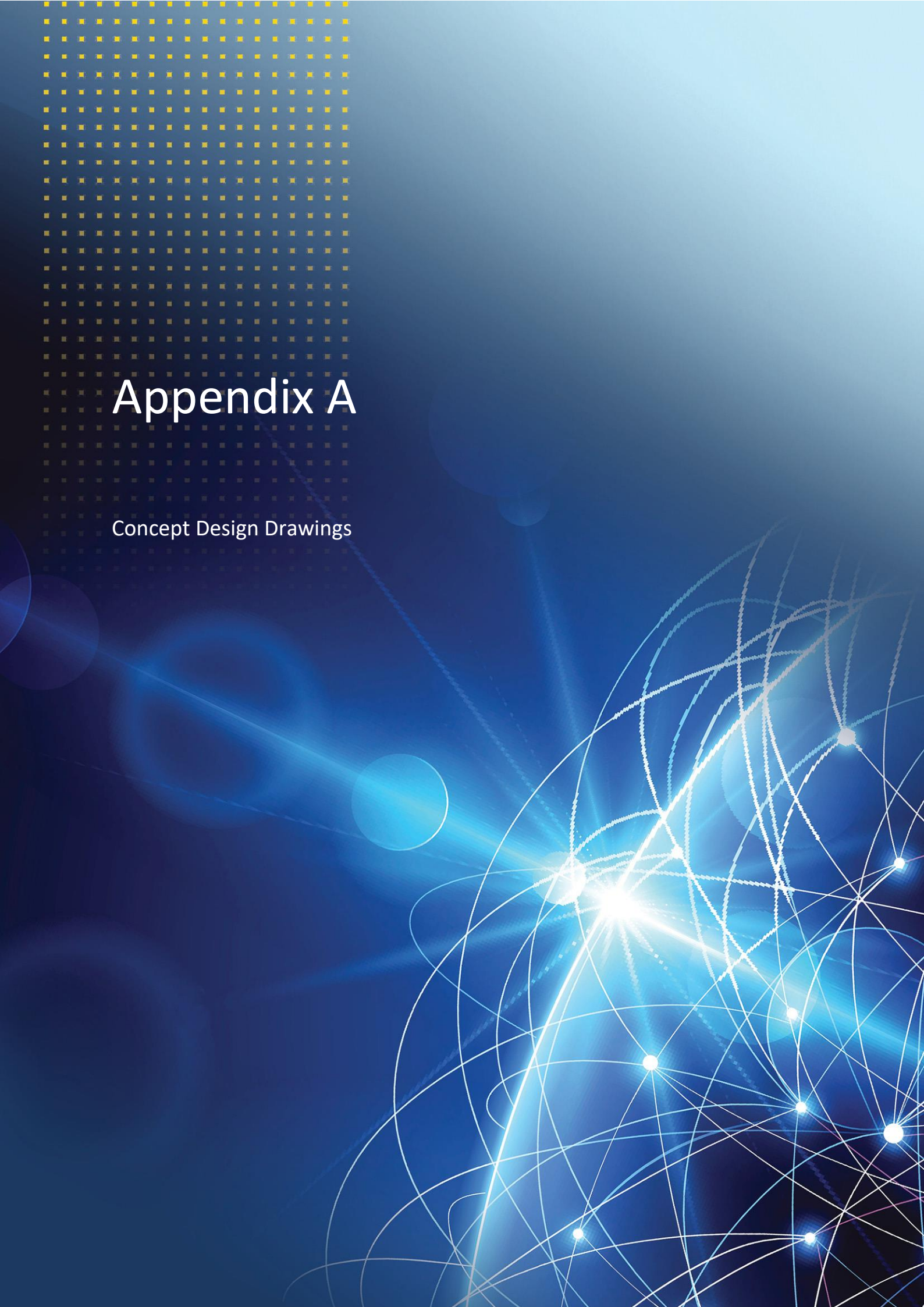
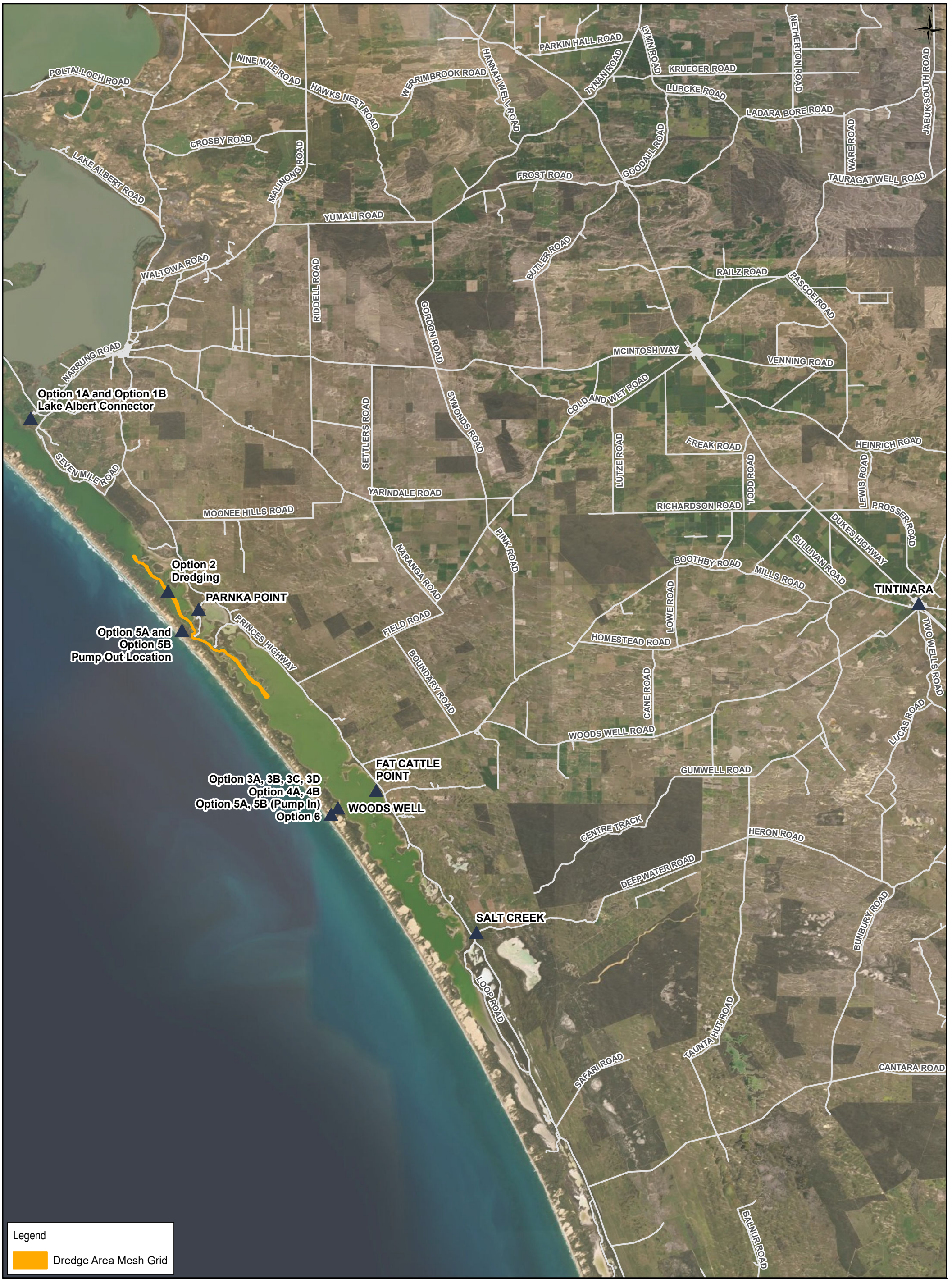
Appendix A

Concept Design Drawings





0 5 10
Kilometers

Scale at A3 1:280,000

SOURCE

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

FILE PATH	COORDINATE SYSTEM	DATE
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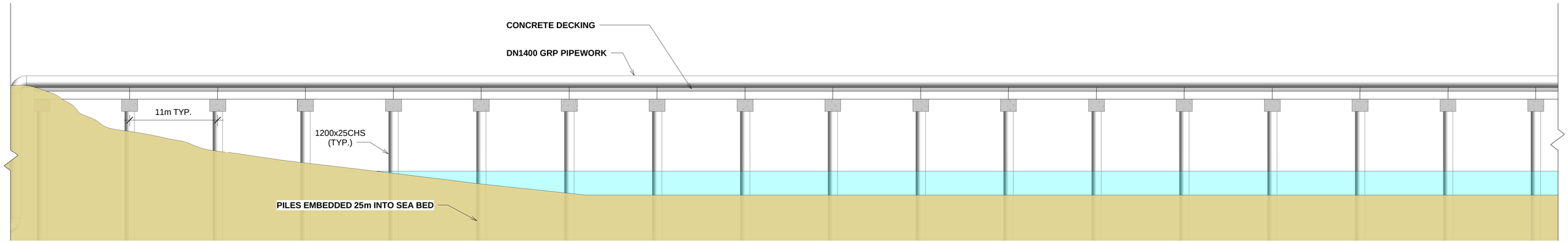
Level 3, 411 St Kilda Road, Victoria VIC 3001

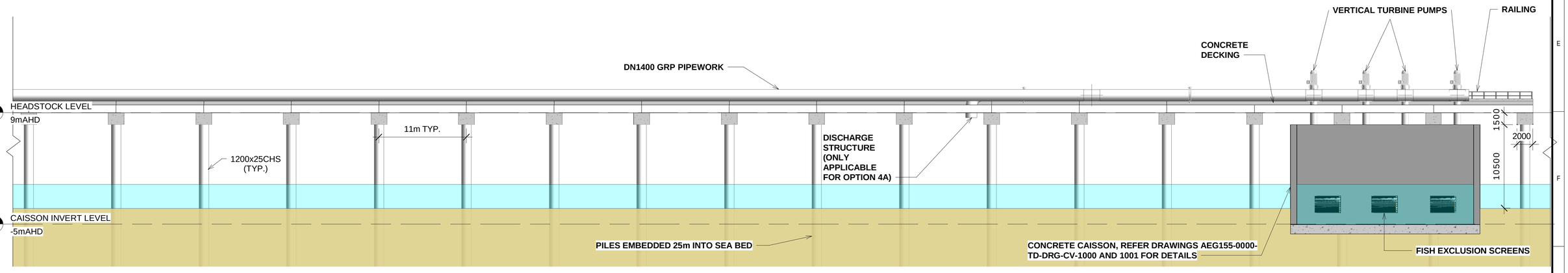
Prepared: TM
Checked: SW

TITLE
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
PROJECT KEY PLAN

DOCUMENT NO.	REV.
AEG155-0000-TD-CV-DRG-0001	B

NOTE:
1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.





2500 0 2500 5000 7500 10000mm
1 : 250 FULL SIZE @ A1

NOTE: THIS DRAWING IS TO BE READ / PRINTED IN COLOUR

NOT FOR CONSTRUCTION

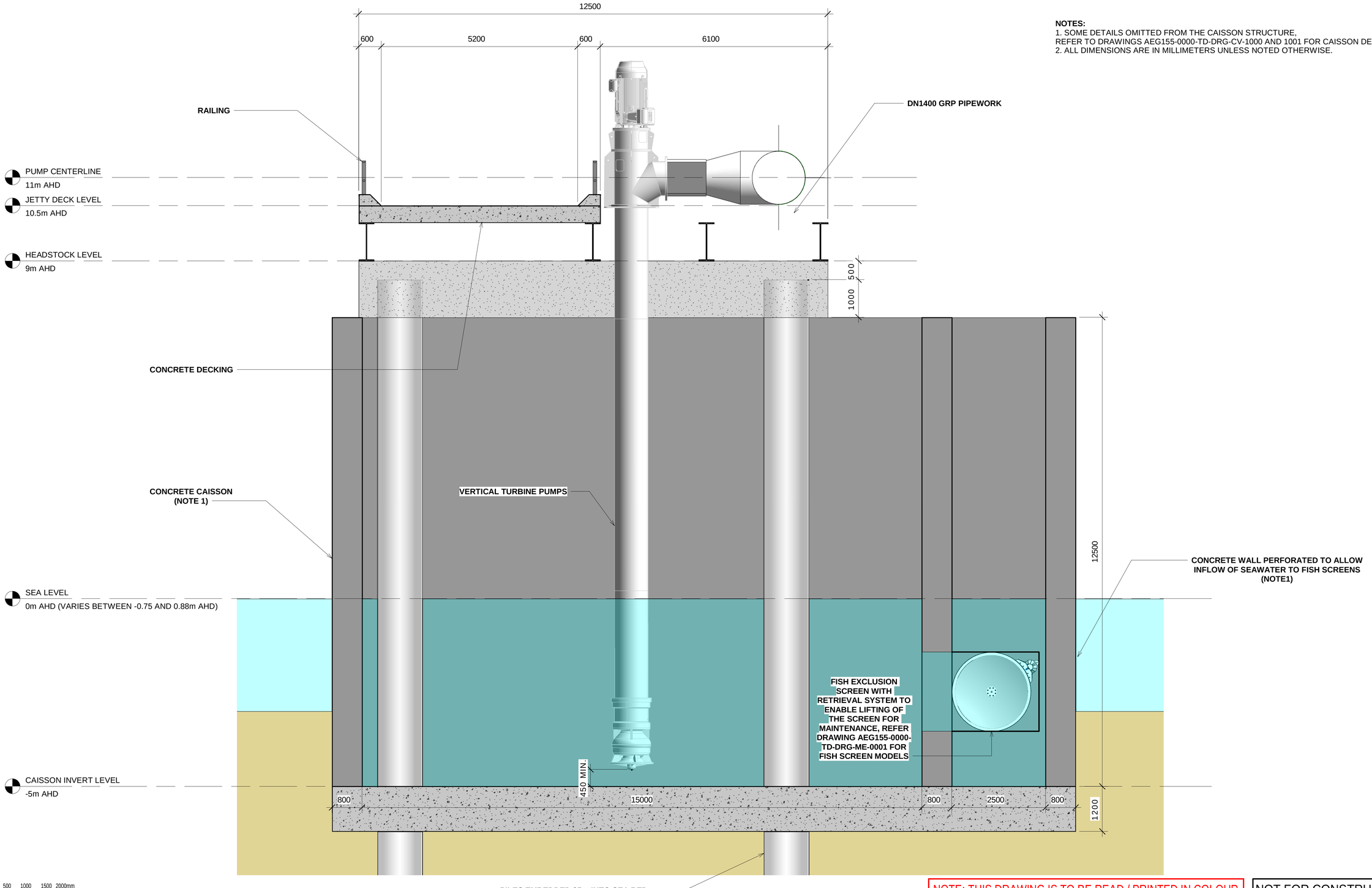
REV	DESCRIPTION	DATE	POSITION	NAME	SIGNATURE
			DRAFTING CHECK	F. RAPONI	FR
			ORIGINATE/ DESIGN	J. BOOTH	JB
			INDEPENDENT CHECK	M. TOLCVAY	MT
			TECHNICAL APPROVAL	P. STANIFORD	PS
D	FINAL CONCEPT ISSUE	21/12/2021	PROJECT APPROVAL	P. STANIFORD	PS
C	CONCEPT DESIGN ISSUE	17/12/2021	CLIENT APPROVAL		
B	CONCEPT DESIGN ISSUE	01/12/2021			
A	ISSUED FOR REVIEW	28/10/2021			

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
SITEWIDE
TYPICAL JETTY GENERAL ARRANGEMENT

DRAWING SCALE	ORIG. SIZE	DRAWING No.	REVISION
As indicated	A1	AEG155-0000-TD-DRG-CV-0200	D

DRAFTER: M. MACIEL



NOTES:
1. SOME DETAILS OMITTED FROM THE CAISSON STRUCTURE,
REFER TO DRAWINGS AEG155-0000-TD-DRG-CV-1000 AND 1001 FOR CAISSON DETAILS.
2. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.

500 0 500 1000 1500 2000mm
1 : 50 FULL SIZE @ A1

NOTE: THIS DRAWING IS TO BE READ / PRINTED IN COLOUR

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE
D	FINAL CONCEPT ISSUE	21/12/2021
C	CONCEPT DESIGN ISSUE	17/12/2021
B	CONCEPT DESIGN ISSUE	01/12/2021
A	ISSUED FOR REVIEW	28/10/2021

POSITION	NAME	SIGNATURE
DRAFTING CHECK	F. RAPONI	FR
ORIGINATE/ DESIGN	J. BOOTH	JB
INDEPENDENT CHECK	M. TOLCVAY	MT
TECHNICAL APPROVAL	P. STANIFORD	PS
PROJECT APPROVAL	P. STANIFORD	PS
CLIENT APPROVAL		

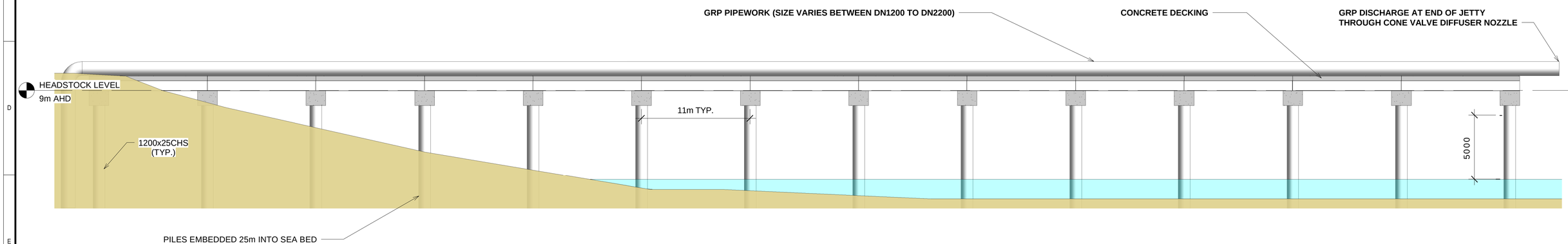
Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
SITEWIDE
TYPICAL JETTY SECTION

DRAWING SCALE	ORIG. SIZE	DRAWING No.	REVISION
1 : 50	A1	AEG155-0000-TD-DRG-CV-0201	D

DRAFTER: M. MACIEL

NOTE:
1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.



2000 0 2000 4000 6000 8000mm
1 : 200 FULL SIZE @ A1

NOTE: THIS DRAWING IS TO BE READ / PRINTED IN COLOUR

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE
D	FINAL CONCEPT ISSUE	21/12/2021
C	CONCEPT DESIGN ISSUE	17/12/2021
B	CONCEPT DESIGN ISSUE	01/12/2021
A	ISSUED FOR REVIEW	28/10/2021

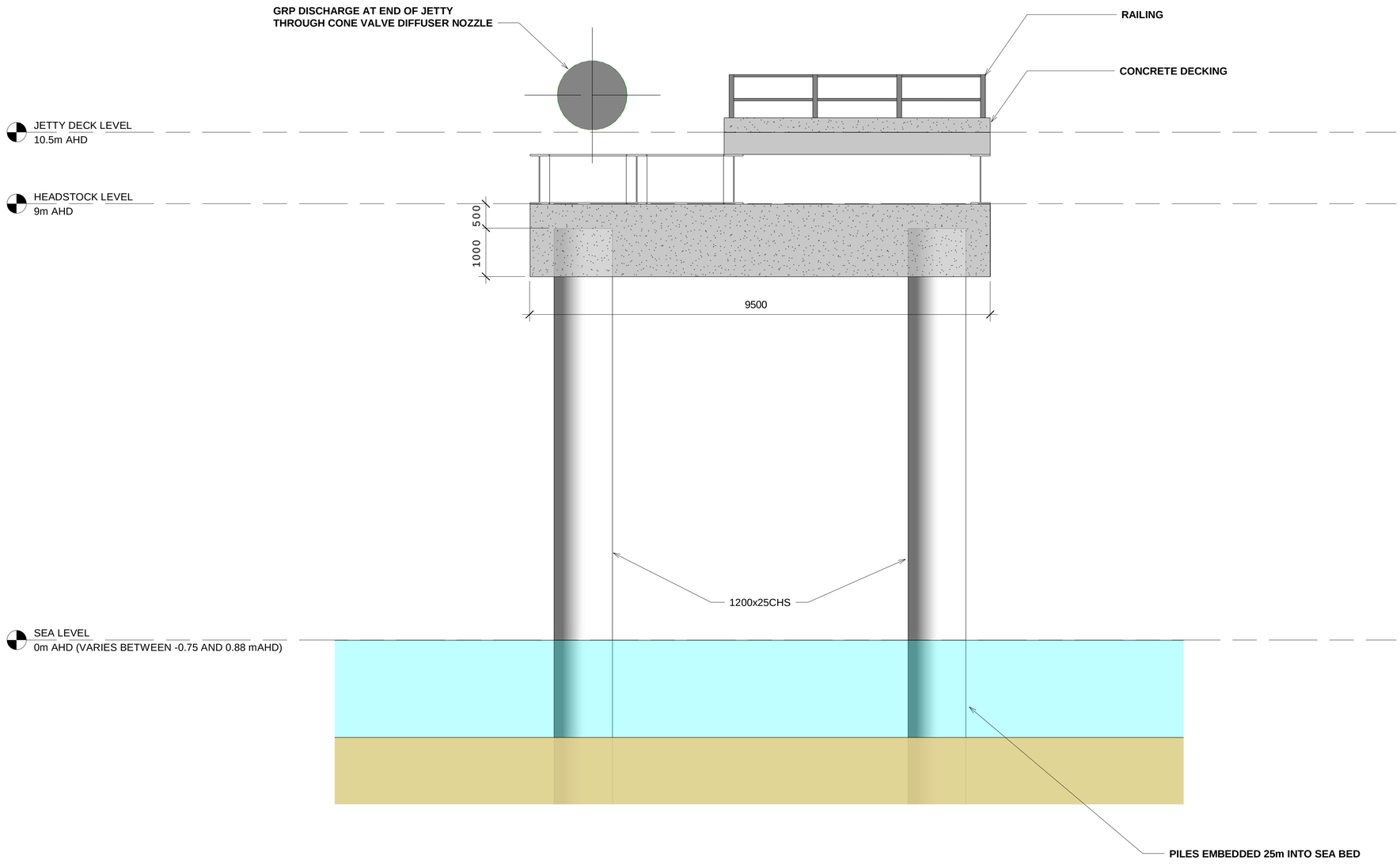
POSITION	NAME	SIGNATURE
DRAFTING CHECK	F. RAPONI	FR
ORIGINATE/ DESIGN	J. BOOTH	JB
INDEPENDENT CHECK	M. TOLCVAY	MT
TECHNICAL APPROVAL	P. STANIFORD	PS
PROJECT APPROVAL	P. STANIFORD	PS
CLIENT APPROVAL		

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
SITEWIDE
TYPICAL DISCHARGE JETTY GENERAL ARRANGEMENT

DRAWING SCALE 1 : 200
ORIG. SIZE A1
DRAWING No. AEG155-0000-TD-DRG-CV-0300
REVISION D
DRAFTER: M. MACIEL

NOTE:
1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.



500 0 500 1000 1500 2000mm
1 : 50 FULL SIZE @ A1

NOTE: THIS DRAWING IS TO BE READ / PRINTED IN COLOUR

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	POSITION	NAME	SIGNATURE
			DRAFTING CHECK	F. RAPONI	FR
			ORIGINATE/ DESIGN	J. BOOTH	JB
			INDEPENDENT CHECK	M. TOLCVAY	MT
			TECHNICAL APPROVAL	P. STANIFORD	PS
D	FINAL CONCEPT ISSUE	21/12/2021	PROJECT APPROVAL	P. STANIFORD	PS
C	CONCEPT DESIGN ISSUE	17/12/2021	CLIENT APPROVAL		
B	CONCEPT DESIGN ISSUE	01/12/2021			
A	ISSUED FOR REVIEW	28/10/2021			

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
SITEWIDE
TYPICAL DISCHARGE JETTY SECTION

DRAWING SCALE	ORIG. SIZE	DRAWING No.	REVISION
1 : 50	A1	AEG155-0000-TD-DRG-CV-0301	D

DRAFTER: M. MACIEL

NORTHERN CONSTRUCTION ACCESS
SCALE - N.T.S.

LOCATION PLAN
SCALE - N.T.S.

NOTES:

1. DREDGING FOR PUMP OUT INFRASTRUCTURE WILL BE REQUIRED WITH TEMPORARY DREDGATE PIPEWORK RUN ON GROUND AND ADJACENT ACCESS TRACK TO NEAR SHORE DISCHARGE.
2. IT IS EXPECTED THAT PIPELINE INSTALLATION FOR PUMP OUT INFRASTRUCTURE WILL UTILISE CONVENTIONAL OPEN TRENCHING, HOWEVER THE CONSTRUCTION METHOD WILL BE CONFIRMED DURING DETAILED DESIGN.

NOTE: THIS DRAWING IS TO BE PRINTED IN COLOUR

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	POSITION	NAME	SIGNATURE
			DRAFTING CHECK	M. PIGNATA	M.V.P.
			ORIGINATE/ DESIGN	S. WEBB	S.A.W.
			INDEPENDENT CHECK	B. CHUA	B.C.
			TECHNICAL APPROVAL	P. STANIFORD	P.J.S.
C	FINAL CONCEPT ISSUE	21.12.2021	PROJECT APPROVAL	P. STANIFORD	P.J.S.
B	CONCEPT DESIGN ISSUE	01.12.2021	CLIENT APPROVAL		
A	ISSUED FOR CLIENT REVIEW	01.11.2021			

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
SITEWIDE
CONSTRUCTION ACCESS - OPTION 5 (NORTH)

DRAWING SCALE	ORIG. SIZE	DRAWING No.	REVISION
N.T.S.	A1	AEG155-0000-TD-DRG-CV-0400	C

DRAFTER: B. SEIDEL

FILE: O:\GBI\CAD\PROJECTS\AEG155\03 CAD\CIVIL\01 DRAWINGS\AEG155-0000-TD-DRG-CV-0400.DWG
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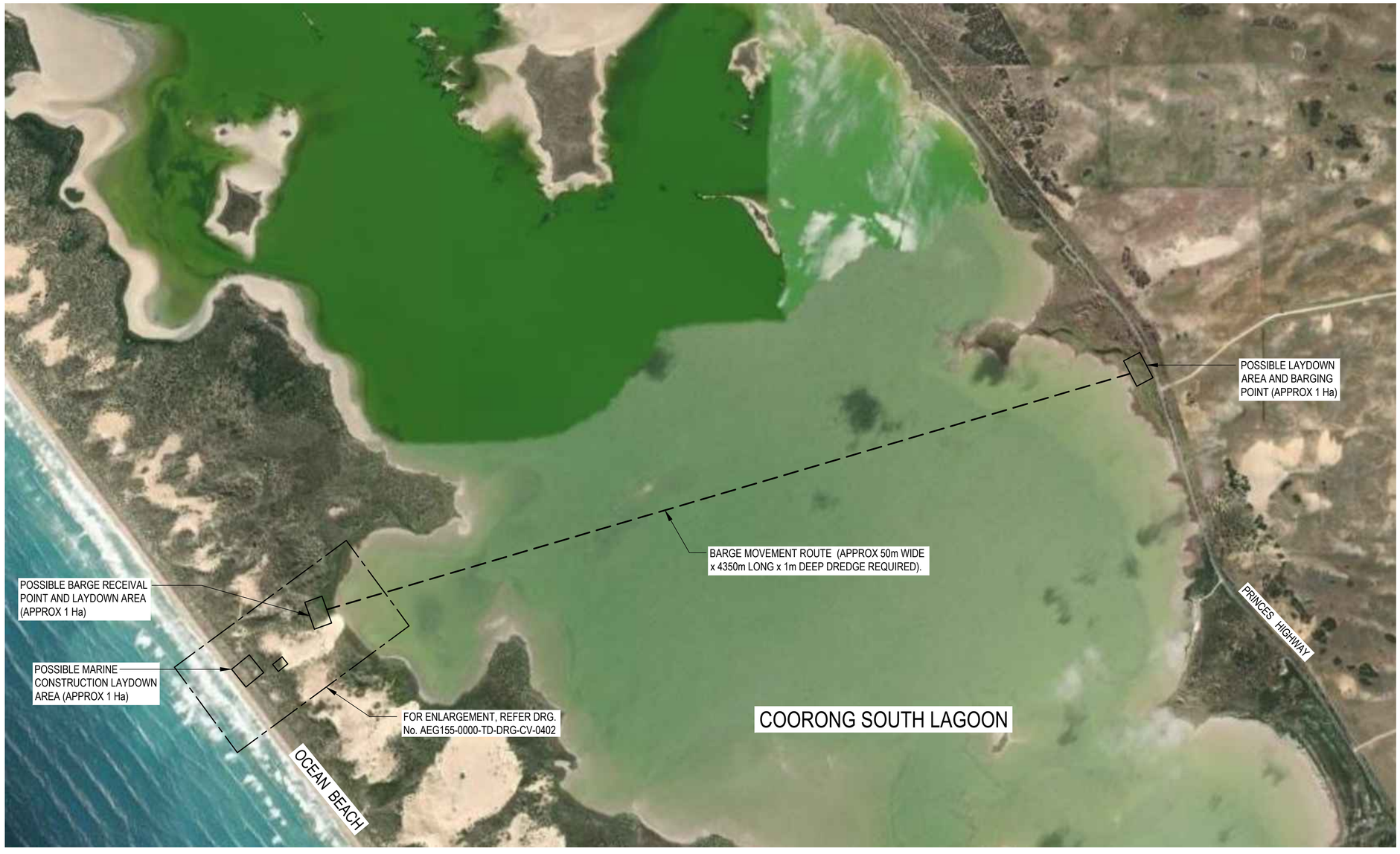

SOUTHERN CONSTRUCTION ACCESS
SCALE - N.T.S.

LOCATION PLAN
SCALE - N.T.S.

