well within the 40:1 target.

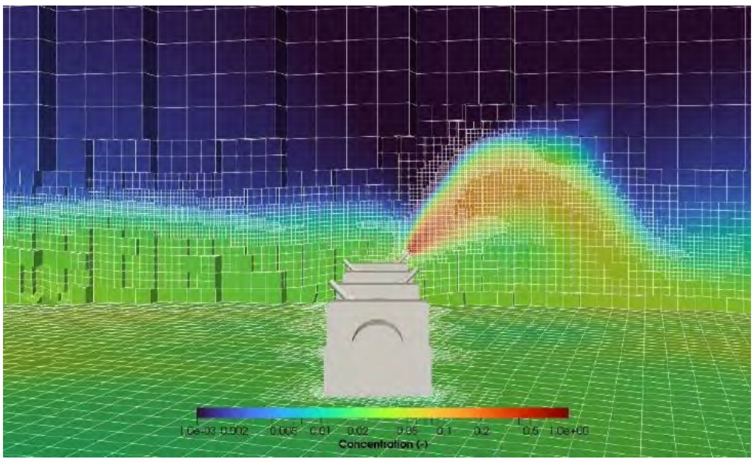


Figure 8.8 Example output from the BMT near-field modelling of the behaviour of the saline waste discharged from a diffuser port (see Appendix L)

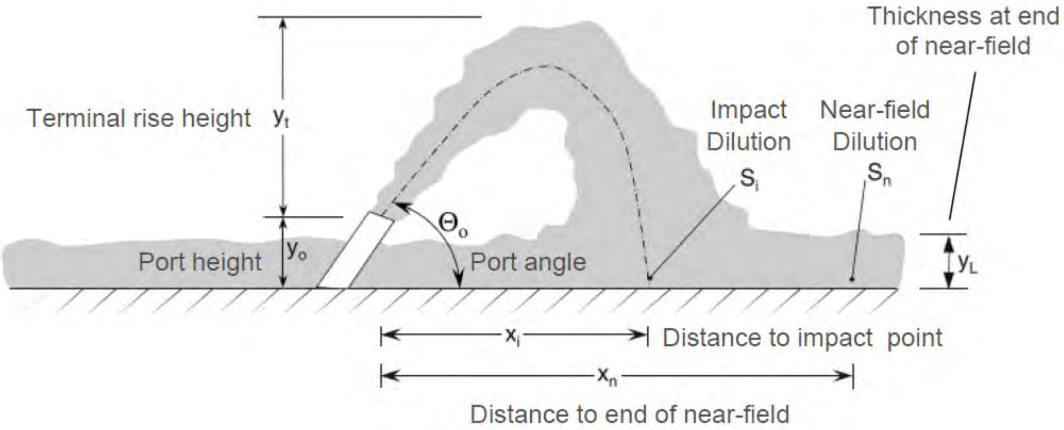


Figure 8.9 Diagram of mixing processes involved when denser saline waste discharge is released from a diffuser port (Adapted from (Abessi & Roberts, 2014), see Appendix L)

Mid-field hydrodynamic modelling of the proposed design has also been carried out to assess the risk of brine accumulation and shows that following the rapid dilution of denser saline waste within the initial compact mixing zone (30 m

radius), a plume of less salty and dense water is gradually dispersed in the marine environment within the vicinity of Billy Lights Point. While the design of the diffuser structure is critical to mixing in the near-field zone (see above), the local currents and tides exert the most influence at larger scales. The mid-field modelling examined dispersion under a range of conditions, including dodge tides. The current data collected over two years (see Section 7.9.1.1) was used to ensure the hydrodynamic modelling accurately represented local currents and tides (see Appendix J and Appendix L).

The modelling utilises scenarios in both winter and summer to describe the dispersion behaviour of the plume. The model outputs also describe the plume footprint results under median conditions (50th percentile) and the 95th percentile. The 50th percentile statistic represents the level of impact which is expected 50% of the time, while the 95th percentile statistic represent the acute levels of impact that may occur for short periods of time. Over a 30 day period the 95th percentile results would represent the conditions which may be present for 36 hours across that period (i.e. infrequent), whereas the 50th percentile conditions may be present for 15 days within that period (i.e. typical). The modelling output presented is focused on the seabed, as this represents the area that would have the highest salinity concentrations, due to the denser saline water sinking to the sea floor after dispersing from the diffuser. The risk of elevated salinity decreases higher in the water column.

The footprint of elevated salinity at the seabed is predicted to be larger in summer than in winter (see Figure 8.10). A median salinity elevation of greater than +0.5 above background may be expected for approximately 50 to 75 m from the diffuser structure and then to reduces to background conditions. Under infrequent (95th percentile) conditions the plume of elevated salinity is predicted to extend over a larger area before reducing to background levels (see Figure 8.11, Figure 7.13 and Figure 7.14).

During dodge tide conditions pooling of the saline waste in local depressions is enhanced, with an elevation in salinity modelled to extend from the diffuser structure over an area larger than that observed during spring tide conditions (see Figure 8.12). Dodge tide conditions are associated with very little water movement and are expected to result in reduced mixing during this period (see Section 7.9.1.1). Regardless salinity concentrations around the immediate area of the diffuser structure remain below the target concentration of less than 0.978 ppt above ambient salinity.

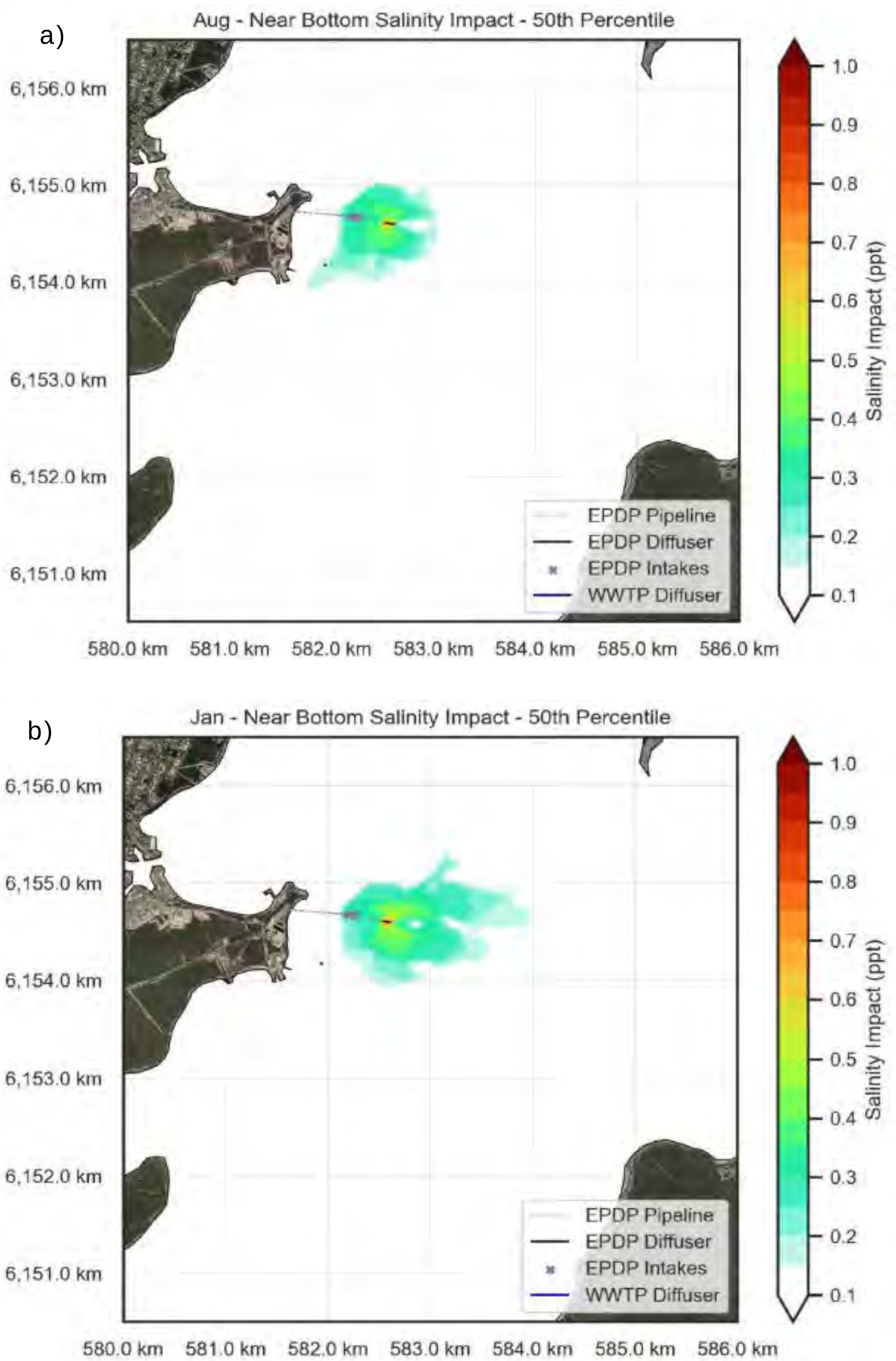


Figure 8.10 Median modelled seabed salinity elevation during (a) winter and (b) summer (see Appendix L)

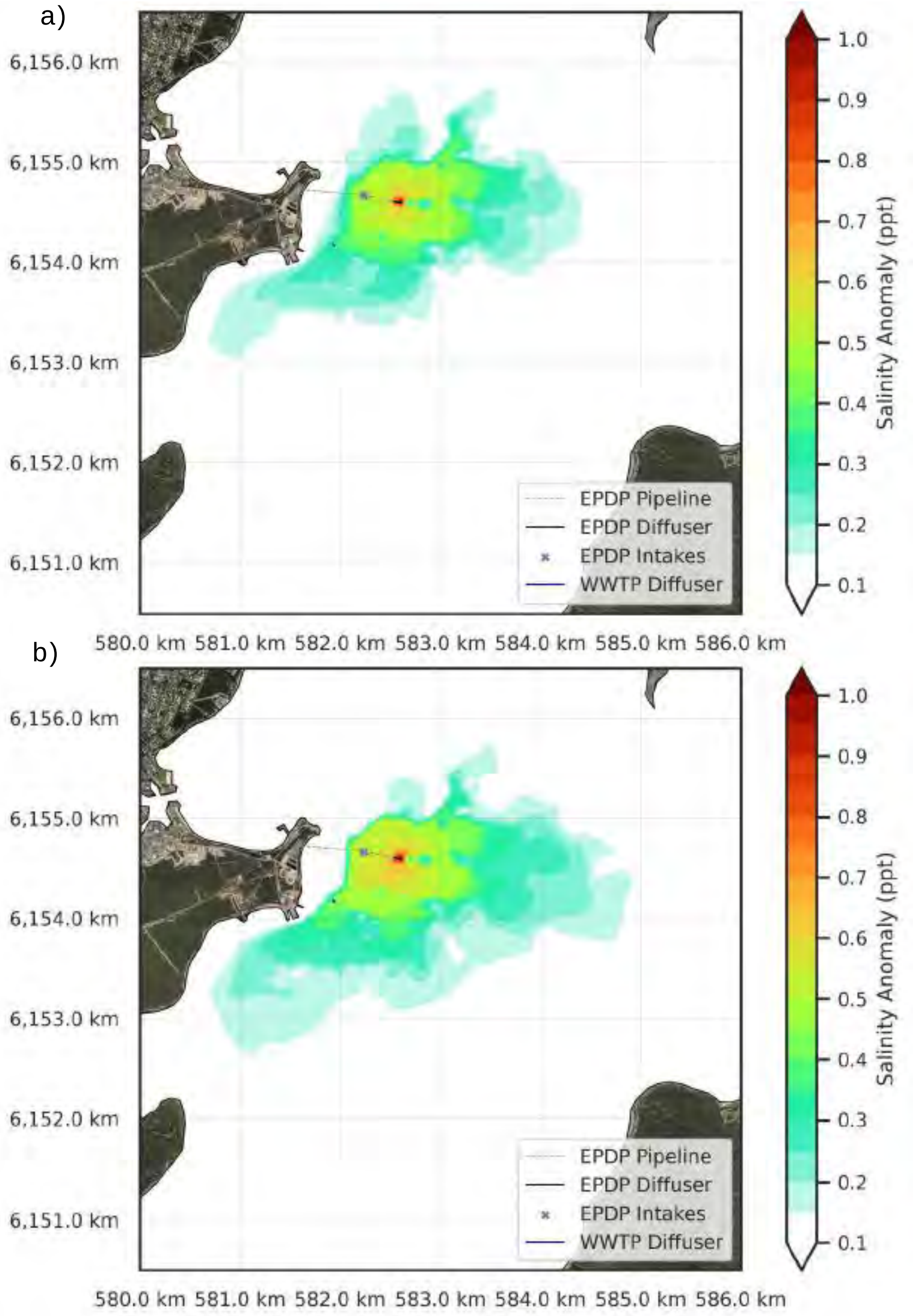


Figure 8.11 95th percentile modelled seabed salinity elevation during (a) winter and (b) summer

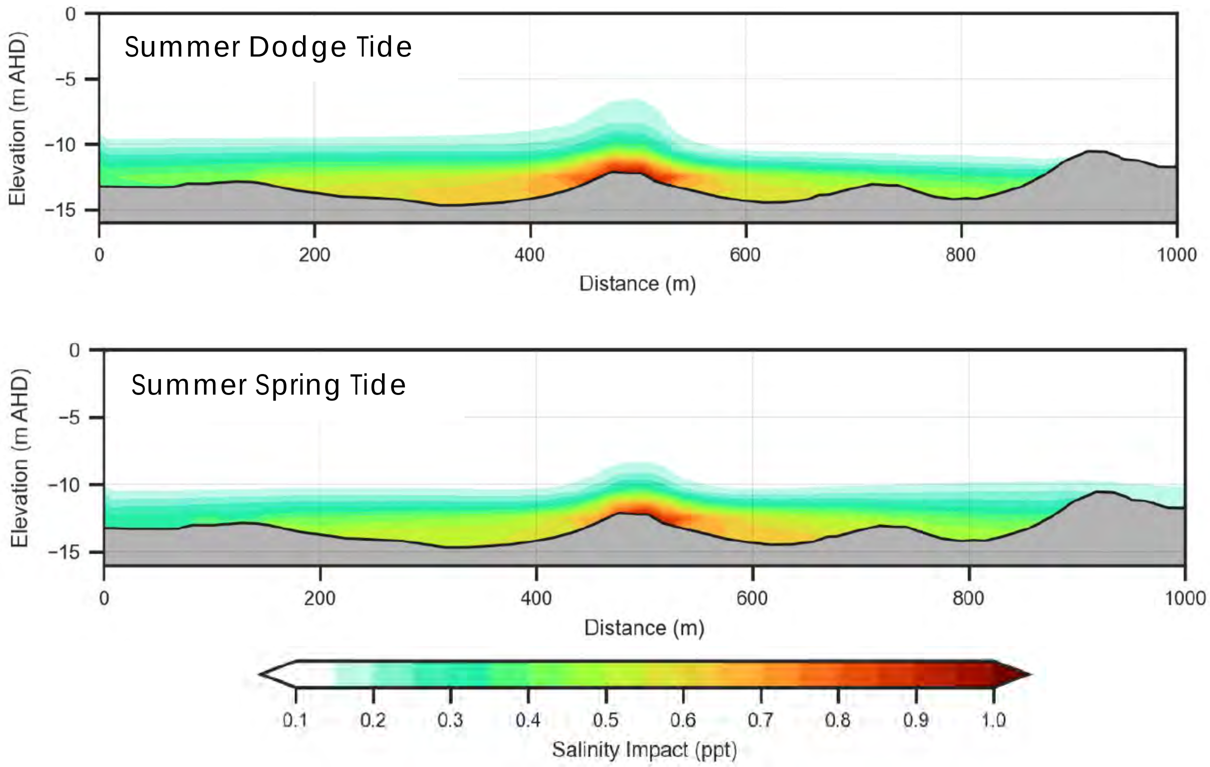


Figure 8.12 Localised salinity pooling around diffuser structure during modelled dodge tide and spring tide conditions during summer (see Appendix L)

Far field modelling provides further understanding of the predicted dispersion of the saline waste on a regional scale (see Appendix J). The far field modelling included examination of the potential for long-term salinity increases in Proper Bay and Boston Bay and further offshore. For the Billy Lights Point location, the modelling predicts that on the basis of the existing hydrodynamic conditions, including currents and tides in the area, the dispersion of the saline plume beyond the discharge point would result in a seasonally averaged salinity elevation of 0.26 psu (equivalent to <0.7 per cent of ambient) at 500 m and 0.07 psu at one km (equivalent to <0.3 per cent of ambient). The seasonal differences in circulation in the area (see Section 7.9.1.1) result in greater dispersion during winter with salinity increases restricted to Proper Bay and Billy Lights Point. In summer, when water movement is reduced, increases in salinity of 0.05 psu (equivalent to <0.15 per cent of ambient) were predicted to extend further (see Appendix J).

The predicted increase in salinity as a result of the saline discharge needs be considered in the context of the background levels of salinity experienced in Boston Bay and Proper Bay. Inshore waters can be expected to experience fluctuations in salinity on daily, weekly, tidal and seasonal cycles (Smyth & Elliott, 2016). Salinity in coastal regions is influenced by evaporation, rainfall, riverine input and the actions of currents and tides in mixing with wider water bodies. The baseline water quality monitoring in Boston Bay and Proper Bay identifiedmedian salinity ranges from 36.2 to 38.2 psu across the year. On shorter timescales large variations in salinity are also observed across Boston Bay and Proper Bay. Salinity values consistently vary up to one psu across the waters within the bays at any one time during the summer, and frequently at other times of the year (see Section 7.9.2.1.2 and Appendix M). Marine organisms would be exposed to fluctuations in salinity levels as this water moves around the bays. Salinity variations of 0.1 psu and 0.5 psu are also observed on hourly and weekly timescales respectively in the more exposed waters to the south of Boston Island (see Appendix J). Vertical variability within the water column is also observed in the baseline environment, with localised stratification observed resulting in an up to 0.2 to 0.4 psu increase in the bottom layer in comparison with mid-top layers of the water column (see Section 7.9.1.1.3 and Appendix M).

The increases in salinity, beyond the initial mixing zone, remain below the level of natural variation observed off Billy Lights Point. The 40:1 target dilution has been incorporated into the design to protect marine organisms and has been defined on the basis of the results of wide ecotoxicology testing of the response of a range of marine taxa to exposure of saline waste (see Appendix S and Appendix T). However, as changes in ambient salinity have the potential to result in effects on marine organisms (Smyth & Elliott, 2016), the following sections provide a summary and contextual information relating to the predicted sensitivity of marine communities and species present in Boston Bay and Proper Bay to a range of salinity changes.

Seagrass

Tolerance to salinity changes varies between seagrass species and can also vary between populations within a species (Cambridge, *et al.*, 2017; Lirman & Cropper, 2003). High salinity levels can result in several effects depending on the seagrass species, including metabolic responses to osmotic stress and an impaired photosynthetic rate, which can result in reduced growth rates and a decrease in plant health (Blanco-Murillo, *et al.*, 2023).

Studies on some northern hemisphere species indicate high sensitivity of species such as *Posidonia oceanica* to salinity changes, demonstrating an effect of high salinities on seedling growth (Fernández-Torquemada & Sánchez -Lizaso, 2013), and on growth of adults (Blanco-Murillo, *et al.*, 2023; Ruíz, *et al.*, 2009), which can impair seagrass meadow expansion and recovery. *P. oceanica* does not occur in Australian waters and is endemic to the Mediterranean Sea.

Tanner and Drabsch (2021) provide a review of salinity tolerance of Australian seagrass species (and other marine organisms) relevant to the Billy Lights Point region in Appendix O. Evidence indicates *Zostera* can tolerate salinities at 400% greater than that of normal seawater over a short period of time (Kerr & Strother, 1985).

Posidonia australis (as found within Boston Bay and Proper Bay) is considered unsuitable for ecotoxicity testing of salinity impacts given its salinity tolerance capabilities. Studies have demonstrated that *P. australis* can tolerate salinities ranging from 27 - >60 psu reflecting its occurrence in both estuarine and hypersaline habitats. Salinity induced inhibition of photosynthesis was only apparent at approx. 54 psu salinity (Cambridge, *et al.*, 2017; Cambridge, *et al.*, 2019) and no impacts on leaf growth in tests on Boston Bay *Posidonia* was apparent with salinities up to 57 PSU (Tyerman, *et al.*, 1984). *P. australis* is also present in the Upper Spencer Gulf with salinities over 40 psu recorded regularly in summer (Westphalen, *et al.*, 2005).

The design has avoided the areas of dense *Posidonia* beds by placing the diffuser structure further offshore. In addition, the elevation in salinity associated with the operation of the Project would be within the natural salinity variability and is therefore considered to present a very low risk to the seagrass community.

Macroalgae

Deviations of salinity conditions outside of tolerance levels of a particular species can impact on algal productivity (Muñoz, *et al.*, 2023). A recent study on the effects of the Sydney desalination plant on the nearby marine communities indicates that algal turf species may be more tolerant to hypersaline conditions than large species such as the kelp *Ecklonia radiata*, although the impacts on kelp were also characterised as low level and were localised to within 25 mettres from the desalination outlet (Kelaher, *et al.*, 2022).

Ecotoxicological analysis of the effects of desalination plant saline waste has identified that macroalgae species display a low sensitivity to toxicity of saline plumes (see Appendix S)

The macroalgal community in the vicinity of the diffuser structure is characterised by filamentous species and areas of turfing algae. The benthic substrate in the area does not provide habitat for large algal species, which are restricted to the reef habitat found closer to the shore (see Section 7.9.4.1 and Appendix P and Appendix Q).

The elevation in salinity associated with the operation of the Project is therefore considered to present a very low risk to the macroalgal community.