NOTES:

1. HAUL ROUTE FOR BREAKWATER MATERIALS WILL BE ALONG OCEAN BEACH.
2. DREDGING FOR PUMP OUT INFRASTRUCTURE AND BARGE ROUTE WILL BE REQUIRED WITH TEMPORARY DREDGATE PIPEWORK RUN ON GROUND AND ADJACENT ACCESS TRACK TO NEAR SHORE DISCHARGE.
3. IT IS EXPECTED THAT PIPELINE INSTALLATION FOR PUMP OUT INFRASTRUCTURE WILL UTILISE CONVENTIONAL OPEN TRENCHING, HOWEVER THE CONSTRUCTION METHOD WILL BE CONFIRMED DURING DETAILED DESIGN

NOTE: THIS DRAWING IS TO BE PRINTED IN COLOUR

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	POSITION	NAME	SIGNATURE
			DRAFTING CHECK	M. PIGNATA	M.V.P.
			ORIGINATE/ DESIGN	S. WEBB	S.A.W
			INDEPENDENT CHECK	B. CHUA	B.C.
			TECHNICAL APPROVAL	P. STANIFORD	P.J.S.
C	FINAL CONCEPT ISSUE	21.12.2021	PROJECT APPROVAL	P. STANIFORD	P.J.S.
B	CONCEPT DESIGN ISSUE	01.12.2021	CLIENT APPROVAL		
A	ISSUED FOR CLIENT REVIEW	01.11.2021			

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
SITEWIDE
CONSTRUCTION ACCESS - OPTIONS 3, 4, 5 & 6 SHEET 1

DRAWING SCALE: N.T.S.
DRAFTER: B. SEIDEL
ORIG. SIZE: A1
DRAWING No.: AEG155-0000-TD-DRG-CV-0401
REVISION: C

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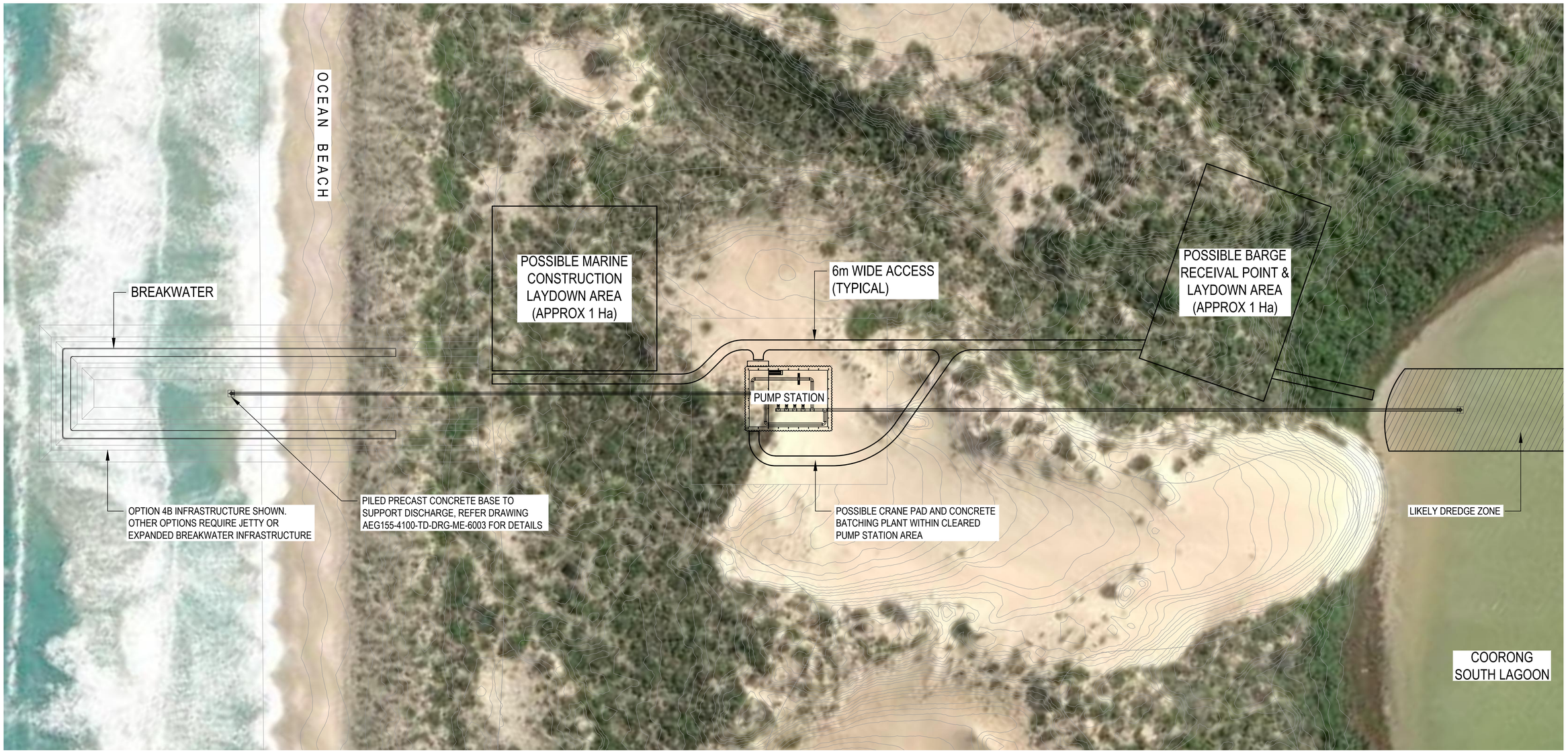

CONSTRUCTION ACCESS
SCALE 1 : 1250

NOTES:

1. HAUL ROUTE FOR BREAKWATER MATERIALS WILL BE ALONG OCEAN BEACH.
2. DREDGING FOR PUMP OUT INFRASTRUCTURE AND BARGE ROUTE WILL BE REQUIRED WITH TEMPORARY DREDGATE PIPEWORK RUN ON GROUND AND ADJACENT ACCESS TRACK TO NEAR SHORE DISCHARGE.
3. IT IS EXPECTED THAT PIPELINE INSTALLATION FOR PUMP OUT INFRASTRUCTURE WILL UTILISE CONVENTIONAL OPEN TRENCHING, HOWEVER THE CONSTRUCTION METHOD WILL BE CONFIRMED DURING DETAILED DESIGN

NOTE: THIS DRAWING IS TO BE PRINTED IN COLOUR

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	POSITION	NAME	SIGNATURE
			DRAFTING CHECK	M. PIGNATA	M.V.P.
			ORIGINATE/ DESIGN	S. WEBB	S.A.W.
			INDEPENDENT CHECK	B. CHUA	B.C.
			TECHNICAL APPROVAL	P. STANIFORD	P.J.S.
C	FINAL CONCEPT ISSUE	21.12.2021	PROJECT APPROVAL	P. STANIFORD	P.J.S.
B	CONCEPT DESIGN ISSUE	1.12.2021	CLIENT APPROVAL		
A	ISSUED FOR CLIENT REVIEW	1.11.2021			

0 25 50 75 100
SCALE 1: 1250 SCALE IN m

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
SITEWIDE
CONSTRUCTION ACCESS - OPTIONS 3, 4, 5 & 6 SHEET 2

DRAWING SCALE	ORIG. SIZE	DRAWING No.	REVISION
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DRAFTER: B. SEIDEL

DATE: Monday, 20 December 2021 4:42:25 PM
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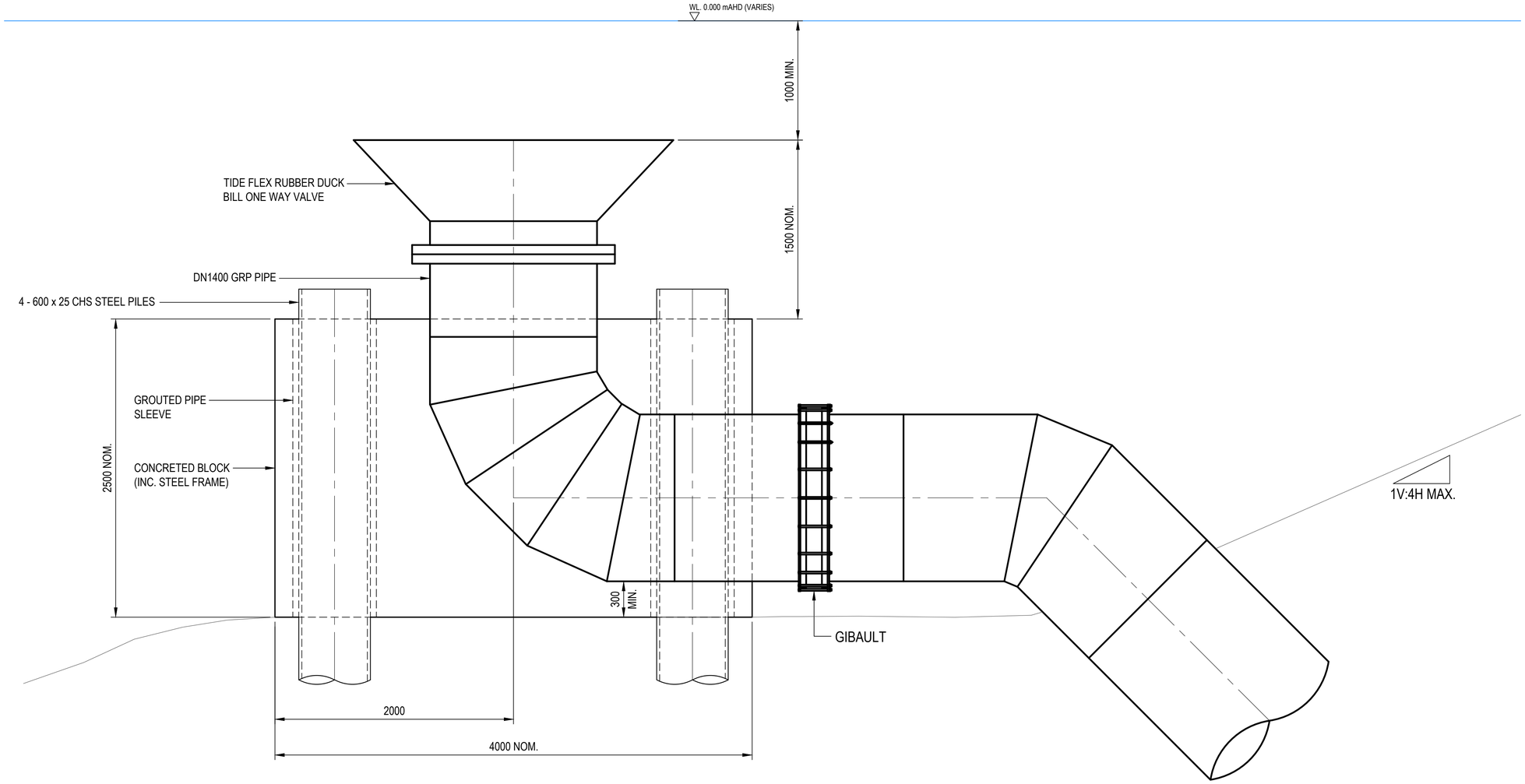
NOTE:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.



DISCHARGE STRUCTURE - SECTION

SCALE 1 : 20

NOTE: THIS DRAWING IS TO BE PRINTED IN COLOUR

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE
D	FINAL CONCEPT ISSUE	21.12.2021
C	CONCEPT DESIGN ISSUE	17.12.2021
B	CONCEPT DESIGN ISSUE	1.12.2021
A	ISSUED FOR CLIENT REVIEW	28.10.2021

POSITION	NAME	SIGNATURE
DRAFTING CHECK	M. PIGNATA	M.V.P.
ORIGINATE/ DESIGN	J. BOOTH	J.T.B.
INDEPENDENT CHECK	M. TOLCVAY	M.T.
TECHNICAL APPROVAL	P. STANIFORD	P.J.S.
PROJECT APPROVAL	P. STANIFORD	P.J.S.
CLIENT APPROVAL		

0 400 800 1200 1600

SCALE 1: 20 SCALE IN mm

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
SITEWIDE
DISCHARGE STRUCTURE - SECTION

DRAWING SCALE	ORIG. SIZE	DRAWING No.	REVISION
1 : 20	A1	AEG155-0000-TD-DRG-CV-0600	D

DRAFTER: F. RAPONI

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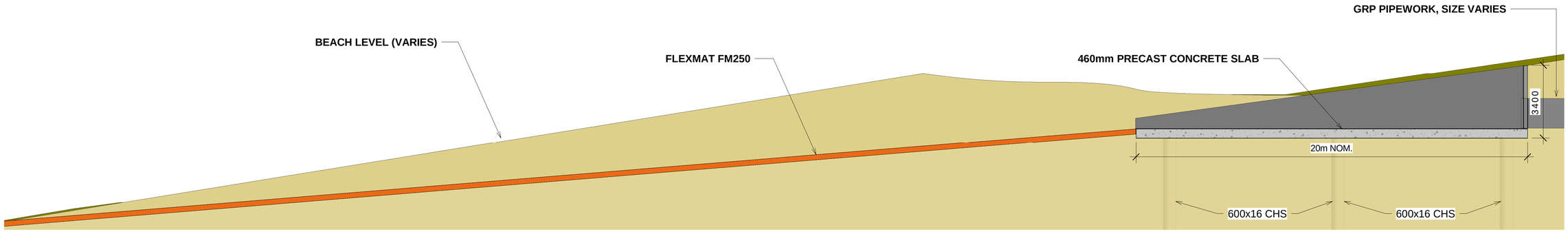
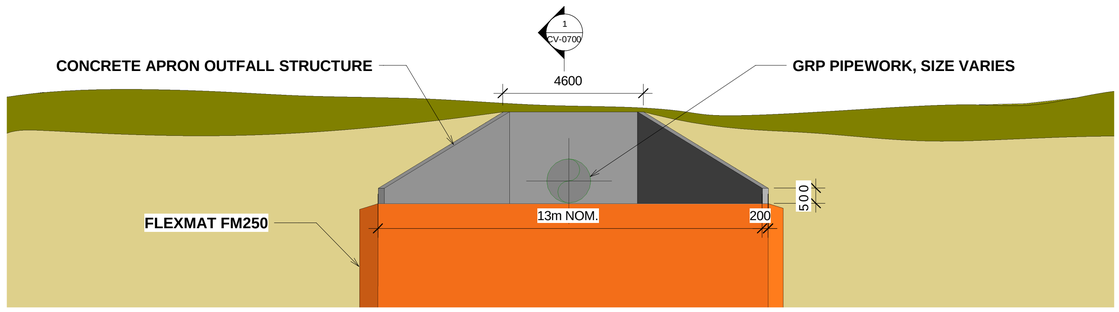
DATE: Tuesday, 21 December 2021 2:06:04 PM

2
0700

NOTE:
1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.



1 SHORE DISCHARGE - LONGITUDINAL SECTION
1 : 100



2 SHORE DISCHARGE - LATITUDINAL SECTION
1 : 100

1000 0 1000 2000 3000 4000mm
1 : 100 FULL SIZE @ A1

NOTE: THIS DRAWING IS TO BE READ / PRINTED IN COLOUR

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE
C	FINAL CONCEPT ISSUE	21/12/2021
B	CONCEPT DESIGN ISSUE	01/12/2021
A	ISSUED FOR REVIEW	28/10/2021

POSITION	NAME	SIGNATURE
DRAFTING CHECK	F. RAPONI	FR
ORIGINATE/ DESIGN	J. BOOTH	JB
INDEPENDENT CHECK	M. TOLCVAY	MT
TECHNICAL APPROVAL	P. STANIFORD	PS
PROJECT APPROVAL	P. STANIFORD	PS
CLIENT APPROVAL		

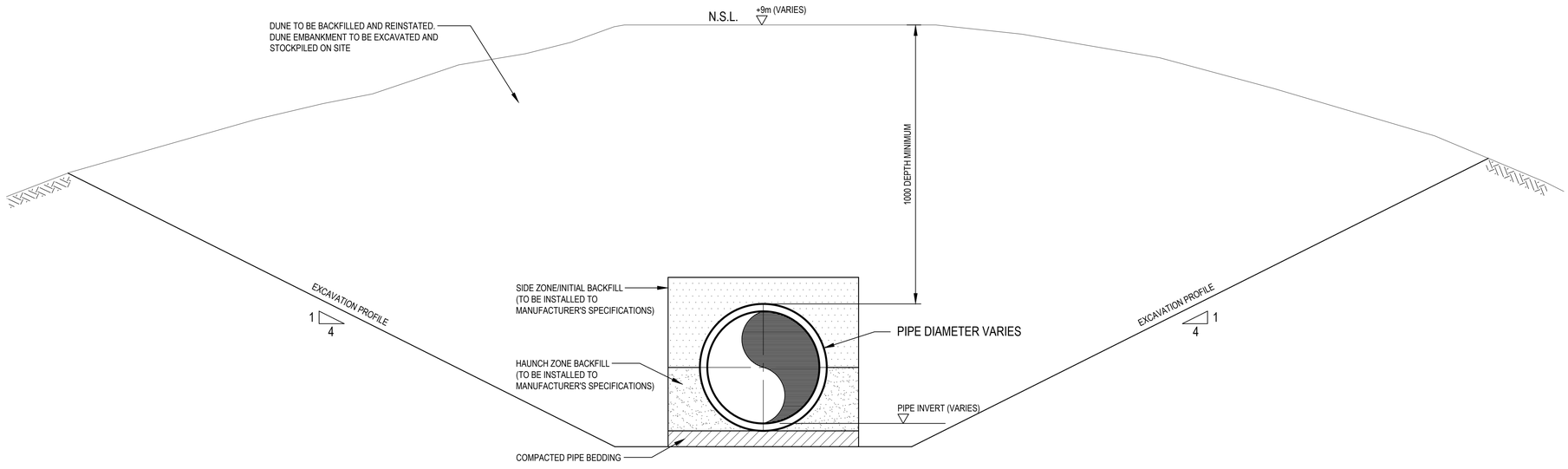
Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
SITEWIDE
NEARSHORE DISCHARGE STRUCTURE DETAILS

DRAWING SCALE 1 : 100
ORIG. SIZE A1
DRAFTER: M. MACIEL
DRAWING No. AEG155-0000-TD-DRG-CV-0700
REVISION C

NOTE:

1. ALL DIMENSIONS SHOWN ARE IN MILLIMETRES, UNLESS NOTED OTHERWISE.



DUNE TRENCH
TYPICAL DETAIL
1 : 50

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	POSITION	NAME	SIGNATURE
			DRAFTING CHECK	M. PIGNATA	M.V.P.
			ORIGINATE/ DESIGN	S. WEBB	S.A.W.
			INDEPENDENT CHECK	B. CHUA	B.C.
			TECHNICAL APPROVAL	P. STANIFORD	P.J.S.
D	FINAL CONCEPT ISSUE	21.12.2021	PROJECT APPROVAL	P. STANIFORD	P.J.S.
C	CONCEPT DESIGN ISSUE	17.12.2021	CLIENT APPROVAL		
B	CONCEPT DESIGN ISSUE	1.12.2021			
A	ISSUED FOR CLIENT REVIEW	28.10.2021			

0 1000 2000 3000 4000
SCALE 1: 50 SCALE IN mm

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
SITEWIDE
TYPICAL TRENCH DETAILS

DRAWING SCALE	ORIG. SIZE	DRAWING No.	REVISION
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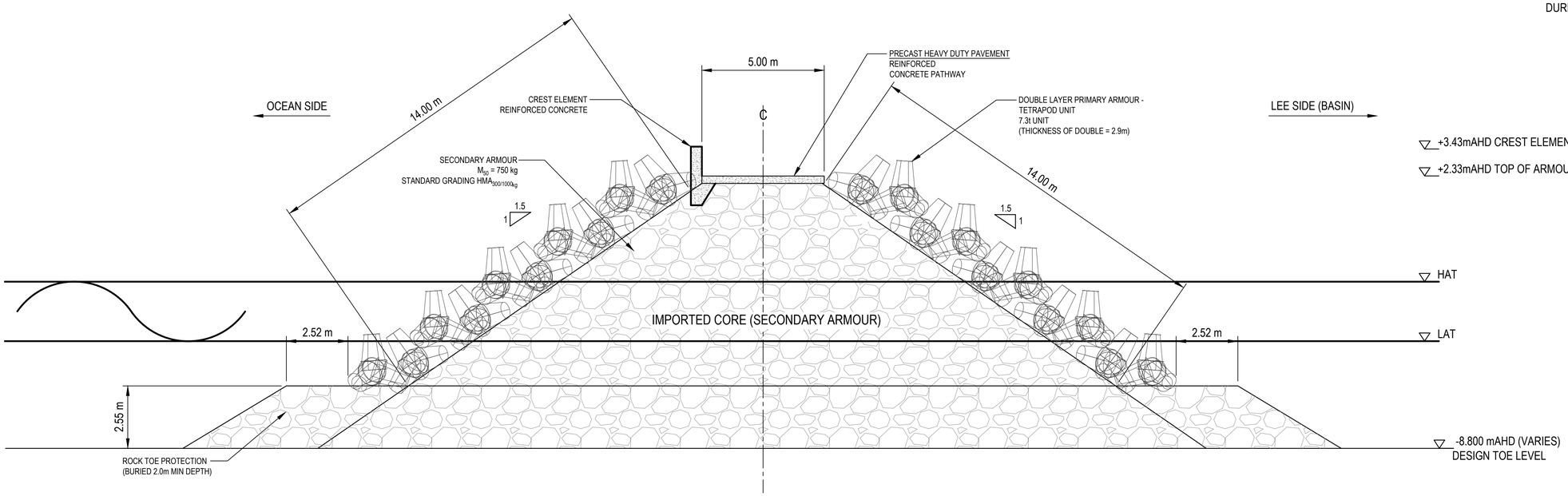
DRAFTER: F. RAPONI

DATE: Monday, 20 December 2021 4:43:47 PM
FILE: O:\G&I\CAD\PROJECTS\AEG155\03 CAD\CIVIL\01 DRAWINGS\AEG155-0000-TD-DRG-CV-0800.DWG

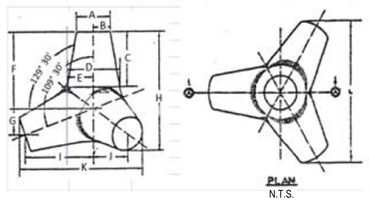
NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
2. OVERTOPPING LIMITED TO 1.0 L/s/m SAFE FOR PEDESTRIANS.
3. CREST LEVEL SET TO ALLOW FOR 40 ML/day OVERTOPPING VOLUME DURING AMBIENT CONDITIONS.



BREAKWATER - TYPICAL SECTION

SCALE 1 : 100



N.T.S.

HEAD UNITS

MASS OF UNIT (t)	M^{50}	16.00
HEIGHT (mm)	H	2830
VOLUME (m²)	V	6.30
THICKNESS OF DOUBLE LAYER (mm)	THK	3800
QUANTITY / 100 m^2	Q	30

DIMENSION	(mm)
A	855
B	427
C	1350
D	1330
E	665
F	1823
G	608
H	2830
I	1715
J	857
K	3088
L	3399

SIDE UNITS

EQUIVALENT UNIT LENGTH (m)	D_{n50}	1.37
MASS OF UNIT (t)	M^{50}	8.00
HEIGHT (mm)	H	2260
VOLUME (m²)	V	3.20
THICKNESS OF DOUBLE LAYER (mm)	THK	3000
QUANTITY / 100 m^2	Q	47

DIMENSION	(mm)
A	683
B	341
C	1078
D	1062
E	531
F	1455
G	486
H	2260
I	1370
J	685
K	2466
L	2714

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE
C	FINAL CONCEPT ISSUE	21.12.2021
B	CONCEPT DESIGN ISSUE	1.12.2021
A	ISSUED FOR CLIENT REVIEW	28.10.2021

POSITION	NAME	SIGNATURE
DRAFTING CHECK	M. PIGNATA	M.V.P.
ORIGINATE/ DESIGN	K. STEMM	K.S.
INDEPENDENT CHECK	P. CUMMINGS	P.C.
TECHNICAL APPROVAL	P. STANIFORD	P.J.S.
PROJECT APPROVAL	P. STANIFORD	P.J.S.
CLIENT APPROVAL		

SCALE 1: 100 — 0 2 4 6 8 — SCALE IN m

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

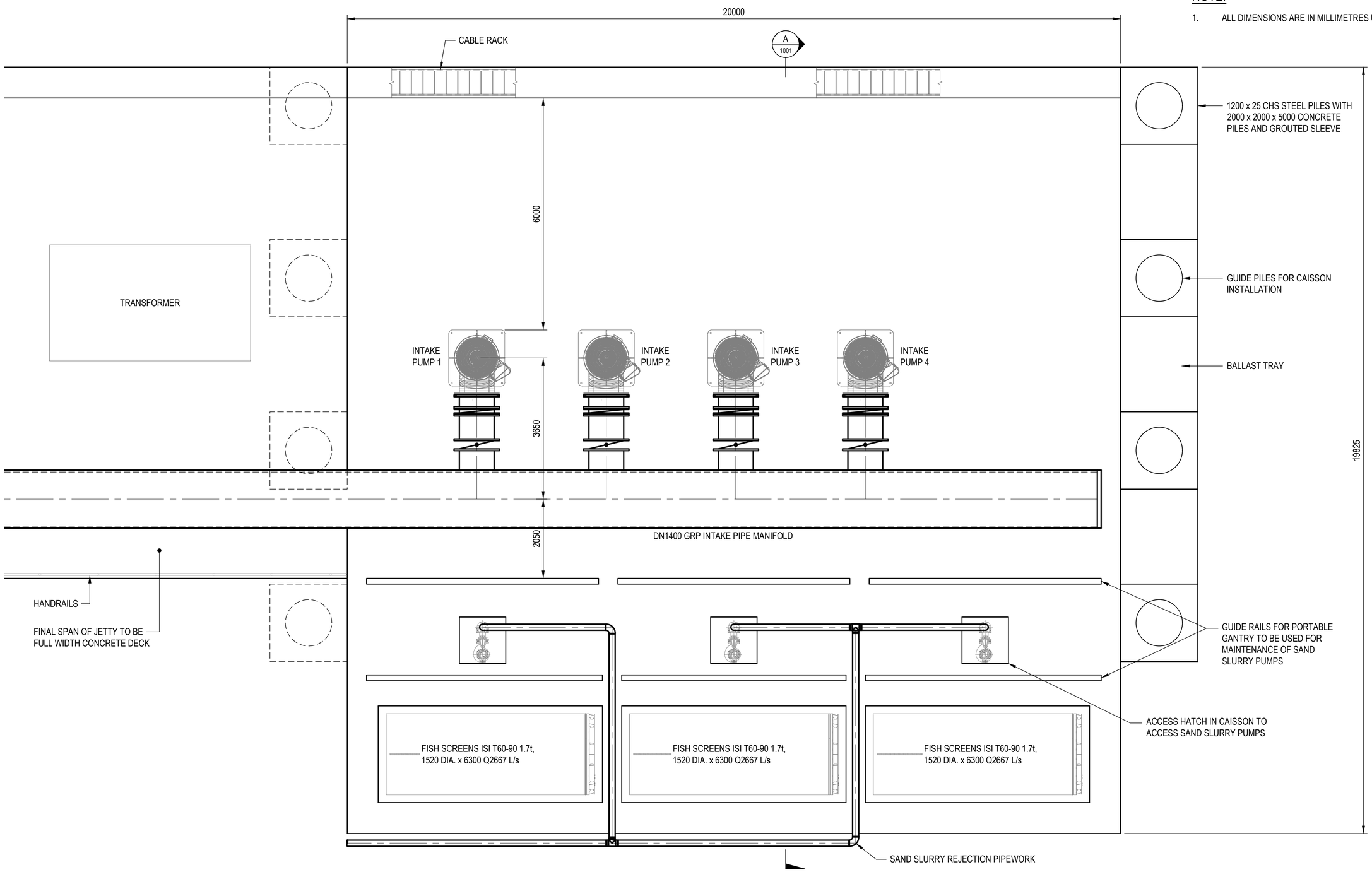
TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
SITEWIDE
BREAKWATER DETAILS

DRAWING SCALE	ORIG. SIZE	DRAWING No.	REVISION
AS SHOWN	A1	AEG155-0000-TD-DRG-CV-0900	C

DRAFTER: F. RAPONI

NOTE:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.



CAISSON STRUCTURE - GENERAL ARRANGEMENT

SCALE 1 : 50

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	POSITION	NAME	SIGNATURE
			DRAFTING CHECK	M. PIGNATA	M.V.P.
			ORIGINATE/ DESIGN	J. BOOTH	J.T.B.
			INDEPENDENT CHECK	M. TOLCVAY	M.T.
			TECHNICAL APPROVAL	P. STANIFORD	P.J.S.
C	FINAL CONCEPT ISSUE	21.12.2021	PROJECT APPROVAL	P. STANIFORD	P.J.S.
B	CONCEPT DESIGN ISSUE	1.12.2021	CLIENT APPROVAL		
A	ISSUED FOR CLIENT REVIEW	28.10.2021			

0 1000 2000 3000 4000

SCALE 1: 50 SCALE IN mm

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
SITEWIDE
CAISSON STRUCTURE GENERAL ARRANGEMENT

DRAWING SCALE	ORIG. SIZE	DRAWING No.	REVISION
1 : 50	A1	AEG155-0000-TD-DRG-CV-1000	C

DRAFTER: F. RAPONI

DATE: Monday, 20 December 2021 4:45:24 PM
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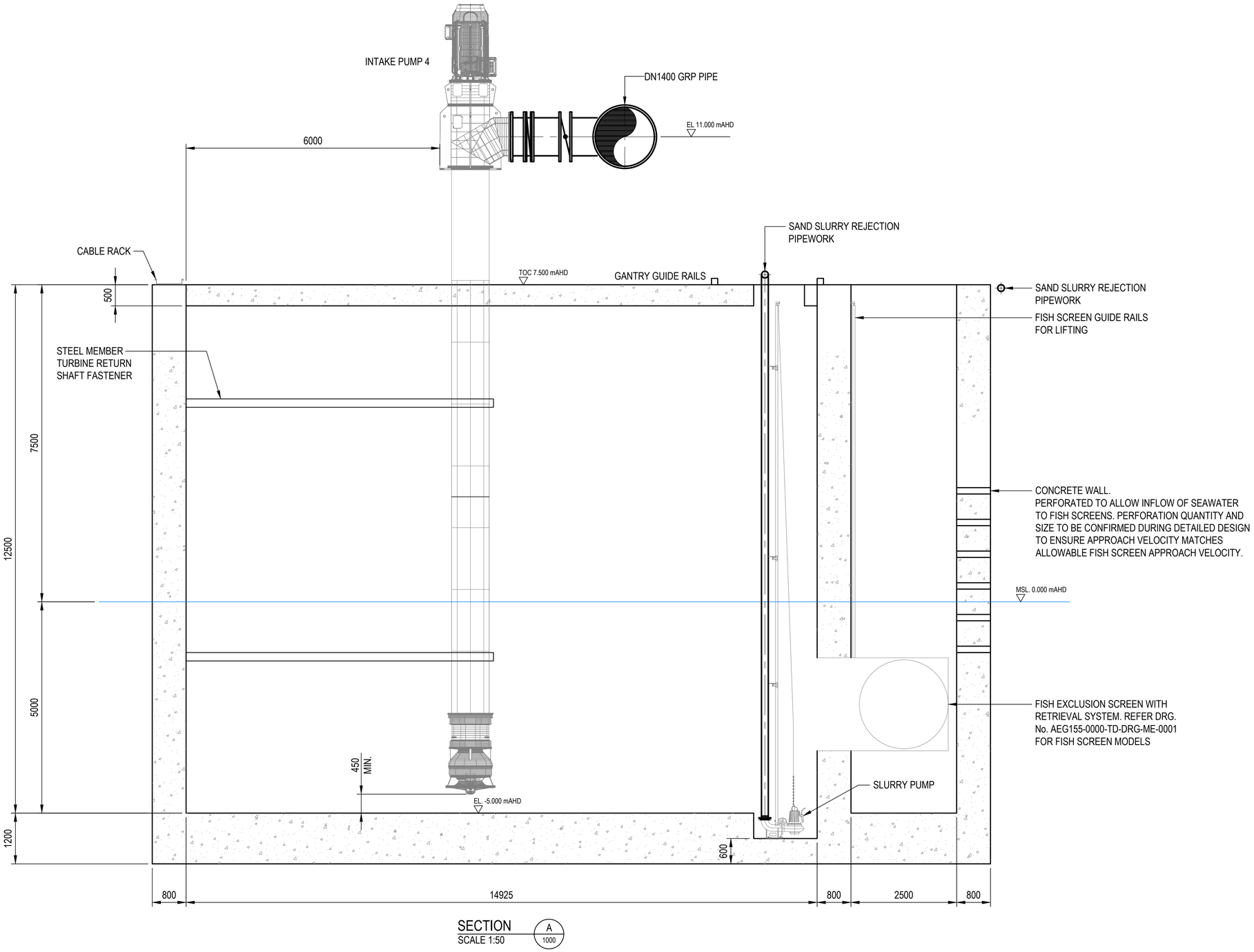


SECTION A
SCALE 1:50 1000

CAISSON STRUCTURE - SECTION

SCALE 1 : 50

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. JETTY DECK HIDDEN FROM SECTION.

NOTE: THIS DRAWING IS TO BE PRINTED IN COLOUR

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	POSITION	NAME	SIGNATURE
			DRAFTING CHECK	M. PIGNATA	M.V.P.
			ORIGINATE/ DESIGN	J. BOOTH	J.T.B.
			INDEPENDENT CHECK	M. TOLCVAY	M.T.
			TECHNICAL APPROVAL	P. STANIFORD	P.J.S.
D	FINAL CONCEPT ISSUE	21.12.2021	PROJECT APPROVAL	P. STANIFORD	P.J.S.
C	CONCEPT DESIGN ISSUE	17.12.2021	CLIENT APPROVAL		
B	CONCEPT DESIGN ISSUE	1.12.2021			
A	ISSUED FOR CLIENT REVIEW	28.10.2021			

0 1000 2000 3000 4000
SCALE 1: 50 SCALE IN mm

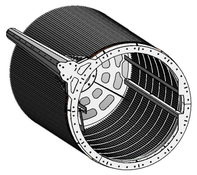
Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
LONG JETTY OCEAN WATER INTAKE / OUTFALL
CAISSON STRUCTURE SECTION

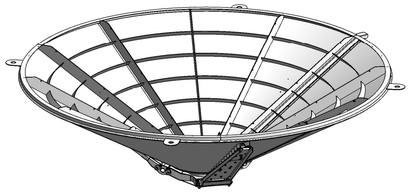
DRAWING SCALE	ORIG. SIZE	DRAWING No.	REVISION
1 : 50	A1	AEG155-0000-TD-DRG-CV-1001	D

DRAFTER: F. RAPONI

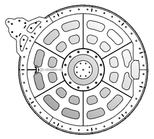
NOTE:
1. FISH EXCLUSION SCREENS SUPPLIED BY AWMA, REFER AWMA FOR FURTHER DETAILS. FINAL SCREEN TYPES AND DIMENSIONS TO BE CONFIRMED DURING DETAILED DESIGN.



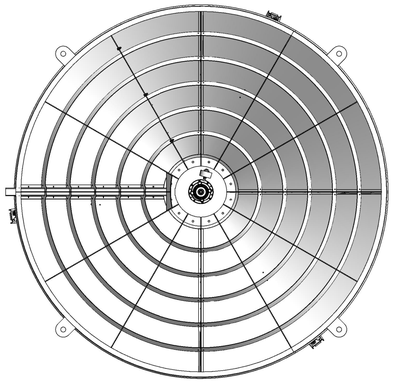
FD1 ME-0001
CYLINDER FISH SCREEN - 3D VIEW
NOT TO SCALE



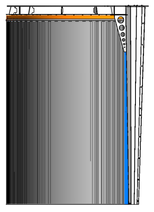
FD4 ME-0001
CONE FISH SCREEN - 3D VIEW
NOT TO SCALE



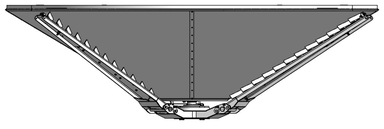
2 ME-0001
CYLINDER FISH SCREEN - PLAN
1 : 50



FD5 ME-0001
CONE FISH SCREEN - PLAN
1 : 50



1 ME-0001
CYLINDER FISH SCREEN - ELEVATION
1 : 50



FD6 ME-0001
CONE FISH SCREEN - ELEVATION
1 : 50

500 0 500 1000 1500 2000mm
1 : 50 FULL SIZE @ A1

NOTE: THIS DRAWING IS TO BE READ / PRINTED IN COLOUR

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE
C	FINAL CONCEPT ISSUE	21/12/2021
B	CONCEPT DESIGN ISSUE	01/12/2021
A	ISSUED FOR REVIEW	28/10/2021

POSITION	NAME	SIGNATURE
DRAFTING CHECK	F. RAPONI	FR
ORIGINATE/ DESIGN	J. BOOTH	JB
INDEPENDENT CHECK	M. TOLCVAY	MT
TECHNICAL APPROVAL	P. STANIFORD	PS
PROJECT APPROVAL	P. STANIFORD	PS
CLIENT APPROVAL		

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
SITEWIDE
FISH SCREEN DETAIL

DRAWING SCALE: AS SHOWN
ORIG. SIZE: A1
DRAFTER: M. MACIEL
DRAWING No.: AEG155-0000-TD-DRG-ME-0001
REVISION: C

DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
LAKE ALBERT CONNECTOR OPTION 1A

DRAWING LIST : LAKE ALBERT CONNECTOR OPTION 1A

DRAWING No.	DRAWING TITLE
AEG155-0000-TD-DRG-CV-0001	PROJECT KEY PLAN
AEG155-0000-TD-DRG-CV-0800	TYPICAL TRENCH DETAILS
AEG155-1000-TD-DRG-CV-0001	COVER SHEET AND DRAWING LIST
AEG155-1000-TD-DRG-CV-0002	LAKE ALBERT CONNECTOR OPTION 1A/B - OPTIONS KEY PLAN
AEG155-1000-TD-DRG-CV-1000	LAKE ALBERT CONNECTOR OPTION 1A - PLAN AND LONGITUDINAL SECTION SHEET 1 OF 4
AEG155-1000-TD-DRG-CV-1001	LAKE ALBERT CONNECTOR OPTION 1A - PLAN AND LONGITUDINAL SECTION SHEET 2 OF 4
AEG155-1000-TD-DRG-CV-1002	LAKE ALBERT CONNECTOR OPTION 1A - PLAN AND LONGITUDINAL SECTION SHEET 3 OF 4
AEG155-1000-TD-DRG-CV-1003	LAKE ALBERT CONNECTOR OPTION 1A - PLAN AND LONGITUDINAL SECTION SHEET 4 OF 4
AEG155-1000-TD-DRG-CV-7000	LAKE ALBERT CONNECTOR OPTION 1A - INLET REGULATING STRUCTURE - SITE PLAN
AEG155-1000-TD-DRG-CV-7001	LAKE ALBERT CONNECTOR OPTION 1A/B - INLET REGULATING STRUCTURE - ELEVATION

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	POSITION	NAME	SIGNATURE
			DRAFTING CHECK	M. PIGNATA	M.V.P.
			ORIGINATE/ DESIGN	S. WEBB	S.A.W.
			INDEPENDENT CHECK	B. CHUA	B.C.
			TECHNICAL APPROVAL	P. STANIFORD	P.J.S.
C	FINAL CONCEPT ISSUE	21.12.2021	PROJECT APPROVAL	P. STANIFORD	P.J.S.
B	CONCEPT DESIGN ISSUE	1.12.2021	CLIENT APPROVAL		
A	ISSUED FOR CLIENT REVIEW	28.10.2021			

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
LAKE ALBERT CONNECTOR OPTION 1A
COVER SHEET AND DRAWING LIST

DRAWING SCALE

ORIG. SIZE A1

DRAFTER: F. RAPONI

DRAWING No. AEG155-1000-TD-DRG-CV-0001

REVISION C

DATE: Monday, 20 December 2021 4:46:46 PM
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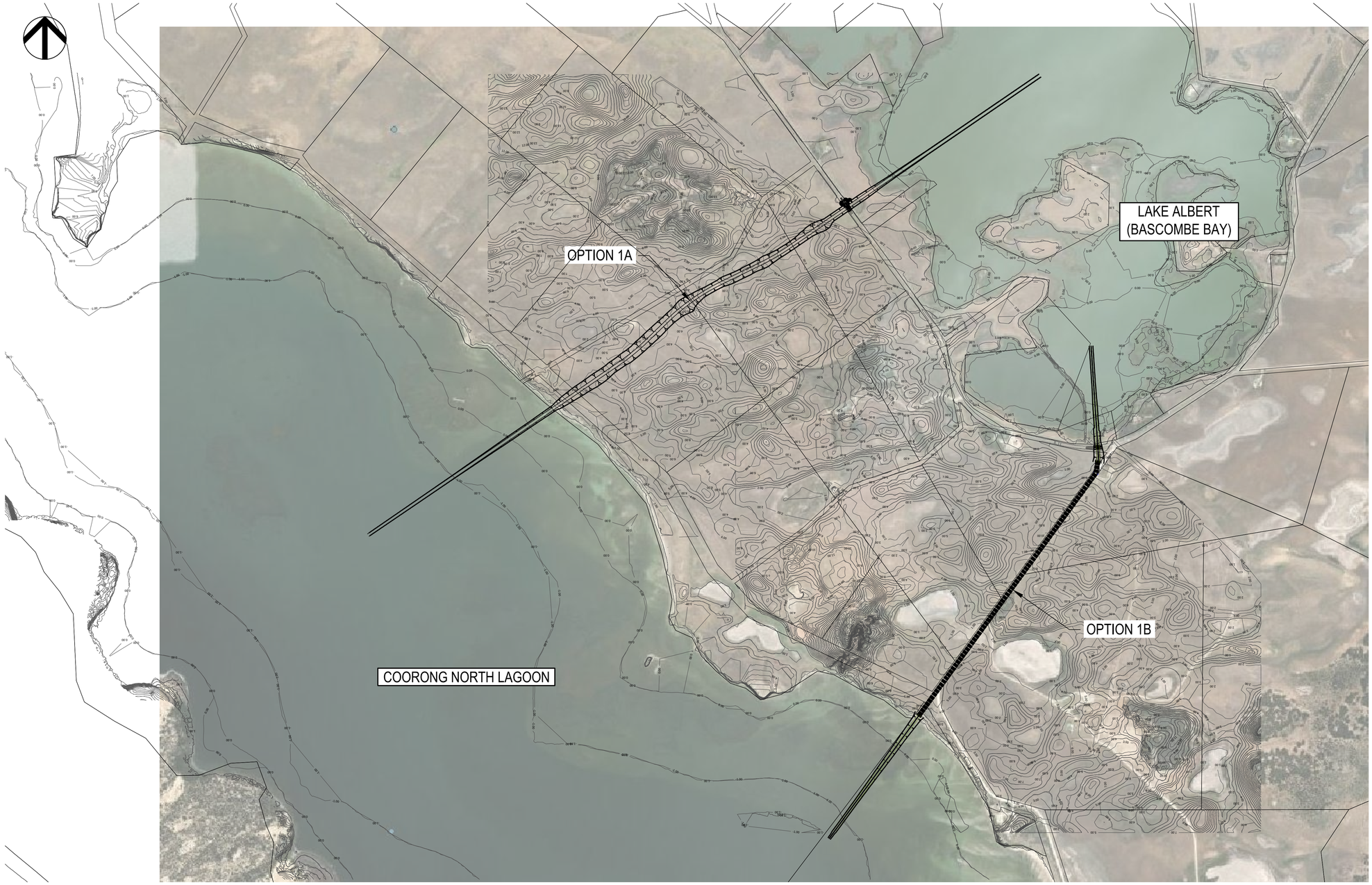


OPTIONS KEY PLAN
SCALE 1 : 10,000

NOTE: THIS DRAWING IS TO BE PRINTED IN COLOUR

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	POSITION	NAME	SIGNATURE
			DRAFTING CHECK	M. PIGNATA	M.V.P.
			ORIGINATE/ DESIGN	S. WEBB	S.A.W.
			INDEPENDENT CHECK	B. CHUA	B.C.
			TECHNICAL APPROVAL	P. STANIFORD	P.J.S.
C	FINAL CONCEPT ISSUE	21.12.2021	PROJECT APPROVAL	P. STANIFORD	P.J.S.
B	CONCEPT DESIGN ISSUE	01.12.2021	CLIENT APPROVAL		
A	ISSUED FOR CLIENT REVIEW	28.10.2021			

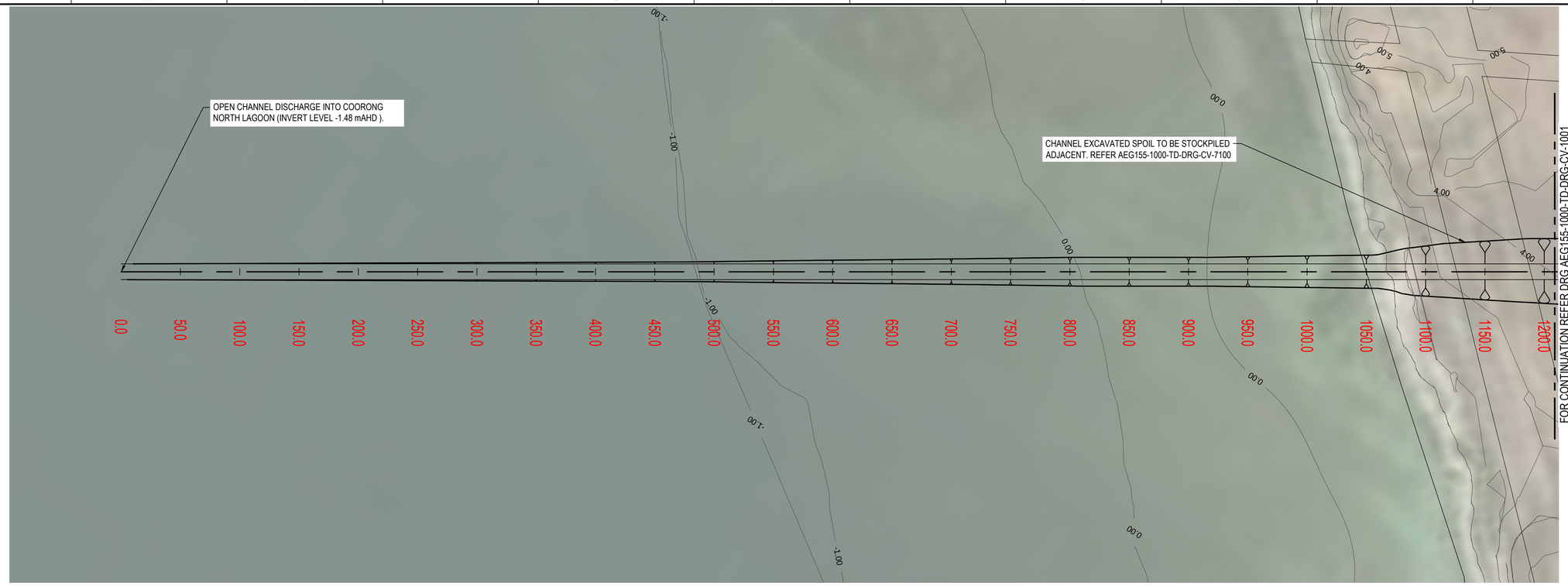
0 200 400 600 800
SCALE 1: 10000 SCALE IN m

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
LAKE ALBERT CONNECTOR OPTION 1A/B
OPTIONS KEY PLAN

DRAWING SCALE	ORIG. SIZE	DRAWING No.	REVISION
1 : 10,000	A1	AEG155-1000-TD-DRG-CV-0002	C

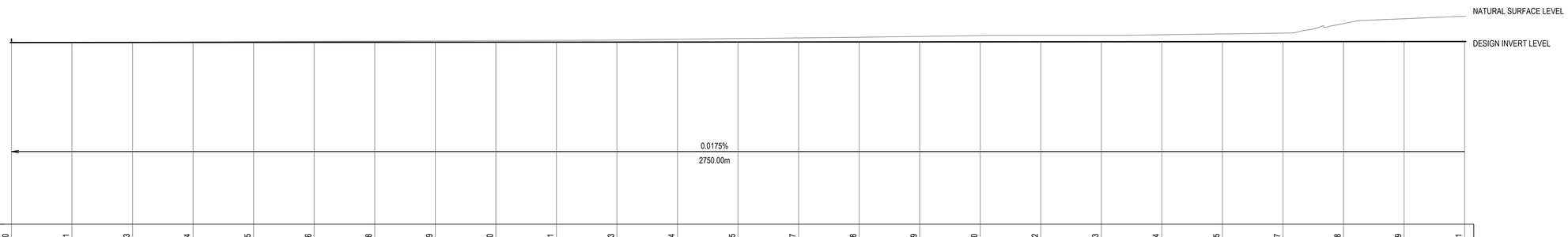
DRAFTER: B. SEIDEL



PLAN

SCALE 1:2000

BASE WIDTH:	13.3m
BATTER SLOPE:	1H IN 4V
TOTAL CUT:	-288975.456m³



DATUM R.L.-39.000

DESIGN INVERT LEVEL	-1.480	-1.471	-1.463	-1.454	-1.445	-1.436	-1.428	-1.419	-1.410	-1.401	-1.393	-1.384	-1.375	-1.367	-1.358	-1.349	-1.340	-1.332	-1.323	-1.314	-1.305	-1.297	-1.288	-1.279	-1.271
EXISTING SURFACE	-1.484	-1.435	-1.386	-1.337	-1.288	-1.240	-1.191	-1.142	-1.092	-1.038	-0.954	-0.787	-0.653	-0.519	-0.382	-0.217	-0.033	0.000	0.000	0.130	0.302	0.473	2.443	3.443	3.947
DEPTH TO INVERT	0.004	-0.036	-0.076	-0.117	-0.157	-0.197	-0.237	-0.277	-0.318	-0.364	-0.439	-0.597	-0.723	-0.847	-0.976	-1.132	-1.307	-1.332	-1.323	-1.444	-1.608	-1.769	-3.731	-4.722	-5.218
CHAINAGE	0.000	50.000	100.000	150.000	200.000	250.000	300.000	350.000	400.000	450.000	500.000	550.000	600.000	650.000	700.000	750.000	800.000	850.000	900.000	950.000	1000.000	1050.000	1100.000	1150.000	1200.000

LAKE ALBERT DRAIN LONGITUDINAL SECTION

SCALE 1:2000H; 1:500V

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE
C	FINAL CONCEPT ISSUE	21.12.2021
B	CONCEPT DESIGN ISSUE	01.12.2021
A	ISSUED FOR CLIENT REVIEW	28.10.2021

POSITION	NAME	SIGNATURE
DRAFTING CHECK	M. PIGNATA	M.V.P.
ORIGINATE/ DESIGN	S. WEBB	S.A.W.
INDEPENDENT CHECK	B. CHUA	B.C.
TECHNICAL APPROVAL	P. STANIFORD	P.J.S.
PROJECT APPROVAL	P. STANIFORD	P.J.S.
CLIENT APPROVAL		

0 10 20 30 40
SCALE 1: 500 SCALE IN m

0 40 80 120 160
SCALE 1: 2000 SCALE IN m

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
LAKE ALBERT CONNECTOR OPTION 1A
PLAN AND LONGITUDINAL SECTION SHEET 1 OF 4

DRAWING SCALE	ORIG. SIZE	DRAWING No.	REVISION
AS SHOWN	A1	AEG155-1000-TD-DRG-CV-1000	C

DRAFTER: B. SEIDEL

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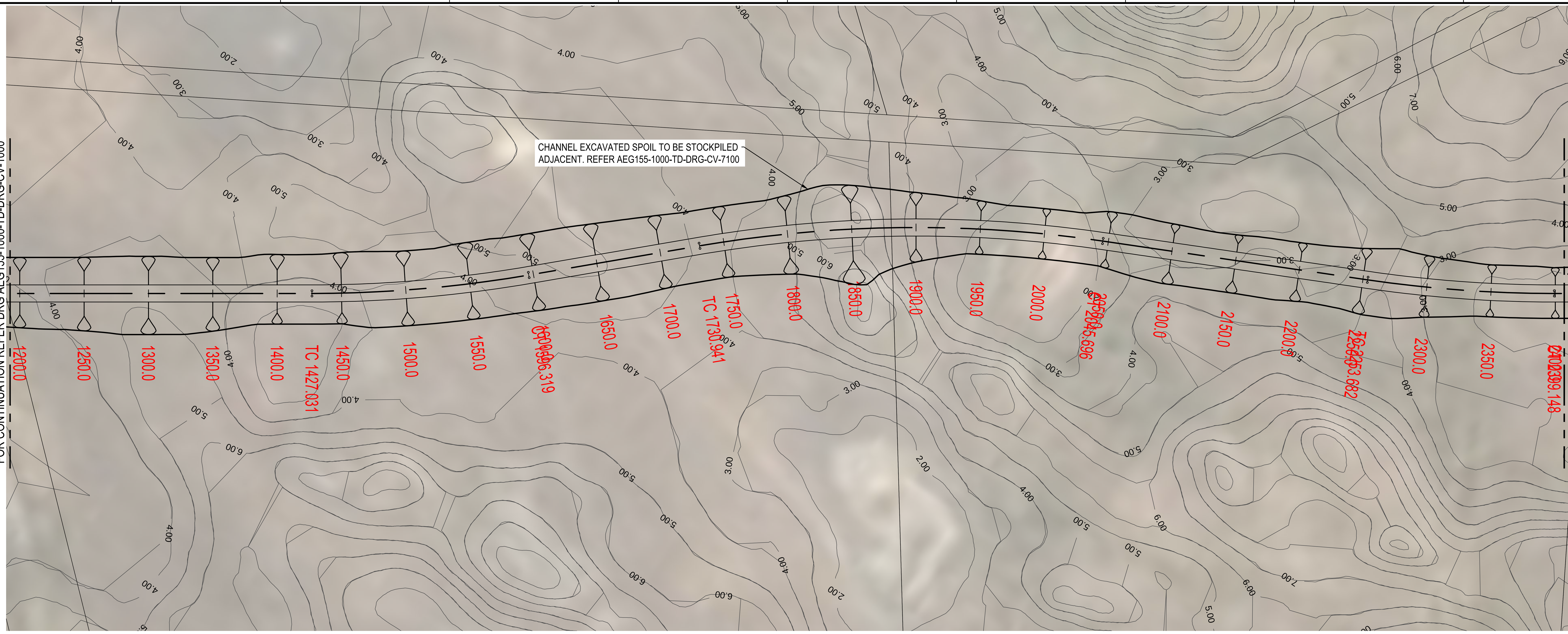
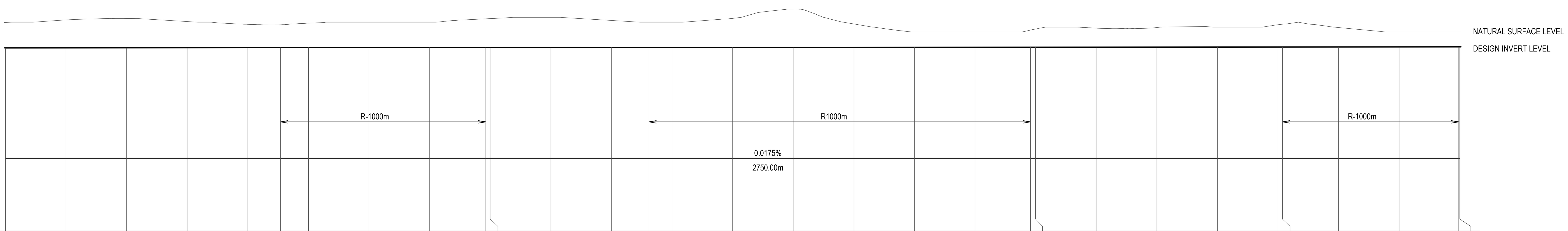
DATE: Tuesday, December 21, 2021 12:32:45 PM



PLAN

SCALE 1:2000

BASE WIDTH:	13.3m
BATTER SLOPE:	1H IN 4V
TOTAL CUT:	-288975.456m³



DATUM R.L.-39.000

CHAINAGE	DESIGN INVERT LEVEL	EXISTING SURFACE	DEPTH TO INVERT
1200.000	-1.271	3.947	-5.218
1250.000	-1.262	4.479	-5.741
1300.000	-1.253	4.779	-6.033
1350.000	-1.244	4.135	-5.379
1400.000	-1.236	3.570	-4.805
1427.031	-1.231	3.487	-4.718
1450.000	-1.227	3.818	-5.045
1500.000	-1.218	4.000	-5.218
1550.000	-1.209	4.000	-5.209
1596.319	-1.201	4.717	-5.918
1600.000	-1.201	4.758	-5.959
1650.000	-1.192	5.000	-6.192
1700.000	-1.183	4.359	-5.542
1730.941	-1.178	4.000	-5.178
1750.000	-1.175	4.000	-5.175
1800.000	-1.166	4.785	-5.951
1850.000	-1.157	6.731	-7.888
1900.000	-1.148	3.640	-4.789
1950.000	-1.140	2.000	-3.140
2000.000	-1.131	2.000	-3.131
2045.696	-1.123	2.380	-3.503
2050.000	-1.122	2.599	-3.721
2100.000	-1.113	2.783	-3.897
2150.000	-1.105	2.912	-4.017
2200.000	-1.096	3.000	-4.096
2250.000	-1.087	3.489	-4.576
2253.682	-1.087	3.595	-4.682
2300.000	-1.079	2.916	-3.995
2350.000	-1.070	2.000	-3.070
2399.148	-1.061	2.000	-3.061
2400.000	-1.061	2.000	-3.061

LAKE ALBERT DRAIN LONGITUDINAL SECTION

SCALE 1:2000H; 1:500V

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE
C	FINAL CONCEPT ISSUE	21.12.2021
B	CONCEPT DESIGN ISSUE	01.12.2021
A	ISSUED FOR CLIENT REVIEW	28.10.2021

POSITION	NAME	SIGNATURE
DRAFTING CHECK	M. PIGNATA	M.V.P.
ORIGINATE/ DESIGN	S. WEBB	S.A.W.
INDEPENDENT CHECK	B. CHUA	B.C.
TECHNICAL APPROVAL	P. STANIFORD	P.J.S.
PROJECT APPROVAL	P. STANIFORD	P.J.S.
CLIENT APPROVAL		

0 10 20 30 40
SCALE 1: 500 SCALE IN m

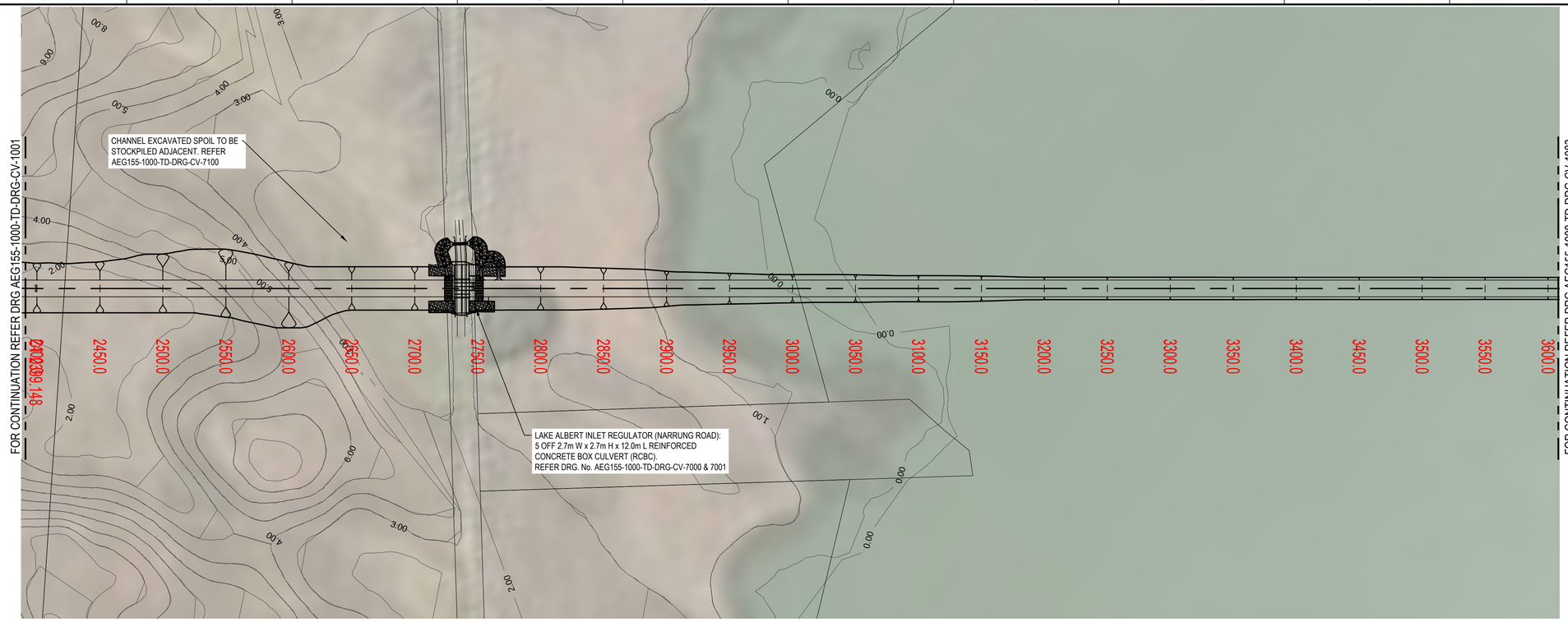
0 40 80 120 160
SCALE 1: 2000 SCALE IN m

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

DRAWING SCALE: AS SHOWN
DRAFTER: B. SEIDEL
ORIG. SIZE: A1

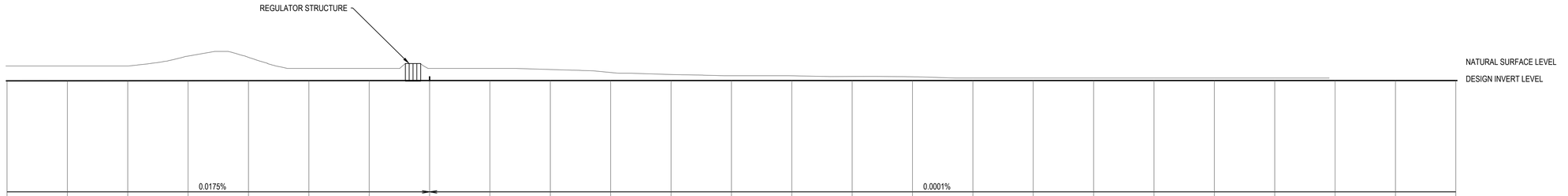
TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
LAKE ALBERT CONNECTOR OPTION 1A
PLAN AND LONGITUDINAL SECTION SHEET 2 OF 4

DRAWING No. AEG155-1000-TD-DRG-CV-1001
REVISION C



PLAN
SCALE 1:2000

BASE WIDTH:	13.3m
BATTER SLOPE:	1H IN 4V
TOTAL CUT:	-288975.456m³



DATUM R.L.-39.000

CHAINAGE	DESIGN INVERT LEVEL	EXISTING SURFACE	DEPTH TO INVERT
2400.000	-1.061	2.000	-3.061
2450.000	-1.052	2.000	-3.052
2500.000	-1.044	2.000	-3.044
2550.000	-1.035	4.051	-5.086
2600.000	-1.026	3.790	-4.816
2650.000	-1.017	1.500	-2.517
2700.000	-1.009	1.500	-2.509
2750.000	-1.000	1.500	-2.500
2800.000	-1.000	1.500	-2.500
2850.000	-1.000	1.282	-2.282
2900.000	-1.000	0.659	-1.659
2950.000	-1.000	0.247	-1.247
3000.000	-1.000	0.000	-1.000
3050.000	-1.000	-0.011	-0.989
3100.000	-1.000	-0.159	-0.841
3150.000	-1.000	-0.233	-0.767
3200.000	-1.000	-0.500	-0.500
3250.000	-1.000	-0.500	-0.500
3300.000	-1.000	-0.500	-0.500
3350.000	-1.000	-0.500	-0.500
3400.000	-1.000	-0.500	-0.500
3450.000	-1.000	-0.500	-0.500
3500.000	-1.000		
3550.000	-1.000		
3600.000	-1.000		

LAKE ALBERT DRAIN LONGITUDINAL SECTION
SCALE 1:2000H; 1:500V

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE
C	FINAL CONCEPT ISSUE	21.12.2021
B	CONCEPT DESIGN ISSUE	01.12.2021
A	ISSUED FOR CLIENT REVIEW	28.10.2021

POSITION	NAME	SIGNATURE
DRAFTING CHECK	M. PIGNATA	M.V.P.
ORIGINATE/ DESIGN	S. WEBB	S.A.W.
INDEPENDENT CHECK	B. CHUA	B.C.
TECHNICAL APPROVAL	P. STANIFORD	P.J.S.
PROJECT APPROVAL	P. STANIFORD	P.J.S.
CLIENT APPROVAL		

0 10 20 30 40
SCALE 1: 500 SCALE IN m

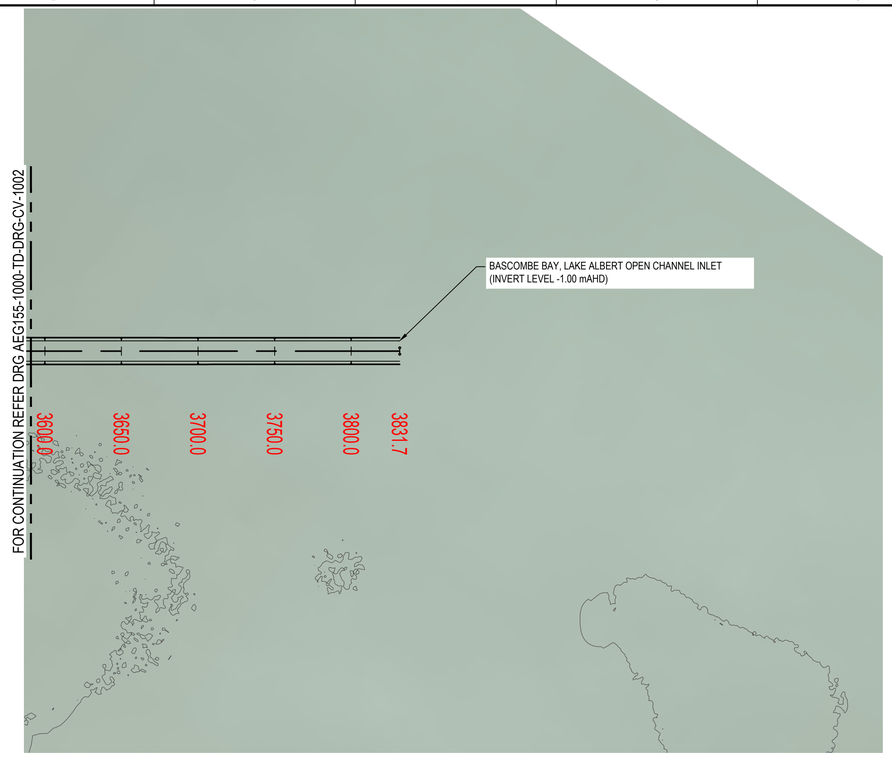
0 40 80 120 160
SCALE 1: 2000 SCALE IN m

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
LAKE ALBERT CONNECTOR OPTION 1A
PLAN AND LONGITUDINAL SECTION SHEET 3 OF 4

DRAWING SCALE	ORIG. SIZE	DRAWING No.	REVISION
AS SHOWN	A1	AEG155-1000-TD-DRG-CV-1002	C

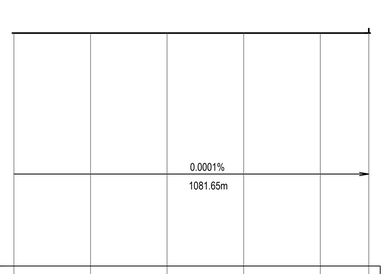
DRAFTER: B. SEIDEL



PLAN

SCALE 1:2000

BASE WIDTH:	13.3m
BATTER SLOPE:	1H IN 4V
TOTAL CUT:	-288975.456m³



DATUM R.L.-39.000

DESIGN INVERT LEVEL	-1.000	-1.000	-1.000	-1.000	-1.000	-1.000
EXISTING SURFACE						
DEPTH TO INVERT						
CHAINAGE	3600.000	3650.000	3700.000	3750.000	3800.000	3831.654

LAKE ALBERT DRAIN LONGITUDINAL SECTION

SCALE 1:2000H; 1:500V

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE
C	FINAL CONCEPT ISSUE	21.12.2021
B	CONCEPT DESIGN ISSUE	01.12.2021
A	ISSUED FOR CLIENT REVIEW	28.10.2021

POSITION	NAME	SIGNATURE
DRAFTING CHECK	M. PIGNATA	M.V.P.
ORIGINATE/ DESIGN	S. WEBB	S.A.W.
INDEPENDENT CHECK	B. CHUA	B.C.
TECHNICAL APPROVAL	P. STANIFORD	P.J.S.
PROJECT APPROVAL	P. STANIFORD	P.J.S.
CLIENT APPROVAL		

0 10 20 30 40
SCALE 1: 500 SCALE IN m

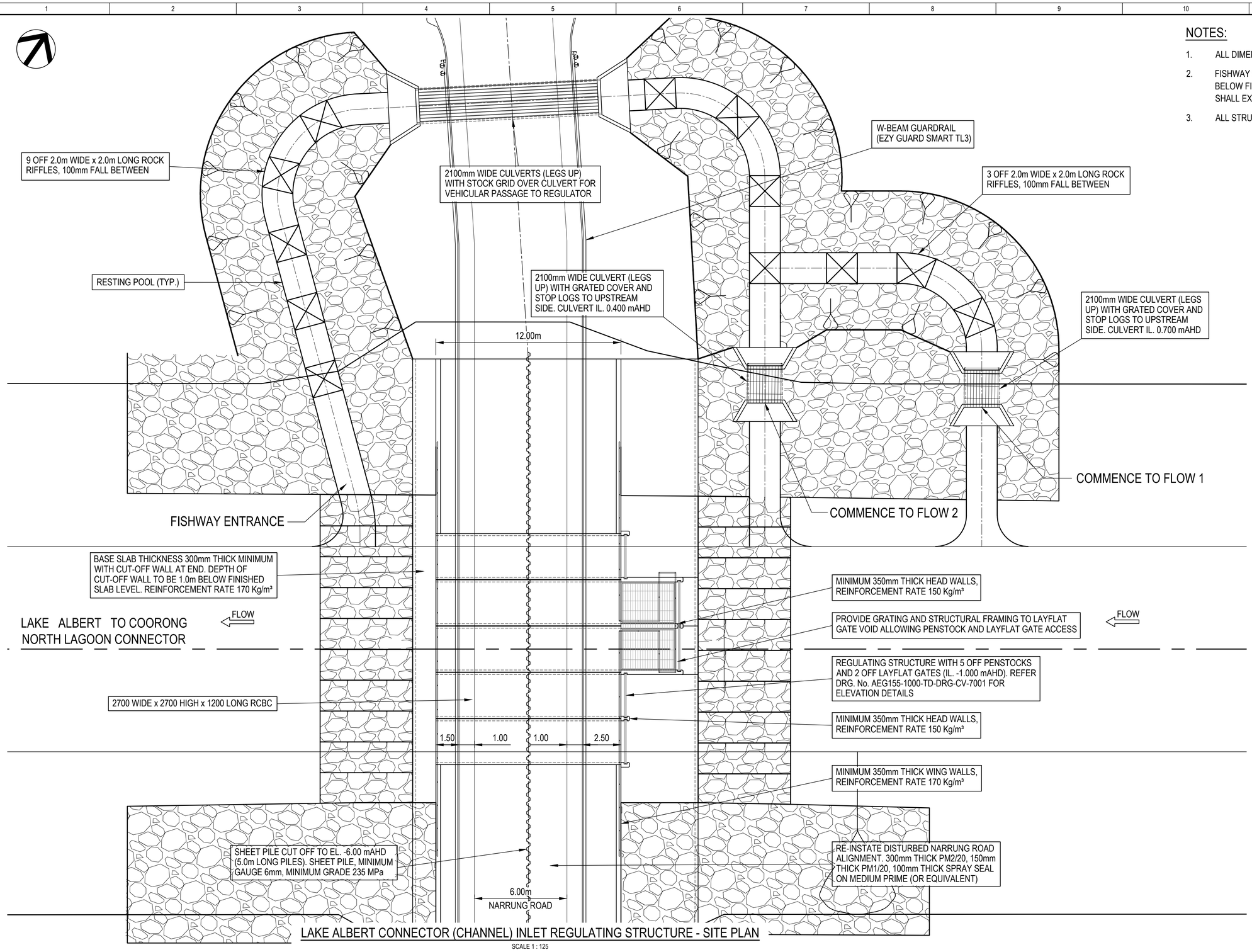
0 40 80 120 160
SCALE 1: 2000 SCALE IN m

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
LAKE ALBERT CONNECTOR OPTION 1A
PLAN AND LONGITUDINAL SECTION SHEET 4 OF 4

DRAWING SCALE	ORIG. SIZE	DRAWING No.	REVISION
AS SHOWN	A1	AEG155-1000-TD-DRG-CV-1003	C

DRAFTER: B. SEIDEL



LAKE ALBERT CONNECTOR (CHANNEL) INLET REGULATING STRUCTURE - SITE PLAN

SCALE 1 : 125

NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
2. FISHWAY SHALL INCLUDE GEOSYNTHETIC CLAY LINER FINISHING 0.50m BELOW FINAL GROUND SURFACE AT TOP OF BATTERS. BIDIM A64 SHALL EXTEND THROUGH TO 0.10m BELOW FINAL GROUND SURFACE.
3. ALL STRUCTURAL STEEL TO BE HOT DIP GALVANISED.