Sessile Benthic Invertebrates

Appendix O includes a review of the varying ability of invertebrate species to tolerate changes in osmotic cell pressure induced by salinity changes, with some taxa responsive to small changes in salinity and others tolerant of large changes (e.g. four psu above ambient). This differing tolerance can result in changes in invertebrate community structure in response to salinity gradients (Smyth & Elliott, 2016; Kelaher, *et al.*, 2022; Riera, *et al.*, 2011).

Clarke *et al.* 2018 presented the results of a long-term Australian study of the responses of marine invertebrates to a desalination discharge. The study identified an impact of the Sydney desalination plant discharge on community structure at locations 30 m from the outfall and 100 m from the outfall. The authors report a negative impact on the recruitment and cover of polychaetes, bryozoans and sponges, which was more pronounced 30 m from the discharge but also significant 100 m from the discharge location. The strongest negative impact was for polychaete tubeworms. Conversely the cover of bivalves and barnacles was greater at the two 'impact' sites (Clark, *et al.*, 2018). The average increase in salinity at the seabed was approximately 1 psu at the near (30 m) outfall location, and 0.8 psu at the far (100 m) location, which the authors note was well within the tolerance levels of the species present. The study concluded that rather than a response to salinity, the change in community composition was more likely to be related to the increase in flow caused by the high velocity diffusers, which would benefit taxa such as barnacles which have fast swimming larvae. In addition, both bivalves and barnacles could benefit from higher flow rates via a faster growth rate which may explain the higher abundance (Clark, *et al.*, 2018). Composition of reef-dwelling invertebrate assemblages has also been found to vary in relation to the discharge from the Sydney desalination plant. Response of sea urchins was species specific with some showing no effects of the discharge and others occurring less frequently near the outlet following the commencement of discharge (Kelaher, *et al.*, 2022). The discharge also had little influence on the occurrence of molluscs and ascidians (Kelaher, *et al.*, 2022).

Some sessile invertebrates are also able to acclimate to long term changes in conditions. For example, the blacklip abalone (*Haliotis rubra*) and greenlip abalone (*Haliotis laevigata*) are able to adapt to salinity of 40 ppt from an ambient level of 34 ppt (Edwards, 2003).

Outside of the immediate area around the diffuser itself, the predicted changes in salinity are within the natural background salinity variability experienced by the benthic organisms. As such, the elevation in the receiving environment salinity associated with the operation of the RO desalination plant is considered to present a low risk to the benthic invertebrate community.

Fish and Other Mobile Species

Unlike marine invertebrates, marine fish are osmoregulators, capable of regulating the amount of salt in their cells (Smyth & Elliott, 2016; Garcia, *et al.*, 2015; Bradley, 2010). Studies assessing the effects of saline discharges from desalination plants on temperate fish assemblages, did not identify impacts on either species abundance or diversity (Whitmarsh , *et al.*, 2021; Kelaher & Coleman, 2022). Long term monitoring at the Sydney desalination plant found only localised (up to 55 m from the discharge) effects on fish species diversity and abundance and that the changes in community structure were associated with an increase in fish richness and functional diversity around the outlet (Kelaher, *et al.*, 2020; Kelaher, *et al.*, 2022).

Other mobile species such as macroinvertebrates can move from the source of stress in order to avoid potential risks posed by osmotic stress. For example, the edible brown crab (*Cancer pagurus*) and the European lobster (*Homarus gammarus*) are able to detect and avoid exposure to excessive salinities (Smyth, *et al.*, 2014). Physiological mechanisms to cope with salinity increases are common in macroinvertebrates, such as modification in metabolism in response to higher salinities (e.g. reduction in activity and oxygen consumption) (Smyth & Elliott, 2016), allowing the organisms to survive fluctuating salinity levels (Bermudes & Ritar, 2008) which are often encountered in the nearshore marine environment (e.g. rock pools).

The elevation in salinity associated with the operation of the desalination plant is therefore considered to present a very low risk to the fish community and mobile marine invertebrates.

Blue Mussels

Salinity variation can result in physiological, biochemical and metabolic responses in marine organisms including bivalves such as mussels and these responses can influence feeding activity and ultimately growth rate and animal health (Westerbom, *et al.*, 2002; Widdows & Shick, 1985).

The salinity within Boston Bay and Proper Bay varies throughout the year but generally remains in the range 36-38 ppt (see Section 7.9.1.1). Experimental studies have provided evidence that while cell damage is avoided, a change in metabolic capacity can be induced in *M. galloprovincialis* by exposure to salinities 5 units outside the ambient level (30) to which the mussels had been previously acclimatised (Freitas, *et al.*, 2019; Freitas, *et al.*, 2020). The biochemical responses observed in the study were more pronounced to lower salinity levels (reduction to 25) than an increase (to 35).

Similarly, (Coppola, *et al.*, 2022)demonstrated that *M. galloprovincialis* is able to tolerate high salinity conditions (40) without displaying significant alteration in metabolic activity (compared to a control salinity of 30) or experiencing cellular damage, but they observed that this extreme salinity was associated with an increase in antioxidant defence activity.

While only limited studies have looked at the effects of high salinity on mussels, several studies have investigated the growth of *Mytilus* along salinity gradients and have observed a decline in size and biomass as salinity levels decreased towards the margin of tolerance limits (Westerbom, *et al.*, 2002; Riisgård, *et al.*, 2012; Riisgård, *et al.*, 2014)although the populations investigated in these studies are acclimated to much lower salinity levels (e.g. 3-30 psu in the Baltic Sea) than those experienced in South Australia. Populations from the Adriatic Sea investigated by (Hamer, *et al.*, 2008), experience salinities ranging from 4 psu to 38 psu, depending on the location within the estuary, were found to display low growth rates and increased mortality in response to hyposaline stress (i.e. exposure to abnormally low salinities).

Significant effects of altered salinity have also been detected on the immune system of *Mytilus*. Low salinity (-10 ppt) had a significant effect on the immune response of *Mytilus coruscus* collected from coastal waters of Zhejiang Province, China (with an ambient salinity around 25 ppt) whereas no effect was detected from the high salinity (+10 ppt) (Wu, *et al.*, 2018).

In support of this development application an ecotoxicology assessment of the effects of salinity on Spencer Gulf reared *M. galloprovincialis* has been carried out by Hydrobiology on behalf of SA Water (see Appendix T). The study utilised saline discharge from the Adelaide Desalination Plant (ADP) and followed international guidelines to conduct 72 hour larval development tests. The ADP saline discharge had a salinity concentration of 64.9 ppt and was serially diluted with filtered seawater to achieve a range of test concentrations as well as a number of required control conditions. The results indicated that the salinity threshold for *M. galloprovincialis* larval development was 38-39 ppt. The testing results were consistent with previous results from testing conducted in 2011-13 (see Appendix S) and indicate a 'safe dilution' of 31.3-31.8 (of ADP saline discharge) to protect the receiving environment, including mussels, from potential toxicity effects related to an increase in salinity.

The incorporation into the design of a minimum 40:1 dilution of the saline discharge from the diffuser structure results in a rapid dilution and decrease in salinity to levels which are within a small distance of the diffuser within the natural variability of the local environment. The predicted discharge plumes (associated with median and 95th percentile conditions) demonstrated that no elevation in salinity was measurable at the nearest aquaculture lease located to the south of Billy Lights Point (see Figure 7.13). Further to this, the discharge position is located within sediment rather than reef driven habitat with no mussel reefs identified within the Project site during the habitat survey/s. The elevation in salinity associated with the operation of the RO desalination plant is therefore considered to present a low risk to the blue mussel population and associated industry.

Salinity above ambient
- 0.2
- 0.2-0.3
- 0.3-0.5
- 0.5-0.7
- 0.7-0.9

- 95 Percentile Plume Extent (Januaury)
- Finfish
- Intertidal Mollusc Oysters
- Production Lease (Finfish)
- Production Lease (Intertidal Oysters)
- Production Lease (Subtidal Mussels)
- Subtidal Mollusc Mussels
- Bathymetry
- Proposed Developement

N

Eyre Peninsula Desalination Project 95 Percentile (Summer) Saline Waste Footprint

SA Water

Government of South Australia

0.5 0.25 0 0.5 1 1.5 2 Kilometres

Salinity above ambient

- 0 - 0.2
- 0.2-0.3
- 0.3-0.7
- 0.5-0.7
- 0.7-0.9

- 95 Percentile Plume Extent (August)
- Finfish
- Intertidal Mollusc Oysters
- Production Lease (Finfish)
- Production Lease (Intertidal Oysters)
- Production Lease (Subtidal Mussels)
- Subtidal Mollusc Mussels
- Bathymetry
- Proposed Developement

N

Eyre Peninsula Desalination Project
95 Percentile (Winter) Saline Waste Footprint

SA Water

Government of South Australia

0.5 0.25 0 0.5 1 1.5 2 Kilometres

Yellowtail Kingfish and Tuna

Yellowtail kingfish experience a wide range of natural salinity conditions within Spencer Gulf. The wild and (historically) farmed populations in the north of the gulf experience hypersaline conditions (see Section 7.9.1.1). The salinity at Fitzgerald Bay ranges between 39 to 42 ppt compared to 35 to 36 ppt in the oceanic waters offshore the Port Lincoln area (Stone, *et al.*, 2014). The energetic cost of the increased need for osmoregulation (maintaining salt and water balance within the body) at higher salinities contributes to a lower growth rate in the northern gulf. Juvenile yellowtail kingfish exhibited reduced survival and growth rates when placed in salinity concentration in excess of 41 ppt (Stone, *et al.*, 2014).

The predicted elevation in salinity associated with the operation of the RO desalination plant is within the natural variability of the system with minimal increases on the seabed expected in the vicinity of the fin fish aquaculture leases (see Figure 8.13). The median or 95th percentile discharge plumes predicted in the mid-field modelling do not intersect with the closest fin fish lease (approx. 2.7 km) from the outfall location. The tuna leases are located at a further distance the other side of Boston Island. The regional modelling predicts only an up to 0.07 psu increase is expected at one km from the discharge point (see Appendix J). The elevation in salinity associated with the operation of the RO desalination plant is therefore considered to present a very low risk to the yellowtail kingfish and tuna stock.

8.3.7.3.2 Elevated temperature due to discharge of saline waste

The RO desalination process would result in a saline waste stream which has a temperature marginally higher than the source water abstracted at the intake structures. The difference between the ambient water temperature off Billy Lights Point and the temperature of the saline waste is predicted to be 1˚C. The modelling predicts that this would result in a temperature increase of 0.03˚C within the near-field receiving environment, when diluted to 40:1 (see Appendix L).

Marine organisms can be impacted if temperatures exceed preferred thermal ranges (Koehn, *et al.*, 2011). The distribution of each species within the mussel genus *Mytilus* for example is primarily driven by temperature tolerance (Seed & Suchanek, 1992), with *M. galloprovincialis* maintaining growth rates at relatively higher temperatures than other species. Experiments show a similar upper thermal tolerance across *Mytilus* species of around 28-30˚C (Kamermans & Saurel, 2022; Anestis, *et al.*, 2007). At higher temperatures mussel metabolism and immune system is impacted (Matozzo, *et al.*, 2012) and beyond a certain temperature (around 30˚C) the mussels do not survive prolonged exposure (Kamermans & Saurel, 2022). The water temperature in Boston and Proper Bay within the baseline environment remains well below this level, varying across the year within the range 16-22˚C (see Section 7.9.2).

The increase in water temperature in the benthic environment adjacent the desalination plant diffuser structures is predicted to be around 0.03˚C, which is well within the baseline variability temperature in Boston Bay and Proper Bay (see Section 7.9.2) and is therefore considered to present a very low risk to the marine environment.

8.3.7.3.3 Reduction in dissolved oxygen as a result of stratification induced by discharge of saline waste

Discharge of saline waste from the outfall diffusers has the potential to induce stratification of the water column. Stratification occurs when the water column is divided vertically into distinct layers based on the density of the water, resulting from differences in salinity (halocline) and/or temperature (thermocline). Prevention of mixing between the layers due to the density barrier can result in lowered dissolved oxygen levels in the bottom layer, when oxygen consumed via respiration is not able to be replaced. Stratification is observed within the baseline environment in Proper Bay and Boston Bay (see Section 7.9.1.1.3 and Appendix M).

The design and placement of the diffuser structure work together to minimise stratification, by optimising mixing of the saline waste in the near-field zone so the salinity increase at the seabed is small (less than one ppt). The temperature difference between the ambient environment and the saline waste is predicted to be around 0.03˚C. However, the modelling does indicate some localised stratification associated with the saline discharge at certain periods. The denser saline waste 'pools' in local bathymetric depressions surrounding the relatively raised diffuser location. Dodge tide periods show reduced flushing of the saline discharge compared to the spring tide periods. While adverse impacts on marine organisms in this localised area could result from a reduction in dissolved oxygen levels, the modelling demonstrates that while the flushing times are slightly reduced there is still some mixing, the dissolved oxygen levels of the saline waste would be high given the initial mixing and the salinity elevation is within natural variability and species tolerances limits.

Behavioural responses by fish and mobile invertebrates would enable these taxa to avoid impacts (Wu, 2002; Bell, *et al.*, 2003), and planktonic organisms would experience only short-term exposure to any lowered oxygen levels, in particular noting the effect would be restricted to the bottom layer only. The location of the diffuser structure has been chosen to avoid the sensitive dense seagrass beds, however macroalgae and sparse seagrass occurs within the area of potential stratification. Sessile invertebrates, seagrass and macroalgae cannot move away from stressors such as lowered dissolved oxygen levels.

Many benthic invertebrate species display behavioural responses to hypoxia (low oxygen levels) such as alteration in position in the sediment or water column to higher oxygenated areas, moving from burrows and tubes, and some bivalves stretch siphons into the water column to access higher oxygen concentrations (Vaquer-Sunyer & Duarte, 2008). A range of metabolic adaptations have also been observed such as a reduction in metabolic rate and activity, and shifting to anaerobic respiration for periods of hours to days, which is a widespread adaptation across bivalves, polychaetes, echinoderms and crustaceans (Vaquer-Sunyer & Duarte, 2008). Different tolerance levels to low oxygen are found in different taxa, with sessile taxa such as worms, echinoderms, and molluscs more tolerant than crustaceans and fish (Vaquer-Sunyer & Duarte, 2008). A persistent reduction in dissolved oxygen levels may result in a change in community structure such as a shift to an increase in abundance of tolerant taxa.

Mussels are capable of anaerobic metabolism (Díaz & Rosenberg, 1995; Taylor, 1976) and can also close their valves in response to low oxygen levels to avoid stress (Hutchison, *et al.*, 2016). Survival in anaerobic conditions has been report for periods of several weeks (Zandee, *et al.*, 1985). *M. galloprovincialis* is tolerant of a wide range of oxygen conditions, although this is associated with a metabolic cost and lowered growth rate (Hamer, *et al.*, 2008).

Given Boston Bay and Proper Bay experience stratified conditions in the existing situation (see Section 7.9.1.1.3), the communities are expected to be composed of species with an existing level of tolerance, behavioural and physiological mechanisms, to short term dissolved oxygen fluctuations. The potential for stratification leading to lowered dissolved oxygen as a result of the operation of the RO desalination plant is predicted to be restricted to an immediate localised area around the diffuser structure. A reduction in dissolved oxygen arising from saline discharge is considered to present a low risk to the marine environment.

8.3.7.3.4 Elevated concentrations of pre-treatment and cleaning chemicals in the saline waste

The pre-treatment system is a critical part of the desalination process (see Section 3.2) and involves removal of particulates using physical filtration and chemical treatment. This limits the negative impact of factors such as suspended solids, scale, and microorganisms to which the reverse osmosis process is sensitive too. Chemicals are also required to clean filter membranes during backwash and to flush pipelines. No coagulation chemicals would be used in the pre-treatment process. Chemicals to be used during pre-treatment would be determined during the detailed design process but would likely be a combination of:

- sodium hydroxide (NaOH)
- sodium bisulphite ($NaHSO_3$)
- citric acid ($C_6H_8O_7$)
- sulfuric acid (H_2SO_4)
- chlorine (either sodium hypochlorite or chorine gas).

Chlorine can have broad environmental effects both as a sterilising agent and through the production of halogenated by-products as a result of reacting with organic constituents of seawater. The chlorine dosing point is located far enough downstream of the intake screen so that, in the event of a power failure, the likelihood of the chlorine leaking into the marine environment would be minimal. The free chlorine would be neutralised (de-chlorinated) by dosing with bi-sodium phosphate in order that there is no active chlorine present in the saline concentrate. Monitoring would be undertaken of all chemicals to ensure no releases above established EPA limits.

Waste chemicals would be disposed of through the pretreatment backwash balance tank which allows flow to be controlled and neutralised prior to discharge.

The reverse osmosis membranes would also require periodic cleaning to retain performance. The membrane CIP system would remove all forms of fouling from the membranes via a mixture of acids and alkalis. CIP chemicals are often dependent on the proprietary system selected during detailed design but would likely be a combination of:

- sodium hydroxide (NaOH)
- sodium laurisulphate ($NaC_{12}H_{25}SO_4$)
- sodium triphosphate ($H_3Na_2O_{10}P_3$)
- bi-sodium phosphate (Na_2HPO_4)
- sodium bisulphite ($NaHSO_3$)
- citric acid ($C_6H_8O_7$)
- hydrochloric acid (HCl).

Antiscalant would be dosed at the lowest rates possible to the feed of the reverse osmosis membranes to prevent scale build up on the membrane surface due to the highly saline concentrate stream. The antiscalant chemical is passed through to the concentrate stream and is disposed to the outfall.

Previous ecotoxicity testing confirmed the main driver of potential stress on marine organisms from desalination plant discharges is the increased salinity concentration. However, chemicals which may be released in the discharge also have the potential to have adverse effects on marine organisms. There is evidence that the effects on marine organisms from the RO desalination plant saline waste are different when compared to effects of changes solely in salinity e.g. in the seagrasses *P. australis* (Cambridge, *et al.*, 2019) and *P. oceanica* (Blanco-Murillo, *et al.*, 2023). Ecotoxicology assessments, including the assessments for the ADP, have included tests of chemicals associated with RO desalination processes and these do indicate some toxicity at high concentrations (see Appendix S).

A review of the results of large seawater desalination plant discharge studies undertaken in Australia (e.g. ADP, Perth Desalination Plant) identified that the effects of salinity are considered the main source of the observed toxicity associated with discharge of desalination plan saline waste (see Appendix S). The chemicals that are potentially toxic to the receiving environment are discharged in such low concentrations they have little to no toxic effect and are considered negligible given the required dilution to reduce saline discharge toxicity to acceptable levels (see Appendix S).

Discharge of any chemicals to the environment requires EPA approval and plant operation would need to comply with the conditions of a discharge licence. The chemicals to be used for the cleaning process, including anti-scalents, have all been subject to ecotoxicology testing. Any chemicals that may be considered for discharge within the saline waste would need to meet dilution requirements as per the previous ecotoxicology assessments (Appendix R). Where alternative chemicals to those currently approved by the EPA are considered, a full ecotoxicology assessment would be required similar to those undertaken previously. All use of chemicals would be carefully monitored to ensure there are no releases above required EPA limits. Screens and equipment would be maintained in order that the plant would run efficiently and achieve the dosing and dilutions predicted. Discharge of pre-treatment and cleaning chemicals is therefore considered to present a low risk to the marine environment.

8.3.7.3.5 Elevated suspended solid concentrations due to discharge of saline waste

The hydrodynamic modelling (see Appendix L) has examined the potential for total suspended solid (TSS) levels to be elevated through the operation of the plant. An increase in suspended solids could cause a visual impact and also limit light penetration to photosynthetic organisms (see Section 8.3.7.2.2).

The TSS in the baseline environment are generally low. Median values at monitoring stations in Proper Bay and Boston Bay range from 0.480 to 0.530 mg/L which is indicative of clear water. The modelling has assumed a worst-case scenario of 1.4 mg/L. The difference in total suspended solids between the inlet water and the outlet concentration is assumed to be a 1:1.9 ratio (see Appendix L). On the basis of these assumptions the modelling predicts that the sediment concentrations immediately adjacent the diffuser structure would increase by up to 0.08 mg/L (99th percentile situation) and then decrease to below the level of detection. This means that a 'worst case' scenario may see a five per cent increase in total suspended solids in the immediate vicinity of the diffuser structure, but outside this increases would generally not be detectable. The discharge of elevated suspended solids is therefore considered to present a very low risk to the marine environment.

8.3.7.3.6 Discharge of concentrated natural elements in saline discharge leading to elevation in nutrients

Fluctuations in the level of nutrients in the water can have significant impacts on the biology of coastal systems. The reliance of the phytoplankton community and response to nutrient fluctuations is discussed in Section 7.9.4.1.5. Release of elevated levels of nutrients such as nitrogen, phosphorus or iron following concentration in the desalination process has the potential to disrupt the phytoplankton community via a stimulation in growth.

The levels of nutrients in the baseline environment are low, and remain well below the ANZG (2018) and ANZECC/ARMCANZ (2000) guideline values. Given the low levels at the inlet location and the design of the diffuser structure providing a rapid 40:1 dilution of the discharge, the concentration of natural elements in the treatment process and discharge of elevated nutrient levels is considered to present a very low risk to the marine environment.

8.3.7.3.7 Discharge of concentrated heavy metals in the saline waste leading to elevation in heavy metal concentrations

The RO desalination process could also concentrate heavy metals which are present naturally in the seawater. Metal concentrations in Proper Bay and Boston Bay are below ANZG (2018) and ANZECC/ARMCANZ (2000) guideline values with the exception of copper (see Section 7.9.2.1.2).

Given the low levels at the inlet location and the design of the diffuser structure providing a rapid 40:1 dilution of the discharge, the concentration of natural elements in the treatment process and discharge of elevated heavy metal levels is considered to present a very low risk to the marine environment.