FISHWAY DESIGN PARAMETERS	
TWL LAKE ALBERT	1.200 mAHD
TWL COORONG NORTH	1.000 mAHD
BWL LAKE ALBERT	0.400 mAHD
BWL COORONG NORTH	-0.200 mAHD
COMMENCE TO FLOW 1	0.700 mAHD
COMMENCE TO FLOW 2	0.400 mAHD

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	POSITION	NAME	SIGNATURE
			DRAFTING CHECK	M. PIGNATA	M.V.P.
			ORIGINATE/ DESIGN	S. WEBB	S.A.W.
			INDEPENDENT CHECK	B. CHUA	B.C.
			TECHNICAL APPROVAL	P. STANIFORD	P.J.S.
C	FINAL CONCEPT ISSUE	21.12.2021	PROJECT APPROVAL	P. STANIFORD	P.J.S.
B	CONCEPT DESIGN ISSUE	1.12.2021	CLIENT APPROVAL		
A	ISSUED FOR CLIENT REVIEW	28.10.2021			

0 2.5 5.0 7.5 10.0
SCALE 1: 125 SCALE IN m

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

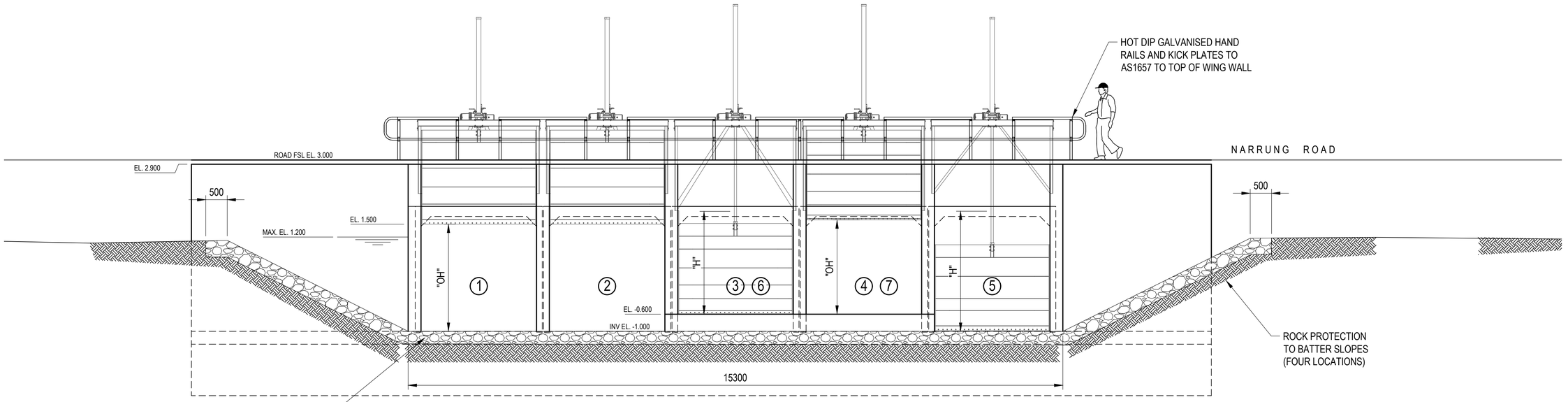
TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
LAKE ALBERT CONNECTOR OPTION 1A
INLET REGULATING STRUCTURE - SITE PLAN

DRAWING SCALE	ORIG. SIZE	DRAWING No.	REVISION
1 : 125	A1	AEG155-1000-TD-DRG-CV-7000	C

DRAFTER: F. RAPONI

NOTES:

1. ALL DIMENSIONS IN MILLIMETRES, UNLESS NOTED OTHERWISE.
2. INLET REGULATING STRUCTURE APPLICABLE TO BOTH CHANNEL (OPTION 1A) AND PIPE CONNECTOR (OPTION 1B) OPTIONS.



LAKE ALBERT CONNECTOR INLET REGULATING STRUCTURE - ELEVATION (FACING DOWNSTREAM)

SCALE 1:50

NOTE: LAY-FLAT GATES OMITTED.

CULVERT #	DESCRIPTION	HEIGHT "H" (mm)	MIN. OPEN HEIGHT "OH" (mm)
1	SINGLE LEAF PENSTOCK	2500	2500
2	SINGLE LEAF PENSTOCK	2500	2500
3	SINGLE LEAF PENSTOCK	2500	2100
4	SINGLE LEAF PENSTOCK	2500	2100
5	SINGLE LEAF PENSTOCK	2500	2500
6	LAY-FLAT GATE	2500	N/A
7	LAY-FLAT GATE	2500	N/A

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE
C	FINAL CONCEPT ISSUE	12.21.2021
B	CONCEPT DESIGN ISSUE	1.12.2021
A	ISSUED FOR CLIENT REVIEW	28.10.2021

POSITION	NAME	SIGNATURE
DRAFTING CHECK	M. PIGNATA	M.V.P.
ORIGINATE/ DESIGN	S. WEBB	S.A.W.
INDEPENDENT CHECK	B. CHUA	B.C.
TECHNICAL APPROVAL	P. STANIFORD	P.J.S.
PROJECT APPROVAL	P. STANIFORD	P.J.S.
CLIENT APPROVAL		

0 1000 2000 3000 4000

SCALE 1: 50 SCALE IN mm

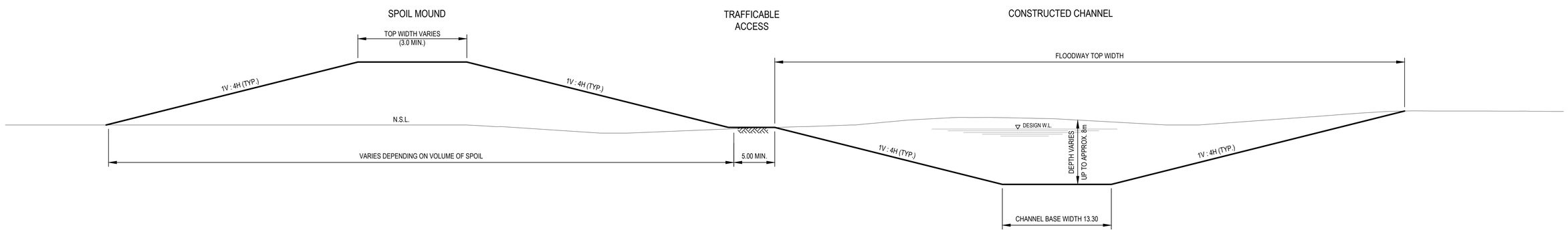
Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
LAKE ALBERT CONNECTOR OPTION 1A/B
INLET REGULATING STRUCTURE - ELEVATION

DRAWING SCALE 1 : 50
DRAFTER: F. RAPONI
ORIG. SIZE A1
DRAWING No. AEG155-1000-TD-DRG-CV-7001
REVISION C

NOTES:

1. CHANNEL INVERT LEVEL SHOWN ON LONGITUDINAL SECTIONS (AEG155-1000-TD-DRG-CV-1000 TO 1002.
2. SPOIL MOUND TO BE GRASSED TO MINIMISE EROSION AND DUST, EITHER WITH NATIVE GRASSES OR SIMILAR.
3. TOP OF SPOIL MOUND SHALL BE TRAFFICABLE. ALL ENDS OF SPOIL MOUNDS SHALL HAVE MAX. 1V : 8H APPROACH GRADES. SPOIL MOUND SHALL BE CONTINUOUS UNLESS NOTED OTHERWISE.
4. CHANNEL BATTER SLOPES 1V : 4H.



TYPICAL CHANNEL CROSS SECTION

1 : 250

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE
C	FINAL CONCEPT ISSUE	21.12.2021
B	CONCEPT DESIGN ISSUE	1.12.2021
A	ISSUED FOR CLIENT REVIEW	28.10.2021

POSITION	NAME	SIGNATURE
DRAFTING CHECK	M. PIGNATA	M.V.P.
ORIGINATE/ DESIGN	S. WEBB	S.A.W.
INDEPENDENT CHECK	B. CHUA	B.C.
TECHNICAL APPROVAL	P. STANIFORD	P.J.S.
PROJECT APPROVAL	P. STANIFORD	P.J.S.
CLIENT APPROVAL		

0 5 10 15 20

SCALE 1: 250 SCALE IN m

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
LAKE ALBERT CONNECTOR OPTION 1A
TYPICAL CHANNEL CROSS SECTION

DRAWING SCALE	ORIG. SIZE	DRAWING No.	REVISION
1 : 250	A1	AEG155-1000-TD-DRG-CV-7100	C

DRAFTER: F. RAPONI

DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
LAKE ALBERT CONNECTOR OPTION 1B

DRAWING LIST : LAKE ALBERT CONNECTOR OPTION 1B

DRAWING No.	DRAWING TITLE
AEG155-0000-TD-DRG-CV-0001	PROJECT KEY PLAN
AEG155-0000-TD-DRG-CV-0800	TYPICAL TRENCH DETAILS
AEG155-1500-TD-DRG-CV-0001	COVER SHEET AND DRAWING LIST
AEG155-1000-TD-DRG-CV-0002	LAKE ALBERT CONNECTOR OPTION 1A/B - OPTIONS KEY PLAN
AEG155-1500-TD-DRG-CV-1000	LAKE ALBERT CONNECTOR OPTION 1B - PLAN AND LONGITUDINAL SECTION SHEET 1 OF 3
AEG155-1500-TD-DRG-CV-1001	LAKE ALBERT CONNECTOR OPTION 1B - PLAN AND LONGITUDINAL SECTION SHEET 2 OF 3
AEG155-1500-TD-DRG-CV-1002	LAKE ALBERT CONNECTOR OPTION 1B - PLAN AND LONGITUDINAL SECTION SHEET 3 OF 3
AEG155-1500-TD-DRG-CV-7000	LAKE ALBERT CONNECTOR OPTION 1B - INLET REGULATING STRUCTURE - SITE PLAN
AEG155-1000-TD-DRG-CV-7001	LAKE ALBERT CONNECTOR OPTION 1B - INLET REGULATING STRUCTURE - ELEVATION

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	POSITION	NAME	SIGNATURE
			DRAFTING CHECK	M. PIGNATA	M.V.P.
			ORIGINATE/ DESIGN	J. BOOTH	J.T.B.
			INDEPENDENT CHECK	B. CHUA	B.C.
			TECHNICAL APPROVAL	P. STANIFORD	P.J.S.
C	FINAL CONCEPT ISSUE	21.12.2021	PROJECT APPROVAL	P. STANIFORD	P.J.S.
B	CONCEPT DESIGN ISSUE	1.12.2021	CLIENT APPROVAL		
A	ISSUED FOR CLIENT REVIEW	28.10.2021			

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
LAKE ALBERT CONNECTOR OPTION 1B
COVER SHEET AND DRAWING LIST

DRAWING SCALE

ORIG. SIZE A1

DRAFTER: F. RAPONI

DRAWING No. AEG155-1500-TD-DRG-CV-0001

REVISION C

DATE: Monday, 20 December 2021 4:49:49 PM
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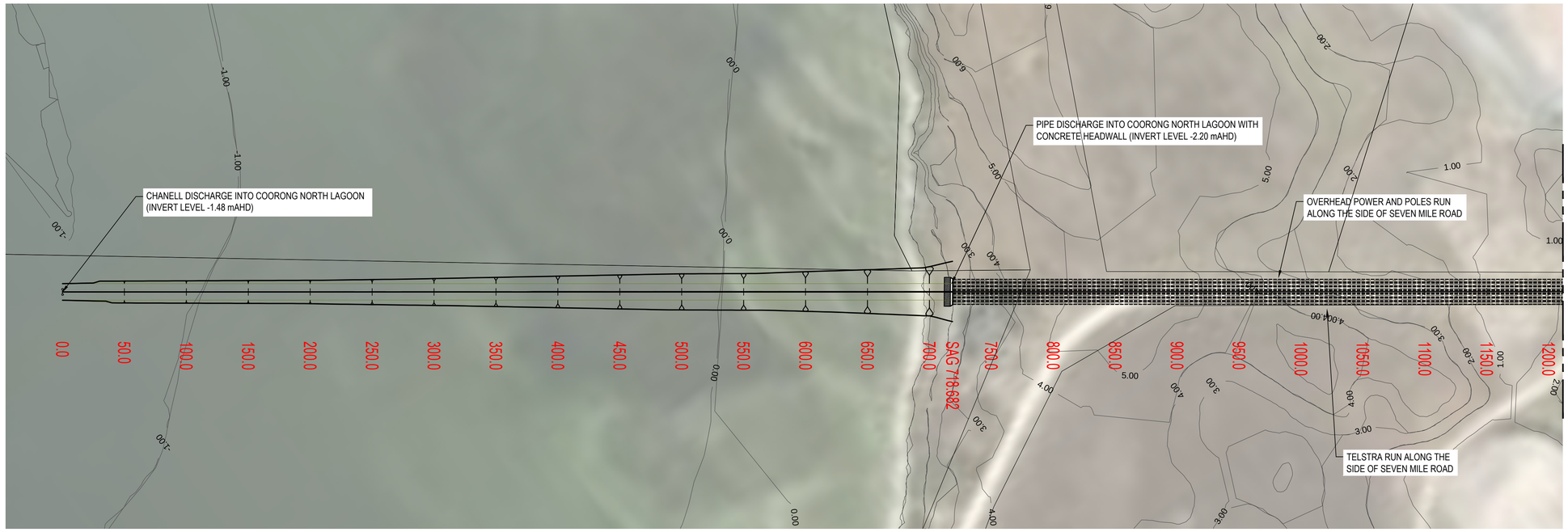
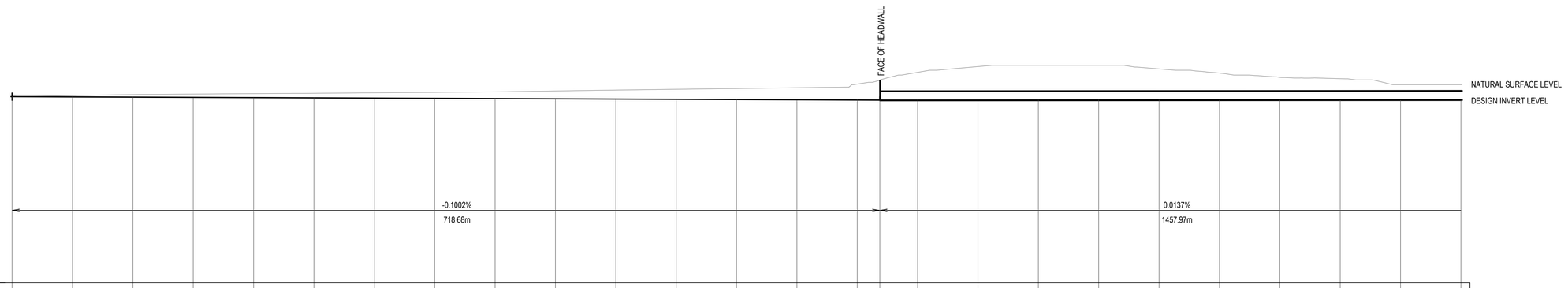


PLAN
SCALE 1:2000



DATUM R.L.-40.000

DESIGN INVERT LEVEL	-1.480	-1.530	-1.580	-1.630	-1.680	-1.730	-1.781	-1.831	-1.881	-1.931	-1.981	-2.031	-2.081	-2.131	-2.181	-2.200	-2.196	-2.189	-2.182	-2.175	-2.168	-2.161	-2.155	-2.148	-2.141	-2.134
EXISTING SURFACE	-1.475	-1.245	-1.044	-0.938	-0.854	-0.770	-0.679	-0.582	-0.488	-0.300	-0.113	0.055	0.214	0.373	1.119	1.885	3.563	4.745	5.000	5.000	4.269	3.401	2.529	2.251	1.000	1.000
DEPTH TO INVERT	-0.005	-0.285	-0.536	-0.692	-0.826	-0.960	-1.102	-1.249	-1.393	-1.631	-1.868	-2.086	-2.295	-2.504	-3.300	-4.085	-5.759	-6.934	-7.182	-7.175	-6.437	-5.562	-4.684	-4.399	-3.141	-3.134
CHAINAGE	0.000	50.000	100.000	150.000	200.000	250.000	300.000	350.000	400.000	450.000	500.000	550.000	600.000	650.000	700.000	718.682	750.000	800.000	850.000	900.000	950.000	1000.000	1050.000	1100.000	1150.000	1200.000

LAKE ALBERT CONNECTOR OPTION 1B LONGITUDINAL SECTION
SCALE 1:2000H; 1:500V

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE
C	FINAL CONCEPT ISSUE	21.12.2021
B	CONCEPT DESIGN ISSUE	01.12.2021
A	ISSUED FOR CLIENT REVIEW	28.10.2021

POSITION	NAME	SIGNATURE
DRAFTING CHECK	M. PIGNATA	M.V.P
ORIGINATE/ DESIGN	S. WEBB	S.A.W.
INDEPENDENT CHECK	B. CHUA	B.C.
TECHNICAL APPROVAL	P. STANIFORD	P.J.S.
PROJECT APPROVAL	P. STANIFORD	P.J.S.
CLIENT APPROVAL		

0 10 20 30 40
SCALE 1: 500 SCALE IN m

0 40 80 120 160
SCALE 1: 2000 SCALE IN m

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
LAKE ALBERT CONNECTOR OPTION 1B
PLAN AND LONGITUDINAL SECTION SHEET 1 OF 3

DRAWING SCALE	ORIG. SIZE	DRAWING No.	REVISION
AS SHOWN	A1	AEG155-1500-TD-DRG-CV-1000	C

DRAFTER: B. SEIDEL

DATE: Tuesday, December 21, 2021 12:30:48 PM
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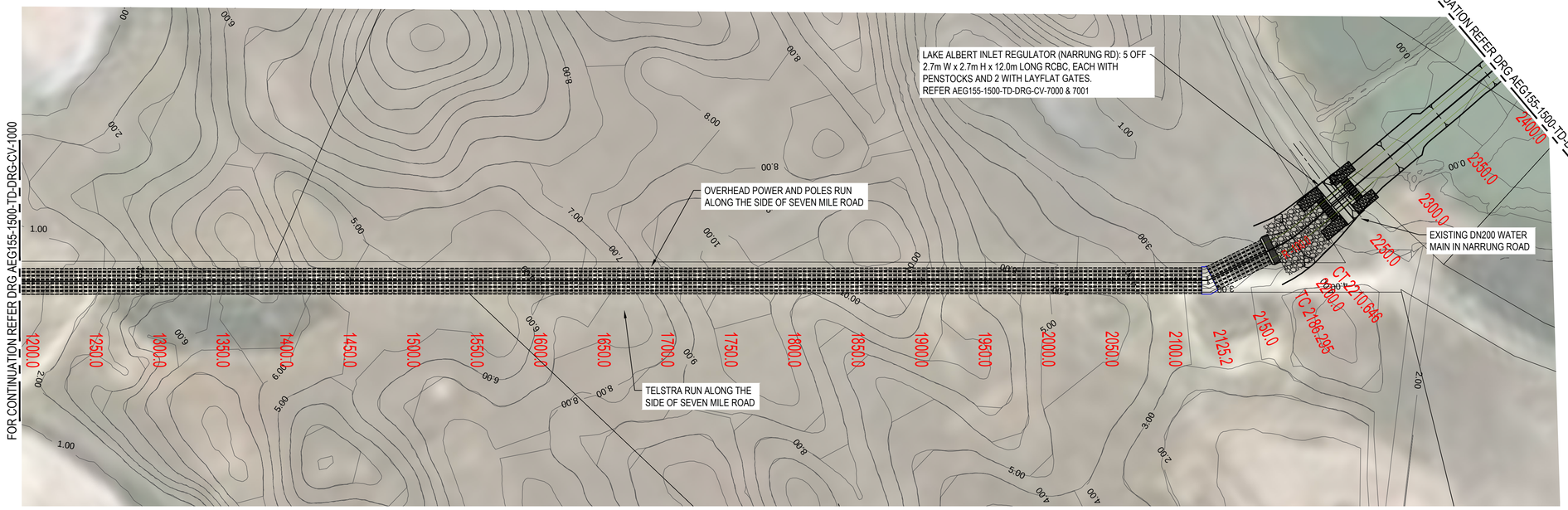
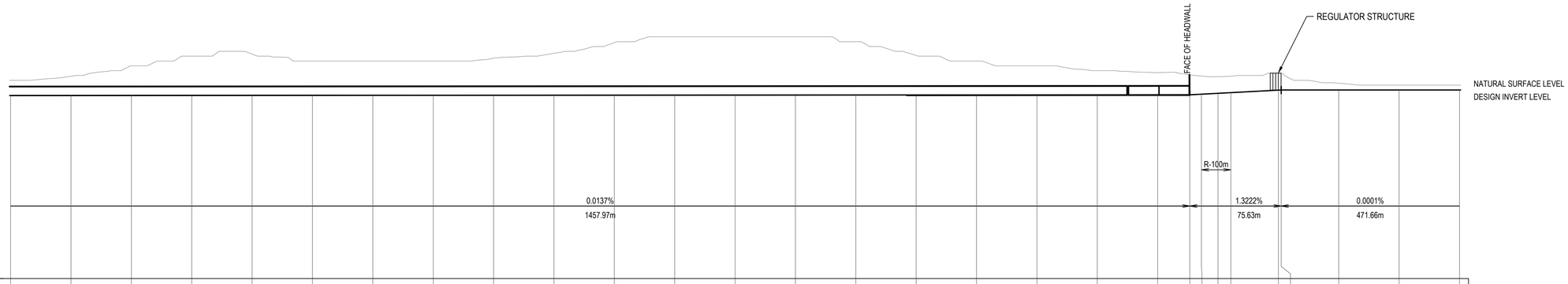


PLAN
SCALE 1:2000



DATUM R.L.-40.000

CHAINAGE	DESIGN INVERT LEVEL	EXISTING SURFACE	DEPTH TO INVERT
1200.000	-2.134	1.000	-3.134
1250.000	-2.127	1.844	-3.971
1300.000	-2.120	4.000	-6.120
1350.000	-2.113	6.000	-8.113
1400.000	-2.107	6.427	-8.534
1450.000	-2.100	5.000	-7.100
1500.000	-2.093	5.000	-7.093
1550.000	-2.086	5.000	-7.086
1600.000	-2.079	5.581	-7.660
1650.000	-2.072	6.587	-8.659
1700.000	-2.065	8.793	-10.859
1750.000	-2.059	10.000	-12.059
1800.000	-2.052	10.000	-12.052
1850.000	-2.045	10.000	-12.045
1900.000	-2.038	9.000	-11.038
1950.000	-2.031	6.141	-8.172
2000.000	-2.024	5.000	-7.024
2050.000	-2.017	4.000	-6.017
2100.000	-2.011	3.000	-5.011
2150.000	-2.004	2.592	-4.596
2176.649	-2.000	2.151	-4.151
2186.295	-1.872	1.887	-3.760
2200.000	-1.691	1.766	-3.457
2210.646	-1.550	1.844	-3.394
2250.000	-1.030	2.500	-3.530
2252.278	-1.000	2.500	-3.500
2300.000	-1.000	0.400	-1.400
2350.000	-1.000	0.000	-1.000
2400.000	-1.000	0.000	-1.000

LAKE ALBERT CONNECTOR OPTION 1B LONGITUDINAL SECTION
SCALE 1:2000H; 1:500V

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE
C	FINAL CONCEPT ISSUE	21.12.2021
B	CONCEPT DESIGN ISSUE	01.12.2021
A	ISSUED FOR CLIENT REVIEW	28.10.2021

POSITION	NAME	SIGNATURE
DRAFTING CHECK	M. PIGNATA	M.V.P
ORIGINATE/ DESIGN	S. WEBB	S.A.W.
INDEPENDENT CHECK	B. CHUA	B.C.
TECHNICAL APPROVAL	P. STANIFORD	P.J.S.
PROJECT APPROVAL	P. STANIFORD	P.J.S.
CLIENT APPROVAL		

0 10 20 30 40
SCALE 1: 500 SCALE IN m

0 40 80 120 160
SCALE 1: 2000 SCALE IN m

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
LAKE ALBERT CONNECTOR OPTION 1B
PLAN AND LONGITUDINAL SECTION SHEET 2 OF 3

DRAWING SCALE: AS SHOWN
DRAFTER: B. SEIDEL
ORIG. SIZE: A1
DRAWING No.: AEG155-1500-TD-DRG-CV-1001
REVISION: C

DATE: Tuesday, December 21, 2021 12:31:01 PM
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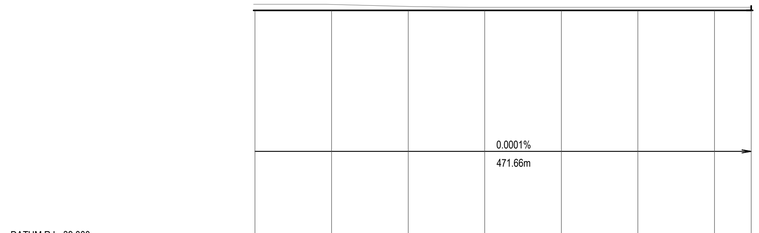
PLAN
SCALE 1:2000



DATUM R.L.-39.000

DESIGN INVERT LEVEL	-1.000	-1.000	-1.000	-1.000	-1.000	-1.000	-1.000	-1.000
EXISTING SURFACE	0.000	-0.025	-0.353	-0.500	-0.500	-0.500	-0.500	-0.500
DEPTH TO INVERT	-1.000	-0.975	-0.647	-0.500	-0.500	-0.500	-0.500	-0.500
CHAINAGE	2400.000	2450.000	2500.000	2550.000	2600.000	2650.000	2700.000	2723.934

LAKE ALBERT CONNECTOR OPTION 1B LONGITUDINAL SECTION
SCALE 1:2000H; 1:500V

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE
C	FINAL CONCEPT ISSUE	21.12.2021
B	CONCEPT DESIGN ISSUE	01.12.2021
A	ISSUED FOR CLIENT REVIEW	28.10.2021

POSITION	NAME	SIGNATURE
DRAFTING CHECK	M. PIGNATA	M.V.P
ORIGINATE/ DESIGN	S. WEBB	S.A.W.
INDEPENDENT CHECK	B. CHUA	B.C.
TECHNICAL APPROVAL	P. STANIFORD	P.J.S.
PROJECT APPROVAL	P. STANIFORD	P.J.S.
CLIENT APPROVAL		

0 10 20 30 40
SCALE 1: 500 SCALE IN m

0 40 80 120 160
SCALE 1: 2000 SCALE IN m

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
LAKE ALBERT CONNECTOR OPTION 1B
PLAN AND LONGITUDINAL SECTION SHEET 3 OF 3

DRAWING SCALE: AS SHOWN
DRAFTER: B. SEIDEL
ORIG. SIZE: A1
DRAWING No.: AEG155-1500-TD-DRG-CV-1002
REVISION: C

DATE: Tuesday, December 21, 2021 12:30:37 PM
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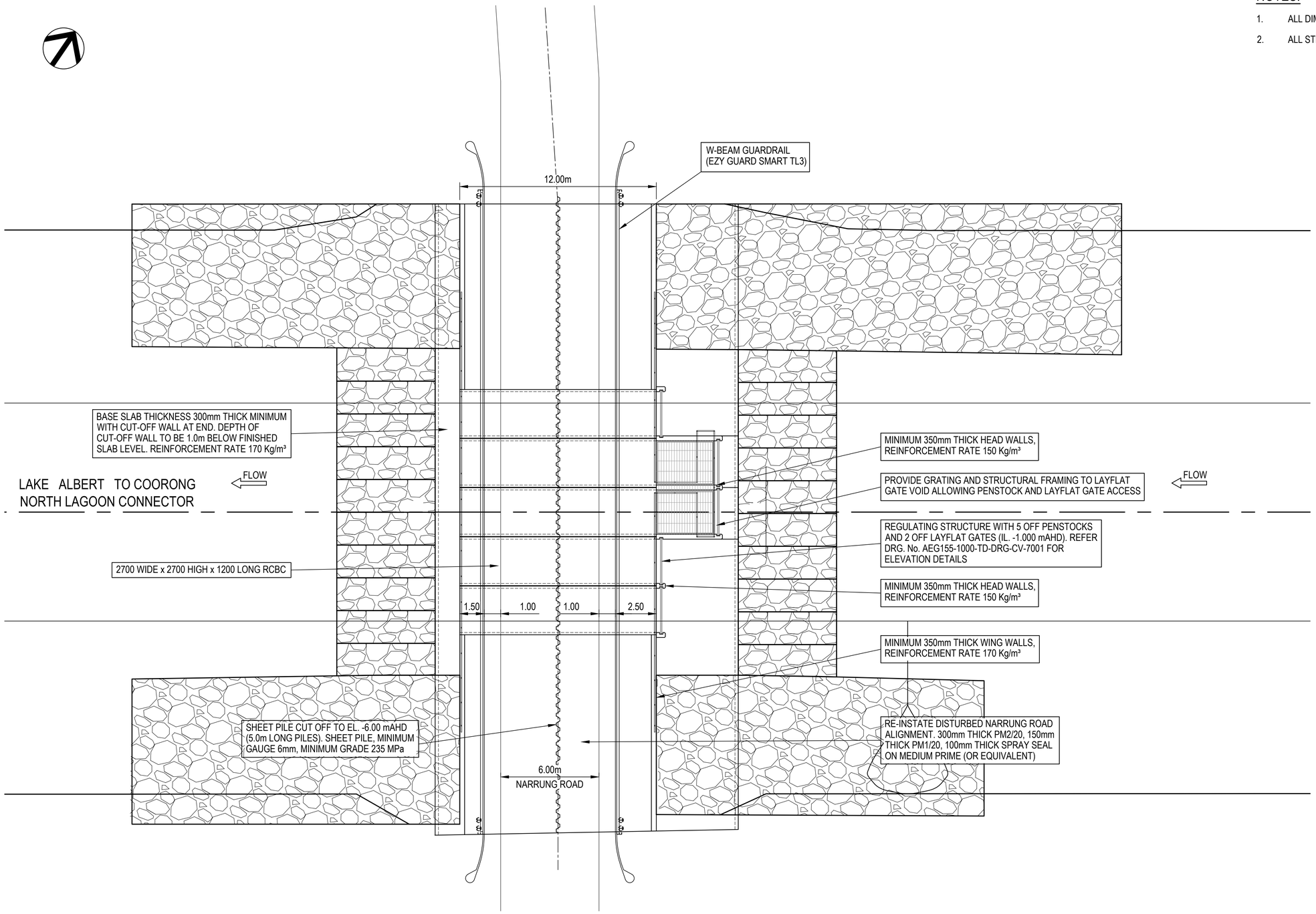
NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
2. ALL STRUCTURAL STEEL TO BE HOT DIP GALVANISED.



LAKE ALBERT CONNECTOR (CHANNEL) INLET REGULATING STRUCTURE - SITE PLAN

SCALE 1 : 125

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	POSITION	NAME	SIGNATURE
			DRAFTING CHECK	M. PIGNATA	M.V.P.
			ORIGINATE/ DESIGN	S. WEBB	S.A.W.
			INDEPENDENT CHECK	B. CHUA	B.C.
			TECHNICAL APPROVAL	P. STANIFORD	P.J.S.
C	FINAL CONCEPT ISSUE	21.12.2021	PROJECT APPROVAL	P. STANIFORD	P.J.S.
B	CONCEPT DESIGN ISSUE	1.12.2021	CLIENT APPROVAL		
A	ISSUED FOR CLIENT REVIEW	28.10.2021			

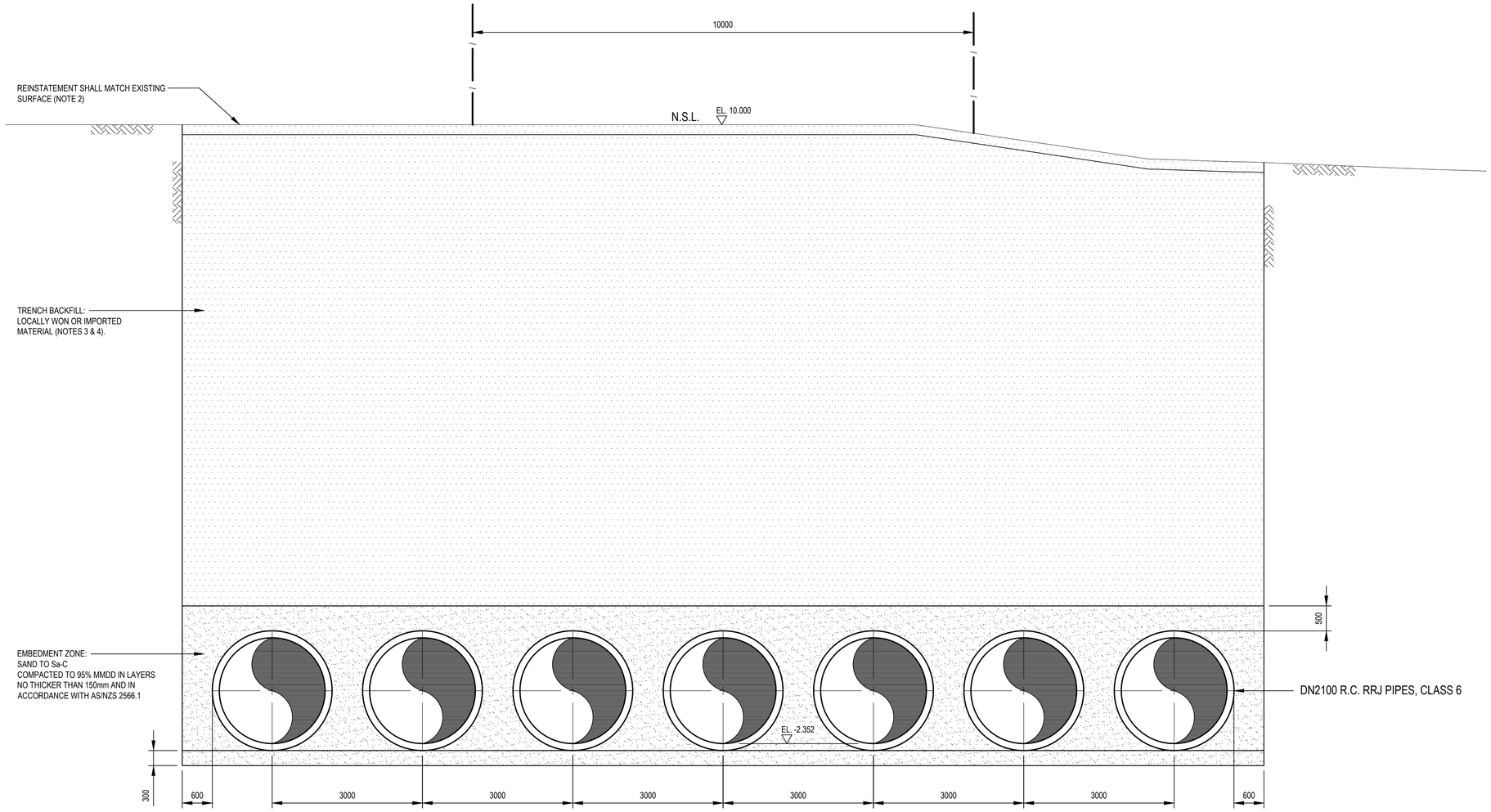
0 2.5 5.0 7.5 10.0
SCALE 1: 125 SCALE IN m

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
LAKE ALBERT CONNECTOR - CHANNEL
INLET REGULATING STRUCTURE - SITE PLAN

DRAWING SCALE	ORIG. SIZE	DRAWING No.	REVISION
1 : 125	A1	AEG155-1500-TD-DRG-CV-7000	C

DRAFTER: F. RAPONI



CROSS SECTION AT CH. 1800

1 : 50

NOTES:

1. ALL DIMENSIONS SHOWN ARE IN MILLIMETRES, UNLESS NOTED OTHERWISE.
2. REINSTATEMENT OF THE DISTURBED TRENCH ALIGNMENT SHALL BE COMPLETED TO MATCH EXISTING SURFACE, TO THE SAME THICKNESS AND FINISH (I.E. TOPSOIL, ROAD, ETC.).
3. TRENCH BACKFILL IN AREAS OTHER THAN ROAD CROSSINGS SHALL BE LOCALLY WON MATERIAL COMPACTED TO 95% SMDD.
4. SMDD - STANDARD MAXIMUM DRY DENSITY TO AS1289.5.1.1
   MMDD - MODIFIED MAXIMUM DRY DENSITY TO AS1289.5.2.1
5. WHERE NON-ENGINEERED FILL, SOFT, WET, WEAK OR POORLY CONSOLIDATED MATERIAL IS ENCOUNTERED AT SUBGRADE LEVEL, MATERIAL SHALL BE OVER EXCAVATED AND REPLACED WITH SELECT FILL COMPACTED TO 98% SMDD TO MIN. 600mm DEPTH BELOW SUBGRADE LEVEL.

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	POSITION	NAME	SIGNATURE
			DRAFTING CHECK	M. PIGNATA	M.V.P.
			ORIGINATE/ DESIGN	S. WEBB	S.A.W.
			INDEPENDENT CHECK	B. CHUA	B.C.
			TECHNICAL APPROVAL	P. STANIFORD	P.J.S.
C	FINAL CONCEPT ISSUE	21.12.2021	PROJECT APPROVAL	P. STANIFORD	P.J.S.
B	CONCEPT DESIGN ISSUE	1.12.2021	CLIENT APPROVAL		
A	ISSUED FOR CLIENT REVIEW	28.10.2021			

SCALE 1: 50 — 0 1000 2000 3000 4000 SCALE IN mm

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
LAKE ALBERT CONNECTOR OPTION 1B
CROSS SECTION CH. 1800

DRAWING SCALE	ORIG. SIZE	DRAWING No.	REVISION
1 : 50	A1	AEG155-1500-TD-DRG-CV-7100	C

DRAFTER: F. RAPONI

DATE: Tuesday, 21 December 2021 5:10:35 PM
FILE: O:\G&I\CAD\PROJECTS\AEG155\03 CAD\CIVIL\01 DRAWINGS\AEG155-1500-TD-DRG-CV-7100.DWG

DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 2 PARNKA NARROWS DREDGE

DRAWING LIST : OPTION 2 PARNKA NARROWS DREDGE	
DRAWING No.	DRAWING TITLE
AEG155-0000-TD-DRG-CV-0001	PROJECT KEY PLAN
AEG155-2000-TD-DRG-CV-0001	COVER SHEET AND DRAWING LIST
AEG155-2000-TD-DRG-CV-1000	PARNKA NARROWS DREDGE - KEY PLAN
AEG155-2000-TD-DRG-CV-1001	PARNKA NARROWS DREDGE - PLAN SHEET 1 OF 14
AEG155-2000-TD-DRG-CV-1002	PARNKA NARROWS DREDGE - PLAN SHEET 2 OF 14
AEG155-2000-TD-DRG-CV-1003	PARNKA NARROWS DREDGE - PLAN SHEET 3 OF 14
AEG155-2000-TD-DRG-CV-1004	PARNKA NARROWS DREDGE - PLAN SHEET 4 OF 14
AEG155-2000-TD-DRG-CV-1005	PARNKA NARROWS DREDGE - PLAN SHEET 5 OF 14
AEG155-2000-TD-DRG-CV-1006	PARNKA NARROWS DREDGE - PLAN SHEET 6 OF 14
AEG155-2000-TD-DRG-CV-1007	PARNKA NARROWS DREDGE - PLAN SHEET 7 OF 14
AEG155-2000-TD-DRG-CV-1008	PARNKA NARROWS DREDGE - PLAN SHEET 8 OF 14
AEG155-2000-TD-DRG-CV-1009	PARNKA NARROWS DREDGE - PLAN SHEET 9 OF 14
AEG155-2000-TD-DRG-CV-1010	PARNKA NARROWS DREDGE - PLAN SHEET 10 OF 14
AEG155-2000-TD-DRG-CV-1011	PARNKA NARROWS DREDGE - PLAN SHEET 11 OF 14
AEG155-2000-TD-DRG-CV-1012	PARNKA NARROWS DREDGE - PLAN SHEET 12 OF 14
AEG155-2000-TD-DRG-CV-1013	PARNKA NARROWS DREDGE - PLAN SHEET 13 OF 14
AEG155-2000-TD-DRG-CV-1014	PARNKA NARROWS DREDGE - PLAN SHEET 14 OF 14

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	POSITION	NAME	SIGNATURE
			DRAFTING CHECK	M. PIGNATA	M.V.P.
			ORIGINATE/ DESIGN	J. BOOTH	J.T.B.
			INDEPENDENT CHECK	B. CHUA	B.C.
			TECHNICAL APPROVAL	P. STANIFORD	P.J.S.
C	FINAL CONCEPT ISSUE	21.12.2021	PROJECT APPROVAL	P. STANIFORD	P.J.S.
B	CONCEPT DESIGN ISSUE	01.12.2021	CLIENT APPROVAL		
A	ISSUED FOR CLIENT REVIEW	28.10.2021			

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 2 PARNKA NARROWS DREDGE
COVER SHEET AND DRAWING LIST

DRAWING SCALE

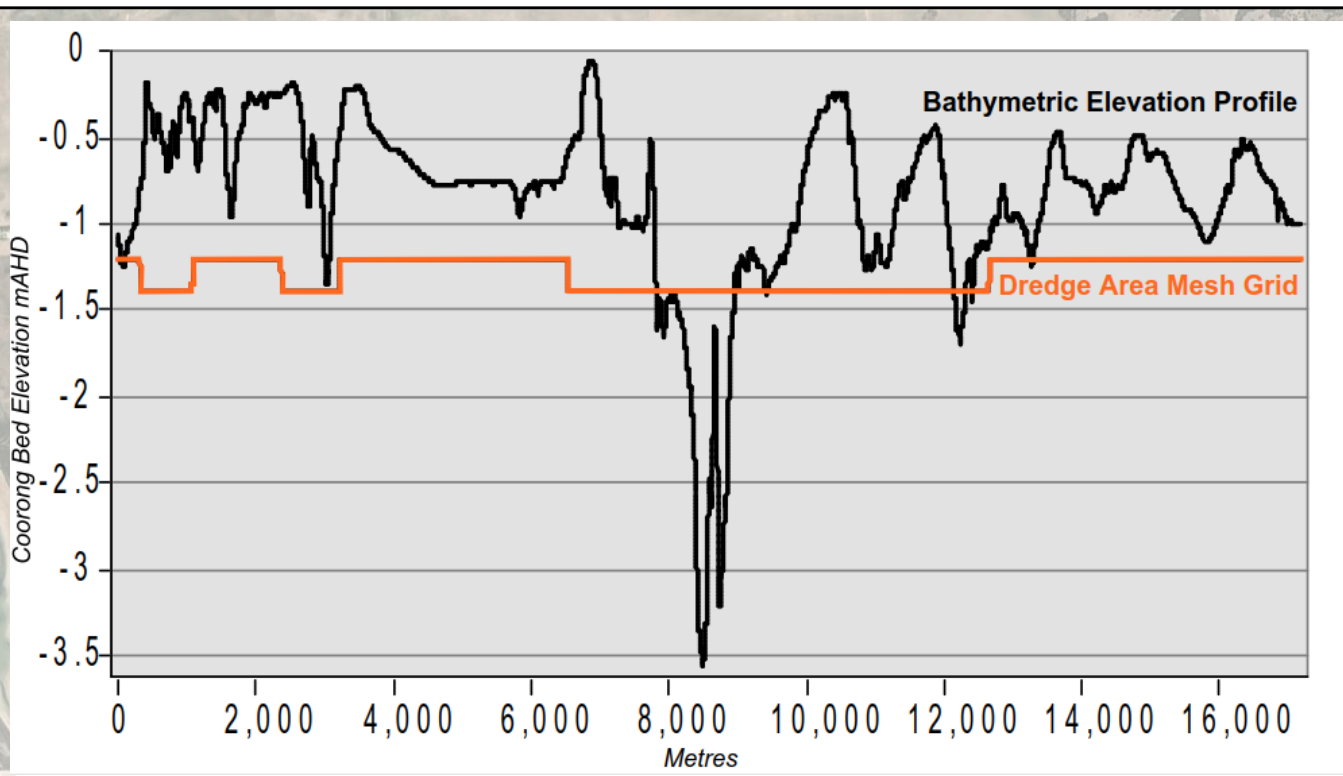
ORIG. SIZE A1

DRAFTER: F. RAPONI

DRAWING No. AEG155-2000-TD-DRG-CV-0001

REVISION C

DATE: Monday, 20 December 2021 4:51:32 PM
FILE: O:\G&I\CAD\PROJECTS\AEG155\03 CAD\CIVIL\01 DRAWINGS\AEG155-2000-TD-DRG-CV-0001.DWG



N

1 0m 500m 1000m
2 1500m
3 2000m 2500m 3000m
4 3500m 4000m 4500m
5 5000m 5500m 6000m
6 6500m 7000m
7 7500m 8000m
8 8500m 9000m 9500m 10000m
9 10500m
10 11000m 11500m
11 12000m 12500m 13000m
12 13500m 14000m
13 14500m 15000m 15500m
14 16000m 16500m 17000m 17179m

Legend

- Dredge Disposal Location
- Dredge Alignment Chainage
- Dredge area (hydrodynamic model mesh grid)

0 1 2
Kilometers

Scale at A3 1:44,000

SOURCE

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

FILE PATH	COORDINATE SYSTEM	DATE
\\adlfile300\data$\GIS\Projects\AEG155 - Coorong\Maps\ AEG155_01_GIS_000_Key_Plan.mxd	GDA 1994 MGA Zone 54	1 Dec 2021

Level 3, 411 St Kilda Road, Victoria VIC 3001

Prepared: SAW
Checked: PJS

TITLE
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 2 - PARNKA NARROWS DREDGE
KEY PLAN

DOCUMENT NO.	REV.
AEG155-2000-TD-DRG-CV-1000	B

0 100 200
Meters

Scale at A3 1:4,000

SOURCE

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

FILE PATH	COORDINATE SYSTEM	DATE
\\adlfile300\data$\GIS\Projects\AEG155 - Coorong\Maps\ AEG155_01_GIS_003_Dredge Alignment.mxd	GDA 1994 MGA Zone 54	1 Dec 2021

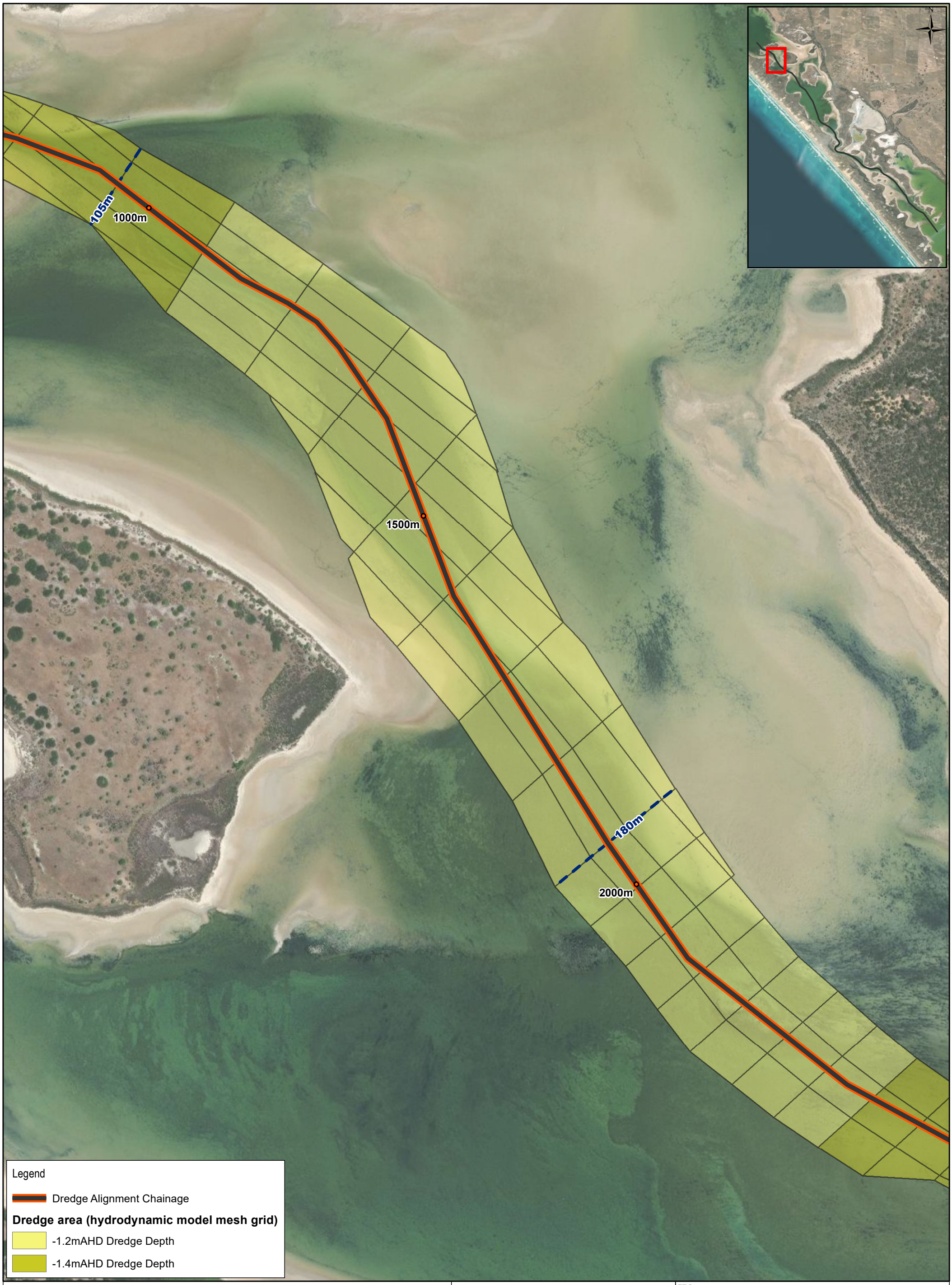
Level 3, 411 St Kilda Road, Victoria VIC 3001

Prepared: SAW
Checked: PJS

TITLE

COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 2 - PARNKA NARROWS DREDGE
PLAN - SHEET 1 OF 14
17.5KM x (235M to 105M) x (-1.4 to -1.2AHD)

DOCUMENT NO.	REV.
AEG155-2000-TD-DRG-CV-1001	B



0 100 200
Meters

Scale at A3 1:4,000

SOURCE

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

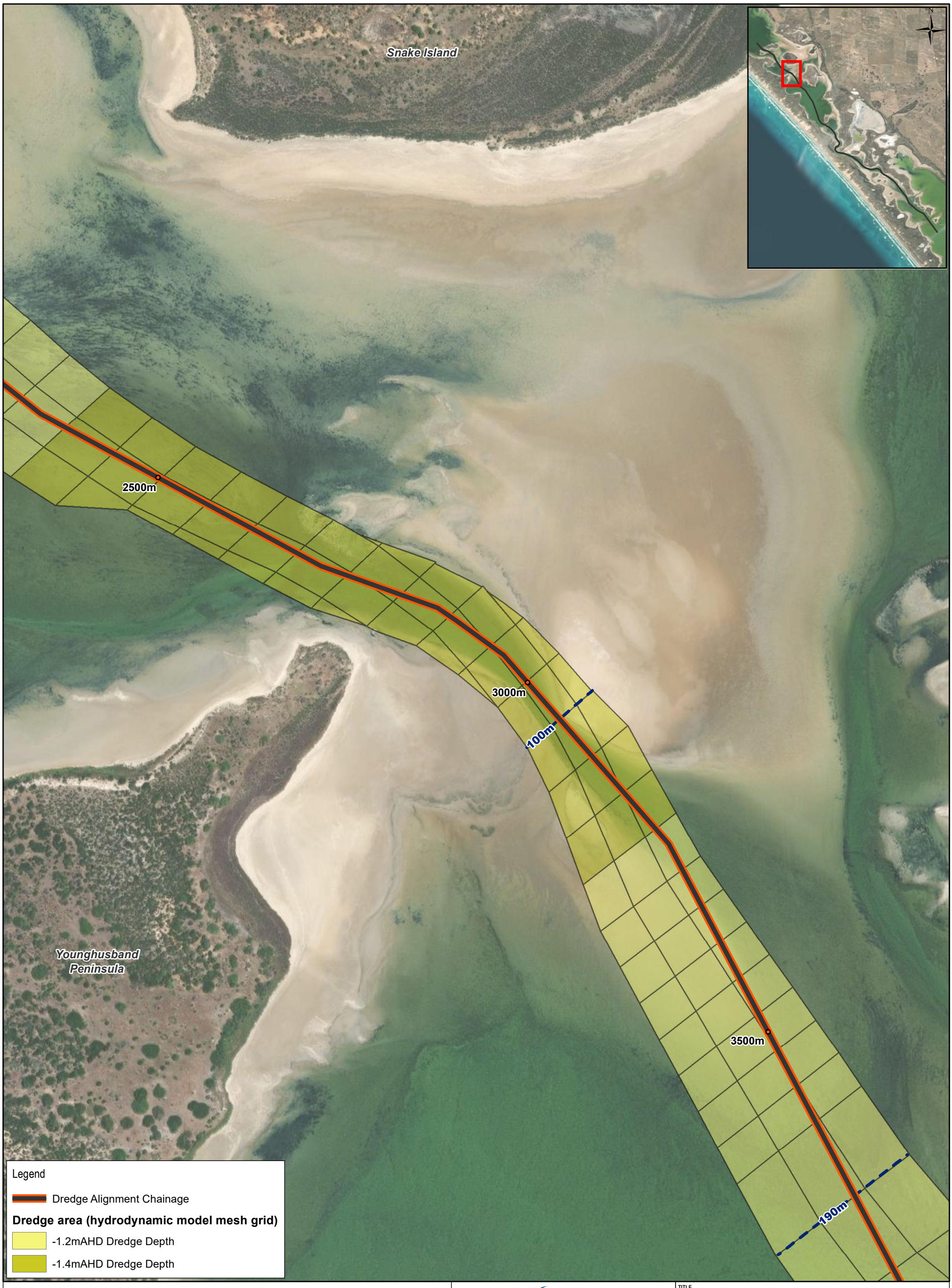
FILE PATH	COORDINATE SYSTEM	DATE
\\adlfile300\data$\GIS\Projects\AEG155 - Coorong\Maps\ AEG155_01_GIS_003_Dredge Alignment.mxd	GDA 1994 MGA Zone 54	1 Dec 2021

Level 3, 411 St Kilda Road, Victoria VIC 3001

Prepared: SAW
Checked: PJS

TITLE
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 2 - PARNKA NARROWS DREDGE
PLAN - SHEET 2 OF 14
17.5KM x (105M to 180M) x (-1.4 to -1.2AHD)

DOCUMENT NO.	REV.
AEG155-2000-TD-DRG-CV-1002	B



Scale at A3 1:4,000

SOURCE

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

FILE PATH	COORDINATE SYSTEM	DATE
\\adlfile300\data$\GIS\Projects\AEG155 - Coorong\Maps\AEG155_01_GIS_003_Dredge Alignment.mxd	GDA 1994 MGA Zone 54	1 Dec 2021

Level 3, 411 St Kilda Road, Victoria VIC 3001

Prepared: SAW
Checked: PJS

TITLE

COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 2 - PARNKA NARROWS DREDGE
PLAN - SHEET 3 OF 14
17.5KM x (100M to 190M) x (-1.4 to -1.2AHD)

DOCUMENT NO.	REV.
AEG155-2000-TD-DRG-CV-1003	B

SOURCE

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

FILE PATH	COORDINATE SYSTEM	DATE
\\adlfile300\data$\GIS\Projects\AEG155 - Coorong\Maps\AEG155_01_GIS_003_Dredge Alignment.mxd	GDA 1994 MGA Zone 54	1 Dec 2021

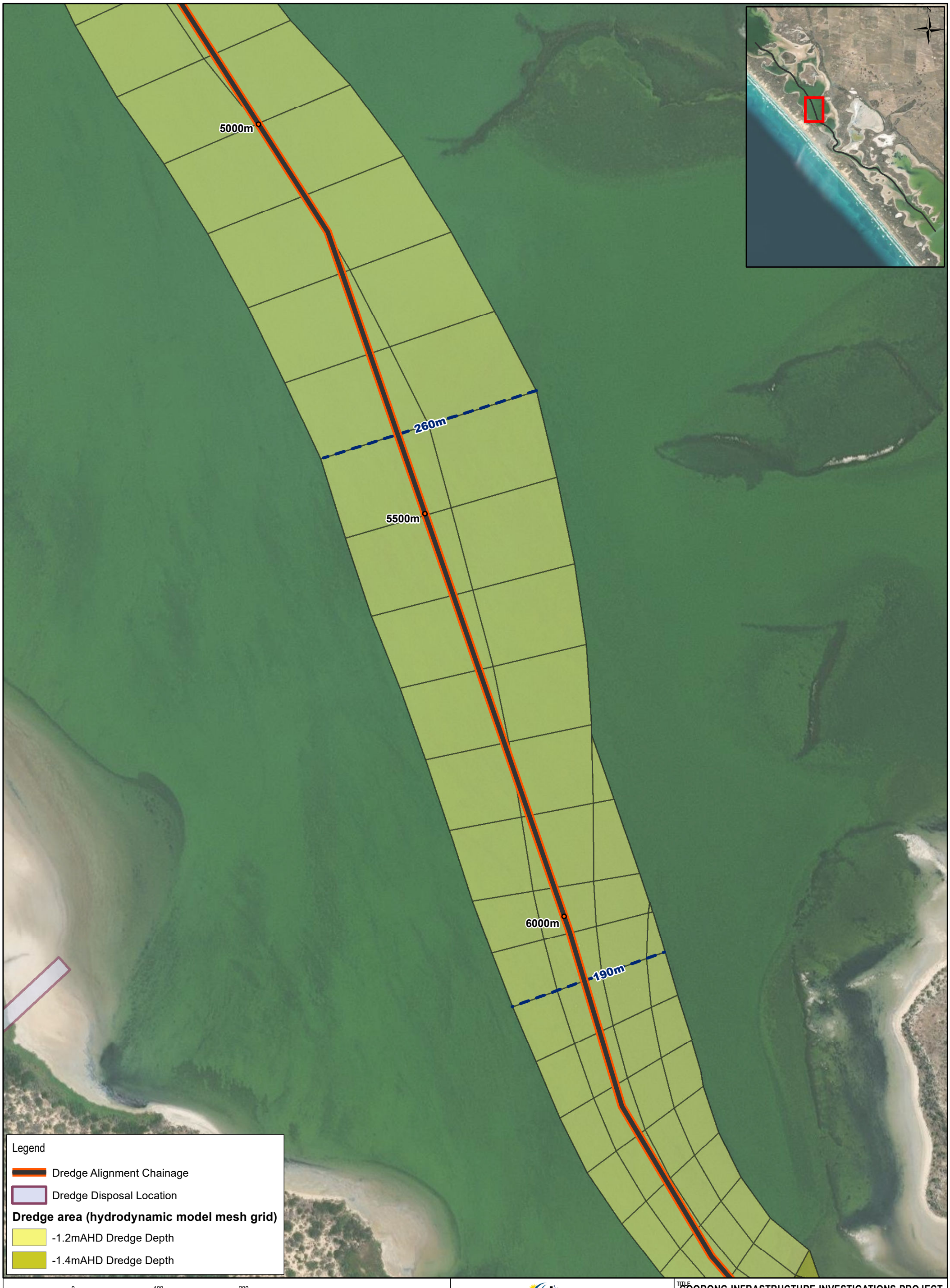
Level 3, 411 St Kilda Road, Victoria VIC 3001

Prepared: SAW
Checked: PJS

TITLE

COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 2 - PARNKA NARROWS DREDGE
PLAN - SHEET 4 OF 14
17.5KM x (190M to 215M) (-1.2AHD)

DOCUMENT NO.	REV.
AEG155-2000-TD-DRG-CV-1004	B



0 100 200
Meters

Scale at A3 1:4,000

SOURCE

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

FILE PATH	COORDINATE SYSTEM	DATE
\\adlfile300\data$\GIS\Projects\AEG155 - Coorong\Maps\ AEG155_01_GIS_003_Dredge Alignment.mxd	GDA 1994 MGA Zone 54	1 Dec 2021

Level 3, 411 St Kilda Road, Victoria VIC 3001

Prepared: SAW
Checked: PJS

TITLE
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 2 - PARNKA NARROWS DREDGE
PLAN - SHEET 5 OF 14
17.5KM x (190M to 260M) x (-1.2AHD)

DOCUMENT NO.	REV.
AEG155-2000-TD-DRG-CV-1005	B

0 100 200
Meters

Scale at A3 1:4,000

SOURCE

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

FILE PATH	COORDINATE SYSTEM	DATE
\\adlfile300\data$\GIS\Projects\AEG155 - Coorong\Maps\ AEG155_01_GIS_003_Dredge Alignment.mxd	GDA 1994 MGA Zone 54	1 Dec 2021

Level 3, 411 St Kilda Road, Victoria VIC 3001

Prepared: SAW
Checked: PJS

TITLE

COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 2 - PARNKA NARROWS DREDGE
PLAN - SHEET 6 OF 14
17.5KM x (110M) x (-1.4 to -1.2AHD)

DOCUMENT NO.	REV.
AEG155-2000-TD-DRG-CV-1006	B

0 100 200
Meters

Scale at A3 1:4,000

SOURCE

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

FILE PATH	COORDINATE SYSTEM	DATE
\\adlfile300\data$\GIS\Projects\AEG155 - Coorong\Maps\ AEG155_01_GIS_003_Dredge Alignment.mxd	GDA 1994 MGA Zone 54	1 Dec 2021

Level 3, 411 St Kilda Road, Victoria VIC 3001

Prepared: SAW
Checked: PJS

TITLE
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 2 - PARNKA NARROWS DREDGE
PLAN - SHEET 7 OF 14
17.5KM x (100M to 110M) x (-1.4AHD)

DOCUMENT NO.	REV.
AEG155-2000-TD-DRG-CV-1007	B

0 100 200
Meters

Scale at A3 1:4,000

SOURCE

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

FILE PATH	COORDINATE SYSTEM	DATE
\\adlfile300\data$\GIS\Projects\AEG155 - Coorong\Maps\ AEG155_01_GIS_003_Dredge Alignment.mxd	GDA 1994 MGA Zone 54	1 Dec 2021

Level 3, 411 St Kilda Road, Victoria VIC 3001

Prepared: SAW
Checked: PJS

TITLE

COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 2 - PARNKA NARROWS DREDGE
PLAN - SHEET 8 OF 14
17.5KM x (90M to 110M) x (-1.4AHD)

DOCUMENT NO.	REV.
AEG155-2000-TD-DRG-CV-1008	B

0 100 200
Meters

Scale at A3 1:4,000

SOURCE

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

FILE PATH	COORDINATE SYSTEM	DATE
\\adlfile300\data$\GIS\Projects\AEG155 - Coorong\Maps\ AEG155_01_GIS_003_Dredge Alignment.mxd	GDA 1994 MGA Zone 54	1 Dec 2021

Level 3, 411 St Kilda Road, Victoria VIC 3001

Prepared: SAW
Checked: PJS

TITLE
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 2 - PARNKA NARROWS DREDGE
PLAN - SHEET 9 OF 14
17.5KM x (115M) x (-1.4AHD)

DOCUMENT NO.	REV.
AEG155-2000-TD-DRG-CV-1009	B

0 100 200
Meters

Scale at A3 1:4,000

SOURCE

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

FILE PATH	COORDINATE SYSTEM	DATE
\\adlfile300\data$\GIS\Projects\AEG155 - Coorong\Maps\ AEG155_01_GIS_003_Dredge Alignment.mxd	GDA 1994 MGA Zone 54	1 Dec 2021

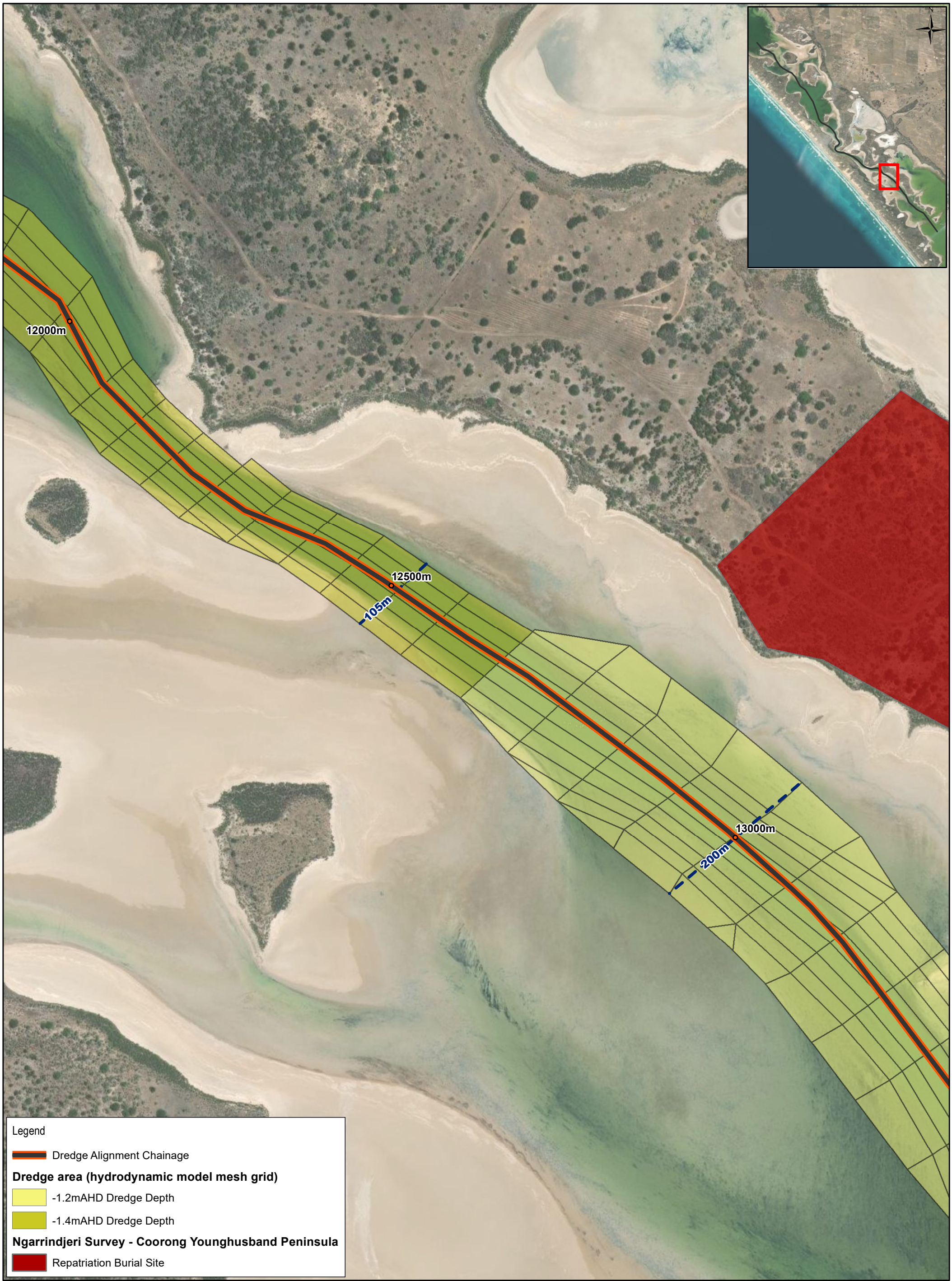
Level 3, 411 St Kilda Road, Victoria VIC 3001