8.3.7.3.8 Entrapment or impingement of marine organisms through intake structure

Impingement occurs when marine fauna such as fish and mammals become trapped against intake screens by the force of water flowing through an intake. Mobile organisms could also actively swim into an intake and become trapped in the pipeline; this is termed entrapment. A key requirement of the design of the intake structure therefore includes the requirement to maintain intake velocities (allowing for marine fouling) below 0.15 ms^{-1}, which allows fish and other mobile species to avoid impingement and entrapment. This velocity criteria was established through research undertaken by the United States Environmental Protection Agency. It is considered best practice and has been adopted by desalination plants across the world. To prevent larger species entering the intake structures 90 mm spaced bars cover the open apertures (see Section 3.1).

Should smaller species swim into the intake pipe the low approach velocity allows fish to escape. The intake screens would be three to four m above the seabed. The raised intake tower would also avoid the possibility of benthic species such as crabs and lobsters having contact with the intakes. Entrapment and/or impingement during intake of water is therefore considered to present a very low risk to the marine environment.

8.3.7.3.9 Entrainment of marine organisms, including larvae, during intake of seawater

Entrainment occurs when marine organisms enter a seawater intake. Passive organisms such as marine larvae, fish eggs and other plankton are most sensitive to entrainment, whereas larger marine fauna can actively swim to avoid entrainment (Missimer & Maliva, 2018).

Organisms within the local environment which may be at risk of entrainment through the desalination plant intake may include larvae, juveniles and eggs of ecologically and commercially important fisheries species and aquaculture species such as blue mussel (see Section 7.9.6.1). The potential for entrainment of larvae and juvenile stages of taxa restricted to the benthic zone (e.g. blue swimmer crab) would be lower in comparison to than those of pelagic species (e.g. blue mussel, fish eggs and larvae) because the intake screens are raised above the sea bed by three to four m.

Particle tracking modelling, using the predictions of the far-field hydrodynamic modelling, has been undertaken to simulate larval transport and investigate the potential for entrainment of larvae through the intake structures, with particular reference to blue mussel larvae given the mussel aquaculture industry relies on settlement of natural mussel spat to provide stock for production (see Appendix J and Appendix K). The assumptions for the modelling were based on expert advice, data acquired from peered review scientific literature and discussions with local mussel farmers. Mussel spawning and the behaviour of early life stages in the context of the aquaculture industry are discussed in Section 7.9.6.1.

Particle tracking modelling assumed blue mussels were distributed across the intertidal zone of the rocky coastline and simulated five monthly spawning events (May-September) of five days duration each. These mussel spawning events were simulated across three years to account for interannual differences in circulation patterns. The modelling was initially undertaken in 2023 (Appendix J) and then rerun in 2024 with the number of particles released increased by a factor of 10 to further increase the statistical confidence in the results (Appendix K). The modelling calculated the percentage of particles (representing larvae) with connectivity to the intake pipe assuming an entrainment radius of 25 m. An example of a spawning event in May 2016 is illustrated in Figure 8.15.

The percentage of particles from each release point (representing spawning locations) along the coastline which come within the 25 m radius of the intake is illustrated in Figure 8.16. On both occasions the modelling predicted that less than 0.1 per cent of the particles released were at risk of entrainment within the intake. Small scale increases in slightly higher connectivity values were observed in the area within two km of the intake, but these values remain low (approximately 0.6 per cent). These simulated results indicate that very low numbers of spat resulting from blue mussel spawning along the coast of Proper or Boston Bay would be at risk of being drawn into the intake structure.

The mortality rate for marine invertebrates in the early life stages is high, up to 99 per cent for bivalves (Gosselin & Qian, 1997) and 1.5 per cent survivorship (i.e. 98.5 per cent mortality) within the first 30 days for crab and barnacle larvae (White, *et al.*, 2014). During the initial pelagic life stage the larvae of blue mussels are exposed to predation by adults of their own species and a range of organisms such as carnivorous zooplankton, adult and fish larvae, and other marine fauna such as jellyfish (Seed & Suchanek, 1992). The significant reproductive output of *Mytilus* (see Section 7.9.6.1) means the large number of planktonic eggs and larvae can represent an important food source for marine fauna, resulting in a loss of a significant proportion of larvae. Predation rates increase with length of time spent in the pelagic stage (Chícharo & Chícharo, 2000) which can vary between two to four weeks in *M. galloprovincialis*. Benthic predators such carnivorous gastropods and sea stars then further reduce the abundance of mussels following settlement (Paine, 1974; Montes, *et al.*, 2021).

Transport to offshore regions also results in the loss of a significant proportion of larvae (Chı́charo & Chı́charo, 2000; Montes, *et al.*, 2021) as demonstrated within the particle tracking modelling. Within the local Boston Bay area there would also be loss of larvae via other mechanisms such as predation by fish within pens and seawater intakes such as the intake to the recirculation system supplying an oyster hatchery on Point Boston.

While the particle tracking modelling showed potentially 0.1 per cent of all particles released were at risk of entrainment within the intake, the model is conservative in that mussels are not passive particles. *M. galloprovincialis* have the ability to orientate and swim within the water column. While not fully understood, larvae at different stages are able to respond to triggers/ stimuli such as turbulence (associated with coastal waves) and pressure changes (associated with depth) which cause larvae to switch to vertical movement and/or change migration behaviour (Bayne, 1976). Coupled with settlement studies having shown that mussels would settle on practically any stable substratum if the rugosity the surface is roughened or pitted (Bayne, 1976; Gosling, 2003),the intake structure and the rock armour around the anchor blocks and pipelines would significantly increase the area available for future mussels to settle and to release more propagules. While a proportion of these spat would be at risk of being entrained through the intake, the increase in available spat, additional adults releasing spat and the large distance particles can be carried (as demonstrated within the particle tracking model) show that potential impacts would likely be mitigated and may increase the available propagules within the local area. The potential change in the relative abundance of mussel spat available for recruitment on mussel farm settlement ropes is therefore considered minimal.

The particle tracking modelling would remain applicable to other species spawning over the same May-September period. Other marine larvae, fish eggs and other plankton are expected to be entrained at a similarly low rate in comparison to natural mortality (Barnthouse, 2013). In common with marine invertebrate larvae, fish eggs are also subject to high rates of natural mortality (Bunn, *et al.*, 2000).

Entrainment during intake of water is therefore considered to present a low risk to the marine environment.

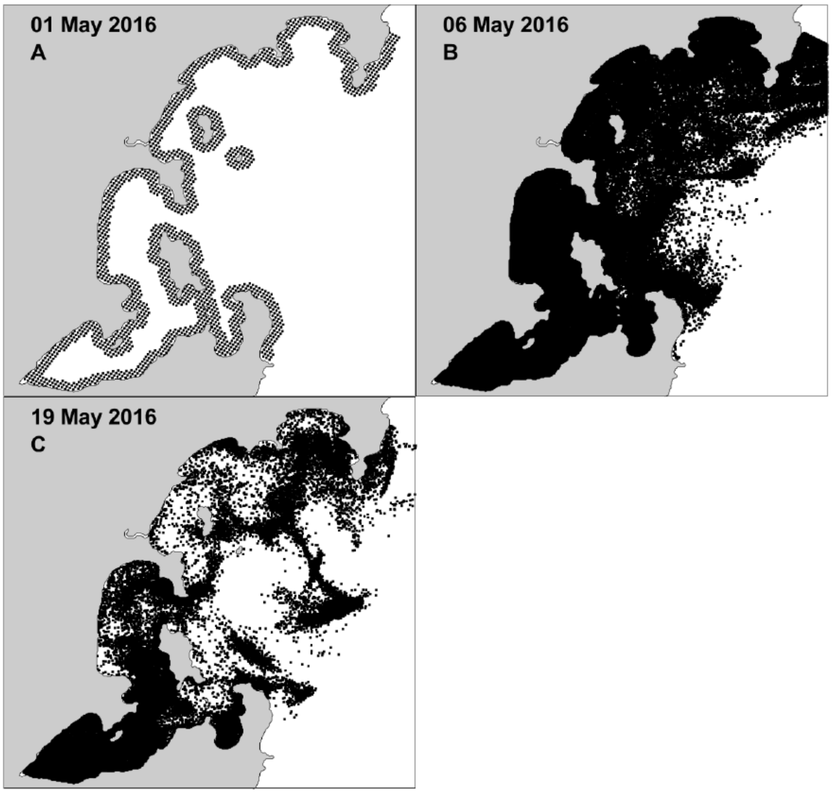


Figure 8.15 Simulated spawning event in May 2016. A) Initial distribution corresponding to release locations within 1 km of the coast. B) Distribution on day 6. B) Distribution on day 20 (see Appendix J)

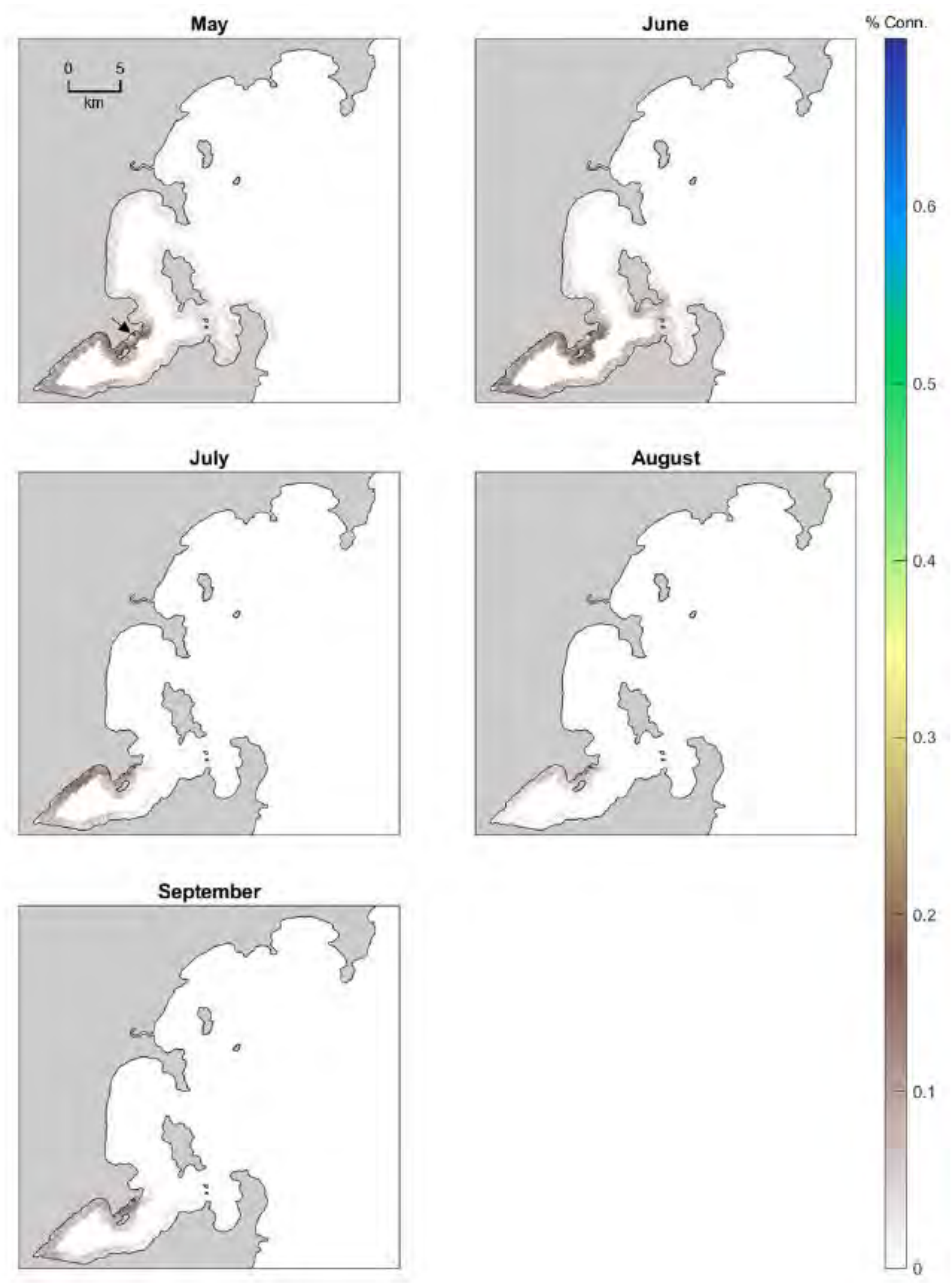


Figure 8.16 Percentage of larvae from each release point which came within 25m of the model intake (monthly averaged distribution for each spawning event averaged over three years) (see Appendix J)

8.3.7.3.10 Interruption or alteration of natural hydrodynamic coastal processes by the presence of pipeline and/or rock armour

The permanent infrastructure in the marine environment would comprise the two intake structures, the outfall diffuser structure and the lay on bed intake and outfall pipes which extend from the tunnelled section to these structures. The pipelines (900 mm diameter) would incorporate concrete collars to stabilise them on the seafloor. Rock armour would also be used to stabilise the sediment under the intake/outfall structures and the concrete collars. The presence of permanent infrastructure on the seabed can result in changes to coastal processes depending on the type of structure and the existing coastal processes. The initial approximately 500 m of the pipelines are tunnelled and remain below the seabed which significantly minimises any effects.

The presence of the pipeline infrastructure may cause near-field disturbance to the near-bed currents. This may result in increased localised current speed over the pipeline(s) and decreased current speed at the upstream side of the pipe (see Appendix L). There is currently little evidence of any significant sediment transport occurring at the proposed development site (see Appendix L). Currents due to wave action during major storm events remain low and have very limited capacity to readily move sediment. Any alteration of near-bed currents would be restricted to a localised area around the infrastructure and therefore little to no overall impact on sediment transport or larger scale current circulation within Proper Bay are considered likely (see Appendix L).

Potential impacts on sediment transport are expected to be localised around the concrete collars and other structures (e.g., some sediment could accrete / erode around the concrete collars to a small degree).

Alteration of coastal processes by the presence of the permanent Project infrastructure is therefore considered to present a low risk to the marine environment.

8.3.7.3.11 Noise and/or vibration from operational activities

Underwater noise from the Project during operation would be limited to noise from the marine intake and outfall pump station. Potential impacts of noise on marina fauna during operation have been included in the noise modelling presented in Appendix U. It should be noted that the marine intake and outfall pump station is located onshore and therefore only amphibious mammals (e.g. sea lions, seals) and reptiles (e.g. marine turtles) could approach the pump station area. Threshold distances of less than 10 m are identified i.e. an individual marine animal would need to remain within a 10 mradius of the marine intake and outfall pump station for a full 24 hour period to be at risk of hearing damage. The underwater noise and/or vibration produced during operation of the Project is considered a very low risk to marine organisms.

8.3.7.3.12 Operational exclusion zone restricting access for recreational and commercial fishing operations

Operation navigational requirements and decisions on whether exclusion zones would be required around intake and outfall structures would be dependent on guidance from DIT. Other SA Water sites have created "no anchor zones" to protect the infrastructure on the seabed but have not excluded marine vessels from transversing the area. Risks to other vessels and marine users from operation are considered very low risk.

8.3.7.4 Marine Environment Residual Risk Assessment Summary

Table 8.37 provides a summary of the risk assessments undertaken for potential marine impacts associated with construction and operation of the Project.

Table 8.37 Summary of risks associated with construction and operational phases

Effect Pathway	Mitigation and Monitoring	Residual Risk
Construction Phase		
Habitat removal and/or disturbance during installation of intake/outfall	The design of the marine infrastructure avoids significant impacts to the coastal, intertidal and nearshore zone (and includes avoiding dense *Posidonia* beds which run to approximately 430 ms) through adoption of a tunnel delivering the pipelines to approximately 500 m offshore. From this point the pipelines transition from the tunnel and the two intake and single outfall pipelines run approximately 530 m on the seabed to their intake and discharge locations. The location of the above surface marine infrastructure has been established in consideration of marine benthic habitat mapping (see Appendix P and Appendix Q) undertaken across the Project site, and placement of the pipelines, intake and diffuser structures will avoid sensitive seagrass beds. A program of fish surveys has documented the presence of mobile species in the Project site (see Appendix R). Dredging activity would only occur following approval of the appointed Contractors Dredge Management Plan (DMP) by the EPA. The DMP will identify potential environmental risks associated with proposed dredging work and include all practical measures to avoid and minimise impacts, including measures such as avoiding sensitive habitat (e.g. seagrass) during anchoring and minimising movement of anchor points. The construction footprint will be reduced as far as practicable (to within an assumed 30 m footprint along the lay on bed pipeline alignment, and an approximately 0.8 ha area at the tunnel retrieval/pipeline transition zone as well as small footprints at the intake structures) with dredging kept to a minimum. The management measures and monitoring requirements within a DMP will ensure impacts outside an approved construction footprint are avoided. The DMP will also be required to document the method of disposal of the dredge spoil and the measures which will be taken to protect the marine environment. A post construction habitat survey will be undertaken to verify the construction footprint remained within the defined areas outlined in the DMP and to document recovery in the area post-construction. The area of expected impact is being constrained to as low as reasonably practicable.	Medium (ALARP)
Sediment disturbance resulting in increased turbidity or concentration of suspended sediments	The proposed tunnelling method (to be used for the first 500 m of the pipeline) will reduce the risk of impacts associated with the marine construction activities. A preliminary assessment of the physical properties of the marine sediments in the Project site has been made (see Appendix N) and detailed geotechnical investigations are proposed which will inform dredging methods and water quality management measures. The sediment characterisation highlighted sediments are predominantly sands and gravels. Sand, due to its grain size and weight, will usually settle out of suspension quickly when compared to silts and clay fine particles. This reduces the potential for increased suspended solids outside of the construction zone of influence.	Low

Effect Pathway	Mitigation and Monitoring	Residual Risk
	The appointed marine works Contractor will use best industry practice to minimise the dredging and trenching footprint. A dredge (including excavation and trenching marine works) management plan will be prepared defining operational protocols for dredging in order to ensure minimal harm to marine ecosystems.	
Sediment disturbance resulting in release of nutrients, contaminants, or algal cysts	A sediment sampling and analysis plan has been implemented to characterise the quality of the sediments in the construction and dredging area against the National Assessment Guidelines for Dredging (NAGD), and no contaminants of concern were identified at levels above the NAGD criteria (see Appendix N). As discussed previously, there is low potential for algal cyst seed beds within sand substrates, but all dredge material will be removed and not returned to the seabed. The rock armour and fill used to provide a stable platform for the pipeline will also reduce the interaction of the existing sediments by effectively 'capping' the sediments underneath and reducing further any potential for algal cysts to be released into the future.	Low
Noise and/or vibration from construction activities	Underwater noise modelling has been completed to assess the potential for impacts on marine fauna from construction activities which will generate underwater noise such as dredging and piling (see Appendix U). The modelling outcomes inform a range of management and mitigation measures which will be required to be adhered to in order avoid impacts to marine mammals. Mitigation measures include use of Marine Mammal Observer to visually monitor for the presence of marine mammals, establishment of shut down and observation zones, and standard operating procures. These measures will be included in the CEMP and DMP.	Low
Hydrocarbon and chemical spills and disposal of waste from construction activities	Precautions will be taken to minimise and contain any contaminants from dredging and construction equipment and storage tanks shall be bunded. The selected Contractor will have a Spill Management Plan and Emergency Response Plan containing contingency measures in the event of an accident. The Contractor will also have an active Waste Management Program which will seek to reduce, remove or reuse chemicals or waste from the Project site.	Very low
Introduction of marine pest species	A DMP will include biofouling mitigation methods and a Ballast Water Management Plan to be implemented by each vessel on site.	Very low
Temporary construction exclusion zone restricting access for recreational and commercial fishing operations	Any construction exclusion zone will be of a short duration and only in place whist the construction works are being undertaken. Mitigation measures will include notification in the local paper of likely construction periods prior to marine works. The exclusion zone will be limited to the area immediately around the intake/outfall structure construction works.	Very low
Operational Phase		
Elevated salinity in receiving environment due to saline discharge from outfall diffusers	A dilution criteria of a minimum of 40:1 has been incorporated into the design which has been conservatively recommended as providing a safe dilution level of the saline waste through ecotoxicology studies (see Appendix S and Appendix T). The ecotoxicology studies include assessment of the effects of the desalination discharge on species relevant to the Project site, including the blue mussel. Near-field, mid-field and far-field hydrodynamic modelling, validated against metocean measurements made over a period of two years, was used to predict the dilution of the saline waste discharged from the outfall diffuser structure see Appendix J and Appendix L). The modelling has informed changes to diffuser structure and placement on the	Very low (seagrass, macroalgae, Fish/mobile species, fin fish aquaculture stock)

Effect Pathway	Mitigation and Monitoring	Residual Risk
	seabed during the iterative design process. The modelling outcomes confirm the minimum dilution target is met under the proposed design. A program of water quality monitoring, which commenced in 2021, is ongoing and will supplement existing data on the local conditions within Boston and Proper Bays (see Appendix M). Continuous monitoring will be carried during operation (see below) to continue to record conductivity, temperature, dissolved oxygen, current speed and current direction at a variety of sites around the diffuser and calculate the dilution achieved. The purpose will be to establish the dilution at the edge of the mixing zone under a range of current, tide, wind and discharge conditions. Additional ecotoxicology assessments are proposed which will investigate the effects of longer-term exposure (21-day juvenile mussel *Mytilus galloprovincialis* growth test) of the saline discharge on blue mussels. An Operational Environmental Management and Monitoring Plan will be developed that incorporates a monitoring program in accordance with the development application approval and EPA licensing requirements. The monitoring program shall include: 1 process monitoring to confirm that performance is within acceptable range (as supported by environmental assessments); 2 discharge water quality monitoring; 3 diffuser performance validation; and 4 habitat / receiving environment monitoring and water quality. Further details of the proposed operational monitoring are provided in Section 8.3.8. The scope of the monitoring program will be developed in collaboration with the EPA. SA Water shall demonstrate through modelling and field measurements that the outfall design system achieves the required mixing and dispersion requirements.	Low (sessile benthic invertebrates; mussel aquaculture stock)
Elevated temperature in receiving environment due to release of saline waste	The RO desalination process proposed will result in a saline discharge which has a temperature only marginally higher than the source water abstracted at the intake structures. The hydrodynamic modelling demonstrates that following incorporation of the required 40:1 dilution, this would result in a nominal temperature increase in the area around the diffuser (see Appendix L). Continuous monitoring during operation (see above) will include monitoring at multiple locations of temperature difference associated with the discharge.	Very low
Reduction in dissolved oxygen as a result of stratification induced by discharge of saline waste	The process design and placement of the diffuser structure is driven by the requirement to minimise stratification related to salinity and temperature through effective mixing, which will in turn minimise potential low dissolved oxygen concentrations around the outfall. Continuous monitoring during operation (see above) will include monitoring at the seabed to report dissolved oxygen, temperature and salinity concentrations. The location of the water quality data sensors will be determined in collaboration with the EPA.	Low

Effect Pathway	Mitigation and Monitoring	Residual Risk
Elevated concentrations of pre-treatment and cleaning chemicals discharged in saline waste	Discharge of any chemicals requires approval by the EPA and the operation of the plant will comply with the discharge license conditions as stipulated by the EPA. The chemicals used during the pre-treatment and cleaning processes, including anti-scalents, will be required to have been subject to previous ecotoxicology testing. All use of chemicals will be carefully monitored to ensure there are no releases above agreed EPA limits. Screens and equipment will be maintained in order that the plant will run efficiently and achieve the dosing and dilutions predicted. An Operational Environmental Management and Monitoring Plan will be developed that incorporates a monitoring program in accordance with the development application approval and EPA licensing.	Low
Elevated suspended solid concentrations due to release of saline waste	The hydrodynamic modelling included examination of the potential for TSS levels to be elevated through the operation of the plant (see Appendix L). The effective mixing achieved through the design of the plant and the diffuser structure has resulted in the modelling predicting a maximum five per cent increase in total suspended solids in the immediate vicinity of the diffuser structure.	Very low
Discharge of concentrated natural elements in of saline waste leading to elevation in nutrients	The levels of nutrients in the baseline environment are low (see Appendix M). The design of the diffuser structure ensures a rapid 40:1 dilution of the discharge. An Operational Environmental Management and Monitoring Plan will be developed that incorporates a monitoring program in accordance with any future development conditions and EPA licensing.	Very low
Discharge of concentrated heavy metals in of saline waste leading to elevation in heavy metal concentrations	The levels of heavy metals in the baseline environment are low (see Appendix M). The design of the diffuser structure ensures a rapid 40:1 dilution of the discharge. An Operational Environmental Management and Monitoring Plan will be developed that incorporates a monitoring program in accordance with any future development conditions and EPA licensing.	Very low
Entrapment or impingement of marine organisms through intake structure	A key requirement of the intake structure design has included the requirement to maintain intake velocities (allowing for marine fouling) at the intake structure below 0.15 ms^{-1}. This will allow fish and other mobile species to avoid impingement and entrapment. This velocity criteria was established through research undertaken by the United States Environmental Protection Agency. It is considered best practice and has been adopted by desalination plants across the world. To prevent larger species entering the intake structures 90 mm spaced bars cover the open apertures. The intake is also situated off the seabed to remove the ability for benthic species to crawl into it.	Very low
Entrainment of marine organisms, including larvae, during intake of seawater	Particle tracking modelling, using the predictions of the far-field hydrodynamic modelling, was undertaken to simulate larval transport and investigate the potential for entrainment of larvae through the intake structures, with particular reference to blue mussel larvae (see Appendix J). The modelling predicts that less than 0.1 per cent of the particles released were at risk of entrainment within the intake. Given that mussels are broadcast spawners and that the pipelines will provide hard substrata for colonisation within a predominantly sediment driven ecosystem, any potential reduction of larvae is likely to be offset by the opportunity for introduction of new larvae into the system.	Low

Effect Pathway	Mitigation and Monitoring	Residual Risk
Interruption or alteration of natural hydrodynamic coastal processes by the presence of pipeline and/or rock armour	The initial 500 m of the pipelines are tunnelled and remain below the seabed, avoiding impacts to the inshore coastal zone and longshore drift. An assessment of sediment dynamics was undertaken to understand impacts of the permanent marine infrastructure on sediment transport and concluded potential impacts minimal given the relatively benign wave and coastal processes (see Appendix L).	Low
Noise and/or vibration from operational activities	Potential impacts of noise on marina fauna during operation were included in underwater noise modelling (see Appendix U). Underwater noise from Project during operation will be limited to noise from seawater pumps, and is not considered a threat to marina fauna health.	Very low
Operational exclusion zone restricting access for recreational and commercial fishing operations	Operation navigational requirements and decisions on whether exclusion zones will be required around intake and outfall structures will be dependent on guidance from Department for Infrastructure and Transport. Other SA Water sites have created "no anchor zones" to protect the infrastructure on the seabed but have not excluded marine vessels from transversing the area.	Very low

8.3.8 Proposed Marine Monitoring Program

The performance of the proposed RO desalination plant would be assessed against the environmental performance criteria during commissioning and operation through a program of compliance monitoring. An initial approach is detailed in Table 8.38. The program would build on the multiple baseline studies conducted pre-application in Boston Bay and Proper Bay, with the studies providing a benchmark in assessing the environmental performance of the RO desalination plant. Regardless, an EPA discharge licence is required before the RO desalination plant may become operational.

Table 8.38 Proposed operational marine monitoring program

Monitoring Type	Proposed scope
Near Field Marine Monitoring	Validation of diffuser through *in situ* monitoring, at low currents and wind will be completed during commissioning of the RO desalination plant with a report submitted to the EPA. Discharge monitoring using *in situ* sensors (x2) located adjacent to the outfall. Sensors would record salinity (specific conductivity, psu), turbidity and dissolved oxygen, at agreed frequencies. Data would be submitted to the EPA. Online sensors within the RO desalination plant would monitor salinity (specific conductivity) and turbidity concentrations of the saline waste before discharge.
Mid Field Marine Monitoring	Vertical profiles using a sonde measuring salinity (specific conductivity, water temperature, turbidity and dissolved oxygen), of the established sites in Proper Bay and Boston Bay. Profiles to be conducted every three months for 12 months.
Cumulative Effects Marine Monitoring	Fish assessments (BRUV surveys) of abundance and species at three sites (one outfall, two reference sites). Surveys to be conduction in autumn and spring. Annual habitat mapping, including seagrass, within a two km by two km grid around the RO desalination plant outfall. Reports to be submitted to the EPA.

9 Other Whole of Development Matters

9.1 Access to Land under Water – Department for Infrastructure and Transport

The proposed development would require an easement to be registered on CT 6193/313, with the Minister for Infrastructure and Transport being the landowner.

As Flinders Ports have care and control of the ports in the local area, SA Water will endeavour to seek the appropriate access permissions as required.

9.2 Social and Community Assessment

The following section summarises the outcomes of a Social Impact Assessment (SIA) that was undertaken to identify, assess and mitigate the social implications of the Project. The full SIA is provided in Appendix V.

The objectives of the SIA were to identify and assess the intended and unintended social consequences, both positive and negative, that may occur during the construction and operational phases of the Project and to identify any appropriate mitigation and management measures. This includes identifying impacts in relation to the community's and people's way of life; community cohesion, values and character both Aboriginal and non-Aboriginal; access and use of infrastructure; culture; health and wellbeing; property impacts, economic impacts such as employment and business and other key concerns and issues raised by stakeholders and the community during consultation.

9.2.1 Legislative and Policy Requirements

The following legislation is relevant to the socio-economic context of the Project:

- *Planning, Development and Infrastructure Act* 2016
- *Aboriginal Heritage Act* 1988
- *Environment Protection Act* 1993 (including policies under this Act)
- *Environment Protection Biodiversity Conservation Act* 1999
- *Heritage Places Act* 1993.

The Project site is covered by the PDI Act. Under this Act, all activities constituting development, including but not limited to building work or a change in land use, requires Development Approval under the Act, unless otherwise exempted.

9.2.2 Potential Impacts

The methodology to assess the significance of each identified social impact is adapted from the current industry best practice guidelines prepared by the New South Wales Department Planning Industry and Environment (2023), Social Impact Assessment Guideline and includes the following evaluation criteria:

- The four impact characteristics that demonstrate the material effect of the impact (extent, duration, severity, sensitivity), defined in Table 9.1.
- Who specifically may be affected, directly, indirectly or cumulatively and the level of concern they feel about the matter (high, medium, low), recognising that impacts may affect population groups or individuals differently.
- When the potential impact is expected to occur (pre-construction, construction, operation).
- Identifying the magnitude scale of each impact, as per Table 9.2.
- Defining likelihood as per the SIA guideline (DPIE, 2023), outlined in Table 9.3.
- Determining the significance of the potential impact pre-mitigation, as per the matrix provided in Table 9.4.

Table 9.1 Characteristics of social impact magnitude

Characteristic	Definition
Extent	Who specifically is expected to be affected (directly, indirectly, and/or cumulatively), including any potential vulnerable people? Which location(s) and people are affected (e.g. near neighbours, local, regional)? Regional: Eyre Peninsula Local: Port Lincoln, Billy Lights Point nearby local communities
Duration	When is the social impact expected to occur? Would it be time-limited (e.g. over particular Project phases) or permanent?
Severity or scale	What is the likely scale or degree of change (e.g. mild, moderate, severe)? High: Social functions are severely altered – large number of directly impacted people/households Medium: Social functions are notably altered – medium number of directly impacted people/households Low: Social functions are slightly altered – small number of directly impacted people/households
Sensitivity or importance	How sensitive, vulnerable (or how adaptable/resilient) are affected people to the impact, or (for positive impacts) how important is it to them? This might depend on the value they attach to the matter; whether it is rare/unique or replaceable; the extent to which it is tied to their identity; and their capacity to cope with or adapt to change.
Level of concern/interest	How concerned/interested are people? Sometimes, concerns may be disproportionate to findings from technical assessments of likelihood, duration and/or severity. Concern itself can lead to negative impacts, while interest can lead to expectations of positive impacts.

(DPIE, 2023)

Table 9.2 Defining magnitude levels for social impacts

Magnitude criteria	
Transformational	Substantial change experienced in community wellbeing, livelihood, amenity, infrastructure, services, health, and/or heritage values; permanent displacement or additional of at least 20% of a community.
Major	Substantial deterioration/improvement to something that people value highly, either lasting for an indefinite time, or affecting many people in a widespread area.
Moderate	Noticeable deterioration/improvement to something that people value highly, either lasting for an extensive time, or affecting a group of people.
Minor	Mild deterioration/improvement, for a reasonably short time, for a small number of people who are generally adaptable and not vulnerable.
Minimal	Little noticeable change experienced by people in the locality.

(DPIE, 2023)

Table 9.3 Defining likelihood levels of social impacts

Likelihood level	Definition
Almost certain	Definite or almost definitely expected (e.g. has happened on similar projects)
Likely	High probability
Possible	Medium probability
Unlikely	Low probability
Very unlikely	Improbable or remote probability

(DPIE, 2023)

Table 9.4 Social impact significance matrix

Magnitude		1 Minimal	2 Minor	3 Moderate	4 Major	5 Transformational
Likelihood Level	A Almost certain	Low	Medium	High	Very high	Very high
	B Likely	Low	Medium	High	High	Very high
	C Possibly	Low	Medium	Medium	High	High
	D Unlikely	Low	Low	Medium	Medium	High
	E Very unlikely	Low	Low	Low	Medium	Medium

(DPIE, 2023)

Construction and operation of the Project is expected to create some temporary and long-term benefits.

Table 9.5 summarises the key benefits the Project will have on the local and regional community.

Table 9.6 summarises the key impacts, the extent and magnitude of the impact and identifies specific affected communities and stakeholders.

Table 9.5 Social benefits during construction and operation

Impact Category	Potential Impact	During construction (temporary)	Post construction/plant operation	Evaluation Rating
Livelihoods	Positive impact to community health and wellbeing and livelihoods through the security of water and provision of a long term, sustainable solution to water supply for the populations, economic industries, and tourism of the Eyre Peninsula.	This potential impact is not applicable to the construction phase of the Project.	Securing fresh water is a high priority for Eyre Peninsula communities and is key to achieving many of the objectives of strategic plans for the region. The Project would deliver a long-term solution, improving the area's water security, but also maintaining their current water resource as it is. The water from the Project would be used to supplement groundwater from the Uley South Basin and the River Murray and would allow the aquifers time to recharge (SA Water, 2023). The Project also has the potential to expand to eight GL/annum of output in the future. The Project would not only diversify the region's water sources but would provide a long-term climate-independent solution for an area that has experienced several consecutive years of low rainfall and reduced natural recharging of groundwater basins. Parts of the Eyre Peninsula have been severely drought-affected in recent years and the Project would future proof the Eyre Peninsula's water supply (SA Water, 2023). The Project would not only provide relief and assurance for the regional area, but is considered the best option to ensure a sustainable, reliable and safe drinking water supply into the future.	Construction – N/A Operation – High Positive

Impact Category	Potential Impact	During construction (temporary)	Post construction/plant operation	Evaluation Rating
Livelihoods	Improved regional and individual economic outcomes, job creation and training leading to improved livelihoods, mental health outcomes and community wellbeing.	The Project would directly create jobs and training opportunities in the Port Lincoln region through construction operation and maintenance. The Project is seeking to maximise the number of Port Lincoln residents employed to undertake the construction, however, it is anticipated that the workforce may require augmentation with a FIFO/DIDO workforce, who would still drive economic benefits in the region through use of local services and businesses when they are in Port Lincoln. There is expected to be up to 150 construction personnel across the 12-month construction program. This would lead to improved wages and salaries and have a positive effect on the way people live.	While there would be significantly less fulltime jobs generated during the operation, there is expected to be 5 operations and maintenance personnel required, having long term positive livelihood impacts. The Project is also expected to support future economic growth and attract development in the Eyre Peninsula in agriculture, mining, manufacturing, renewables and tourism which are the primary drivers for regional employment and economic growth.	Construction – High Positive Operation – Medium Positive
Livelihoods	Improved direct and indirect regional and individual economic outcomes through increase demand on goods and services lead to improved livelihoods, mental health outcomes and community wellbeing.	The Project is expected to generate considerable direct and indirect local and regional economic benefits through construction activities and indirectly through additional demand for goods and services in the areas of accommodation, hospitality and retail.	The Project is expected to create 5 fulltime positions onsite. During operation there is likely to be additional local business generation as a result of the operation of the Project, such as general maintenance and cleaning services.	Construction – High Positive Operation – Medium Positive
Health and Wellbeing	Improved water supply and quality resulting in improved wellbeing outcomes for the populations of the Eyre Peninsula.		The Project is expected to help reduce the region's naturally occurring water hardness (which also leaves a chalky residue) and would likely improve the quality of the reticulated water for everyone on the Eyre Peninsula (SA Water, 2023). It should be noted that the water produced would be mixed with groundwater from the Uley South Basin before distribution in the Eyre Peninsula reticulated water network.	Construction – not applicable Operation – High Positive

Table 9.6 Social impacts during construction and operation

Impact Category	Potential Impact	During construction (temporary)	Post construction/plant operation	Unmitigated Evaluation Rating
Health and wellbeing	Construction and operation noise could result in impacts to wellbeing as result of changes in the noise environment.	Noise impacts to surrounding residential and recreational areas from machinery on site, additional traffic, and potential night works, particularly for transmission line that runs underground through residential areas and past Navigator College. Construction activities may have the potential to exceed noise management levels where work is located close to nearby residential properties and sensitive receptors, however, would be temporary in nature and considered to have a moderate short-term impact. Construction activities at Billys Light Point site would have relatively minor impact.	Ongoing noise associated with the RO desalination plant operation, particularly from evaporative coolers during night period, impacting the nearest residential locations to the Site. Without mitigation measures, some properties on Sheoak Court and Eucalyptus Drive are predicted to experience nighttime noise levels above the Noise Policy criteria. With mitigation, these noise levels would be reduced to comply with the Noise Policy. Further monitoring of noise would occur during operation and further mitigation considered if required. The operation of the Project would create a change in the noise environment that is expected to be audible above background during low ambient noise periods at the nearest residential locations, even though the level complies with the Noise Policy with proposed mitigation implemented. Operation of the Marine Intake Pump Station is also predicted to create audible noise around Billy Lights Point and boat ramp for recreational users of this area.	Construction – Medium Operation – Medium
Surroundings	Traffic impacts may change the way people move around, potentially causing a diminished sense of safety when driving, riding or walking around.	Traffic movements generated by the Project construction activities would be distributed across the local road network. These would be concentrated closer to the Project site along Ravendale Road, Marina Drive, and St Andrews Drive. During construction, there is anticipated to be up to 15,000 light vehicle movements to transport personnel to and from site, around 10,000 heavy vehicle	During operation, there is expected to be around 5 operational staff and occasional maintenance personnel, which would generate mainly passenger car trips with occasional utility or small trucks, which may generate some additional traffic along St Andrews Drive which is a growing residential area. However, the low numbers of staff travelling to the Site is considered to have low to negligible impact.	Construction – Medium Operation – Low

Impact Category	Potential Impact	During construction (temporary)	Post construction/plant operation	Unmitigated Evaluation Rating
		movements and around 25 oversized deliveries. Passenger car trips and buses and minibuses transporting construction personnel to and from the Site would occur daily but would represent only a small proportional increase in daily traffic volumes on most roads. The volume of car and bus trips would have a minor impact on the performance of the road network. Truck movements are expected to be around 30-80 per day, with concrete deliveries along Marina Drive and St Andrews Drive expected to increase traffic by 1.2-2.4%. Total traffic generation is not expected to have any significant impacts on traffic operations, although it is expected to be noticeable to the community. 5 km of 7 km buried pipeline would be within the road reserve, creating potential traffic impacts during construction, particularly in residential streets. The key social impact to the Port Lincoln community and residential areas closest to the Site could include delays at some intersections, driveways or where traffic management is required for large loads. Increased traffic could also increase safety risk through changed traffic conditions, and more heavy vehicles on residential streets. The potential impact to residents would be mitigated through traffic management plans. However, these are considered temporary throughout the duration of the construction period.		

Impact Category	Potential Impact	During construction (temporary)	Post construction/plant operation	Unmitigated Evaluation Rating
Surroundings	Potential generation of dust, air pollutants and odour creates amenity impacts to local residents.	Construction would generate dust and air pollutants from earth moving activities, other construction activities and vehicle emissions and movements on unsealed surfaces. The risk of dust soiling or impacts to human health at sensitive receptors on St Andrews Drive is considered low and mitigation measures would be implemented to ensure residual dust impacts would not be of significance. Vehicle emissions would also be adequately managed through mitigation measures. Marine construction activities such as tunnel boring and dredging can lead to odour and dust emissions, particularly if stockpiled on land. With mitigation measures in place, the risk of impacts is negligible to low.	During operation, the largest potential impact is odour emissions from potential organic material collected at screening/trapping from the water intake, if it is not properly managed, creating potential amenity impacts at the recreational areas around Billy Lights Point. However, with mitigation measures including proper storage and disposal, the residual risk of this impact is low. Other potential impacts include venting from chemical storage tanks, however the risk of this impact is low through mitigation measures such as the installation of scrubbers on the vents. The risk of dust impacts during operation would also be negligible with appropriate mitigation measures implemented.	Construction – Low Operation – Low
Surroundings	Visual impact of construction and the placement of the RO desalination plant and the associated above ground infrastructure.	During the construction phase, there would be temporary changes to visual amenity for community in areas near Windsor Avenue and Greyhound Road from earthworks, with the presence of construction equipment and increase in the number of people and vehicles being visible to passersby. At the RO desalination plant site, the short-term use of a crane may create a change in visual amenity. Construction-related traffic is expected to be visually noticeable to the community, as described in the traffic impacts outlined above. These changes are temporary and low impact.	The potential for visual amenity impact comes from new permanent facilities and transmission infrastructure. The new permanent facilities are not expected to create a visual impact from sensitive receptor locations due to dense vegetation that surrounds the site and distance from receptors. The above-ground transmission lines would be on poles 11m to 13 m above ground level and will be visible at locations on Windsor Avenue and Greyhound Road. At Windsor Avenue, the visual impact is considered to be slightly adverse to moderately adverse, and the lines and poles would be prominent and obvious to people using this road. At Greyhound Road, while the lines and poles would be highly visible in the landscape, visitation to this location is low and infrequent, and the visual impact is expected to be	Construction – Medium Operation – Medium

Impact Category	Potential Impact	During construction (temporary)	Post construction/plant operation	Unmitigated Evaluation Rating
			moderately adverse in the immediate vicinity and slightly adverse to no change within the wider visual landscape.	
Surroundings	Loss of vegetation at the Project site and along the DWTP and transmission line route in an area of significant vegetation may cause community stress about loss of habitat and environmental impacts	The Project is expected to impact on approximately 23.39 ha of native vegetation. The largest areas of impact are at the proposed RO desalination plant site (5.0 ha) and along the corridor for the DWTP and transmission line between proposed RO desalination plant and Greyhound Road (9.3 ha). Residual impacts will be offset by the rehabilitation of vegetation on SA Water land at Uley. While the loss of vegetation is not likely to be highly visible to receptors, the loss of vegetation through this area is likely to cause concern within the community about habitat loss and environmental impact.		Construction – Medium
Way of life	Temporary alteration of local access to the Billy Lights Point may result in changes in usage patterns and impact a sense of place for community and trail users.	Temporary reduced access to walking path around Billy Lights Point while construction is underway, particularly of marine infrastructure and the marine intake and outfall pump station, may impact recreational users of this area and decrease enjoyment and amenity.	Following construction, it is anticipated that there will no impact on the walking path around Billy Lights Point. SA Water are working with Council to identify whether we can extend the walking path.	Construction – Medium