Prepared: SAW
Checked: PJS

TITLE

COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 2 - PARNKA NARROWS DREDGE
PLAN - SHEET 10 OF 14
17.5KM x (125M) x (-1.4AHD)

DOCUMENT NO.	REV.
AEG155-2000-TD-DRG-CV-1010	B



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Meters

Scale at A3 1:4,000

SOURCE

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

FILE PATH	COORDINATE SYSTEM	DATE
\\adlfile300\data$\GIS\Projects\AEG155 - Coorong\Maps\ AEG155_01_GIS_003_Dredge Alignment.mxd	GDA 1994 MGA Zone 54	1 Dec 2021

Level 3, 411 St Kilda Road, Victoria VIC 3001

Prepared: SAW
Checked: PJS

TITLE
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 2 - PARNKA NARROWS DREDGE
PLAN - SHEET 11 OF 14
17.5KM x (105M to 200M) x(-1.4 to -1.2AHD)

DOCUMENT NO.	REV.
AEG155-2000-TD-DRG-CV-1011	B

0 100 200
Meters

Scale at A3 1:4,000

SOURCE

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

FILE PATH	COORDINATE SYSTEM	DATE
\\adlfile300\data$\GIS\Projects\AEG155 - Coorong\Maps\ AEG155_01_GIS_003_Dredge Alignment.mxd	GDA 1994 MGA Zone 54	1 Dec 2021

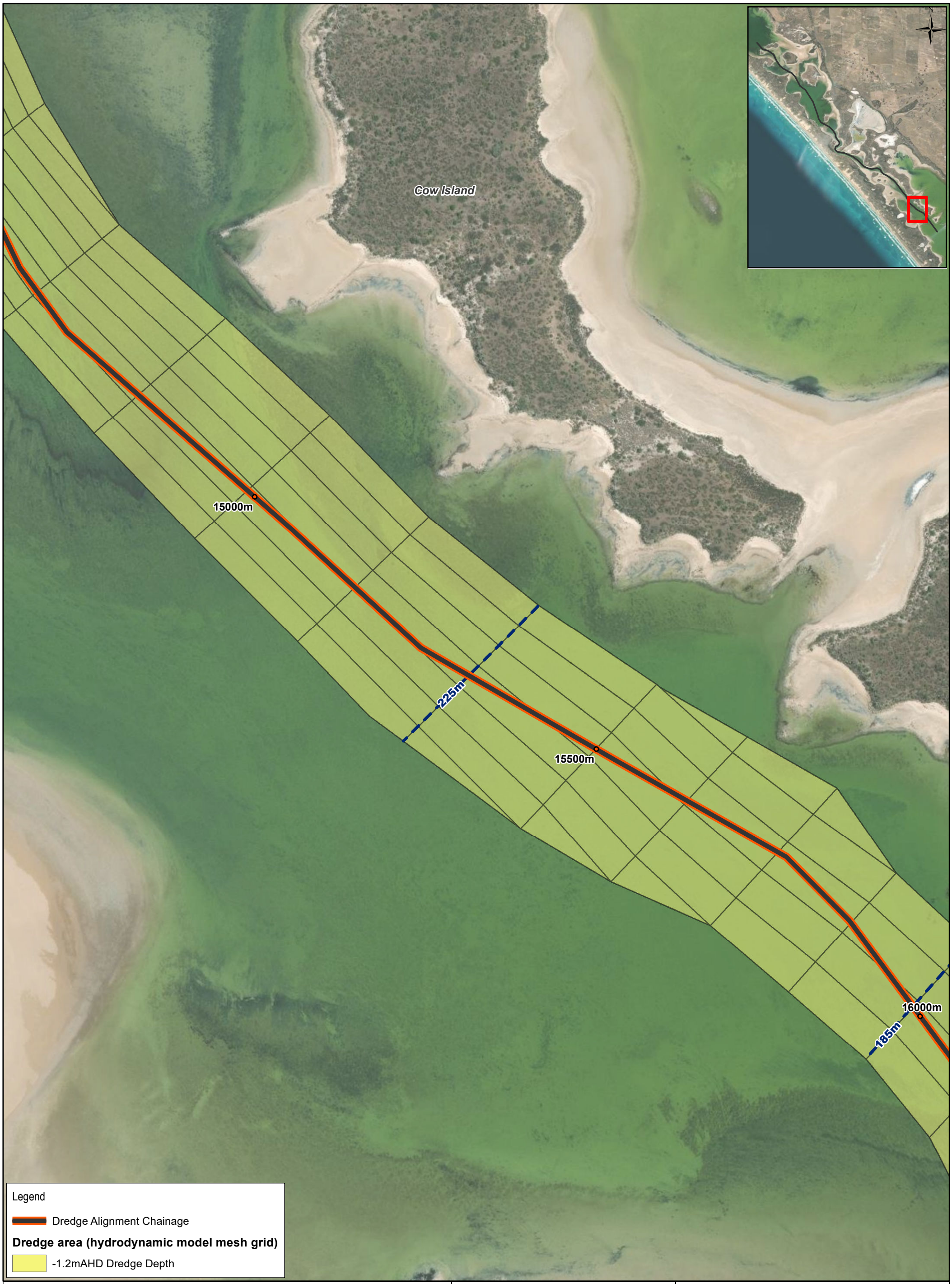
Level 3, 411 St Kilda Road, Victoria VIC 3001

Prepared: SAW
Checked: PJS

TITLE

COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 2 - PARNKA NARROWS DREDGE
PLAN - SHEET 12 OF 14
17.5KM x (195M) x (-1.2AHD)

DOCUMENT NO.	REV.
AEG155-2000-TD-DRG-CV-1012	B



SOURCE

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

FILE PATH	COORDINATE SYSTEM	DATE
\\adlfile300\data$\GIS\Projects\AEG155 - Coorong\Maps\ AEG155_01_GIS_003_Dredge Alignment.mxd	GDA 1994 MGA Zone 54	1 Dec 2021

Level 3, 411 St Kilda Road, Victoria VIC 3001

Prepared: SAW
Checked: PJS

TITLE

COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 2 - PARNKA NARROWS DREDGE
PLAN - SHEET 13 OF 14
17.5KM x (185M to 225M) x (-1.2AHD)

DOCUMENT NO.	REV.
AEG155-2000-TD-DRG-CV-1013	B

0 100 200
Meters

Scale at A3 1:4,000

SOURCE

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

FILE PATH	COORDINATE SYSTEM	DATE
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Level 3, 411 St Kilda Road, Victoria VIC 3001

Prepared: SAW
Checked: PJS

TITLE
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 2 - PARNKA NARROWS DREDGE
PLAN - SHEET 14 OF 14
17.5KM x (185M to 330M) x (-1.2AHD)

DOCUMENT NO.	REV.
AEG155-2000-TD-DRG-CV-1014	B

DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 3A - 1000 ML/D CSL PUMP OUT (JETTY DISCHARGE)

DRAWING LIST	
DRAWING No.	DRAWING TITLE
AEG155-0000-TD-DRG-CV-0001	PROJECT KEY PLAN
AEG155-0000-TD-DRG-CV-0300	TYPICAL DISCHARGE JETTY GENERAL ARRANGEMENT
AEG155-0000-TD-DRG-CV-0301	TYPICAL DISCHARGE JETTY SECTION
AEG155-0000-TD-DRG-CV-0401	CONSTRUCTION ACCESS - OPTIONS 3,4,5,6 SHEET 1
AEG155-0000-TD-DRG-CV-0402	CONSTRUCTION ACCESS - OPTIONS 3,4,5,6 SHEET 2
AEG155-0000-TD-DRG-CV-0800	TYPICAL TRENCH DETAILS
AEG155-0000-TD-DRG-ME-0001	FISH SCREEN DETAIL
AEG155-3000-TD-DRG-CV-0001	COVER PAGE
AEG155-3000-TD-DRG-CV-1000	KEY PLAN
AEG155-3000-TD-DRG-CV-1001	PLAN - SHEET 1
AEG155-3000-TD-DRG-CV-1002	PLAN - SHEET 2
AEG155-3000-TD-DRG-ME-6001	PUMP STATION SECTIONS - SHEET 1

NOT FOR CONSTRUCTION

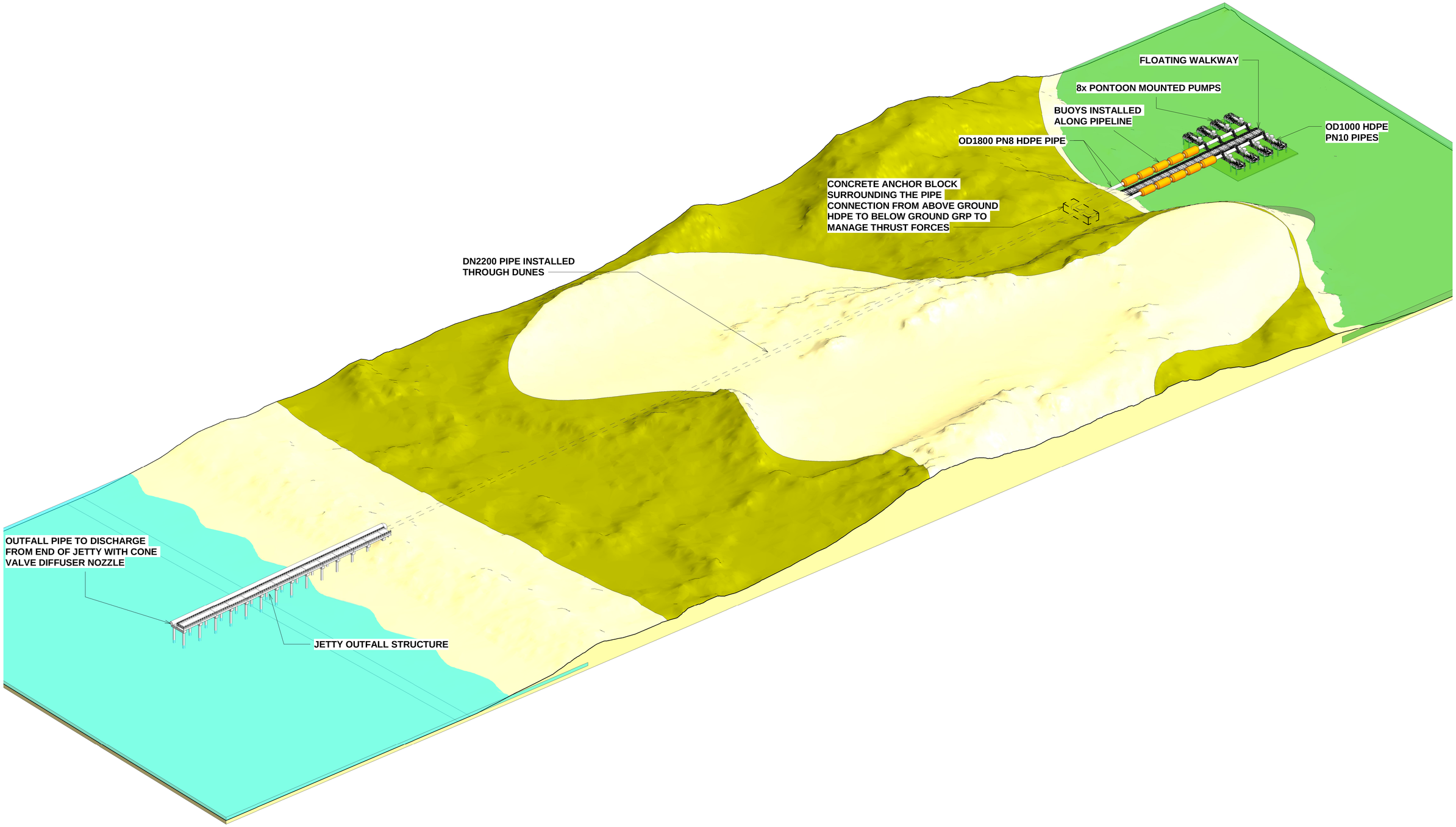
REV	DESCRIPTION	DATE
C	FINAL CONCEPT ISSUE	21/12/2021
B	CONCEPT DESIGN ISSUE	01/12/2021
A	ISSUED FOR CLIENT REVIEW	28/10/2021

POSITION	NAME	SIGNATURE
DRAFTING CHECK	F. RAPONI	FR
ORIGINATE/ DESIGN	J. BOOTH	JB
INDEPENDENT CHECK	M. TOLCVAY	MT
TECHNICAL APPROVAL	P. STANIFORD	PS
PROJECT APPROVAL	P. STANIFORD	PS
CLIENT APPROVAL		

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 3A - 1000 ML/D CSL PUMP OUT (JETTY DISCHARGE)
COVER PAGE

DRAWING SCALE: NOT TO SCALE
ORIG. SIZE: A1
DRAFTER: P. PIGNATA
DRAWING No.: AEG155-3000-TD-DRG-CV-0001
REVISION: C



NOTE: THIS DRAWING IS TO BE READ / PRINTED IN COLOUR

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	POSITION	NAME	SIGNATURE
			DRAFTING CHECK	F. RAPONI	FR
			ORIGINATE/ DESIGN	J. BOOTH	JB
			INDEPENDENT CHECK	M. TOLCVAY	MT
			TECHNICAL APPROVAL	P. STANIFORD	PS
D	FINAL CONCEPT ISSUE	21/12/2021	PROJECT APPROVAL	P. STANIFORD	PS
C	CONCEPT DESIGN ISSUE	17/12/2021	CLIENT APPROVAL		
B	CONCEPT DESIGN ISSUE	01/12/2021			
A	ISSUED FOR CLIENT REVIEW	28/10/2021			

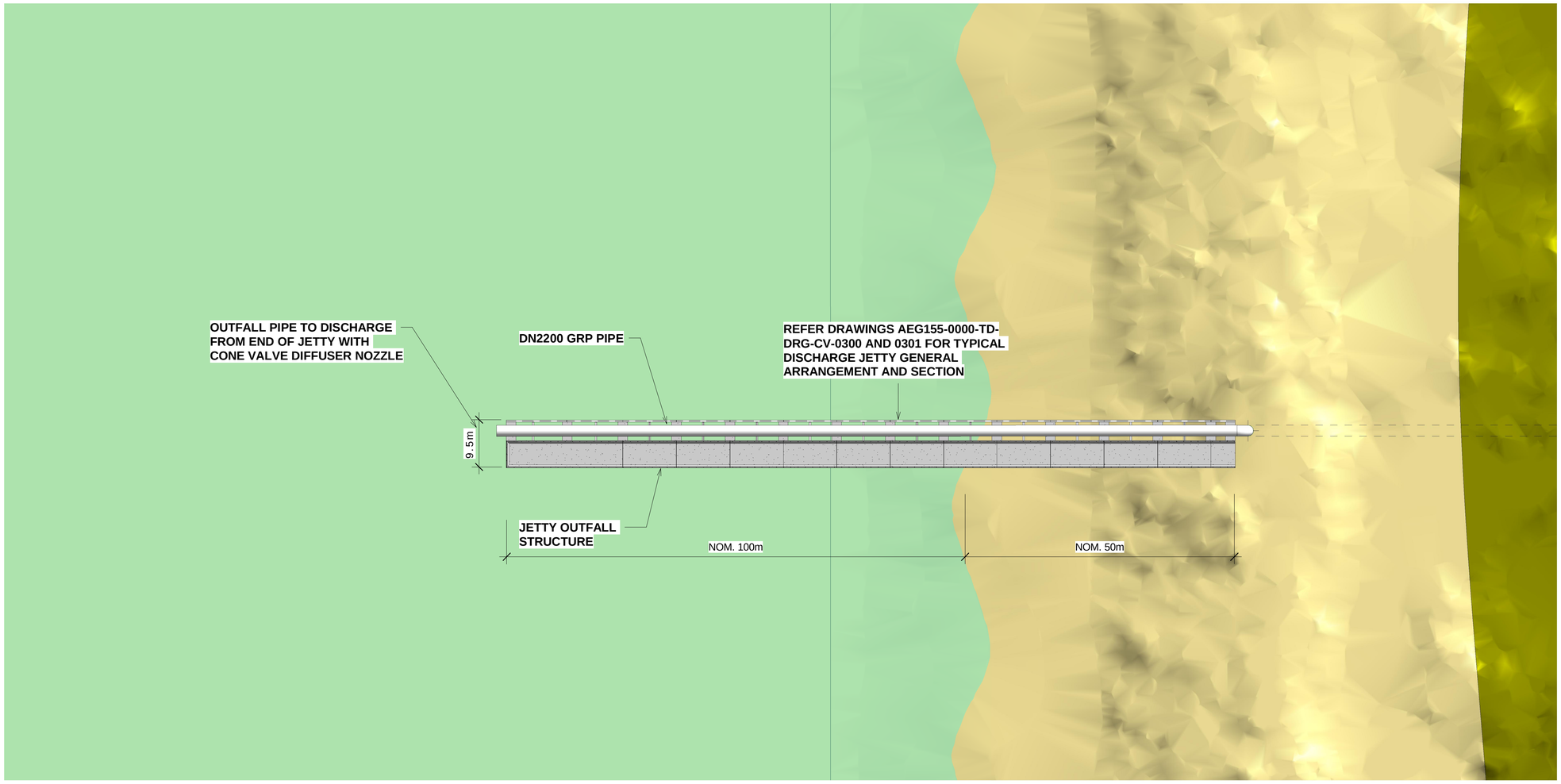
Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 3A - 1000 ML/D CSL PUMP (JETTY DISCHARGE)
KEY PLAN

DRAWING SCALE	ORIG. SIZE	DRAWING No.	REVISION
NOT TO SCALE	A1	AEG155-3000-TD-DRG-CV-1000	D

DRAFTER: P. PIGNATA

NOTE:
1. LENGTH OF JETTY SUBJECT TO CHANGE, PENDING BATHYMETRIC SURVEY AND REQUIRED WATER DEPTH



5 0 5 10 15 20m
1 : 500 FULL SIZE @ A1

NOTE: THIS DRAWING IS TO BE READ / PRINTED IN COLOUR

NOT FOR CONSTRUCTION

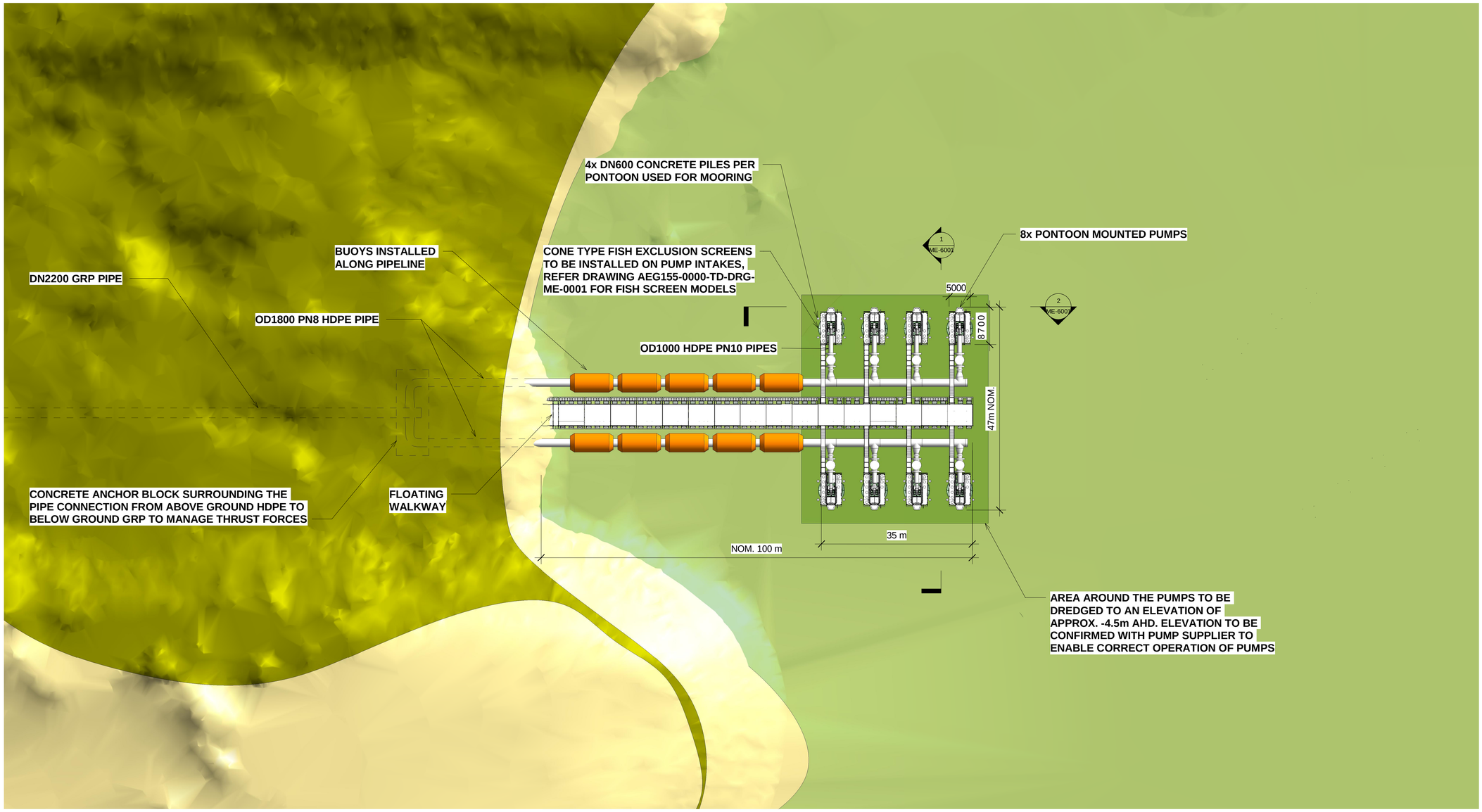
REV	DESCRIPTION	DATE	POSITION	NAME	SIGNATURE
			DRAFTING CHECK	F. RAPONI	FR
			ORIGINATE/ DESIGN	J. BOOTH	JB
			INDEPENDENT CHECK	M. TOLCVAY	MT
			TECHNICAL APPROVAL	P. STANIFORD	PS
C	FINAL CONCEPT ISSUE	21/12/2021	PROJECT APPROVAL	P. STANIFORD	PS
B	CONCEPT DESIGN ISSUE	01/12/2021	CLIENT APPROVAL		
A	ISSUED FOR CLIENT REVIEW	28/10/2021			

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 3A - 1000 ML/D CSL PUMP OUT (JETTY DISCHARGE)
PLAN - SHEET 1

DRAWING SCALE	ORIG. SIZE	DRAWING No.	REVISION
1 : 500	A1	AEG155-3000-TD-DRG-CV-1001	C

DRAFTER: P. PIGNATA



5000 0 5000 10000 15000 20000mm

1 : 500 FULL SIZE @ A1

NOTE: THIS DRAWING IS TO BE READ / PRINTED IN COLOUR

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	POSITION	NAME	SIGNATURE
			DRAFTING CHECK	F. RAPONI	FR
			ORIGINATE/ DESIGN	J. BOOTH	JB
			INDEPENDENT CHECK	M .TOLCVAY	MT
			TECHNICAL APPROVAL	P. STANIFORD	PS
C	FINAL CONCEPT ISSUE	21/12/2021	PROJECT APPROVAL	P. STANIFORD	PS
B	CONCEPT DESIGN ISSUE	01/12/2021	CLIENT APPROVAL		
A	ISSUED FOR CLIENT REVIEW	28/10/2021			

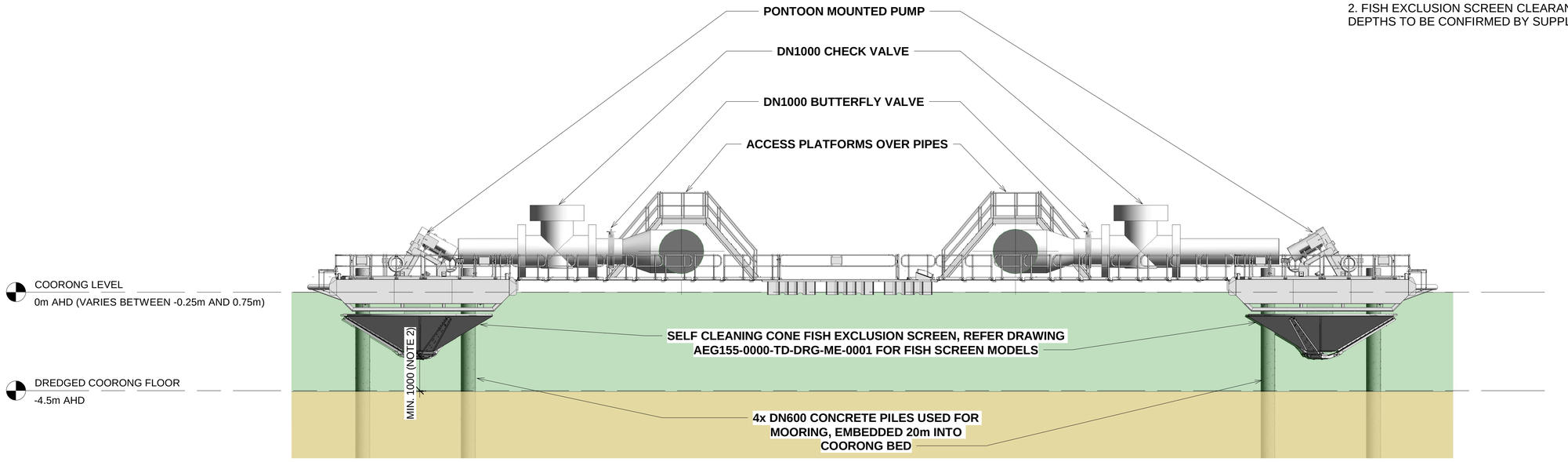
Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 3A - 1000 ML/D CSL PUMP OUT (JETTY DISCHARGE)
PLAN - SHEET 2

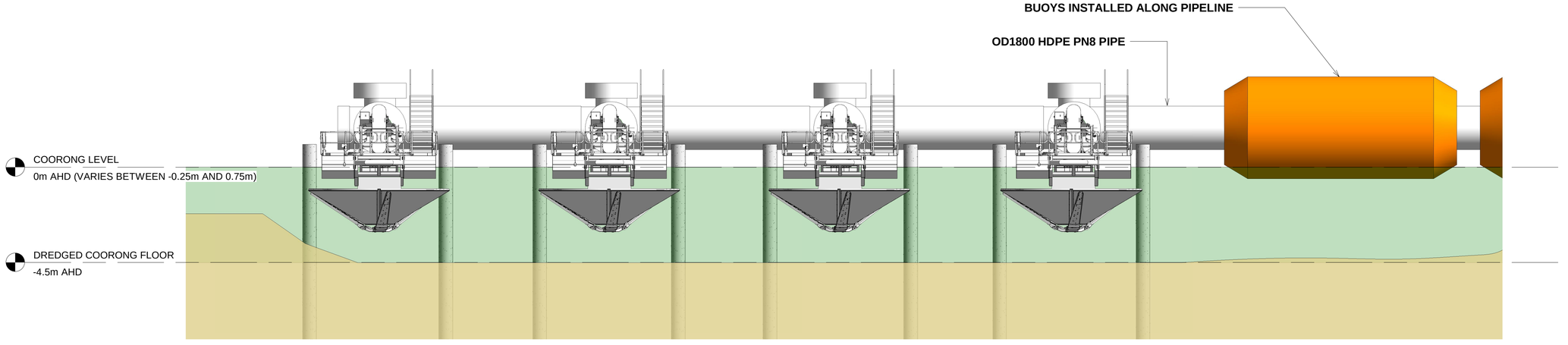
DRAWING SCALE	ORIG. SIZE	DRAWING No.	REVISION
1 : 500	A1	AEG155-3000-TD-DRG-CV-1002	C

DRAFTER: P. PIGNATA

NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
2. FISH EXCLUSION SCREEN CLEARANCES AND REQUIRED WATER DEPTHS TO BE CONFIRMED BY SUPPLIER DURING DETAILED DESIGN



1 CV-1002 PUMP STATION SECTION 1
1 : 100



2 CV-1002 PUMP STATION SECTION 2
1 : 100

1000 0 1000 2000 3000 4000mm
1 : 100 FULL SIZE @ A1

NOTE: THIS DRAWING IS TO BE READ / PRINTED IN COLOUR

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	POSITION	NAME	SIGNATURE
			DRAFTING CHECK	F. RAPONI	FR
			ORIGINATE/ DESIGN	J. BOOTH	JB
			INDEPENDENT CHECK	M. TOLCVAY	MT
			TECHNICAL APPROVAL	P. STANIFORD	PS
D	FINAL CONCEPT ISSUE	21/12/2021	PROJECT APPROVAL	P. STANIFORD	PS
C	CONCEPT DESIGN ISSUE	17/12/2021	CLIENT APPROVAL		
B	CONCEPT DESIGN ISSUE	01/12/2021			
A	ISSUED FOR CLIENT REVIEW	28/10/2021			

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 3A - 1000 ML/D CSL PUMP OUT (JETTY DISCHARGE)
PUMP STATION SECTIONS

DRAWING SCALE	ORIG. SIZE	DRAWING No.	REVISION
1 : 100	A1	AEG155-3000-TD-DRG-ME-6001	D

DRAFTER: P. PIGNATA

DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 3B - 1000 ML/D CSL PUMP OUT (NEARSHORE DISCHARGE)

DRAWING LIST	
DRAWING No.	DRAWING TITLE
AEG155-0000-TD-DRG-CV-0001	PROJECT KEY PLAN
AEG155-0000-TD-DRG-CV-0401	CONSTRUCTION ACCESS - OPTIONS 3,4,5,6 SHEET 1
AEG155-0000-TD-DRG-CV-0402	CONSTRUCTION ACCESS - OPTIONS 3,4,5,6 SHEET 2
AEG155-0000-TD-DRG-CV-0700	NEARSHORE DISCHARGE STRUCTURE DETAILS
AEG155-0000-TD-DRG-CV-0800	TYPICAL TRENCH DETAILS
AEG155-0000-TD-DRG-ME-0001	FISH SCREEN DETAIL
AEG155-3100-TD-DRG-CV-0001	COVER PAGE
AEG155-3100-TD-DRG-CV-1000	KEY PLAN
AEG155-3100-TD-DRG-CV-1001	PLAN - SHEET 1
AEG155-3100-TD-DRG-CV-1002	PLAN - SHEET 2
AEG155-3100-TD-DRG-ME-6001	PUMP STATION SECTIONS - SHEET 1

NOT FOR CONSTRUCTION

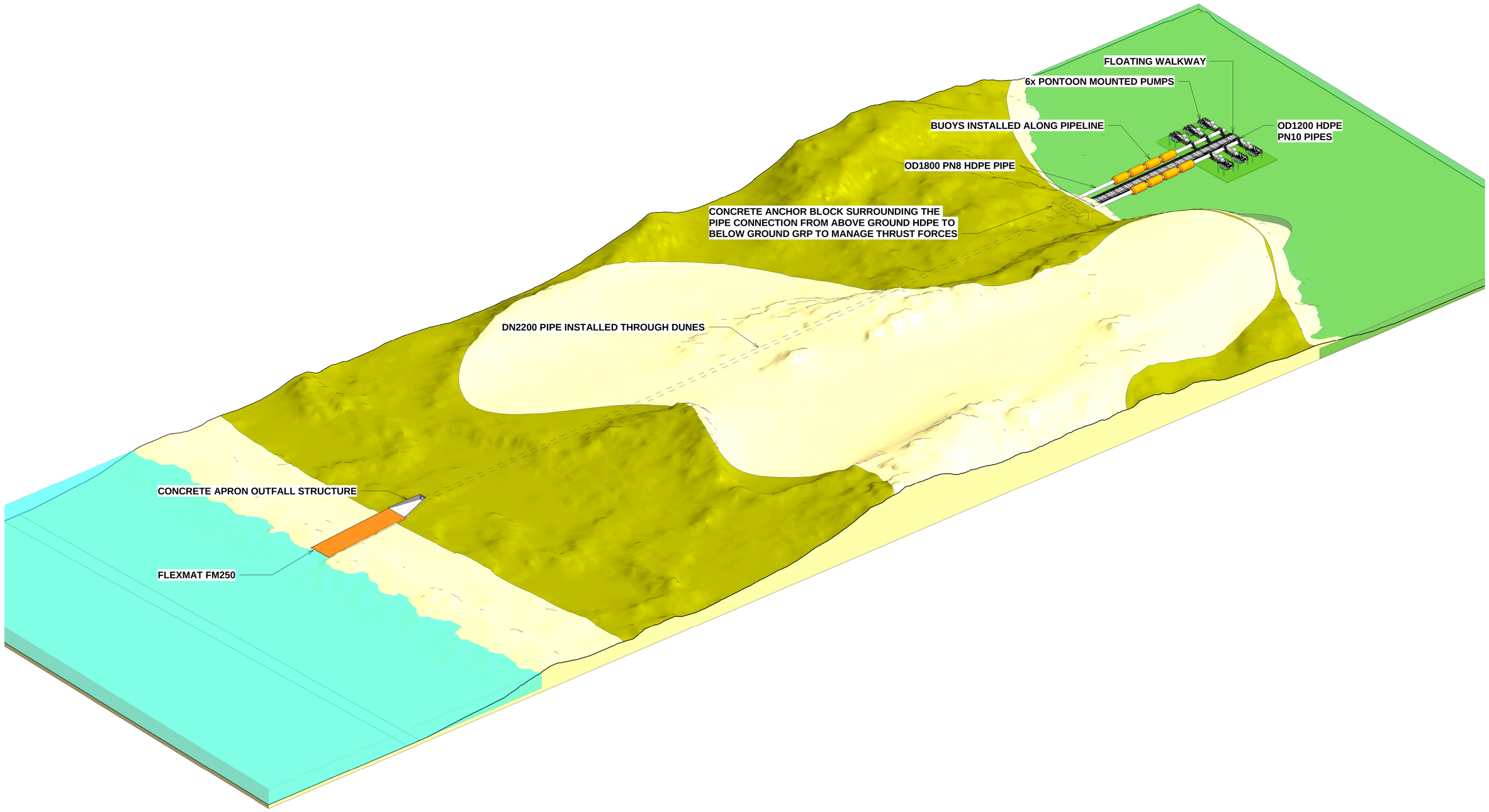
REV	DESCRIPTION	DATE
C	FINAL CONCEPT ISSUE	21/12/2021
B	CONCEPT DESIGN ISSUE	01/12/2021
A	ISSUED FOR CLIENT REVIEW	28/10/2021