Impact Category	Potential Impact	During construction (temporary)	Post construction/plant operation	Unmitigated Evaluation Rating
Livelihood	Potential impact to the marine environment.	There is expected to be a medium risk to the marine environment from habitat disturbance and removal and a low risk of impacts from sediment and impacts from noise and/or vibration during installation of the marine intake and outfall pipelines. While mitigation measures will be implemented to minimise or avoid impacts, there is a low possibility that impacts either real or perceived flow on to the community as a result of the high community value on the pristine coastal amenity of the area, and the aquaculture industry that accounts for 91% of South Australia's overall aquaculture output.	There is expected to be a very low risk of impacts to the marine environment during operation, including from elevated salinity, reduction in dissolved oxygen, elevated concentrations of chemicals, entrainment of organisms during intake, and interruption to natural hydrodynamic coastal processes. While the current design and modelling indicates the minimum dilution targets are met, and further assessments and ongoing monitoring will be undertaken, there is the potential for these risks to create community impacts through real or perceived impacts to recreation, the community's high value on the pristine coastal amenity of the area, and the aquaculture industry that accounts for 91% of South Australia's overall aquaculture output.	Construction – Medium Operation – Low
Accessibility	Influx of construction workforce may increase the use and therefore place pressure on accommodation, housing, local services and infrastructure.	There is expected to be some pressure on housing from increased workforce in Port Lincoln, expected to peak at 150 people, in a climate of already limited supply. While the Project aims to employ as many local people as possible, there is expected to be workers who would move into the area to work on the Project or FIFO or DIDO. The SIA (Appendix V) outlines the increasing price of rental accommodation in Port Lincoln over the past 12 months, and additional people moving into Port Lincoln for the Project may put further pressure on affordability and availability of housing. This could impact vulnerable groups such as low-income owners, young people, single parents and Aboriginal people. There could also be impacts to the availability of short-term accommodation options which could impact local tourism industry.	The operation period is expected to generate 5 fulltime positions and is unlikely to have any long-term impacts to accommodation, housing, services and social infrastructure.	Construction – Medium Operation – Low

Impact Category	Potential Impact	During construction (temporary)	Post construction/plant operation	Unmitigated Evaluation Rating
		There is expected to be additional pressure on local services such as short-term accommodation, healthcare flight availability due to an increased workforce of up to 150 people during construction. This may create social impacts such as increased wait times for appointments and reduced level of service to local residents.		
Health and Wellbeing	Disturbance of land previously used for fuel storage and unauthorised waste dumping may create contamination risks in the surrounding area	There is the potential that removal of soils and the nature of the site as a historical bulk fuel storage may create perceived or real risks of contamination impacts to surrounding community during construction.		Construction – Low
Community Values	Decrease in trust in SA Water decision- making	While there is strong support for a seawater desalination plant and SA Water has provided ongoing and significant consultation opportunities for the community and key stakeholders during the planning and development phase of this Project, there is a level of criticism from some of the community regarding the decision to construct at Billy Lights Point. As a result, there is level of frustration and distrust in the decision making process which is likely to result in negative interactions and friction in the community and with key stakeholders during the construction period.	Ongoing community and stakeholder consultation during operation would be critical in addressing and monitoring of community concerns specifically to the coastal, marine and heritage environments.	Construction – High Operation – High

9.2.3 Management and Mitigation Measures

Table 9.7, Table 9.8 and Table 9.9 summarise the recommended management, enhancement and mitigation measures. A residual social impact rating has been determined after implementation of the recommended mitigation or enhancement measure.

Table 9.7 Social Benefits

Impact Category	Potential Impact	Benefit Enhancement Measure	Residual Rating
Livelihoods	Positive impact to community health and wellbeing and livelihoods through the security of water and provision of a long term, sustainable solution to water supply for the populations, economic industries, and tourism of the Eyre Peninsula.	Continued communication and engagement activities with the local community and stakeholders to highlight and promote the benefits and improvements of the Project.	Operation – High Positive
Livelihoods	Improved regional and individual economic outcomes, job creation and training leading to improved livelihoods, mental health outcomes and community wellbeing.	Prepare local employment and training plan to optimise the local employment benefits for the region both during construction and operation.	Construction – High Operation – High
Livelihoods	Improved direct and indirect regional and individual economic outcomes through increase demand on goods and services lead to improved livelihoods, mental health outcomes and community wellbeing.	Prepare local industry participation plan to optimise the local employment benefits for the region. Continue engagement with local businesses and contractors through economic forums.	Construction – High
Health and Wellbeing	Improved water supply and quality resulting in improved wellbeing outcomes for the populations of the Eyre Peninsula.	Continued communication and engagement activities with the local community and stakeholders to highlight the benefits and improvements of the Project.	Operation – High Positive

Table 9.8 Social Impacts During construction

Impact Category	Potential Impact	Management and Mitigation Measures	Residual Impact Evaluation
Health and wellbeing	Construction and operation noise could result in impacts to residents in the area as result of changes in the noise environment.	Consult early with impacted neighbours including residents, the school and other sensitive receptors regarding potential impacts and mitigation measures. Monitor impacts and discuss options as needed with local residents, including consideration of respite periods, if necessary. Provide 24/7 phone number for community to contact the project team regarding any issues.	Low

Impact Category	Potential Impact	Management and Mitigation Measures	Residual Impact Evaluation
Surroundings	Changes to the way people move around, diminished sense of safety when driving, riding or walking around.	Aim for deliveries to occur outside of peak traffic times in Port Lincoln wherever possible. Any oversized loads would be designed to account for road restriction in the Port Lincoln area and would have necessary permits and escorts (if required) in place. Delivering the large offshore intake structures via sea to be considered. Communicate truck routes and any changes to traffic conditions or access to residents, sensitive receptors, businesses and road users using appropriate tools such as face-to-face engagement, letter box drop, SMS technology, email and signage. Ensure truck operators use same local routes to build familiarity in the community of expected traffic conditions.	Low
Surroundings	Potential generation of dust, air pollutants and odour.	Implement dust and odour suppression and mitigation measures in accordance with Environmental Management Plan. Consult early with potentially impacted neighbours regarding potential impacts and mitigation measures. Provide 24/7 phone number for community to contact the project team regarding any issues.	Low
Surroundings	Potential visual impact of construction activities and the location of the desalination plant and the associated above ground infrastructure in coastal region.	Communicate these impacts to the community before construction commences and before vegetation clearance occurs, including the duration they would be experienced.	Low
Surroundings	Loss of vegetation at the RO desalination plant site and along the DWTP and transmission line route in an area of significant vegetation may cause community concern about loss of habitat and environmental impacts	Consult with the community about the offset strategy/ Significant Environmental Benefit offset and keep updated with progress. Provide advance notice of when vegetation removal would be occurring. Ensure close monitoring of removal activities to ensure only designated vegetation is cleared. Identify opportunities to work with the community and local residents to revegetate areas as part of offset requirements.	Low

Impact Category	Potential Impact	Management and Mitigation Measures	Residual Impact Evaluation
Way of life	Alteration of local access to the Billy Lights Point may result in changes in usage patterns and impact a sense of place for community and trail users.	Advise community early regarding changes to access via appropriate channels such as social media, websites and advertisements to capture a wide audience who may use the area and provide appropriate warning signage and information on site. Consider alternative safe access arrangements if required.	Low
Livelihood	Potential impact to the marine environment.	Communicate how impacts would be managed and avoided. Loop back with the stakeholders on how their concerns have been addressed. Share outcomes of further assessments and monitoring in a timely manner. Proactively develop a strategy and communicate with key stakeholders and aquaculture industry as to the nature of the plan in the unlikely situation of an adverse event. Ensure timely response and resolution to community concerns or complaints.	Low
Accessibility	Influx of construction workforce may increase the use and therefore the pressure on housing, local services and infrastructure.	Seek to maximise the number of Port Lincoln residents employed to undertake the construction. Ensure workforce planning includes consideration of accommodation and service provision needs and that these can be adequately supplied without detriment to the local community, and document in an accommodation strategy.	Low
Health and wellbeing	Disturbance of land previously used for fuel storage and unauthorised waste dumping may create contamination risks in the surrounding area.	Ensure early and clear communication with neighbouring community about any identified contamination and how it is being managed safely. Provide advance notification of any clean up activities that would be visible to the neighbouring community.	Low
Community Values	Decrease in trust in SA Water and decision-making.	Prepare and implement a community engagement framework for implementation across the life of the Project, providing regular opportunities for the community to be informed, including regular updates and reporting. Prepare and Implement a community benefit strategy, to ensure the community can generate benefits from this significant investment in the region.	Medium

Table 9.9 Social Impacts Post construction/plant operations

Impact Category	Potential Impact	Management and Mitigation Measures	Residual Impact Evaluation
Health and wellbeing	Construction and operation noise could result in impacts to residents in the area as result of changes in the noise environment.	Implement noise mitigation and management plan. Engage early with impacted receptors regarding potential impacts and mitigation measures. Provide 24/7 phone number for community to contact the project team regarding any issues.	Low
Surroundings	Potential generation of dust, air pollutants and odour.	Maintain ongoing communications with the local community, including maintaining phone and email contact channels. Ensure timely response and resolution to community concerns or complaints.	Low
Surroundings	Possible visual impact of construction and the location of the placement of the RO desalination plant and the associated above ground infrastructure.	Incorporate design solutions for materials and finishes to reduce visual impact in the environment and communicate these solutions to the community.	Low
Livelihood	Potential impact to the marine environment.	Engage with relevant stakeholders in developing the Operational Environmental Management and Monitoring Plan. Communicate how impacts would be managed and provide opportunities for information transfer with industry, Council and recreation groups. Share outcomes of monitoring in a timely manner. Ensure timely response and resolution to community concerns or complaints.	Low
Community Values	Decrease in trust in SA Water and decision- making.	Implement an Operational Communications Plan to ensure ongoing communications with the community throughout operations. Ensure timely response and resolution to community concerns or complaints.	Medium

9.3 Tourism, Recreation and Industry Overview

Tourism is significant to Port Lincoln and the Eyre Peninsula, generating valuable economic output and creating jobs.

Tourists and visitors are attracted to the region primarily due to its natural environment and recreational activities, particularly marine activities. Mitigating any impacts to the environment and amenity of places visitors come to the region to enjoy would be important to ensure the Project does not negatively impact tourism.

A memo was prepared that establishes a baseline summary of the significance of tourism to Port Lincoln and the Southern Eyre Peninsula as part of the wider regional area of the Eyre Peninsula, for the impact assessment of SA Water's proposed Eyre Peninsula Desalination Plant (provided in Appendix W). A desktop assessment using both qualitative and quantitative resources was completed to assess the existing significance of tourism in the area and the potential impacts that the Project may cause to the value of tourism and the industry during construction and operation of the proposed RO desalination plant.

The assessment was undertaken using the following sources of information:

- Statistical information from Regional Development Australia Eyre Peninsula (RDAEP), South Australian Tourism Commission (SATC), and Tourism Research Australia (TRA)
- Desktop review of social service providers' websites including the District Council of Lower Eyre Peninsula and City of Port Lincoln
- Review of the role of the tourism industry and its significance to Port Lincoln, the Southern Eyre Peninsula and the Eyre Peninsula.

Where potential impacts are considered to have some impact, management and mitigation measures are proposed.

9.3.1 Legislative and Policy Requirements

The following pieces of legislation are relevant to the tourism context of the Project:

- *Planning, Development and Infrastructure Act* 2016
- *Aboriginal Heritage Act* 1988
- *Environment Protection Act* 1993 (including policies under this Act)
- *Environment Protection Biodiversity Conservation Act* 1999
- *Heritage Places Act* 1993.

9.3.2 Potential Impacts and mitigation measures

The following section details the potential impacts and benefits to tourism to Port Lincoln, the Southern Eyre Peninsula and the wider region of the Eyre Peninsula that are anticipated during the construction and operation of the Project. Where potential impacts have been identified during each Project phase, corresponding mitigation measures have been recommended.

It is recommended that SA Water and their appointed contractor prepare and develop a CEMP and a Community Engagement Plan, which covers a range of likely construction impacts with consideration to the identified potential impacts in Table 9.10. This framework would provide direction to the construction contractors who are normally responsible for the preparation of the detailed CEMPs and SA Water who would be responsible for the delivery of community and stakeholder engagement activities and management.

An Operational Community Engagement Plan should also be developed that outlines how SA Water would continue to engage with and involve the community during the RO desalination plants operation.

9.3.3 Potential impacts

Table 9.10 Potential impacts and recommended mitigation measures for identified impacts to tourism during construction and operation of the Project

Potential Impact	Implications	Mitigation Measures
Changes to pedestrian access	• During construction, pedestrian access to areas such as the walking trail around Billy Lights Point may be impacted, which would discourage visitors.	• Ensure adequate signage on approaches and appropriate alternative pathways and wayfinding information. • Provide information to tourism-related websites and services so they can advertise closures or other changes to access. • Provide contact information on signage so public can contact SA Water about any issues or concerns. • Ensure issues and concerns are responded to and resolved in a timely manner.
Visual amenity and temporary changes to landscape	• The Project site is near key areas of interest for tourists including the marina, boat ramp, picnic areas, hiking trails such as Billy Lights Point walk and Boston Bay. The changes to visual amenity in this area during construction may discourage visitors. • During operation, the marine intake and outfall pump station would be constructed on Billy Lights Point within the existing WWTP, and may be visible to people walking around or using the area. The RO desalination plant itself would not be visible from Billy Lights Point due to dense vegetation. • The Project site has previously been used for industrial purposes so the visual amenity impact is not expected to be significant.	• Use appropriate fencing or barriers around construction site and where visible to people using adjacent areas consider using materials that enhance amenity such as landscaping or semi-permanent rather than temporary fencing. • Consider if public art can be used to enhance visual amenity of construction areas. • Ensure the construction site is appropriately maintained and free from debris and damage visible from public areas. • Provide contact information on signage so public can contact SA Water about any issues or concerns. • Ensure issues and concerns are responded to and resolved in a timely manner.

Potential Impact	Implications	Mitigation Measures
Increased demand on accommodation, hospitality and services, including airport, from increased workforce	• Construction of the desalination would require around 150 workers at the peak. While attempts would be made to maximise the number of local employees, it is anticipated that some workers would need to come from outside Port Lincoln and would therefore require accommodation while they are working at the site. This could impact the availability of accommodation for tourists and visitors. • With occupancy rates around 60 per cent in 2023 (as outlined in Appendix W), it is not expected that the construction workforce would create a significant impact on accommodation availability, however peak tourist periods such as school holidays could limit the accommodation options available and make it harder for tourists to visit. • Services such as food and beverage, health, taxis, and the airport may also have increased usage as a result of additional workers, which may create impacts for tourists and visitors who also use these services.	• Workforce plan to include processes and procedures for sourcing appropriate accommodation and services for workers including engagement with accommodation providers to manage peak periods.
Construction traffic and activities impacting local access and pedestrian and traffic movements	• Increased truck movements or other construction related traffic could create local access issues and delays, particularly at peak tourist times. • Access to the Site from the north is through Port Lincoln township and increased truck and construction traffic is expected to have a low but noticeable impact on traffic conditions through the town. • Safety risks from more trucks and heavy vehicles on roads, particularly with tourists who may be unfamiliar with the area as drivers or pedestrians.	• Traffic management plan to ensure consideration of local access and routes to places of high visitor interest and times of peak visitor travel and consider routes that bypass the township to reduce traffic impacts. • Early, regular communications to the Port Lincoln community including visitors about expect traffic impacts, any traffic changes, major construction routes and other relevant information regarding traffic and access.

Potential Impact	Implications	Mitigation Measures
Construction and operational noise impacting amenity	• Noise from construction activities at Billy Lights Point could potentially be heard at nearby areas frequented by tourists and visitors such as the boat ramp, picnic and walking areas and Boston Bay, reducing amenity and discouraging visitors. • During operations, there will be noise associated with the operation of the intake pump station at Billy Lights Point, which is expected to be audible at recreational areas around the point such as the boat ramp and walking areas, especially at times when ambient noise is low such as early morning. • While noise is likely to be noticeable at times, the location of the site is expected to be a sufficient distance from nearby public areas for noise impacts to not be significant. On-water areas near the coastline where the site is located may also experience noise impacts.	• Construction environmental management plan to outline noise mitigation measures to ensure nearby users of public spaces are not significantly impacted. • Early and regular communication with community and visitors about construction activities and potential noise impacts. • Consider respite periods for high noise activities at times of high visitor usage of adjacent public areas. • Operational environmental plan to outline noise mitigation measures to ensure nearby users of public spaces are not significantly impacted by the operation of plant at Billy Lights Point. • Ensure signage with contact information is available at publicly accessible areas so issues and concerns can be reported. • Ensure issues and concerns are responded to and resolved in a timely manner.
Construction and operational odour impacting amenity	• Dredging and tunnelling of the seabed during construction, and screening/trapping of the water intake during operations has the potential to cause odour related to the stockpiling of this organic matter/waste at Billy Lights Point, which may be noticeable to users of this area and discourage visitation. • The marine intake and outfall pump station is adjacent a WWTP that may cause cumulative odour impacts if not managed appropriately. • With appropriate mitigation for storage and disposal of this waste, odour impacts are not expected to be significant.	• Ensure signage with contact information is available at publicly accessible areas so issues and concerns can be reported. • Ensure issues and concerns are responded to and resolved in a timely manner.
Construction and operational impacts to the marine environment.	• Construction of the marine infrastructure and operations of the RO desalination plant have the potential to disrupt the marine environment and impact marine activities that are attractive to tourists such as fishing and boating.	• Consult with the marine tourism industry about potential impacts and mitigation measures and keep them informed of further assessments and monitoring activities to build trust and confidence that the RO desalination plant would not impact marine-related tourist activities.

9.3.4 Potential benefits

9.3.4.1 New tourism opportunities

It is recommended that SA Water engage with the RDAEP, Councils and local tourism boards and operators to identify potential long-term benefits of the Project for the local area as a tourist attraction. Opportunities should be sought to use the plant as an education tourism opportunity for visitors, similar to the Kauwi Interpretive Centre and Desalination Plant Community Tour, including schools and universities, as well as tourists. Educational and technical tours may include:

- The need for the RO desalination plant and education piece around the need to secure a reliable water source for the surrounding area
- The Projects operations and objectives
- The development, including the changes in preferred locations, and construction processes
- Information on the environmental protection measures in place to safeguard the natural surrounding ecologically significant environment
- Education on the desalination process in the form of an accompanying information centre.

Furthermore, it is recommended to engage and partner with representatives of the RDAEP's Tourism Development program (RDAEP, 2020) to seek opportunities to align with the strategic program for tourism in the Eyre Peninsula to maximise potential tourism opportunities via partnership and collaboration to attract new and returning visitors to the area.

Undertaking these engagement activities for potential benefits would align with SATC's (SATC, 2023) strategic priorities of:

- Collaboration (by creating new and enhancing existing partnerships)
- Experience development (by creating new visitor experiences)
- New visitor infrastructure (investment in infrastructure to support overnight stay and securing water supply for regional tourism related business).

9.3.4.2 Secure quality water supply

Securing a quality water supply for the Eyre Peninsula would allow the region's industries and economy to grow, including the tourism sector, and provide better services to support more tourists and visitors.

The RO desalination plant would diversify the region's water sources and provide a long-term climate-independent solution for an area that has experienced several consecutive years of low rainfall and reduced natural recharging of groundwater basins.

The RO desalination plant is expected to help reduce the region's naturally occurring water hardness (which also leaves a chalky residue) and would likely improve the quality of the reticulated water for everyone on the Eyre Peninsula (SA Water, 2021).

9.3.4.3 Community benefit sharing

The Project has the opportunity to ensure that the community benefits from the development of this new infrastructure being built and operated in their community. Community benefit sharing initiatives could include improving facilities and services that are also a benefit to visitors and tourists, increasing the attractiveness of the Port Lincoln region as a tourist destination.

9.4 Commitment to Sustainability

9.4.1 Reaching net zero carbon

SA Water is committed to the United Nations Sustainable Development Goals and have programs across the State to action the commitment.

As part of its strategic objective of proactive environmental leadership, SA Water have adopted an ambitious target to achieve net zero Scope 1 and Scope 2 carbon emissions by 2030. To support this, SA Water has developed a Net Zero Greenhouse Gas Emissions Pathway to 2030 (Pathway), that has been informed by Based on industry guidance from the Water Services Association of Australia (WSAA) document (2023).

While achieving the Net Zero by 2030 is ambitious and remains contingent upon economic regulatory process and funding priorities, SA Water is also committed to meeting the State Government targets 50% emissions reduction below 2005 level by 2030 and zero net emissions by 2050.

One of the initiatives in SA Water's Pathway is to establish biodiverse carbon plantings on its landholdings to sequester and off-set a portion of its scope 1 and 2 emissions.

The proposed plantings would be subject to all the relevant assessments and approvals (including, but not limited to, any required development and water related approvals).

SA Water intends to implement Stage 1 of the biodiverse carbon plantings initiative, which subject finalisation of the planting design and carbon measurement methodology, is estimated to be able to off-set, on average, between 58 per cent and 100 percent of the Projects operational emissions over a 30-year period.

9.4.2 Greenhouse gas emissions

The proposed development is expected to require 31,031 megawatts (MW) of electricity. The marine intake and outfall pump station requiring 1,160 MW, the RO desalination plant requiring 14,540 MW and the DWTP requiring 15,330 MW of electricity.

Based on the expected electricity requirements, it is estimated that the Project would result in average annual greenhouse gas emissions of 3,433 t CO_2 per year. A breakdown of this estimate is provided below in Table 9.11.