POSITION	NAME	SIGNATURE
DRAFTING CHECK	F. RAPONI	FR
ORIGINATE/ DESIGN	J. BOOTH	JB
INDEPENDENT CHECK	M. TOLCVAY	MT
TECHNICAL APPROVAL	P. STANIFORD	PS
PROJECT APPROVAL	P. STANIFORD	PS
CLIENT APPROVAL		

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 3B - 1000 ML/D CSL PUMP OUT (NEARSHORE DISCHARGE)
COVER SHEET

DRAWING SCALE: NOT TO SCALE
ORIG. SIZE: A1
DRAWING No.: AEG155-3100-TD-DRG-CV-0001
REVISION: C
DRAFTER: P. PIGNATA



NOTE: THIS DRAWING IS TO BE READ / PRINTED IN COLOUR

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE
D	FINAL CONCEPT ISSUE	21/12/2021
C	CONCEPT DESIGN ISSUE	17/12/2021
B	CONCEPT DESIGN ISSUE	01/12/2021
A	ISSUED FOR CLIENT REVIEW	28/10/2021

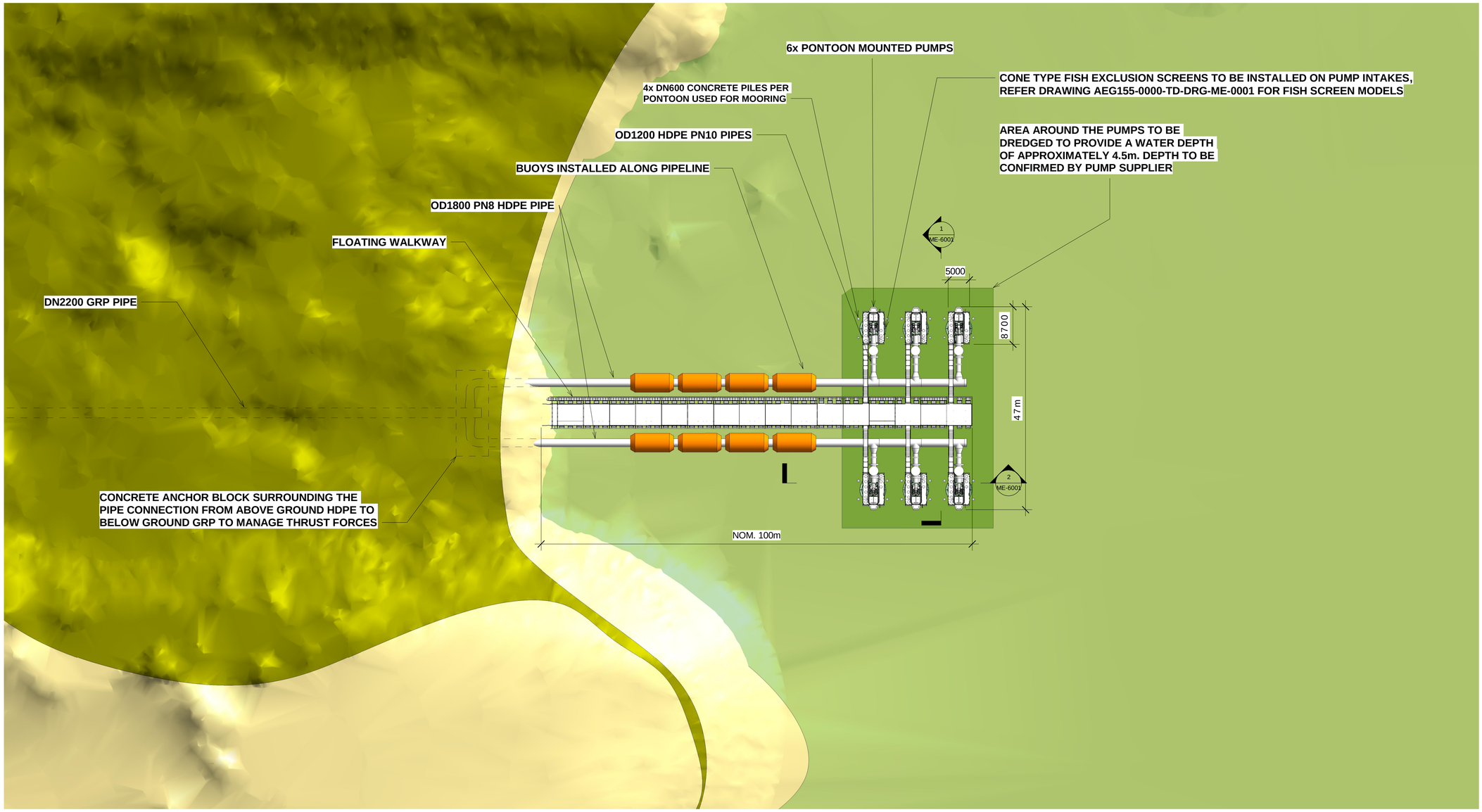
POSITION	NAME	SIGNATURE
DRAFTING CHECK	F. RAPONI	FR
ORIGINATE/ DESIGN	J. BOOTH	JB
INDEPENDENT CHECK	M. TOLCVAY	MT
TECHNICAL APPROVAL	P. STANIFORD	PS
PROJECT APPROVAL	P. STANIFORD	PS
CLIENT APPROVAL		

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 3B - 1000 ML/D CSL PUMP OUT (NEARSHORE DISCHARGE)
KEY PLAN

DRAWING SCALE	ORIG. SIZE	DRAWING No.	REVISION
NOT TO SCALE	A1	AEG155-3100-TD-DRG-CV-1000	D

DRAFTER: P. PIGNATA



5000 0 5000 10000 15000 20000mm

1 : 500 FULL SIZE @ A1

NOTE: THIS DRAWING IS TO BE READ / PRINTED IN COLOUR

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	POSITION	NAME	SIGNATURE
			DRAFTING CHECK	F. RAPONI	FR
			ORIGINATE/ DESIGN	J. BOOTH	JB
			INDEPENDENT CHECK	M. TOLCVAY	MT
			TECHNICAL APPROVAL	F. RAPONI	PS
C	FINAL CONCEPT ISSUE	21/12/2021	PROJECT APPROVAL	P. STANIFORD	PS
B	CONCEPT DESIGN ISSUE	01/12/2021	CLIENT APPROVAL		
A	ISSUED FOR CLIENT REVIEW	28/10/2021			

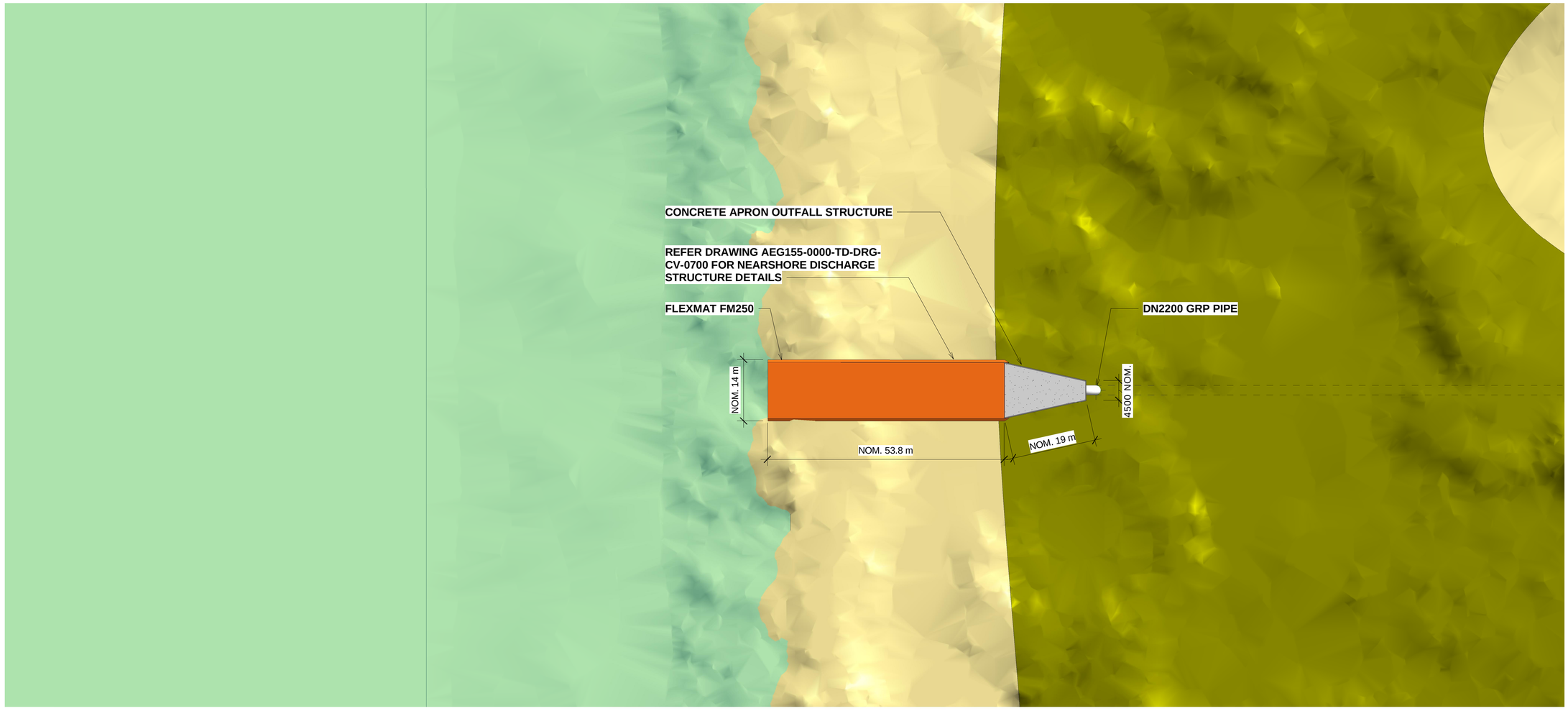
Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 3B - 1000 ML/D CSL PUMP OUT (NEARSHORE DISCHARGE)
PLAN - SHEET 1

DRAWING SCALE	ORIG. SIZE	DRAWING No.	REVISION
1 : 500	A1	AEG155-3100-TD-DRG-CV-1001	C

DRAFTER: P. PIGNATA

NOTE:
1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.



5000 0 5000 10000 15000 20000mm
1 : 500 FULL SIZE @ A1

NOTE: THIS DRAWING IS TO BE READ / PRINTED IN COLOUR

NOT FOR CONSTRUCTION

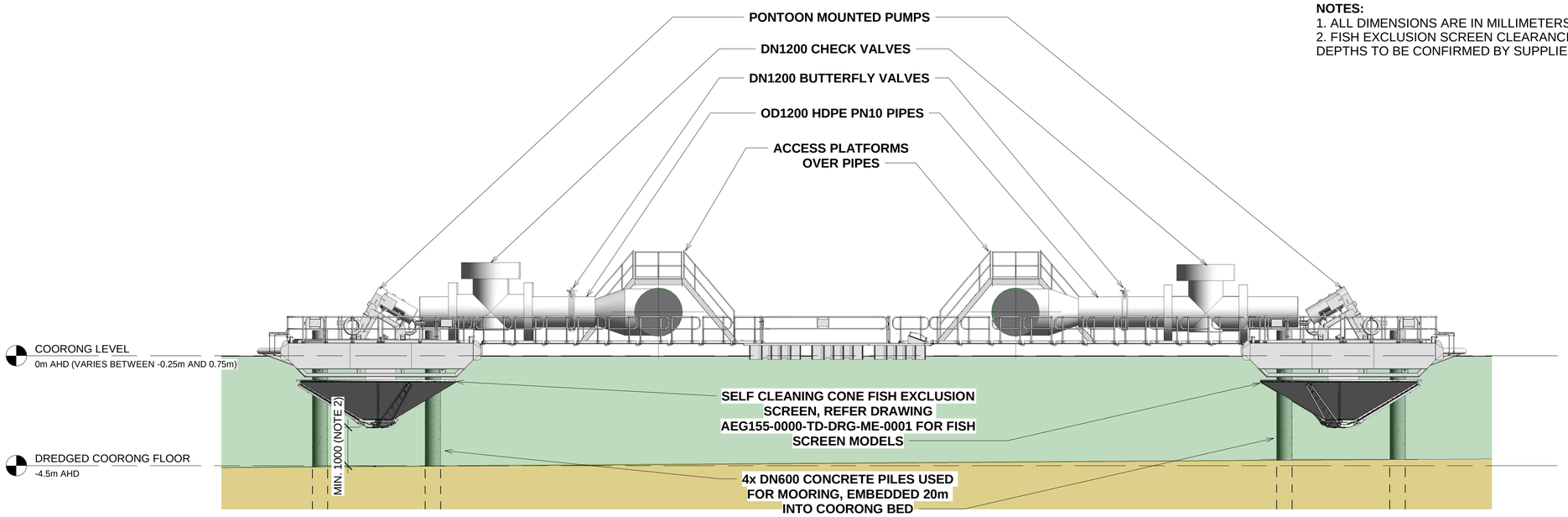
REV	DESCRIPTION	DATE
C	FINAL CONCEPT ISSUE	21/12/2021
B	CONCEPT DESIGN ISSUE	01/12/2021
A	ISSUED FOR CLIENT REVIEW	28/10/2021

POSITION	NAME	SIGNATURE
DRAFTING CHECK	F. RAPONI	FR
ORIGINATE/ DESIGN	J. BOOTH	JB
INDEPENDENT CHECK	M. TOLCVAY	MT
TECHNICAL APPROVAL	P. STANIFORD	PS
PROJECT APPROVAL	P. STANIFORD	PS
CLIENT APPROVAL		

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

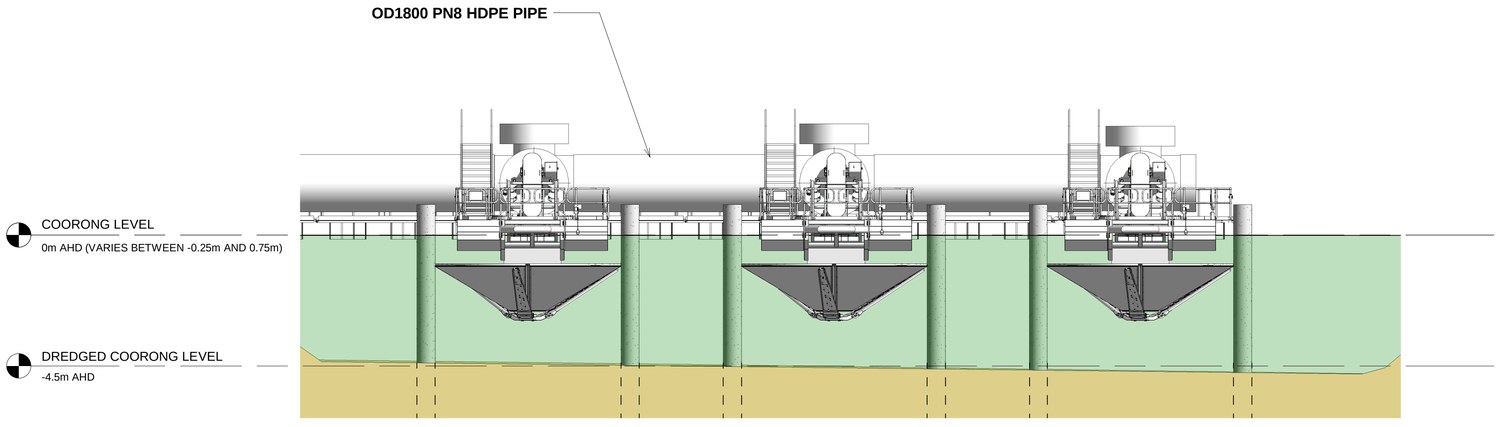
TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 3B - 1000 ML/D CSL PUMP OUT (NEARSHORE DISCHARGE)
PLAN - SHEET 2

DRAWING SCALE 1 : 500
ORIG. SIZE A1
DRAFTER: P. PIGNATA
DRAWING No. AEG155-3100-TD-DRG-CV-1002
REVISION C



1 CV-1001 PUMP STATION SECTION 1
1 : 100

NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
2. FISH EXCLUSION SCREEN CLEARANCES AND REQUIRED WATER DEPTHS TO BE CONFIRMED BY SUPPLIER DURING DETAILED DESIGN.



2 CV-1001 PUMP STATION SECTION 2
1 : 100

1000 0 1000 2000 3000 4000mm
1 : 100 FULL SIZE @ A1

NOTE: THIS DRAWING IS TO BE READ / PRINTED IN COLOUR

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	POSITION	NAME	SIGNATURE
			DRAFTING CHECK	F. RAPONI	FR
			ORIGINATE/ DESIGN	J. BOOTH	JB
			INDEPENDENT CHECK	M. TOLCVAY	MT
			TECHNICAL APPROVAL	P. STANIFORD	PS
D	FINAL CONCEPT ISSUE	21/12/2021	PROJECT APPROVAL	P. STANIFORD	PS
C	CONCEPT DESIGN ISSUE	17/12/2021	CLIENT APPROVAL		
B	CONCEPT DESIGN ISSUE	01/12/2021			
A	ISSUED FOR CLIENT REVIEW	28/10/2021			

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 3B - 1000 ML/D CSL PUMP OUT (NEARSHORE DISCHARGE)
PUMP STATION SECTIONS

DRAWING SCALE: 1 : 100
ORIG. SIZE: A1
DRAWING No.: AEG155-3100-TD-DRG-ME-6001
REVISION: D
DRAFTER: P. PIGNATA

DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 3C - 250 ML/D CSL PUMP OUT (JETTY DISCHARGE)

DRAWING LIST	
DRAWING No.	DRWAING TITLE
AEG155-0000-TD-DRG-CV-0001	PROJECT KEY PLAN
AEG155-0000-TD-DRG-CV-0300	TYPICAL DISCHARGE JETTY GENERAL ARRANGEMENT
AEG155-0000-TD-DRG-CV-0301	TYPICAL DISCHARGE JETTY SECTION
AEG155-0000-TD-DRG-CV-0401	CONSTRUCTION ACCESS - OPTIONS 3,4,5,6 SHEET 1
AEG155-0000-TD-DRG-CV-0402	CONSTRUCTION ACCESS - OPTIONS 3,4,5,6 SHEET 2
AEG155-0000-TD-DRG-CV-0800	TYPICAL TRENCH DETAILS
AEG155-0000-TD-DRG-ME-0001	FISH SCREEN DETAIL
AEG155-3200-TD-DRG-CV-0001	COVER PAGE
AEG155-3200-TD-DRG-CV-1000	KEY PLAN
AEG155-3200-TD-DRG-CV-1001	PLAN - SHEET 1
AEG155-3200-TD-DRG-CV-1002	PLAN - SHEET 2
AEG155-3200-TD-DRG-ME-6001	PUMP STATION SECTIONS - SHEET 1

NOT FOR CONSTRUCTION

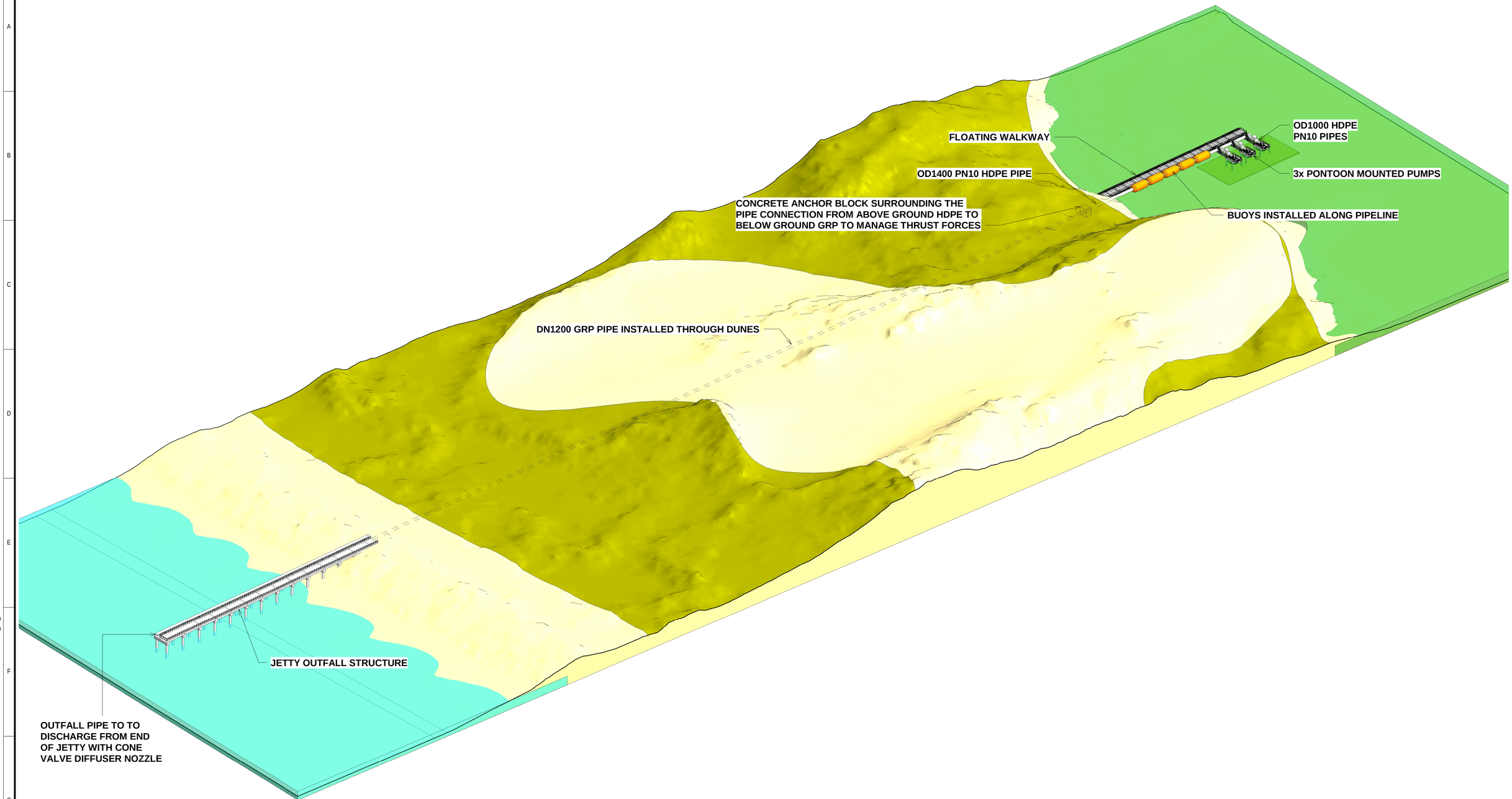
REV	DESCRIPTION	DATE
C	FINAL CONCEPT ISSUE	21/12/2021
B	CONCEPT DESIGN ISSUE	01/12/2021
A	ISSUED FOR CLIENT REVIEW	28/10/2021

POSITION	NAME	SIGNATURE
DRAFTING CHECK	F. RAPONI	FR
ORIGINATE/ DESIGN	J. BOOTH	JB
INDEPENDENT CHECK	M. TOLCVAY	MT
TECHNICAL APPROVAL	P. STANIFORD	PS
PROJECT APPROVAL	P. STANIFORD	PS
CLIENT APPROVAL		

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 3C - 250 ML/D CSL PUMP OUT (JETTY DISCHARGE)
COVER SHEET

DRAWING SCALE: NOT TO SCALE
ORIG. SIZE: A1
DRAWING No.: AEG155-3200-TD-DRG-CV-0001
REVISION: C
DRAFTER: P. PIGNATA



NOTE: THIS DRAWING IS TO BE READ / PRINTED IN COLOUR

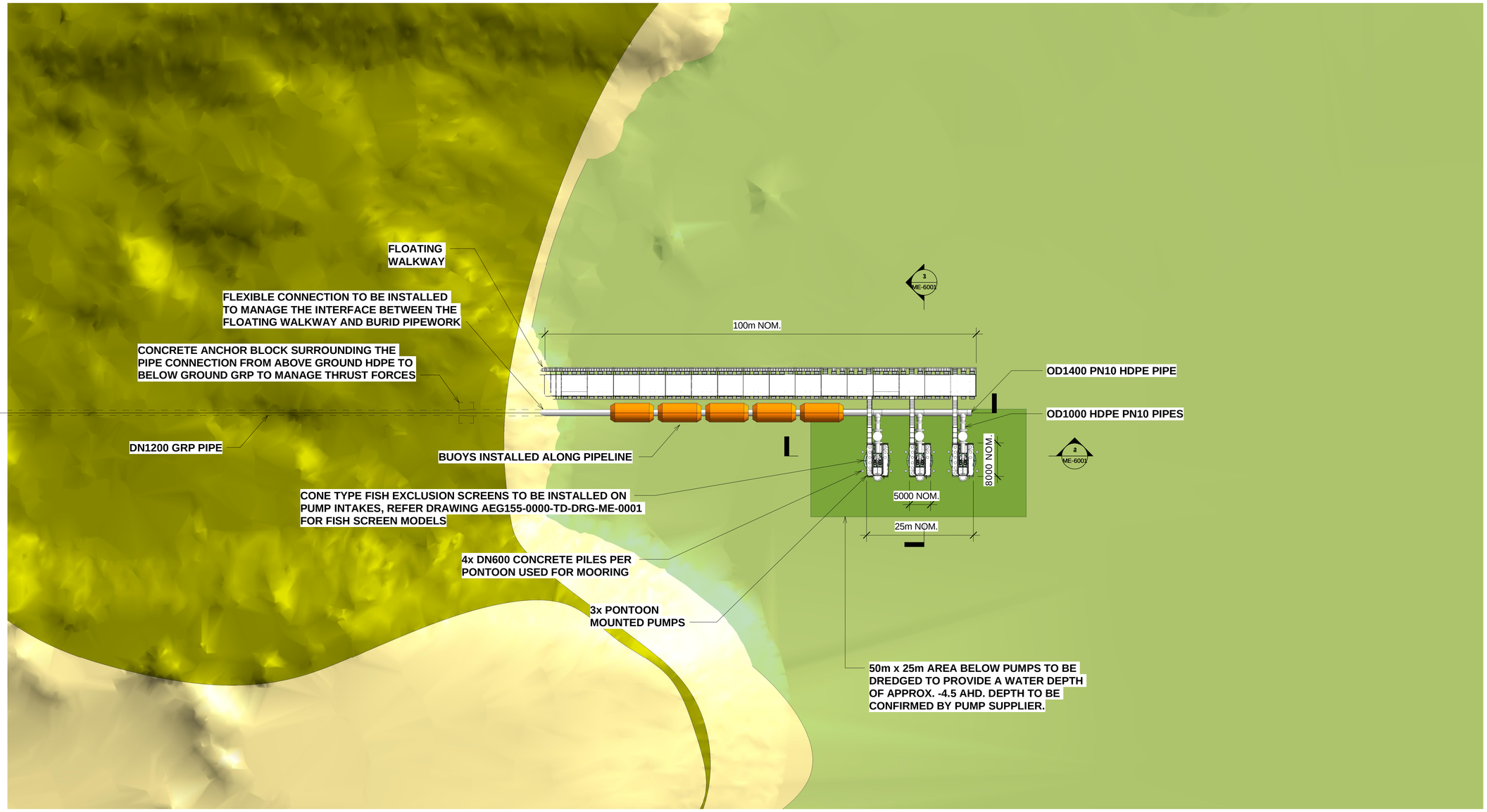
NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	POSITION	NAME	SIGNATURE
			DRAFTING CHECK	F. RAPONI	FR
			ORIGINATE/ DESIGN	J. BOOTH	JB
			INDEPENDENT CHECK	M. TOLCVAY	MT
			TECHNICAL APPROVAL	P. STANIFORD	PS
D	FINAL CONCEPT ISSUE	21/12/2021	PROJECT APPROVAL	P. STANIFORD	PS
C	CONCEPT DESIGN ISSUE	17/12/2021	CLIENT APPROVAL		
B	CONCEPT DESIGN ISSUE	01/12/2021			
A	ISSUED FOR CLIENT REVIEW	28/10/2021			

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 3C - 250 ML/D CSL PUMP OUT (JETTY DISCHARGE)
KEY PLAN

DRAWING SCALE: NOT TO SCALE
ORIG. SIZE: A1
DRAWING No.: AEG155-3200-TD-DRG-CV-1000
REVISION: D
DRAFTER: P. PIGNATA



5000 0 5000 10000 15000 20000mm

1 : 500 FULL SIZE @ A1

NOTE: THIS DRAWING IS TO BE READ / PRINTED IN COLOUR

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	POSITION	NAME	SIGNATURE
			DRAFTING CHECK	F. RAPONI	FR
			ORIGINATE/ DESIGN	J. BOOTH	JB
			INDEPENDENT CHECK	M. TOLCVAY	MT
			TECHNICAL APPROVAL	P. STANIFORD	PS
C	FINAL CONCEPT ISSUE	21/12/2021	PROJECT APPROVAL	P. STANIFORD	PS
B	CONCEPT DESIGN ISSUE	01/12/2021	CLIENT APPROVAL		
A	ISSUED FOR CLIENT REVIEW	28/10/2021			

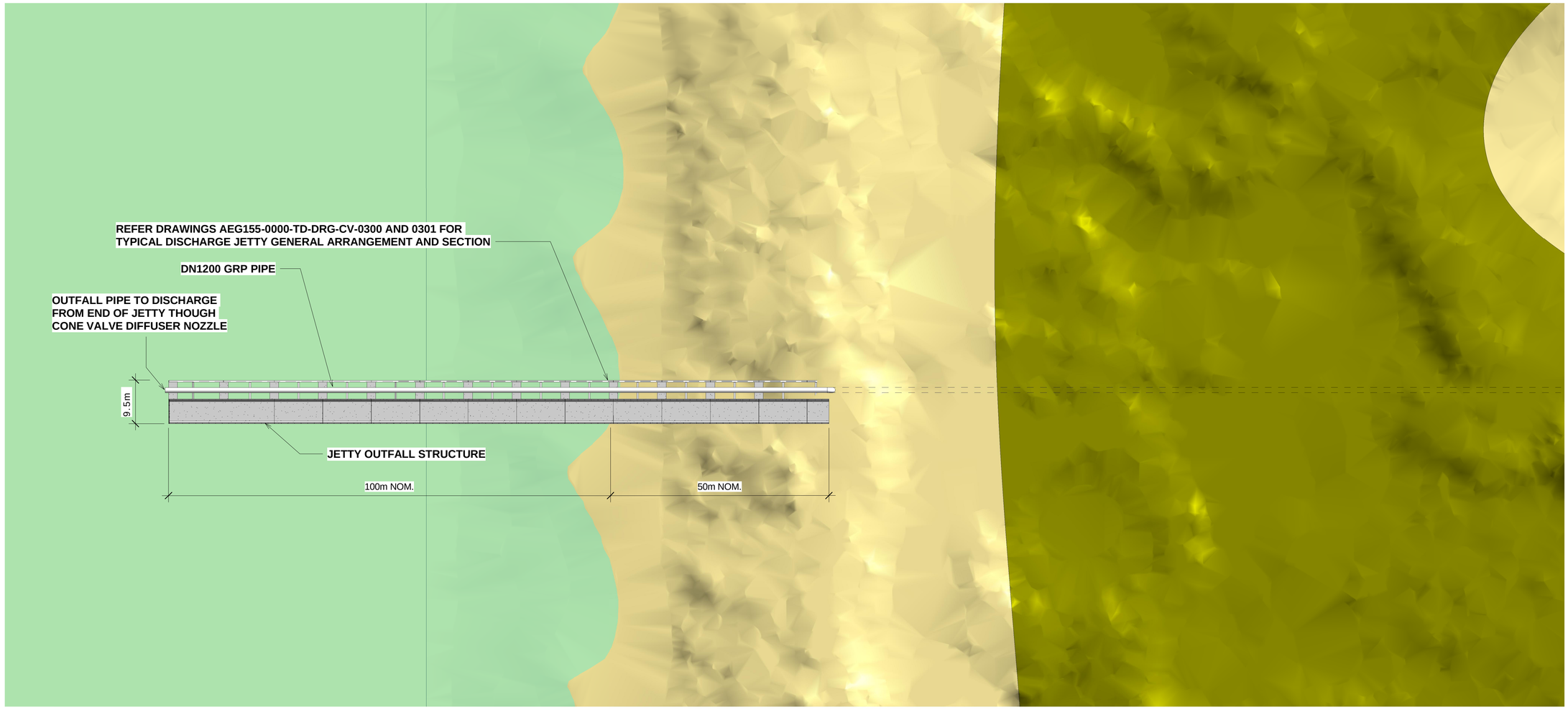
Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 3C - 250 ML/D CSL PUMP OUT (JETTY DISCHARGE)
PLAN - SHEET 1

DRAWING SCALE	ORIG. SIZE	DRAWING No.	REVISION
1 : 500	A1	AEG155-3200-TD-DRG-CV-1001	C

DRAFTER: P. PIGNATA

NOTE
1. LENGTH OF JETTY SUBJECT TO CHANGE, PENDING BATHYMETRIC SURVEY AND REQUIRED WATER DEPTH.