Table 9.11 Estimated annual average greenhouse gas emissions of the Project

Parameter	Annual Carbon Impact – Electricity (tCO_2-e/yr.)	Annual Carbon Impact – Chemicals (tCO_2-e/yr.)	Annual Carbon Impact – Electricity + Chemicals (tCO_2-e/yr.)	EP desal as % of Scope 2 only (%)	EP desal as % of NGERS Scope 1 and 2 (%)
MIN Value	2,019	938	3,576	2%	1%
MAX Value	4,965	1,876	6,841	6%	2%
AVERAGE Value	3,433	1,845	5,278	4%	1%

Provision has been made in the design of the Project for roof mounted solar panels to potentially be installed in future; however this element is not currently proposed as part of this development application.

SA Water has already invested heavily in renewable energy generation and storage across the State, and is continuing to explore further viable and prudent renewal energy generation and storage initiatives as part of its commitment to a renewable energy future.

9.4.3 Climate Change Risks and Adaptation

In August 2023, WSP undertook a climate change risk assessment for the proposed development (WSP, 2023). The risk assessment considered the different packages of work being proposed as the RO desalination plant site and saline waste transfer pipeline, the marine intake and outfall pump station and the 7 km DWTP.

The desktop risk assessment considered historic weather-related events and the site climatic conditions.

The risk assessment highlighted the Representative Concentration Pathway 8.5 (RCP 8.5) which expects a scenario of limited efforts to curb emissions, which continue to rise throughout the 21st century. CO_2 concentration of 940 ppm by 2100 resulting in a 3.7 degree global warming mean and likely range of 2.8 to 4.8 degrees Celsius.

Table 9.12 provides a summary of the risk assessment and details the lifecycle of SA Water's proposed assets for the Project.

Table 9.12 Climate change risk assessment summary

Asset	Minimum design life (years)
Major Asset Category – Marine Structures	
Marine structures and concrete	100
Marine Pipework	100
Marine replacement components	50
Electrical plant – pump station	25
Major Asset Category – Transfer System	
Above ground pipe – metallic	50
Above ground pipe – non-metals	25
Buried pipe	100
Major Asset Category – Desalination Plant	
Buildings	40 years to first maintenance
Structures (walkways, platforms, access etc.)	40 years to first maintenance
Mechanical plant and processing	25
Filters	25
Access Road	100
Major Asset Category – Utilities	
Power	50

Table 9.13 provides a summary of proposed adaptation measures (edited for clarity) in response to the expected climate change risks for the Project.

Table 9.13 Climate change adaptation measures for the Project

Risk	Adaptions
Increasing temperatures	The proposal is part of SA Water's response to increased temperatures in South Australia.
Extreme heat/heat waves	The proposal is part of SA Water's response to extreme heat and heat waves in South Australia.
Decline in rainfall	The proposal is part of SA Water's response to a decline in rainfall on the Eyre Peninsula.
Increased drought	The proposal is part of SA Water's response to increased drought on the Eyre Peninsula.

Risk	Adaptions
Ember attack resulting in bushfire damage resulting in temporary closure of plant for repairs	SA Water expect to construct the RO desalination plant building with Colorbond Ultra without requiring additional systems given the walling will conform to the requirements for BAL -12.5. The proposed construction will result in lower overall protection from external heat sources (radiant heat) experienced during a bushfire event. The non-combustible external cladding will provide a cost-effective solution to protecting UF and RO skids, allowing for a degree of protection and enabling replacement in an efficient manner if damaged by bushfire.
1% AEP storm event/sea level rise as per Coast Protection Board Policy	The marine works have considered the sea level rise values applicable to Port Lincoln, over the design life of the marine works. • 0.44m by the year 2075 • 0.71 by the year 2100 • 0.96m by the year 2125. An allowance of 0.96 m sea level rise at 100 years from the estimated commission date of the marine works has been adopted in the design of the proposal. This is applicable for hydraulic seawater levels, as well as for the determination of minimum floor levels for land-based infrastructure. The development has been design to withstand the 1% AEP storm event and sea level rise.
Salinity of marine waters	The South East of Australia is expected to experience an increase in sea surface salinity (WSP, 2023). The proposed marine component of the development is expected to be monitored to track salinity and ocean acidity.

9.4.4 Sustainable use of resources

The environmental and sustainability objectives for the Project are:

- sustainability in design
- sustainability targets in procurement with key performance indicators
- governance
- early engagement with local subcontractors – reduces travel requirements from Adelaide, accommodation requirements
- communication protocols on site.

9.4.5 Sustainability in Design

Creating an ecologically sustainable development has and will continue to be a key focus across all stages of the Project from planning through to design, construction and operation. SA Water and the proposed Project has embedded sustainability into the process from its initiation at a design and Project level including the following:

- Sustainability workshops during early design development with multi-disciplinary project team and designers to identify sustainability impacts and opportunities for incorporation as part of design development. The plan identified proposed initiatives to be taken forward for consideration during detailed design to mitigate sustainability risks/improve outcomes.

- Development of a concept phase Sustainability Plan that identified design-based sustainability impacts and opportunities and how key design decisions and options selection were incorporated consideration of environmental, social and economic outcomes.

- The plan also documents for each of the identified key sustainability risk and opportunity areas how these have been considered and integrated into Project design and decision-making processes, how the identified risks and opportunities have been evaluated or assessed, any assessed costs/benefits, any barriers to implementation and/or justification for decisions not to incorporate or implement identified initiatives.

- To inform decisions on viability and implementation of identified emissions reduction initiatives or circular economy outcomes the environment/ social/ economic and technical merits of the initiative compared to 'business as usual' are assessed.
- Key sustainability impact areas considered included greenhouse gas emissions, circular economy, site water management/ green infrastructure, environmental footprint, social impacts associated with design (visual amenity, noise, air quality).

Specific requirements for each of these identified key sustainability areas are identified below:

- Understand and quantify GHG / Carbon emissions for the project including:
  - Identify and understand sources and quantum of emissions. This should include setting out the approach to estimating energy use and carbon emissions over life of asset
  - Estimate materials embodied energy between options
  - Document how decision making and selection of preferred concept design solutions have considered whole of life emission impacts and that the preferred concept seeks to minimise these.
  - Design should seek to optimise energy footprint and embodied carbon.
  - Identify viable GHG emissions reduction to be pursued in detailed design and delivery.
- Circular Economy assessment to be undertaken which includes:
  - Identification of major material / product categories
  - In accordance with the waste management hierarchy the design should consider whole of life waste management and impacts for the Project
  - Identify opportunities to avoid demand and/or substitute materials
  - Identify design elements that offer opportunities to incorporate and/or substitute recycled materials (e.g. this may include supplementary cementitious materials as replacements for Portland cement)
  - Identify waste streams that will be generated by the Project and identify opportunities to recycle / beneficially reuse.
- Assess site water management and green infrastructure as part of design development including mapping opportunities and constraints which includes:
  - Management of site water quality and quantity to minimise hydrological impacts of site runoff
  - Identify opportunities to capture and reuse site water including for purposes such as irrigation
  - Identify design outcomes to achieve state WSUD policy performance targets for water quality, peak flow and flood risk (site water management) aligned to
  - Minimise impacts to natural ecosystems from runoff (terrestrial and marine)
  - Identify and pursue opportunities to improve site biodiversity including through site offsets and landscaping. Landscaping to comprise locally indigenous plant species giving consideration to urban design outcomes and functional landscape requirements.
- Preliminary assessments of climate change and natural hazards risks and potential mitigations over the life of the asset:
  - This should include undertaking a risk assessment with a time series that covers the life of the asset, identifies relevant climate and natural hazard variables (both stresses and shocks) for agreed climate change projections. The assessment risks should be aligned to *Guide to climate projects for risk assessment and planning in South Australia 2022*.

9.4.6 Current sustainability initiatives

At the core of the design process has been the focus on design optimisation to reduce the material demand of the Project, create construction phase efficiencies and create the most efficient processing capability with a focus on material durability and climate change risks. By ensuring the design is focused on optimal efficiency of plant operations the Project can achieve the greatest reductions to climate impacts over the Project life cycle.

Minimising ecological impacts is also a primary objective of the Project and has been considered across all aspects of the plants design, construction and operations.

Key to sustainability being part of the fabric of a project is ensuring that the initiatives and plans are implemented. The current initiatives that have been incorporated are:

- Commitments to circular economy participation to reduce embodied carbon in materials
  - Use less – design optimisation to reduce material inputs, maximise site won material reuse (e.g. spoil, rock, water, ballast, mulched vegetation).
  - Use again – maximise recycled materials and materials with recycled content (e.g. steel, aggregates, concrete will include SCMs to replace Portland cement), design considers material inputs and reusability, adaptability and recyclability as the end of life.
  - Use longer – design considers material and component durability tailored to material use, exposure and serviceability.
- SA Water have ensured that the design contractors are working towards carbon neutrality with Acciona (the ECI contractor) currently the only contractor in Australia that is carbon neutral for all Scope 1 and Scope 2 emissions.
- Commitment to 100% green power for all temporary site office facilities (e.g. hybrid / solar generator).
- Utilisation of a proportion of hybrid and EV vehicle fleet for construction vehicles.
- Solar power installation considered in the structural design of the RO building to power office and ancillary buildings.
- Treatment of tunnelling wastewater to maximise reuse options over discharge and disposal.
- Rainwater harvesting for construction and operational reuse.
- Investigate the use of alternative fuels for construction vehicles to reduce emissions.
- Optimal chemical storage to reduce transport emissions (optimal delivery frequency and considering chemical shelf life to reduce waste).
- Sustainable procurement practices to maximise local supplier and subcontractor innovation and participation in achievement of sustainability goals.
- Maximise the efficiency of the plant operations (e.g. maximise natural light, ventilation, use of LED lights, optimisation of pipe alignments and lengths, optimisation of pump size, water head heights and configuration (e.g. maximise use of gravity)).
- Utilise common service trenches to reduce construction emissions.
- Ecological outcomes incorporated in design (e.g. marine and terrestrial habitat creation from underwater structures and landscaping).
- Maximise off site fabrication to reduce transport emissions and waste generation.
- Desing optimisation to reduce Project footprint (e.g. pump station pads).
- Incorporate trenchless pipeline construction to reduce waste and emissions.
- Membrane durability, longevity, reuse and recycling feasibility study.
- Optimising inflow and outfall pipelines location and length to reduce materials and environmental impacts.
- Modular design allows for climate change adaption (plant scalability) and refined maintenance processes.

10 Construction, Operation, and Decommissioning

10.1 Construction

10.1.1 Indicative Timelines

Commencement of site works is expected in Q1 of 2025 with initial activities commencing at the marine intake and outfall pump station of the WWTP. Tunnelling, marine pipeline works and fit out of the marine intake and outfall pump station are planned to be completed by mid-2026.

Works on the RO desalination plant and terrestrial pipelines would commence when long-lead specialist equipment is available in mid-2025 and conclude in late-2026.

The Project works would include:

- Site establishment and mobilisation (6 months).
- Construction of the saline waste/seawater transfer pipelines between the marine intake and outfall pump station site and the RO desalination plant site is planned to commence at the end of 2025.
- Construction of the marine intake and outfall pump station at the TBM launch site, including an associated wet well, is planned to commence in January 2026.
- Construction of the RO desalination plant and associated infrastructure is planned to commence in mid-2025 and be completed by mid-2026.
- Construction of the DWTP and the SAPN power supply is planned to commence mid-2025 and be completed by early-mid 2026.

10.1.2 Construction Activities and Staging

It is anticipated that Project construction would be undertaken in four key stages:

- Site mobilisation: would commence with installation of the security fencing, hoardings, storm water management systems, and temporary construction facilities. Site security would also be established at the site mobilisation stage with planned security patrols.
- Primary works: including development of RO desalination plant, marine infrastructure and terrestrial pipelines to be undertaken concurrently.
- Commissioning: would be undertaken progressively, in line with the construction progress.
- Demobilisation: including removal of temporary facilities and equipment, site reinstatement and reseeding of disturbed areas.

10.1.3 Resourcing Requirements

Construction personnel numbers would vary depending on the type of activities occurring on site; and is expected to peak at 150 people.

The Project would seek to employ Port Lincoln residents for the construction workforce, where possible. It is anticipated, however, that a portion of the workforce will need to comprise FIFO and DIDO personnel, given the size, nature and location of the Project.

Construction works would predominantly be undertaken between the hours of 6 am to 6 pm, seven-days a week. Some activities would require 24-hour working that will consist of multiple shifts. It is expected that some construction activities would require a 24-hour working window.

The FIFO and DIDO workforce are expected to utilise existing accommodation in Port Lincoln as a first preference. Where sufficient capacity within existing accommodation cannot be secured, accommodation may be provided via a self-contained construction camp. The location of a potential camp has not been identified, though it is not expected that it would be located at Billy Lights Point.

10.1.4 Construction Environmental Management Plan

A CEMP will be prepared for the Project, prior to commencement of construction. The CEMP will include provisions for the following:

- Aboriginal and European Cultural Heritage, including an accidental discovery procedure.
- Air quality and dust suppression.
- Emergency and fire management.
- Flora and fauna management, including weeds, pests, and diseases controls.
- Materials, fuels, and waste management.
- Noise and vibration.
- Storage of hazardous chemicals and substances.
- Traffic and access.
- Water quality protection, erosion and sediment control.

A draft CEMP is provided in Appendix X.

A DMP will be prepared in line with the EPAs Dredge Guideline (2020) will biofouling mitigation methods and a Ballast Water Management Plan. A draft DMP is provided in Appendix Y.

A SEDMP will also be prepared for the Project, in line with the recommendation from the Soils, Drainage and Erosion – Impact Assessment, provided in Appendix H.

10.1.5 Health and Safety

A site-specific health and safety plan will be prepared to ensure compliance with all health and safety requirements on site.

10.2 Operation

10.2.1 Hours of Operation

The RO desalination plant would have capacity to operate 24 hours a day, seven days per week.

The Site would not be staffed 24 hours a day.

10.2.2 Maintenance

Maintenance would occur on site and will be schedule during business hours, where possible.

Out of hours maintenance may be required in some rare circumstances, for instance if required for emergency works or where deemed necessary to minimise community or network impacts.

10.2.3 Bushfire Management

The Project has been designed in accordance with SA Water's Technical Standard *0601 – Design, Assessment and Retrofitting of SA Water Assets in Bushfire-Prone Areas.* The objective of the Standard is to minimise the risk of damaged to SA Water assets (both new and existing) from bushfire attacks. Refer to 8.2.12 for more information

Vegetation clearance buffers around proposed infrastructure is being developed in consultation with the CFS.

10.2.4 Emergency Management

An Operational Emergency Management Plan (OEMP) will be prepared for the Project. The Plan will include provisions for the following:

- Hazard minimisation, including fire and chemical management – this should include a bushfire management subplan and chemical management subplan
- Key responsibilities and authorities.
- Emergency contacts.
- Evacuation plan.
- Incident and injury management.
- Emergency preparedness information.
- Emergency response actions.
- Post emergency investigations, rehabilitation, and records.

10.2.5 Site Security

Critical RO desalination plant infrastructure would be contained within a new 3 m tall mesh security fence. All access gates around the Site would be secured; with the main access on St Andrews Drive fitted with card readers, intercom and CCTV coverage. Light towers and gensets would also be installed around the Site.

The marine intake and outfall pump station would be contained within the existing WWTP, which has existing security fencing and secured gates.

10.3 Decommissioning

The Project is a permanent structure and total decommissioning of the Site is not expected, however individual elements may be decommissioned and/or replaced, as needed.

At the end of the lifespan for individual infrastructure or plant, these elements would be decommissioned and dismantled. All components would be removed from site and the site restored to its original condition (where appropriate). Consideration would be given for components that may be suitable for repurpose, redeployment, or recycling. Where these options are not deemed feasible, components would be appropriately disposed of.

During decommissioning, vegetation clearance and ground disturbance would be contained to the smallest area required to safely facilitate construction and operation of the Project. Rehabilitation and reseeding of disturbed areas would occur as soon as practicable, once use of the area is no longer required. This is expected to occur at the demobilisation stage.

11 Conclusions

This Development Application Report outlines SA Water's proposal to develop the Eyre Peninsula Desalination Plant Project at Billy Lights Point, Port Lincoln. The application constitutes essential infrastructure and is seeking development approval under Section 131 of the *Planning, Development and Infrastructure Act 2016* (PDI Act).

The Project involves the construction of a new 16 megalitres per day or 5.3 gigalitres (GL) per annum reverse osmosis (RO) desalination plant and all necessary associated infrastructure, such as that for sourcing and treating the seawater, transferring the treated drinking water to SA Water's existing network system, and returning the saline concentrate from the RO desalination plant to the ocean.

The three main elements of the Project are:

- RO desalination plant and saline waste/seawater transfer pipelines.
- Marine intake and outfall pump station and associated intake and outfall pipelines within the marine environment.
- Desalinated water transfer pipeline to SA Water's existing North Side Hill tanks.

The Project site is situated approximately 4 kilometres south-east of the Port Lincoln city centre at Billy Lights Point on the Eyre Peninsula, South Australia. The Site comprises approximately 8 hectares, with the coast to the south and other land holders to the east and west. A new access road is proposed with an entry and exit point from St Andrews Drive.

The Project is proposed in response to a long process of consideration by SA Water and other South Australian government agencies, for the need to secure a long-term, climate-independent source of drinking water for the Eyre Peninsula. Furthermore, selection of the site at Billy Lights Point has been subject to a comprehensive site selection process, involving commissioning and review of numerous site investigations.

A series of detailed technical studies and assessments has been undertaken as part of the Project in order to gain a more in-depth understanding of the potential issues, impacts and corresponding mitigation measures required. These assessments address potential impacts to both the terrestrial and marine environments, relating to noise, air quality and odour, non-Aboriginal heritage, visual amenity, traffic and access, flora and fauna, contamination, geotechnical impacts, drainage and erosion, bushfire risks, marine habitat, turbidity, salinity (among other matters related to the marine environment), and the social and economic environment.

It should also be noted that while an expansion of the capacity of the RO desalination plant from a 5.3 GL/annum to an eight GL/annum would require a separate development application, the RO desalination plant site contains sufficient space to accommodate a larger plant. In addition, all pipelines and marine infrastructure are 'future proofed' and sized to support an eight GL/annum plant. This decision by SA Water is in recognition that the construction of the pipeline and marine infrastructure are the most impactful to the environment and sizing for a possible expansion of the plant at some future date removes the requirement to disturb the environment a second time. The marine impact assessment and modelling was therefore undertaken for an eight GL/annum saline waste discharge to match the built capability of the terrestrial pipelines and marine infrastructure. This assessment of a larger plant is therefore conservative compared to the 5.3 GL/annum RO desalination plant which is proposed under this development application.

Environmental management measures would be applied whenever necessary, to manage or mitigate any potential impacts of the Project upon either the land based or marine environment. Potential impacts of the Project would be managed during the construction process of the Project via a construction environmental management plan (CEMP). This plan would include a number of sub-plans that would address individual areas of environmental, cultural and social risk.

These sub-plans and the broader CEMP will be prepared in consultation with the Environment Protection Authority and other South Australian regulatory authorities to ensure that all relevant guidelines and policies are adhered to. Operational management plans will be developed where required.

The Eyre Peninsula Desalination Plant is expected to be an appropriate and fit for purpose response to the requirements of Eyre Peninsula's future water demands.

The Eyre Peninsula Desalination Plant should be granted development approval under the Section 131 of the PDI Act, considering:

- It will provide a necessary long-term water security solution on the Eyre Peninsula, enabling SA Water to reduce the use of existing groundwater sources that are under stress.
- It supports relevant State and local government guidelines and strategic directions.
- Potential environmental, social and economic impacts have been investigated in detail and can be appropriately managed.
- The proposed 5.3 GL/annum RO desalination plant and associated infrastructure is not seriously at variance with the Planning and Design Code.

Site works for the Project are expected to commence in 2025, subject to the granting of development approval Section 131 of the PDI Act and additional approval including:

- Section 21/23 permit under the *Aboriginal Heritage Act 1988.*
- Completion of an EPBC Self-Referral under the *Environment Protection and Biodiversity Conservation Act 1999.*
- Approval to clear native vegetation under the *Native Vegetation Act 1991.*

12 Bibliography

Abessi, O., & Roberts, P. J., 2014. Multiport Diffusers for Dense Discharges. *Journal of Hydraulic Engineering, 140*(9).

ALA, 2024. *Atlas of Living Australia* [Online] Avaliable at: http://www.ala.org.au.

Al-Kharusi, A., Al-Hashmi, K. A., & Dobrestov, S., 2020. Study on distribution of Cysts of Harmful Algal Blooms-forming algae at Sohar Industrial Port, Sea of Oman. *International Journal of Oceans and Oceanography, 14*(1), 9-16.

Amoser, S., & Ladich, F., 2005. Are hearing sensitivities of freshwater fish adapted to the ambient noise in their habitats? *Journal of Experimental Biology, 208*(18).

Anderson, D. M., 1997. Bloom dynamics of toxic *Alexandrium* species in the northeastern U.S. *Limnology and Oceanography, 42*, 1009-1022.

Anderson, D. M., Boerlage, S. F., & Dixon, M. B., 2017. Harmful Algal Blooms (HABs) and Desalination: A Guide to Impacts, Monitoring and Management. *Intergovernmental Oceanographic Commission of Unesco, 78*, 539.

Anderson, D. M., Fukuyo, Y., & Matsuoka, K., 2003. Manual on Harmful Marine Microalgae. Cyst methodologies. (G. M. Hallegraeff, D. M. Anderson, A. D. Cembella, & H. O. Enevoldsen, Eds.) *Monographs on Oceanographic Methodology, 11*, 793.

Anestis, A., Lazou, A., Pörtner, H. O., & Michaelidis, B., 2007. Behavioral, metabolic, and molecular stress responses of marine bivalve *Mytilus galloprovincialis* during long-term acclimation at increasing ambient temperature. *American Journal of Physiology-Regulatory, Integrative and Comparative Physiology, 293*(2).

ANZECC/ARMCAN, 2000. *Australian and New Zealand guidelines for fresh and marine water quality.* Canberra: Australian and New Zealand Environment and Agriculture and Respirce Management Council of Australia and New Zealand.

ANZG, 2018. *Australian and New Zealand Guidelines for Fresh and Marine Water Quality.* Australian and New Zealand Governments and Australian state and territory governments, Canberra, ACT, Australia. [Online] Avaliable at: www.waterquality.gov.au/anz-guidelines.

Aquaculture (Zones - Lower Eyre Peninsula) Policy 2003 (SA), Maps of zones - Schedule 2. 2.11.2023 (2023).

Australian Soil Resource Information System, n.d. *ASRIS mapping*. [Online] Avaliable at: http://www.asris.csiro.au/mapping/viewer.htm.

Barnthouse, L. W., 2013. Impacts of entrainment and impingement on fish populations: A review of the scientific evidence. *Environmental Science & Policy, 31*, 149-156.

Bayne, B. L., 1976. Marine mussels: their ecology and physiology. *International Biological Programme 10*.

Bell, E. C., & Gosline, J. M., 1997. Strategies for life in flow: tenacity, morphometry, and probability of dislodgment of two *Mytilus* species. *Marine Ecology Progress Series, 159*, 197-208.

Bell, G. W., Eggleston, D. B., & Wolcott, T. G., 2003. Behavioural responses of free-ranging blue crabs to episodic hypoxia. I. Movement. *Marine Ecology Progress Series , 259*, 215-225.

Bermudes, M., & Ritar, A. J., 2008. Response of early stage spiny lobster *Jasus edwardsii phyllosoma* larvaw to changes in temperature and photoperiod. *Aquaculture, 281*(1), 63-68.

Bilgmann, K., Parra, G., Holmes , L., Peters, K., Jonsen, I., & Moller, L., 2019. Abundance estimates and habitat preferences of bottlenose dolphins reveal the importance of two gulfs in South Australia. *Scientific Reports, 9*, 8044.

Blanco-Murillo, F., Marín-Guirao, L., Sola, I., Rodríguez-Rojas, F., Ruiz, J. M., Sánchez-Lizaso, J. L., & Sáez, C. A., 2023. Desalination brine effects beyond excess salinity: Unravelling specific stress signalling and tolerance responses in the seagrass *Posidonia oceanica*. *Chemosphere , 341*.

Bolch, C. J., 1997. *Dinoflagellate Cysts in sediments from Port Lincoln, Boston Bay and surrounds.* Port Lincoln: Report to Tuna Boat Owners Association.

BOM., 2024. *Tide Tables for Port Lincoln*. [Online] Avaliable at: IDO59001_2024_SA_TP003.pdf (bom.gov.au).

Bourman, R. P., Murray-Wallace, C. V., & Harvey, N., 2016. *The Gulf of Eyre Peninsula - Chapter 9 in Castal Landscapes of South Australia.* Universoty of Adelaide Press.

Bowyer, J., Booth, M., Qin, J., D'Antignana, T., Thomson, M., & Stone, D., 2014. Temperature and dissolved oxygen influence growth and digestive enzyme activities of yellowtail kingfish *Seriola lalandi* (Valenciennes, 1833). *Aquaculture Research, 45*(12), 2010-2020.

Bradley, T., 2010. Animal Osmoregulation. *Oxford Animal Biology Series*, 320.

Bunn, N., Fox, C., & Webb, T., 2000. A literature review of studies on fish egg mortality: implications for the estimation of spawning stock biomass by the annual egg production method. *Science Series Technical Report*, 37.

Bureau of Meteorology and CSIRO, 2022. *State of the Climate 2022.* Bureau of Meteorology and CSIRO.

Butterfield, N., & Gaylard, S., 2005. *The heavy metal status of South Australian dolphins.* Adelaide: Environment Protection Authority.

Cabaco, S., Santos, R., & Duarte, C. M., 2008. The impact of sediment burial and erosion on seagrasses: A review. *Estuarine, Coastal and Shelf Science, 79*(3), 354-366.

Cambridge, M. L., Zavala-Perez, A., Cawthray, G. R., Mondon, J., & Kendrick, G. A., 2017. Effects of high salinity from desalination brine on growth, photosynthesis, water relations and osmolyte concentrations of seagrass *Posidonia australis*. *Marine Pollution Bulletin, 115*(1-2), 252-260.

Cambridge, M. L., Zavala-Perez, A., Cawthray, G. R., Statton, J., Mondon, J., & Kendrick, G. A., 2019. Effects of desalination brine on growth, photosynthesis, water relations and osmolyte concentration of seagrass Posidonia australis. *Marine Pollution Bulletin, 140*, 462-471.

Campanati, C., Arantzamendi, L., Zorita, I., Briaudeau, T., Lekube, X., Izagirre, U., & Aldridge, D., 2023. Nutritional effect of substituting microalgal concentrates with microencapsulated diets in *Mytilus galloprovincialis* spat. *Aquaculture 576*, 739879.

Charlton, C., Ward, R., McCauley, R., Brownell, R., Chandra, S. K., & Burnell, S., 2019. Southern right whale (*Eubalaena australis*), seasonal abundance and distribution at Head of Bight, South Australia. *Aquatic Conservation: Marine and Freshwater Ecosystems, 29*(4), 576-588.

Chı́charo, L. M., & Chı́charo, M. A., 2000. Estimation of the life history parameters of *Mytilus galloprovincialis* (Lamarck) larvae in a coastal lagoon (Ria Formosa — south Portugal). *Journal of Experimental Marine Biology and Ecology, 243*(1), 81-94.

City of Port Lincoln in conjunction with Lucid Economics, 2023. *Economic Development Strategy 2023-2026.*

Clark, G., Knott, N., Miller, B., Kelaher, B., Coleman, M., Ushiama, S., & Johnston, E., 2018. First large-scale ecological impact study of desalination outfall reveals trade-offs in effects of hypersalinity and hydrodynamics. *Water Research, 145*, 757-768.

Clarke, T. M., Whitmarsh, S. K., Fairweather, P. G., & Huveneers, C., 2019. Overlap in fish assemblages observed using pelagic and benthic baited remote underwater video stations. *Marine and Freshwater Research, 29*(4), 37-45.

Clausen, I., & Riisgård, H. U., 1996. Growth, filtration and respiration in the mussel *Mytilus edulis*: No evidence for physiological regulation of the filter-pump to nutritional needs. *Marine Ecology-Progress Series 141*, 37-45.

Collier, C. J., Lavery, P. S., Ralph, P. J., & Masini, R. J., 2009. Shade-induced response and recovery of the seagrass *Posidonia sinuosa*. *Journal of Experimental Marine Biology and Ecology, 370*(1-2), 89-103.

Collingham, E. B., 1990. *Port Lincoln Sewage Treatment Works Geotechnical Report.* Port Lincoln: EWS Department, South Australia.

Commonwealth of Australia, 2020. Australian Ballast Water Management Requirements. *Department of Agriculture, Water and the Environment, 8*.

Coppola, F., Russo, T., Soares, A. M., Marques, P. A., Polese, G., Pereira, E., & Freitas, R., 2022. The influence of salinity on the toxicity of remediated seawater. *Environmental Science and Pollution Research International, 29*(22), 32967-32987.

Danvers Architects, 1987. *Heritage Survey of the Eyre Peninsula and West Coast - City of Port Lincoln.* Department of Environment and Planning, State Heritage Branch.

Department of Climate Change, Energy, the Environment and Water (DCCEEW), 2024. *A guide to the Integrated Marine and Coastaion Regionalisation of Australia.* Canberra: Department of Climate Change, Energy, the Environment and Water.

Department of Climate Change, Energy, the Environment and Water (DCCEEW), 2024. Species Profile and Threats Database. Canberra: Department of Climate Change, Energy, the Environment and Water, Department of the Environment.

Department of Climate Change, Energy, the Environment and Water (DCCEEW), 2024a. *A guide to The Integrated Marine and Coastal Regionalisation of Australia*. [Online] Avaliable at: https://www.dcceew.gov.au/resource/guide-integrated-marine-and-coastal-regionalisation-australia-version-40-june-2006-imcra.

Dennison, W. C., 1987. Effects of light on seagrass photosynthesis, growth and depth distribution. *Aquatic Botany, 27*(1), 15-28.

Department for Environment and Water (DEW), 2021. *WaterConnect Groundwater Data*. [Online] Avaliable at: https://www.waterconnect.sa.gov.au/Systems/GD/Pages/Default.aspx.

Department for Environment and Water (DEW), 2023. *Annual Water Security Update.* Government of South Australia.

Department for Trade and Investment (DTI), 2023). *Planning for Climate Change.* Government of South Australia.

Department for Trade and Investment (DTI), 2024. *What we heard - Eyre and Western Regional Plan Visioning Workshop.* [Online] Avaliable at: https://plan.sa.gov.au/__data/assets/pdf_file/0006/1219029/Eyre-and-Western-Regional-Plan-Visioning-Workshop-What-We-Heard.pdf.

Department of Planning, Transport and Infrastructure, 2012. *Eyre and Western Region Plan.* Government of South Australia.

Department of the Environment, 2013. *Matters of National Environmental Significance Significant impact guidelines 1.1.* Canberra: Australian Government.

Department for Environment and Water (DEW), 2024. *Eyre Bioregion Fact Sheet.* Adelaide: Department of Environment and Water.

Department for Envrionment and Water (DEW), 2024b. Naturemaps. Department of Environment and Water. [Online] Avaliable at: environment.sa.gov.au.

Díaz, R. J., & Rosenberg, R., 1995. Marine benthic hypoxia: a review of its ecological effects and the behavioural responses of benthic macrofauna. *Oceanography and Marine Biology, 33*, 245-303.

Doubell, M. J., James, C. E., & Middleton, J. F., 2015. Modelling of oceanographic variables for the development of additional finfish aquaculture in the Spencer Gulf. *SARDI Research Report Series 830*, 64pp.

Doubell, M., & James, C., 2003. *Oceanographic monitoring and far-field modelling to inform desalination in Boston Bay. Report to SA Water.* Adelaide: South Australian Research and Development Institute (Aquatuc Sciences).

DPIE, 2023. *Social impact assessment - Guideline for resource projects.* Department of Planning, Infrastructure and Environment.

Drew, M. J., Rogers, T., Doubell, M. J., James, C., Oxley, A., McGarvey, R., Steer, M. A., 2020. King George Whiting (*Sillaginodes punctatus*) spawning dynamics in South Australia's southern gulfs. *FRDC project no 2016/003*.

Duarte, C. M., 2002. The future of seagrass meadows. *Environmental Conservation, 29*(2), 192–206.

Easton, A. K., 1978. A Reppraisal of the Tides in Spencer Gulf, South Australia. *Marine and Freshwater Research 29*, 467-477.

Ecological Associates, 2024. *Native Vegetation Clearance - Billy Lights Point: Eyre Peninsula Desalination Plant Project Data Report - Working Draft.* Ecological Associates Pty Ltd.

Ecological Associates Pty Ltd., 2023. *Billy Lights Point Threatened Flora and Other Tasks Progress Report.*

Edvayne, K. S., 1999. Conserving Marine Biodiversity in South Australia - Part 2 - Identification of areas of high conservation value in South Australia. *Water to Plate Process*.

Edwards, S., 2003. Assessment of the physiological effort of altered salinity on greenlip (*Haliotis laevigata*) and blacklip (*Heliotis rubra*) abalone using repiriometry. *Aquaculture Research, 34*(14), 1361-1365.

EPA, 2009. *Ambient water quality of Boston and Proper Bays, Port Lincoln 1997-2008.* Environment Protection Authority.

EPA, 2013. *State of the Environment South Australia.* Environment Protection Authority, Adelaide.

EPA, 2015. *Tod River, near the Tod Reservoir 2015 Aquatic Ecosystem Condition Report.* Environment Protection Authority, Adelaide.

EPA, 2016. *Jussieu Nearshore Marine Biounit 2016 Aquatic Ecosystem Condition Report*. [Online] Avaliable at: https://www.epa.sa.gov.au/reports_water/jussieu-ecosystem-2016.

EPA, 2022. *Jussieu Nearshore Marine Biounit 2022 Aquatic Ecosystem Condition Report*. [Online] Avalaible at: https://www.epa.sa.gov.au/reports_water/jussieu-ecosystem-2022.

EPA, 2023. *South Australia State of the Environment Summary Report.* Environment Protection Authority, Adelaide.

Erftemeijer, P. L., & Lewis, R. R., 2006. Environmental impacts of dredging on seagrasses: A review. *Marine Pollution Bulletin, 52*(12), 1553-1572.

Erftemeijer, P. L., Riegl, B., Hoeksema, B. W., & Todd, P. A., 2012. Environmental impacts of dredging and other sediment disturbances on corals: A review. *Marine Pollution Bulletin, 64*(9), 1737-1765.

Eyre Peninsula Landscape Board, 2021. *Southern Eyre Subregional Description: Landscape Plan for Eyre Peninsula - Appendix C.*

Fernández-Torquemada, Y., & Sánchez -Lizaso, J. L., 2013. Effects of salinity on seed germination and early seedling growth of the Mediterranean seagrass Posidonia oceanica. *Estuarine, Coastal and Shelf Science, 119*, 64–70.

FMG Engineering, 2021. *Geotechnical Investigation Report, Eyre Peninsula Desalinatin Plant and Pipeline, reference number: 275827 / S54636.*

Folpp, A. J., McLeay, L., & Short, D. A., 2000. Fish assemblages on estuarine artificial reefs: natural rocky-reef mimics or discrete assemblages? *PLOS One, 8*(6).

Fowler, A. J., McGarvey, R., Carroll, J., & Feenstra, J. E., 2014. King George Whiting (*Sillaginodes punctatus*) Fishery. *Fishery Assessment Report to PIRSA Fisheries and Aquaculture (PDF 5.1 MB)*, 85.

Fowler, A. J., McLeay, L., & Short, D. A., 2000. Spatial variation in size and age structures and reproductive characteristics of the King George whiting (*Percoidei: Sillaginidae*) in South Australian waters. *Marine and Freshwater Research, 51*, 11-22.

Fraser, M. W., Short, J., Kendrick, G., McLean, D., Keesing, J., Byrne, M., Caley, M., Clarke, D., Davis, A R., Erftemeijer, P L A., FIeld, S., Gustin-Craig, S., Huisman, J., Keough, M., Lavery, P S., Masini, R., McMahon, K., Mengersen, K., Rasheed, M., Statton, J., Stoddart, J., Wu, P., 2017. Effects of dredging on critical ecological processes for marine invertebrates, seagrasses and macroalgae, and the potential for management with environmental windows using Western Australia as a case study. *Ecological Indicators, 28*, 229-242.

Freitas, R., Coppola, F., Costa, S., Manzini, C., Intorre, L., Meucci, V., Soares, A M V M; Pretti, C., Solé, M., 2019. Does salinity modulates the response of *Mytilus galloprovincialis* exposed to triclosan and diclofenac? *Environ Pollut, 251*, 756-765.

Freitas, R., Silvestro, S., Coppola, F., Meucci, V., Battaglia, F., Intorre, L., Soares, A M V M., Pretti, C., Faggio, C., 2020. Combined effects of salinity changes and salicylic acid exposure in *Mytilus galloprovincialis. Science of the Total Environment*.

Garcia, A. B., Partridge, G. J., Flik, G., Roques, J. A., & Abbink, W., 2015. Ambient salinity and osmoregulation, energy metabolism and growth in juvenile yellowtail kingfish (*Seriola lalandi*) (Valenciennes 1833) in a recirculating aquaculture system. *Aquaculture Research, 46*(11), 2789-2797.

Gaylard, S., 2009. *Ambient water quality of Boston and Proper Bays, Port Lincoln 1997-2008.* Environment Protection Authority.

GHD., 2018. *Port Lincoln WWTP Geotechnical Investigation Factial Report.* Port Lincoln: SA Water (C5659 Port Lincoln Sludge Management Project October 2018).

Gibbs, S. E., & Kemper , C. M., 2014. Chapter 17: Whales and dolphins in Spencer Gulf in Natural History of Spencer Gulf. (S. A. Shepherd , S. M. Madigan, B. M. Gillanders, S. Murray-Jones, & D. J. Wilshire, Eds.) *Royal Society of South Australia*, 444pp.

Goldsworthy, S. D., 2020. Australian sea lion listing assessment. *SARDI Publication No. F2020/00131-1. SARDI Research Report Series No. 1056*, 26.

Goldsworthy, S. D., Shaughnessy, P. D., & Page, B., 2014. Chapter 18: Seals in Spendcer Gulf. (S. A. Shepherd, S. M. Madigan, B. M. Gillanders, S. Murray-Jones, & D. J. Wilshire, Eds.) *Natural History of Spencer Gulf*, 444pp.

Gordon, D. M., Grey, K. A., Chase, S. C., & Simpson, C. J., 1994. Changes to the structure and productivity of a *Posidonia sinuosa* meadow during and after imposed shading. *Aquatic Botany, 47*(3-4), 265-275.

Gosling, E., 2003. Bivalve Molluscs. Biology, Ecology and Culture. In *Fishing News Books* (p. 443). Blackwell.

Gosselin, L. A., & Qian, P., 1997. Juvenile mortality in benthic marine invertebrates. *Marine Ecology Progress Series, 146*, 265–282.

Green, E. P., & Short, F. T., 2003. World Atlas of Seagrasses. *University of California Press*, 324.

Hallegraeff, G., 1998. Transport of toxic dinoflagellates via ships' ballast water: bioeconomic risk assessment and efficacy of possible ballast water management strategies. *Marine Ecology Progress Series, 168*, 297-309.

Hallegraeff, G. M., & Bolch, C. J., 1992. Transport of diatom and dinoflagellate resting spores in ships' ballast water: implications for plankton biogeography and aquaculture. *Journal of Plankton Research, 14*, 1067–1084.

Hallegraeff, G. M., Anderson, D. M., Cembella, A. D., & Enevoldsen, H. O., 2004. Manual on Harmful Marine Microalgae. 2nd revised edition. *Monographs on Oceanographic Methodology, 11*, 793pp.

Hamer, B., Jaksic, Z., Pavičić-Hamer, D., Perić, L., Medaković, D., Ivankovic, D., Pavicić, J., Zilberberg, C., Schröder, H C., Müller, W., Smodlaka, N., Batel, R., 2008. Effect of hypoosmotic stress by low salinity acclimation of Mediterranean mussels *Mytilus galloprovincialis* on biological parameters used for pollution assessment. *Aquatic toxicology, 89*(137-51).

Harrison, P. J., Furuya, K., Gilbert, P. M., Xu, J., Liu, H. B., Yin, K., Lee, J H W., Anderson, D M., Gowen, R., Al-Azri, A R., Ho, A. Y.,2011. Geographical distribution of red and green *Noctiluca scinillans*. *Chinese Journal of Oceanology and Limnology, 29*(4), 807-831.

Heldt, K. A., & Hooper, G. E., 2023. Spencer Gulf Prawn Penaeus (*Melicertus*) latisulcatus Fishery. *Fishery Hooper Assessment Report to PIRSA Fisheries and Aquaculture*, 81.

Herzfeld, M., Middleton, J. F., Andrewartha, J. R., Luick, J., & Leeying, W., 2009. Numerical hydrodynamic modelling of the tuna farming zone, Spencer Gulf. *Aquafin CRC Project 4.6, FRDC Project 2005/049, Sardi Research Report Series No 342*, 100 pp.

Humphrey, C., Weber, M., Lott, C., Cooper, T., & Fabricius, K., 2008. Effects of suspended sediments, dissolved inorganic nutrients and salinity on fertilisation and embryo development in coral *Acropora millepora* (Ehrnberg, 1834). *Coral Reefs, 27*, 837-850.

Hutchison, Z. L., Hendrick, V. L., Burrows, M. T., Wilson, B., & Last, K. S., 2016. Buried Alive: The Behavioural Response of Mussels, *Modiolus modiolus* and *Mytilus edulis* to Sudden Burial by Sediment. *PLoS One, 3*, 11.

Izzo , C., & Gillanders, B. M., 2015. *Spencer Gulf Ecosystem and Development Initiative: Interactions between whales and vessels: causes and mitigation options – with reference to southern Australia.* Report to the Board of the Spencer Gulf Ecosystem and Development Institute.

Jones, R., Ricardo, G. F., & Negri, A. P., 2015. Effects of sediments on the reproductive cycle of corals. *Marine Pollution Bulletin, 100*(1), 13-33.

Jung, S. W., Kang, D., Kim, H. J., Shin, H. H., Park, J. S., Park, S. Y., & Lee, T. K., 2018. Mapping distribution of cysts of recent dinoflagellate and *Cochlodinium polykrikoides* using next-generation sequencing and morphological approaches in South Sea, Korea. *Scientific Reports, 8*(1), 7011.

Kamermans, P., & Saurel, C., 2022. Interacting climate change effects on mussels (*Mytilus edulis* and *M. galloprovincialis*) and oysters (*Crassostrea gigas* and *Ostrea edulis*): experiments for bivalve individual growth models. *Aquatic Living Resources, 35*(1).

Kelaher, B. P., & Coleman, M. A., 2022. Spatial extent of desalination discharge impacts to habitat-forming species on temperate reefs. *Marine Pollution Bulletin , 175*.

Kelaher, B. P., Clark, G. F., Johnston, E. L., & Coleman, M. A., 2020. Effect of Desalination Discharge on the Abundance and Diversity of Reef Fishes. *Environmental Science & Technology, 54*(2), 735-744.

Kelaher, B. P., Clark, G. F., Johnston, E. L., Ingleton, T., Knott, N. A., & Coleman, M. A., 2022. Desalination Discharge Influences the Composition of Reef Invertebrate and Fish Assemblages. *nvironmental Science & Technology, 56*(16), 11300-11309.

Kerr, E. A., & Strother, S., 1985. Effects of irradiance, temperature and salinity on photosynthesis of *Zostera muelleri*. *Aquatic Botany, 23*, 177-183.

Koehn, J. D., Hobday, A. J., Pratchett, M. S., & Gillanders, B. M., 2011. Climate change and Australian marine and freshwater environments, fishes and fisheries: synthesis and options for adaptation. *Marine and Freshwater Research, 62*(1148-1164).

Landscape South Australia - Eyre Peninsula., 2024, April 11. *News article*. [Online] Avaliable at: https://www.landscape.sa.gov.au/ep/news/110424-ep-water-revision.

Langlois, T., Goetze, J., Bond, T., Monk, J., Abesamis, R., Asher, J., Barrett, N; Bernard, A., Bouchet, P., Birt, M., Cappo, M., Currey-Randall, L., Fairclough, D., Fullwood, L., Gibbons, B., Harasti, D., Heupel M., Hicks, J., Holmes , T., Harvey, E., 2020. A field and video-annotation guide for baited remote underwater stereo-video surveys of demersal fish assemblages. *Methods in Ecology and Evolution, 11*, 1401-1409.

Larkum, A. W., Kendrick, G. A., & Ralph, P. J., 2018. Seagrasses of Australia: Structure, Ecology and Conservation. *Springer International Publishing*, 797pp.

Li, H., Gao, Z., Song, Z., Su, Y., Hui, J., Ou, W., Zhang, J., Zhang, Y., 2024. Investigation on the contribution of swim bladder to hearing in crucian carp (*Carassius carassius*). *Journal of the Acoustical Society of America, 155*(4), 2492-2502.

Linnane, A., McGarvey, R., Feenstra, J., & Graske, D., 2021. Northern Zone Rock Lobster (*Jasus edwardsii*) Fishery Stock Assessment 2020/21. *PIRSA Fisheries and Aquaculture*, 21.

Lirman, D., & Cropper, W. P., 2003. The influence of salinity on seagrass growth, survivorship and distribution within Biscane Bay, Florida: Field, experimental and modelling studies. *Estuaries, 26*(1), 131-141.

Martin, C., 2024, 01 29. Shipping increases. *Port Lincoln Times*.

Matozzo, V., Chinellato, A., Munari, M., Finos, L., Bressan, M., & Marin, M. G., 2012. First Evidence of Immunomodulation in Bivalves under Seawater Acidification and Increased Temperature. *PLOS ONE, 7*(3).

McMahon, K., Collier, C., & Lavery, P. S., 2013. Identifying robust bioindicators of light stress in seagrasses: A meta-analysis. *Ecological Indicators, 30*, 7-15.

Middleton, J. F., Luick, J., & James, C., 2014. Carrying capacity for finifsh aquaculture, Part II - Rapid assessment using hydrodynamic and semi-analytic solutions. *Aquacultural Engineering, 62*, 66-78.

Middleton, J., Doubell, M., James, C., Luick, J., & van Ruth , P., 2013. PRISA Initiative II: carrying capacity of Spencer Gulf: hydrodynamic and biogeochemical measurement modelling and performance monitoring. *SARDI Publication No. F2013/000311-1, SARDI Research Report Series No. 705.*, 97pp.

Missimer, T. M., & Maliva, R. G., 2018. Environmental issues in seawater reverse osmosis desalination: Intakes and outfalls. *Desalination, 434*, 198-215.

Montes, A., Vázquez, E., Peteiro, L., & Olabarria, C., 2021. Dynamics and processes influencing recruitment of the invasive mussel *Xenostrobus securis* and the coexisting indigenous *Mytilus galloprovincialis* in north-western Spain. *Aquatic Invasions, 16*, 391-414.

Muñoz, P. T., Rodríguez-Rojas, F., Celis-Plá, P. S., López-Marras, A., Blanco-Murillo, F., Sola, I., Lavergne, C., Valenzuela, F., Orrego, R., Sánchez-Lizaso, J L., Sáez, C. A., 2023. Desalination effects on macroalgae (part A): Laboratory-controlled experiments with *Dictyota spp*. from the Pacific Ocean and Mediterranean Sea. *Frontiers in Marine Science*.

Naranjo, S. A., Carballo, J. L., & García-Gómez, J. C., 1996. Effects of environmental stress on ascidian populations in Algeciras Bay (southern Spain). Possible marine bioindicators? *Marine Ecology Progress Series, 144*, 119-131.

NHMRC., 2008. *Gudelines for Managing Risks in Recreational Water.* National Health and Medical Research Council.

Nunes, R. A., Lennon , G. W., & Bowers, D. G., 1990. Physical behaviour of a large, negative or inverse estuary. *Continental Shelf Research, 10*(3), 277-304.

O'Brien, J., 2002. *Chapter 2 Impacts of Shipping - South-east Regional marine plan assessment report.* Hobart: National Oceans Office.

Onuf, C. P., 1994. Seagrasses, Dredging and Light in Laguna Madre. *Coastal and Shelf Science, 39*(1), 75-91.

Paine, R. T., 1974. Intertidal community structure: Experimental studies on the relationship between a dominant competitor and its principal predator. *Oecologia, 15*(2), 93-120.

Pecl, G. T., Doubleday, Z., Ward, T., Clarke, S., Day, J., Dixon, C., Frusher, S., Gibbs, P., Hobday, A., Hutchinson, N., Jennings, S., Jones, K., Li, X., Spooner, D., Stoklosa, R., 2011. Risk Assessment of Impacts of Climate Change for Key Marine Species in South Eastern Australia. Part 2: Species profiles. *Fisheries and Aquaculture Risk Assessment*.

Petrusevices, P., Bye, J., Luick, J., & Teixeira, C., 2011. Summer sea surface temperature fronts and elevated chlorophyll-a in the entrance to Spencer Gulf, South Australia. *Continental Shelf Research, 31*, 849-856.

Petrusevics, P., 1993. SST fronts in inverse estuaries, South-Australia - indicators of reduced gulf shelf exchange. *Australian Journal of Marine and Freshwater Research, 44*(2), 305-323.

Pineda, M. C., Duckworth, A., & Webster, N., 2016. Appearance matters: sedimentation effects on different sponge morphologies. *Journal of the Marine Biological Association of the United Kingdom, 96*(2), 481–492.

PIRSA, 2021. *Management Plan for the South Australian Commercial Northern Zone Rock Lobster Fishery.* Primary Industries and Regions South Australia. Adelaide: The South Australian Fisheries Management Series. Paper number 81.

PIRSA, 2022. *Sector-based aquaculture strategy: Subtidal mussels.* Adelaide: Primary Industries and Regions South Australia.

PIRSA, 2023. *Zoning In: South Australian Aquaculture Report 2023.* Adelaide: Primary Industries and Regions South Australia.

PlanSA, 2023. *Population Projections for South Australia and Regions - 2021 to 2051: Version 3.* Government of South Australia.

Polzer, M., 2023, September 11. Email to J Philbey: Shipwreck off Port Lincoln.

Ralph, P. J., Durako, M. J., Enríquez, S., Collier, C. J., & Doblin, M. A., 2007. Impact of light limitation on seagrasses. *Journal of Experimental Marine Biology and Ecology, 350*(1-2), 176-193 .

Ralph, P. J., Tomasko, D., Moore, K., Seddon, S., & Macinnis-Ng, C., 2006. Human impacts on seagrasses: eutrophication, sedimentation, and contamination. (A. W. Larkum, R. Orth, & C. M. Duarte, Eds.) *Seagrasses: Biology, Ecology and Conservation*.

RDAEP, 2020. *Tourism Development*. [Online] Available at: https://www.rdawep.org.au/economic-programs/tourism-development/.

Regional Development South Australia, 2024, May 3. *Regional Blueprint 2023.* [Online] Available at: https://regionaldevelopmentsa.com.au/.

Riera, R., Tuya, F., Sacramento, A., Ramos, E., Rodríguez, M., & Monterroso, O., 2011. The effects of brine disposal on a subtidal meiofauna community. *Estaurine, Coastal and Shelf Science, 93*(4), 359-365.

Riisgård, H. E., 2011. Feeding Behaviour of the Mussel, *Mytilus edulis*: New Observations, with a Minireview of Current Knowledge. *Journal of Marine Biology*, 312459.

Riisgård, H. U., Bøttiger, L., & Pleissner, D., 2012. Effect of Salinity on Growth of Mussels, *Mytilus edulis*, with Special Reference to Great Belt (Denmark). *Journal of Marine Science*, 167-176.

Riisgård, H. U., Larsen, P., Turja, R., & Lundgreen, K., 2014. Dwarfism of blue mussels in the low saline Baltic Sea - Growth to the lower salinity limit. *Marine Ecology Progress Series, 517*, 181-192.

Rixon , S., Kotz , S., & Thomas, D., 2002. A river management plan for the Tod Catchment. Environment Protection Agency, Adelaide.

Roberts, S. D., van Ruth, P. D., Wilkinson, C., Bastianello, S. S., & Bansemer, M. S., 2019. Marine Heatwave, Harmful Algae Blooms and an Extensive Fish Kill Event During 2013 in South Australia. *Frontiers in Marine Science, 6*, 610.

Rodda, K., Huveneers, C., & Baker, J. L., 2014. Chapter 16: Chondrichthyans of Spencer Gulf in Natural History of Spencer Gulf. (S. A. Shepherd, S. M. Madigan, B. M. Gillanders, S. Murray-Jones, & D. J. Wiltshire, Eds.) *Royal Society of South Australia*, 444pp.

Ruíz, J. M., Marín-Guirao, L., & Sandoval-Gil, J. M., 2009. Responses of the Mediterranean seagrass *Posidonia oceanica* to in situ simulated salinity increase. *Botanica Marina, 52*(5), 459-470.

SA EPA, 1997, December 01. EPA Licence 001370 issued under Section 36 of the *Environment Protection Act 1993* to Integrated Steel Division BHP Steel.

SA Government, 2024, May. *State Prosperity Plan*. [Online] Available at: https://www.stateprosperity.sa.gov.au/.

SA Water, 2008. *SA Water's Long Term Plan for the Eyre Region.* Government of South Australia.

SA Water, 2019, May. *Energy Management*. Available at: https://www.sawater.com.au/water-and-the-environment/recycling-and-the-environment/energy-management-and-climate.

SA Water, 2021. *SAWater - Water for future generations*.[Online] Available at: https://www.sawater.com.au/water-and-the-environment/water-in-south-australia/water-for-future-generations.

SA Water, 2023. *SAWater - Water for future generations*. [Online] Available at: https://www.sawater.com.au/water-and-the-environment/water-in-south-australia/water-for-future-generations.

SA Water, 2024, January 17. *Desalination plant at Billy Lights Point*. [Online] Available at: https://watertalks.sawater.com.au/getthefacts.

SATC, 2023. *South Australian Regional Visitor Strategy Progress Snapshot Jan 1 - Dec 31 2022.* [Online] Available at: https://tourism.sa.gov.au/media/qdjmxp10/satc_dd_rvs-progress-snapshot_eyre_peninsula.pdf.

Seed, R., & Suchanek, T. H., 1992. The Mussel Mytilus: Ecology, Physiology, Genetics and Culture. Chapter 4 Population and Community Ecology of Mytilus. (E. Gosling, Ed.) *Developments in Aquaculture and Fisheries Science, 25*, 589.

Shaughnessy, P., Goldsworthy, S., & Mackay, A., 2014. Status and trends in abundance of New Zealand fur seal populations in South Australia. *SARDI Publication No. F2014/000338-1, SARDI Research Report Series No 781*, 33.

Shepherd , S. A., & Baker, J. L., 2014. Chapter 22: Reef fishes of Spencer Gulf in Natural History of Spencer Gulf,. (S. A. Shepherd, B. M. Madigan, S. Murray-Jones, & D. J. Wilshire, Eds.) *Royal Society of South Australia*, 444pp.

Shepherd, S. A., & Robertson, E. L., 1989. Regional Studies - Seagrasses of South Australia, Western Victoria and Bass Strait. (A. W. Larkum, A. J. McComb, & S. A. Shepherd, Eds.) *Biology of Seagrasses: a treatise on the biologiy of seagrasses with special reference to the Australian Region, Elsevier*, 211-229.

Smart, J. J., McGarvey, R., Feenstra, J., Drew, M. J., Earl, J., Durante, L., Beckmann, C L., Matthews, D., Matthews, J M., Mark, K., Bussell, J., Davey, J., Tsolos, A., Noell C., 2023. Assessment of the South Australian Marine Scalefish Fishery in 2021–22. *Report to PIRSA Fisheries and Aquaculture*, 296.

Smyth, K., & Elliott, M., 2016. Chapter 9 Effects of changing salinity on the ecology of the marine environment. (M. Solan, & N. M. Whiteley, Eds.) *Stressors in the Marine Environment*.

Smyth, K., Mazik, K., & Elliott, M., 2014. Behavioural effects of hypersaline exposure on the lobster *Homarus gammarus* (L) and the crab *Cancer pagurus* (L). *Journal of Experimental Marine Biology and Ecology, 457*, 208-214.

Sorokin, S., Connolly, R. D., & Currie, D., 2009. *Syngnathids* of the Spencer Gulf – morphometrics and stable isotope signatures. *SARDI Publication No. F2009/000655-1, SARDI Research Report Series, 412*, 30pp.

South Australian Heritage Council, 2023. *SA Heritage Places Database*. [Online] Available at: https://maps.sa.gov.au/heritagesearch/HeritageSearchLocation.aspx.

South Australian Research Gateway . (n.d.). *SARIG map*. [Online] Available at: https://map.sarig.sa.gov.au/.

Southall, B. L., Finneran, J. J., Reichmuth, C., Nachtigall, P. E., Ketten, D. R., Bowles, A. E., Ellison, W T., Nowacek, D P., Tyack, P. L., 2019. Marine mammal noise exposure criteria: Updated scientific recommendations for residual hearing effects. *Aquatic Mammals, 45*(2), 125-232.

Southall, B., Bowles, A., Ellison, W., Finneran, J. J., Gentry, R. L., Green, C. R., Kastak, C R., Ketten, D., Miller, J., Nachtigall, P., Richardson, W., Thomas, J., Tyack, P., 2007. Marine mammal noise exposure criteria. *Aquatic Mammals, 33*, 125-232.

Stobart, B., Mayfield, S., & Heldt, K., 2017. Western Zone Abalone Blacklip (*Haliotis rubra*) and Greenlip (*H. laevigata*) Fishery in 2016. *PIRSA Fisheries and Aquaculture*, 91.

Stone, D. A., Roberts, S. D., & Currie, K. L., 2014. Hyper-Saline Conditions Affect Growth, Osmoregulation and Survival of Fingerling and Juvenile Yellowtail Kingfish, Seriola lalandi. *Journal of Aquaculture & Marine Biology, 1*(1).

T&M Ecologists., 2021. *Eyre Peninsula Desalination Plant Project: Vegetation Survey and Fauna Assessment.* Aldgate: T&M Ecologists Pty Ltd.

Tanner, J. E., & Volkman, J., 2009. Aquafin CRC – Southern Bluefin Tuna Aquaculture Subprogram: Risk and Response – Understanding the Tuna Farming Environment. *Aquafun CRC Project 4.6, FRDC Project 2005/059, SARDI Research Report Series No 344*, 287pp.

Tanner, J. E., Doubell, M., van Ruth, P., James, C., & Middleton, J., 2020. *Aquaculture Environmental Monitoring Program 2015-2019.* Adelaide : South Australian Research and Development Institute (Aquatic Sciences), SARDI Publication No. F2019/000334-1, SARDI Research Report Series No 1053.

Taylor, A., 1976. The Cardiac Responses to Shell Opening and Closure in the Bivalve Arctica islandica (L.). *Journal of Experimental Biology, 64*, 751-759.

Tonkin, 2014. *Port Lincoln Stormwater Management Plan.* Port Lincoln: City of Port Lincoln.

Tyerman, S. D., Hatcher, A. I., West, R. J., & Larkum, A. W., 1984. *Posidonia australis* growing in altered salinities: leaf growth, refulation of turgor and the development of osmotic gradients. *Australian Jounal of Plant Physiology, 11*, 35-47.

van Ruth, P., 2014. Chapter 12: Plankton in Spencer Gulf in Natural History of Spencer Gulf. (S. A. Shepherd, S. M. Madigan, B. M. Gillanders, S. Murray-Jones, & D. J. Wiltshire, Eds.) *Royal Society of South Australia*, 444.

van Ruth, P., Thompaon, P., Blackburn, S., & Bonham P., 2009. Chapter 7: Temporal and spatial; variability in phytoplankton abundance and community composition, and pelagic biogeochemistry in the tuna farming zone. In Aquafin CRC – Southern Bluefin Tuna Aquaculture Subprogram: Risk and Response – Understanding the Tu. (J. E. Tanner, & J. Volkman, Eds.) *ARDI Publication No. F2008/000646-1, SARDI Research Report Series*.

Vaquer-Sunyer, R., & Duarte, C. M., 2008. Thresholds of hypoxia for marine biodiversity. *PNAS, 105*(40), 15452-15457.

Walker, D. J., & McComb, A. J., 1992. Seagrass degradation in Australian coastal waters. *Marine Pollution Bulletin , 25*(5-8), 191-195.

Water Services Association of Australia, 2023. *Climate Change - Accelerating to Net Zero.* Water Services Association of Australia Ltd.

Westerbom, M., Kilpi, M., & Mustonen, O., 2002. Blue mussels, *Mytilus edulis*, at the edge of the range: population structure, growth and biomass along a salinity gradient in the north-eastern Baltic Sea. *Marine Biology* (991-999), 140.

Westphalen, G., O'Loughlin, E., Collings, G., Tanner, J., Eglinton, Y., & Bryars, S., 2005. Responses to reduced salinities of the meadow forming seagrasses *Amphibolis* and *Posidonia* from the Adelaide metropolitan coast. ACWS Technical Report No. 9 prepared for the Adelaide Coastal Waters Study Steering Committee. *South Australian Research and Development Institute (Aquatic Sciences)*.

White, J. W., Morgan, S. G., & Fisher, J. L., 2014. Planktonic larval mortality rates are lower than widely expected. *Ecology, 95*, 3344–3353.

Whitmarsh , S. K., Barbara , G., Brook, J., Colella, D., Fairweather, P., Kildea, T., & Huveneers, C., 2021. No detrimental effects of desalination waste on temperate fish assemblages. *ICES Journal of Marine Science, 78*.

Whitmarsh, S., Barbara, G., Brook, J., Colella, D., Fairweather, P., Kildea, T., & Huveneers, C., 2017. What is Big BRUVver up to? Methods and uses of baited underwater video. *Reviews in Fish Biology and Fisheries, 27*, 53-73.

Widdows, J., & Shick, J., 1985. Physiological responses of *Mytilus edulis* and Cardium edule to aerial exposure. *Marine Biology*, 85(3), pp.217-232.

Widdows, J., Lucas, J. S., Brinsley, M. D., Salkeld, P. N., & Staff, F. J., 2002. Investigation of the effects of current velocity on mussel feeding and mussel bed stability using an annular flume. *Helgoland Marine Research, 56*, 3-12.

WSP, 2021. *Eyre Peninsual Desalination Plant - Soils and geology desktop report, reference number: PS125512-GEO-MEM-002 (Draft).*

WSP, 2022. *Eyre Peninsula Desalination Plant Desktop Study - Former BHP Site, reference number: PS131577-ADL-GEO-MEM-002 RevA.*

WSP, 2023. *Climate Change Risk Assessment - SA Water Eyre Peninsula Desalination Plant.* Adelaide: WSP.

WSP, 2023. *Environmental Investigation- Eyre Peninsula Desalination Project Transfer Pipeline, reference: PS135801-WSP-ADL-CLM-LTR-00001 RevA.*

WSP, 2023. *Eyre Peninsual Desalination - Transfer Pipeline, Geotechnical Report, reference: PS135801-WSP-ADL-GEO-REP-00001 RevA.*

WSP, 2023. *Geotechnical Interpretative Report, Eyre Peninsula Desalination Plant, reference number: PS131577-ADL-GEO-REP-001 Rev).*

Wu, F., Xie, Z., Lan, Y., Dupont, S., Sun, M., Cui, S., Xizhi, H., Huang, W., Liu, L., Hu, M., Lu, W., Wang, Y., 2018. Short-Term Exposure of *Mytilus coruscus* to Decreased pH and Salinity Change Impacts Immune Parameters of Their Haemocytes. *Frontiers in Physiology, 9*, 166.

Wu, R. S., 2002. Hypoxia: from molecular responses to ecosystem responses. *Marine Pollution Bulletin, 45*(1-12), 35-45.

Yuan, G. D., Theng, B. K., Churchman, G. J., & Gates, W. P., 2013. Clays and Clay Minerals for Pollution Control. *Developments in Clay Science, 5*, 587-644.

Zandee, D. I., Holwerda, D. A., Kluytmans, J. H., & Zwaan, A. D., 1985. Metabolic Adaptations To Environmental Anoxia in the Intertidal Bivalve Mollusc *Mytilus edulis L*. *Netherlands Journal of Zoology, 36*, 322-343.

Zardi, G. I., Nicastro, K. R., McQuaid, C. D., & Erlandsson, J. 2008. Sand and wave induced mortality in invasive (*Mytilus galloprovincialis*) and indigenous (*Perna perna*) mussels. *Marine Biology, 153*, 853–858.

Zardi, G., Nicastro, K., Porri, F., & McQuaid, C. D., 2006. Sand stress as a non-determinant of habitat segregation of indigenous (*Perna perna*) and invasive (*Mytilus galloprovincialis*) mussels in South Africa. *Marine Biology, 148*, 1031–1038.

Zonneveld, K., Grotheer, H., & Versteegh, G., 2022. *Dinoflagellate* cysts production, excystment and transport in the upwelling off Cape Blanc (NW Africa). *Frontiers in Marine Science, 9*.