5000 0 5000 10000 15000 20000mm
1 : 500 FULL SIZE @ A1

NOTE: THIS DRAWING IS TO BE READ / PRINTED IN COLOUR

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE
C	FINAL CONCEPT ISSUE	21/12/2021
B	CONCEPT DESIGN ISSUE	01/12/2021
A	ISSUED FOR CLIENT REVIEW	28/10/2021

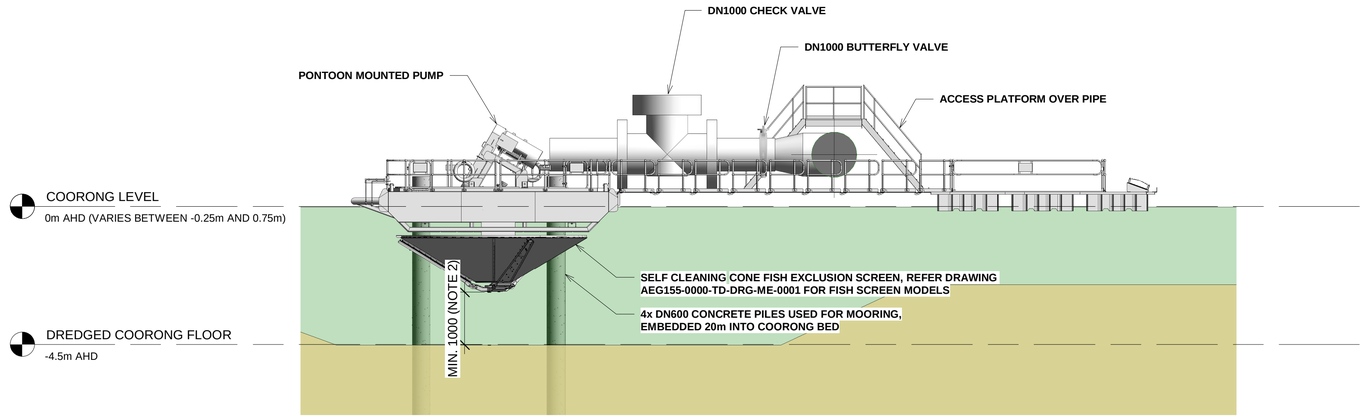
POSITION	NAME	SIGNATURE
DRAFTING CHECK	F. RAPONI	FR
ORIGINATE/ DESIGN	J. BOOTH	JB
INDEPENDENT CHECK	M .TOLCVAY	MT
TECHNICAL APPROVAL	P. STANIFORD	PS
PROJECT APPROVAL	P. STANIFORD	PS
CLIENT APPROVAL		

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

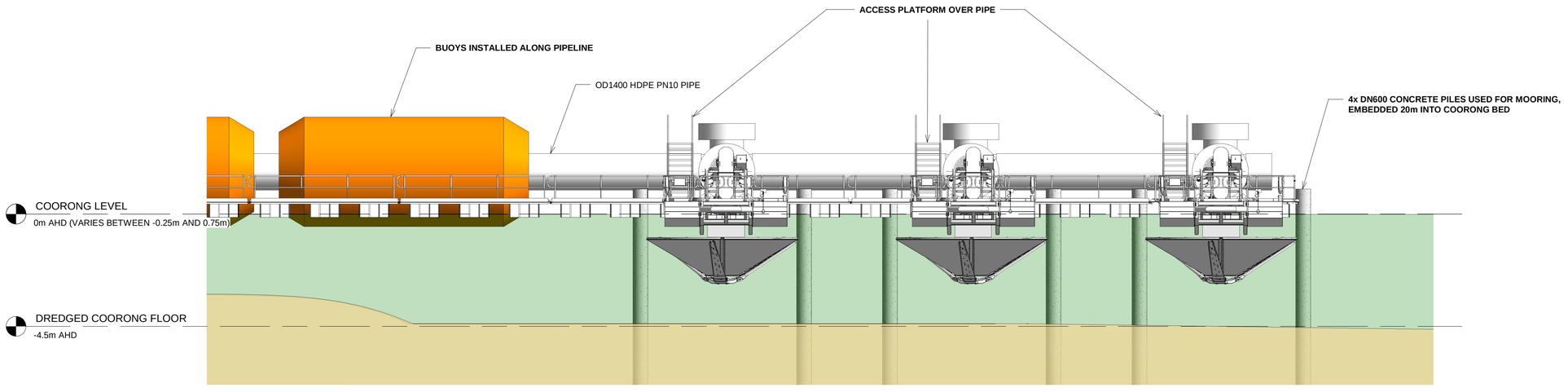
TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 3C - 250 ML/D CSL PUMP OUT (JETTY DISCHARGE)
PLAN - SHEET 2

DRAWING SCALE 1 : 500
ORIG. SIZE A1
DRAWING No. AEG155-3200-TD-DRG-CV-1002
REVISION C
DRAFTER: P. PIGNATA

NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
2. FISH EXCLUSION SCREEN CLEARANCES AND REQUIRED WATER DEPTHS TO BE CONFIRMED BY SUPPLIER DURING DETAILED DESIGN.



1 CV-1001 PONTOON SECTION 1
1 : 100



2 CV-1001 PONTOON SECTION 2
1 : 100

1000 0 1000 2000 3000 4000mm
1 : 100 FULL SIZE @ A1

NOTE: THIS DRAWING IS TO BE READ / PRINTED IN COLOUR

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	POSITION	NAME	SIGNATURE
			DRAFTING CHECK	F. RAPONI	FR
			ORIGINATE/ DESIGN	J. BOOTH	JB
			INDEPENDENT CHECK	M. TOLCVAY	MT
			TECHNICAL APPROVAL	P. STANIFORD	PS
D	FINAL CONCEPT ISSUE	21/12/2021	PROJECT APPROVAL	P. STANIFORD	PS
C	CONCEPT DESIGN ISSUE	17/12/2021	CLIENT APPROVAL		
B	CONCEPT DESIGN ISSUE	01/12/2021			
A	ISSUED FOR CLIENT REVIEW	28/10/2021			

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 3C - 250 ML/D CSL PUMP OUT (JETTY DISCHARGE)
PUMP STATION SECTIONS

DRAWING SCALE: As indicated
ORIG. SIZE: A1
DRAFTER: P. PIGNATA
DRAWING No.: AEG155-3200-TD-DRG-ME-6001
REVISION: D

DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 3D- 250 ML/D CSL PUMP OUT (NEARSHORE DISCHARGE)

DRAWING LIST

DRAWING No.	DRAWING TITLE
AEG155-0000-TD-DRG-CV-0001	PROJECT KEY PLAN
AEG155-0000-TD-DRG-CV-0401	CONSTRUCTION ACCESS - OPTIONS 3,4,5,6 SHEET 1
AEG155-0000-TD-DRG-CV-0402	CONSTRUCTION ACCESS - OPTIONS 3,4,5,6 SHEET 2
AEG155-0000-TD-DRG-CV-0700	NEARSHORE DISCHARGE STRUCTURE DETAILS
AEG155-0000-TD-DRG-CV-0800	TYPICAL TRENCH DETAIALS
AEG155-0000-TD-DRG-ME-0001	FISH SCREEN DETAIL
AEG155-3300-TD-DRG-CV-0001	COVER PAGE
AEG155-3300-TD-DRG-CV-0002	GENERAL NOTES
AEG155-3300-TD-DRG-CV-1000	KEY PLAN
AEG155-3300-TD-DRG-CV-1001	PLAN - SHEET 1
AEG155-3300-TD-DRG-CV-1002	PLAN - SHEET 2
AEG155-3300-TD-DRG-ME-6001	PUMP STATION SECTION

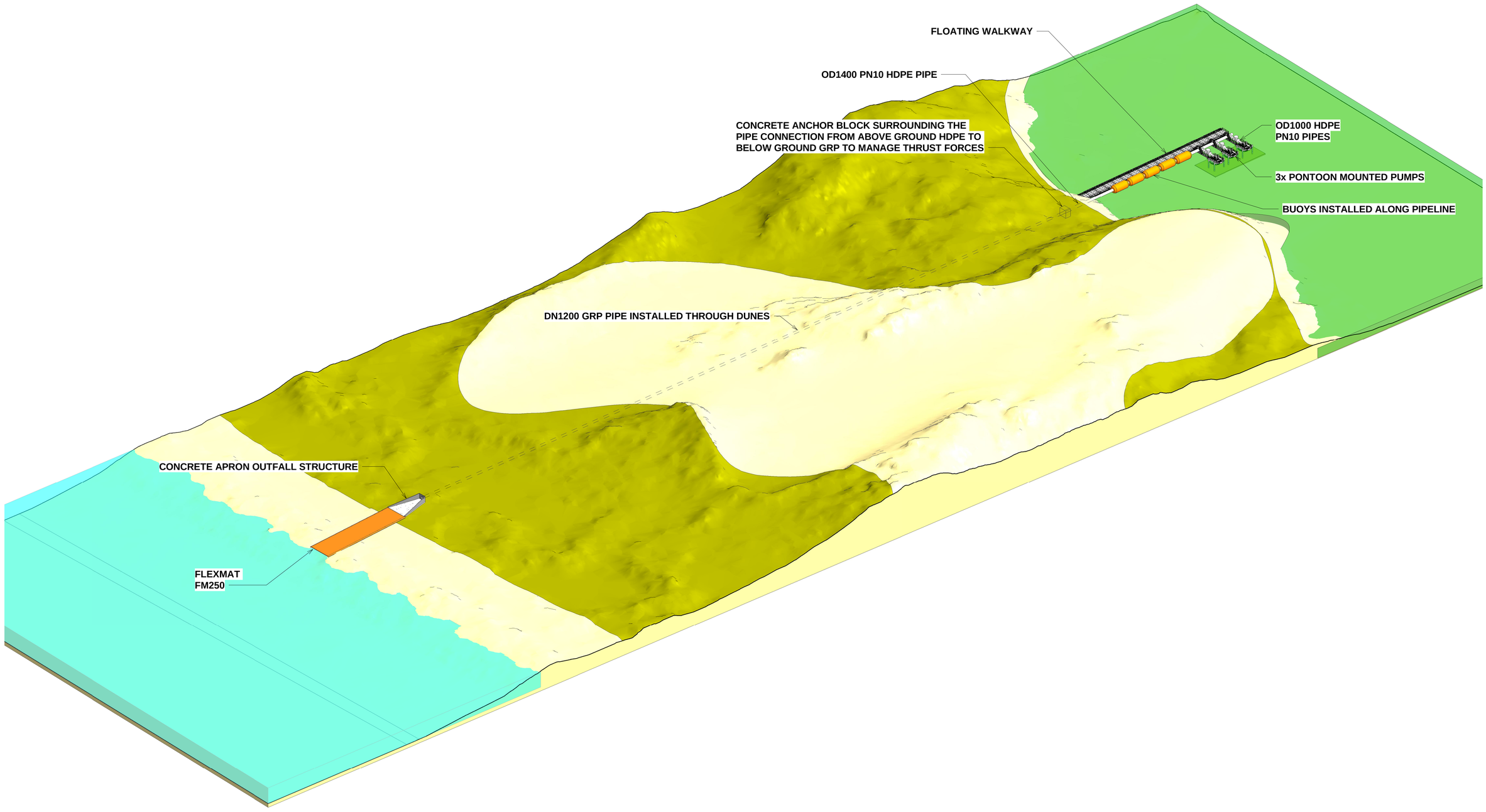
NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	POSITION	NAME	SIGNATURE
			DRAFTING CHECK	F. RAPONI	FR
			ORIGINATE/ DESIGN	J. BOOTH	JB
			INDEPENDENT CHECK	M. TOLCVAY	MT
			TECHNICAL APPROVAL	P. STANIFORD	PS
C	FINAL CONCEPT ISSUE	21/12/2021	PROJECT APPROVAL	P. STANIFORD	PS
B	CONCEPT DESIGN ISSUE	01/12/2021	CLIENT APPROVAL		
A	ISSUED FOR CLIENT REVIEW	28/10/2021			

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 3D - 250 ML/D CSL PUMP OUT (NEARSHORE DISCHARGE)
COVER PAGE

DRAWING SCALE: NOT TO SCALE
ORIG. SIZE: A1
DRAFTER: M. MACIEL
DRAWING No.: AEG155-3300-TD-DRG-CV-0001
REVISION: C



NOTE: THIS DRAWING IS TO BE READ / PRINTED IN COLOUR

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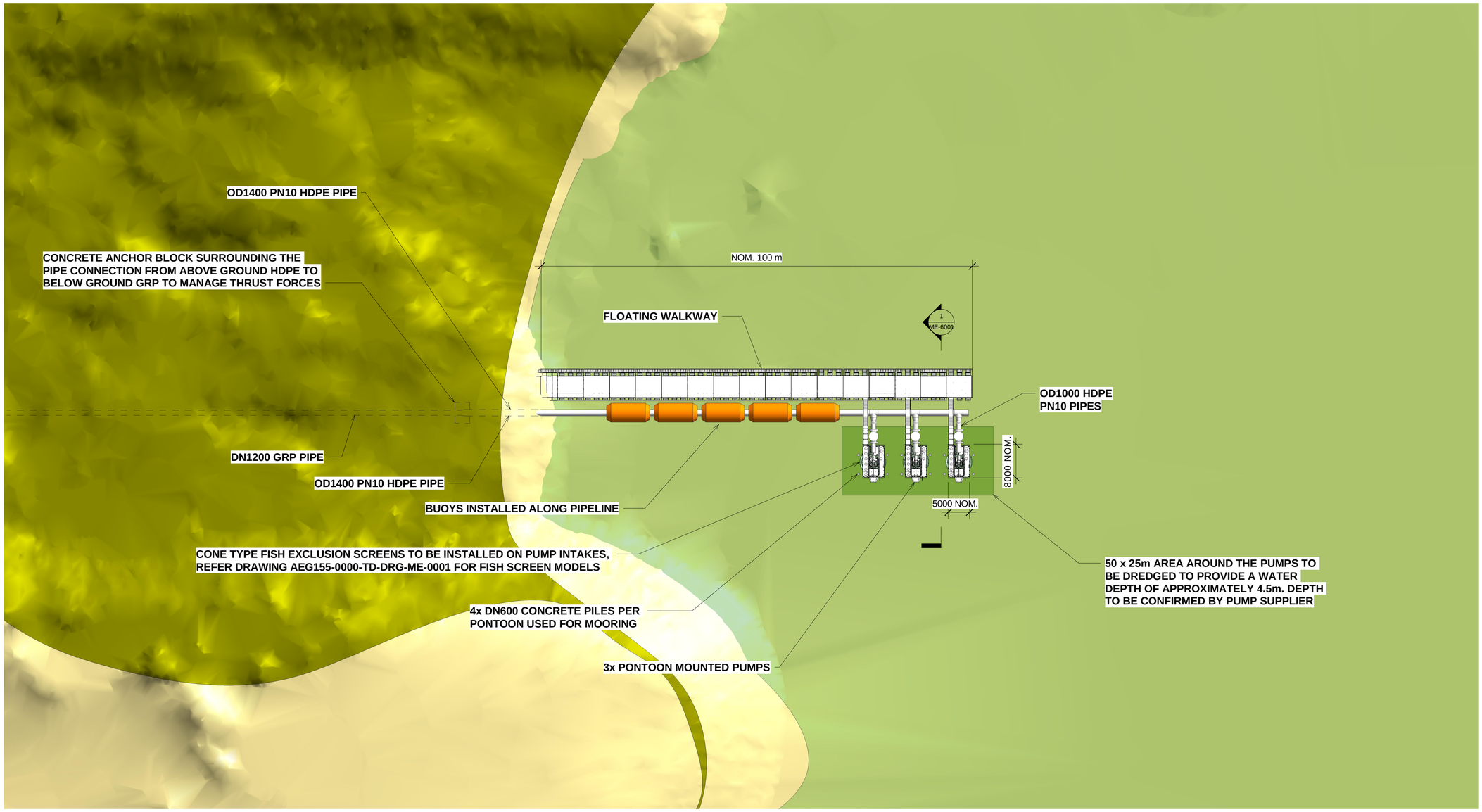
REV	DESCRIPTION	DATE
D	FINAL CONCEPT ISSUE	21/12/2021
C	CONCEPT DESIGN ISSUE	17/12/2021
B	CONCEPT DESIGN ISSUE	01/12/2021
A	ISSUED FOR CLIENT REVIEW	28/10/2021

POSITION	NAME	SIGNATURE
DRAFTING CHECK	F. RAPONI	FR
ORIGINATE/ DESIGN	J. BOOTH	JB
INDEPENDENT CHECK	M. TOLCVAY	MT
TECHNICAL APPROVAL	P. STANIFORD	PS
PROJECT APPROVAL	P. STANIFORD	PS
CLIENT APPROVAL		

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 3D - 250 ML/D CSL PUMP OUT (NEARSHORE DISCHARGE)
KEY PLAN

DRAWING SCALE: NOT TO SCALE
ORIG. SIZE: A1
DRAFTER: P. PIGNATA
DRAWING No.: AEG155-3300-TD-DRG-CV-1000
REVISION: D



5000 0 5000 10000 15000 20000mm

1 : 500 FULL SIZE @ A1

NOTE: THIS DRAWING IS TO BE READ / PRINTED IN COLOUR

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE
C	FINAL CONCEPT ISSUE	21/12/2021
B	CONCEPT DESIGN ISSUE	01/12/2021
A	ISSUED FOR CLIENT REVIEW	28/10/2021

POSITION	NAME	SIGNATURE
DRAFTING CHECK	F. RAPONI	FR
ORIGINATE/ DESIGN	J. BOOTH	JB
INDEPENDENT CHECK	M. TOLCVAY	MT
TECHNICAL APPROVAL	P. STANIFORD	PS
PROJECT APPROVAL	P. STANIFORD	PS
CLIENT APPROVAL		

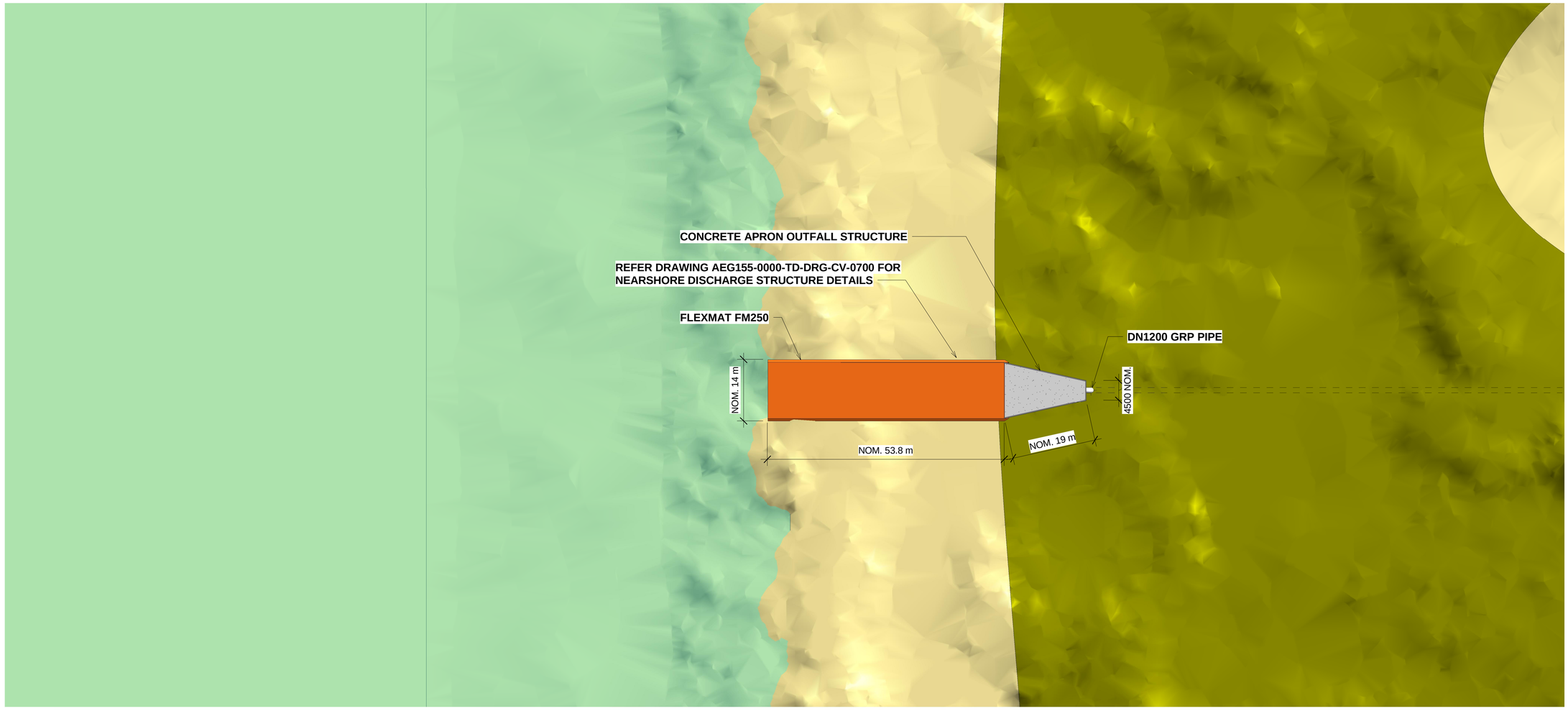
Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 3D - 250 ML/D CSL PUMP OUT (NEARSHORE DISCHARGE)
PLAN - SHEET 1

DRAWING SCALE	ORIG. SIZE	DRAWING No.	REVISION
1 : 500	A1	AEG155-3300-TD-DRG-CV-1001	C

DRAFTER: P. PIGNATA

NOTE:
1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.



5000 0 5000 10000 15000 20000mm
1 : 500 FULL SIZE @ A1

NOTE: THIS DRAWING IS TO BE READ / PRINTED IN COLOUR

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE
C	FINAL CONCEPT ISSUE	21/12/2021
B	CONCEPT DESIGN ISSUE	01/12/2021
A	ISSUED FOR CLIENT REVIEW	28/10/2021

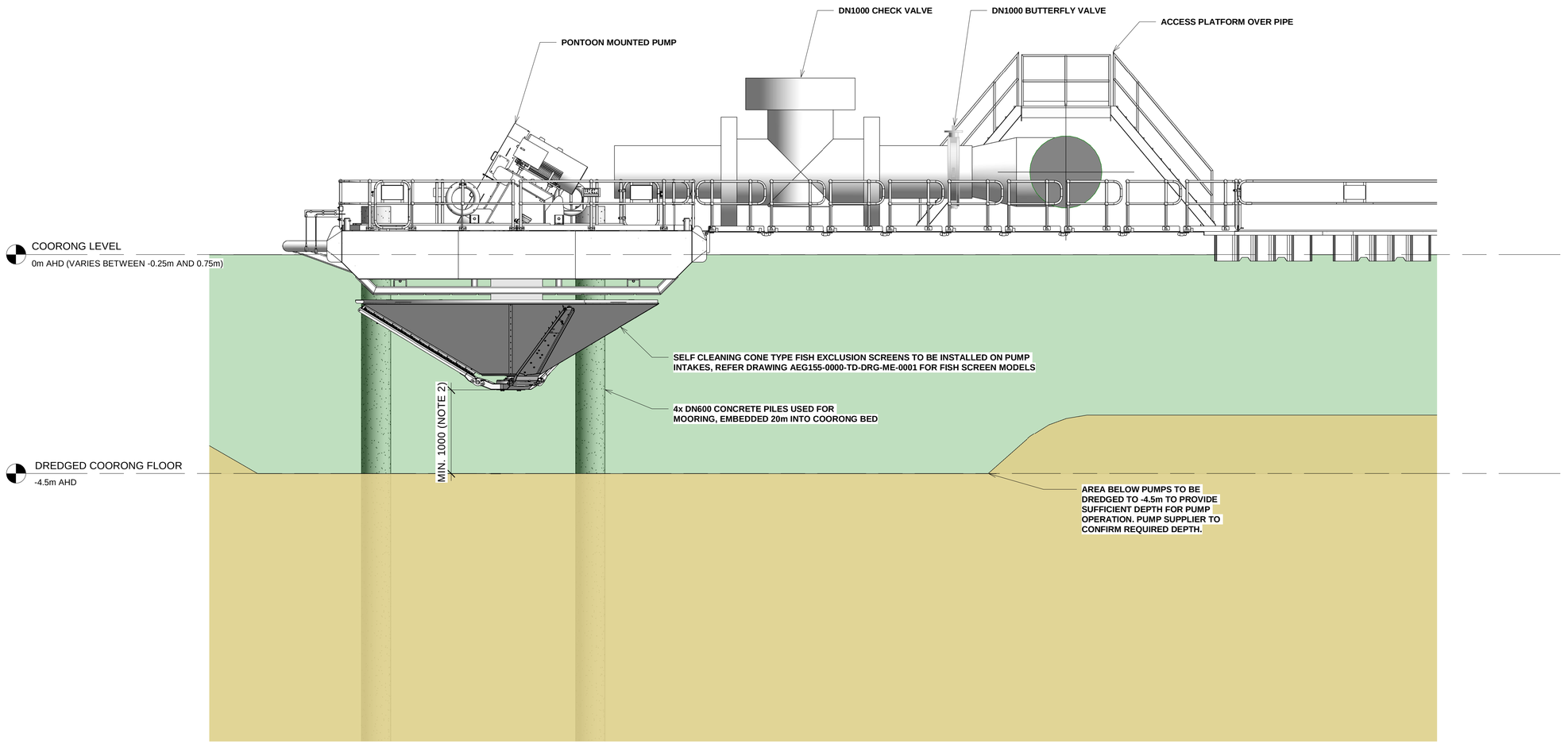
POSITION	NAME	SIGNATURE
DRAFTING CHECK	F. RAPONI	FR
ORIGINATE/ DESIGN	J. BOOTH	JB
INDEPENDENT CHECK	M. TOLCVAY	MT
TECHNICAL APPROVAL	P. STANIFORD	PS
PROJECT APPROVAL	P. STANIFORD	PS
CLIENT APPROVAL		

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 3D - 250 ML/D CSL PUMP OUT (NEARSHORE DISCHARGE)
PLAN - SHEET 2

DRAWING SCALE 1 : 500
ORIG. SIZE A1
DRAWING No. AEG155-3300-TD-DRG-CV-1002
REVISION C
DRAFTER: P. PIGNATA

NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
2. FISH EXCLUSION SCREEN CLEARANCES AND REQUIRED WATER DEPTHS TO BE CONFIRMED BY SUPPLIER DURING DETAILED DESIGN.



1 / 1001 PUMP STATION SECTION 1
1 : 50

500 0 500 1000 1500 2000mm
1 : 50 FULL SIZE @ A1

NOTE: THIS DRAWING IS TO BE READ / PRINTED IN COLOUR

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	POSITION	NAME	SIGNATURE
			DRAFTING CHECK	F. RAPONI	FR
			ORIGINATE/ DESIGN	J. BOOTH	JB
			INDEPENDENT CHECK	M. TOLCVAY	MT
			TECHNICAL APPROVAL	P. STANIFORD	PS
D	FINAL CONCEPT ISSUE	21/12/2021	PROJECT APPROVAL	P. STANIFORD	PS
C	CONCEPT DESIGN ISSUE	17/12/2021	CLIENT APPROVAL		
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Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 3D - 250 ML/D CSL PUMP OUT (NEARSHORE DISCHARGE)
PUMP STATION SECTION

DRAWING SCALE	ORIG. SIZE	DRAWING No.	REVISION
1 : 50	A1	AEG155-3300-TD-DRG-ME-6001	D

DRAFTER: M. MACIEL

DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 4A - BI-DIRECTIONAL TWO PUMP STATIONS

DRAWING LIST: OPTION 4A - BI-DIRECTIONAL TWO PUMP STATIONS	
DRAWING No.	**DRAWING TITLE**
AEG155-0000-TD-DRG-CV-0001	PROJECT KEY PLAN
AEG155-0000-TD-DRG-CV-0200	TYPICAL JETTY GENERAL ARRANGEMENT
AEG155-0000-TD-DRG-CV-1000	CAISSON STRUCTURE GENERAL ARRANGEMENT
AEG155-0000-TD-DRG-CV-1001	CAISSON STRUCTURE SECTION
AEG155-0000-TD-DRG-ME-0001	FISH SCREEN DETAIL
AEG155-4000-TD-DRG-CV-0001	COVER PAGE
AEG155-4000-TD-DRG-CV-0002	GENERAL NOTES
AEG155-4000-TD-DRG-CV-1000	KEY PLAN
AEG155-4000-TD-DRG-CV-1001	PLAN - SHEET 1
AEG155-4000-TD-DRG-CV-1002	PLAN - SHEET 2
AEG155-4000-TD-DRG-EL-8000	SINGLE LINE DIAGRAM
AEG155-4000-TD-DRG-EL-8001	SCHEMATIC
AEG155-4000-TD-DRG-ME-6000	PONTOON PUMP SECTION

NOT FOR CONSTRUCTION

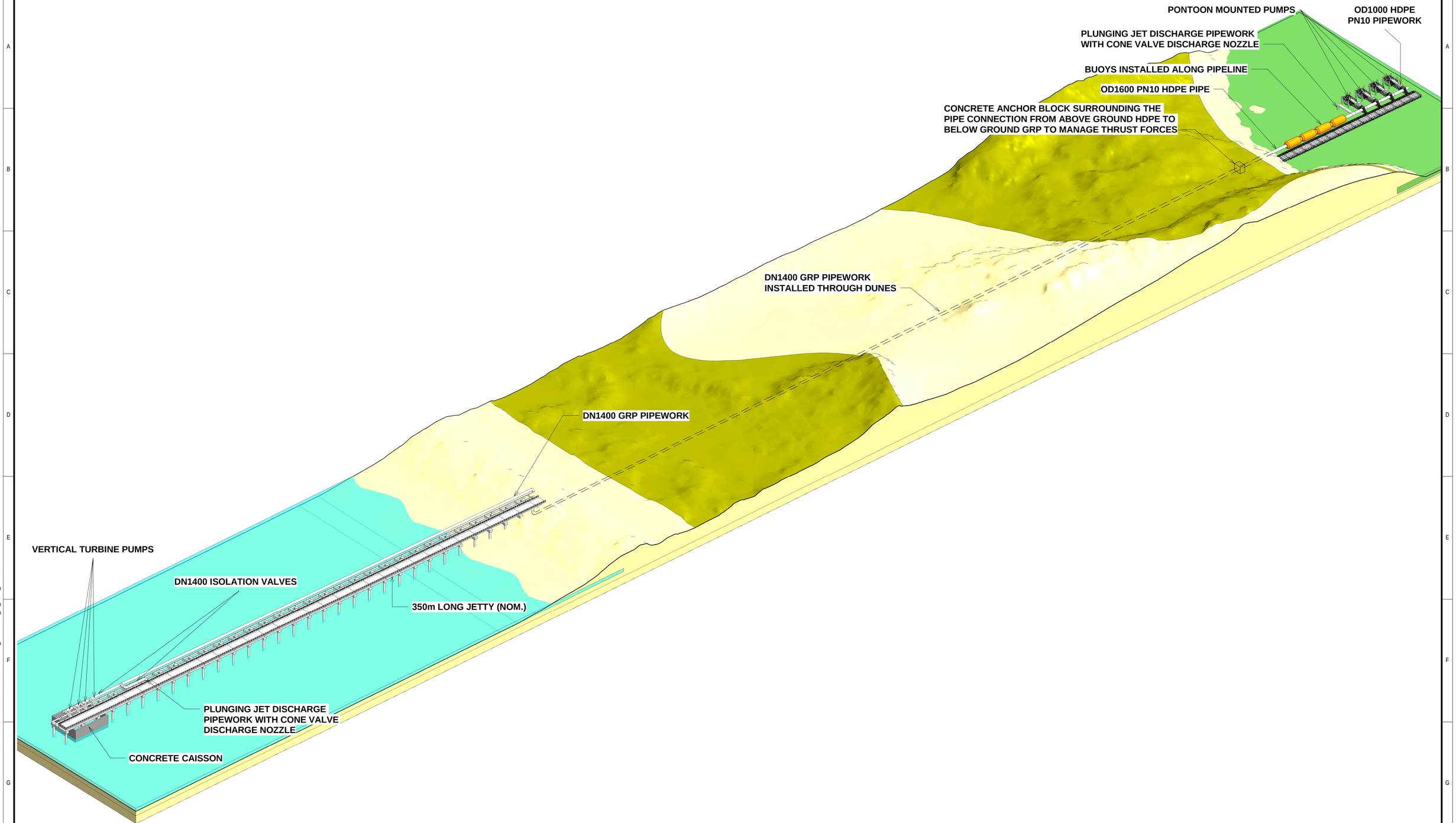
REV	DESCRIPTION	DATE	POSITION	NAME	SIGNATURE
			DRAFTING CHECK	F. RAPONI	FR
			ORIGINATE/ DESIGN	J. BOOTH	JB
			INDEPENDENT CHECK	M. TOLCVAY	MT
			TECHNICAL APPROVAL	P. STANIFORD	PS
C	FINAL CONCEPT ISSUE	21/12/2021	PROJECT APPROVAL	P. STANIFORD	PS
B	CONCEPT DESIGN ISSUE	01/12/2021	CLIENT APPROVAL		
A	ISSUED FOR REVIEW	28/10/2021			

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 4A - BI-DIRECTIONAL TWO PUMP STATIONS
COVER PAGE

DRAWING SCALE	ORIG. SIZE	DRAWING No.	REVISION
NOT TO SCALE	A1	AEG155-4000-TD-DRG-CV-0001	C

DRAFTER: M. MACIEL



NOTE: THIS DRAWING IS TO BE READ / PRINTED IN COLOUR

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REV	DESCRIPTION	DATE	POSITION	NAME	SIGNATURE
			DRAFTING CHECK	F. RAPONI	FR
			ORIGINATE/ DESIGN	J. BOOTH	JB
			INDEPENDENT CHECK	M. TOLCVAY	MT
			TECHNICAL APPROVAL	P. STANIFORD	PS
D	FINAL CONCEPT ISSUE	21/12/2021	PROJECT APPROVAL	P. STANIFORD	PS
C	CONCEPT DESIGN ISSUE	17/12/2021	CLIENT APPROVAL		
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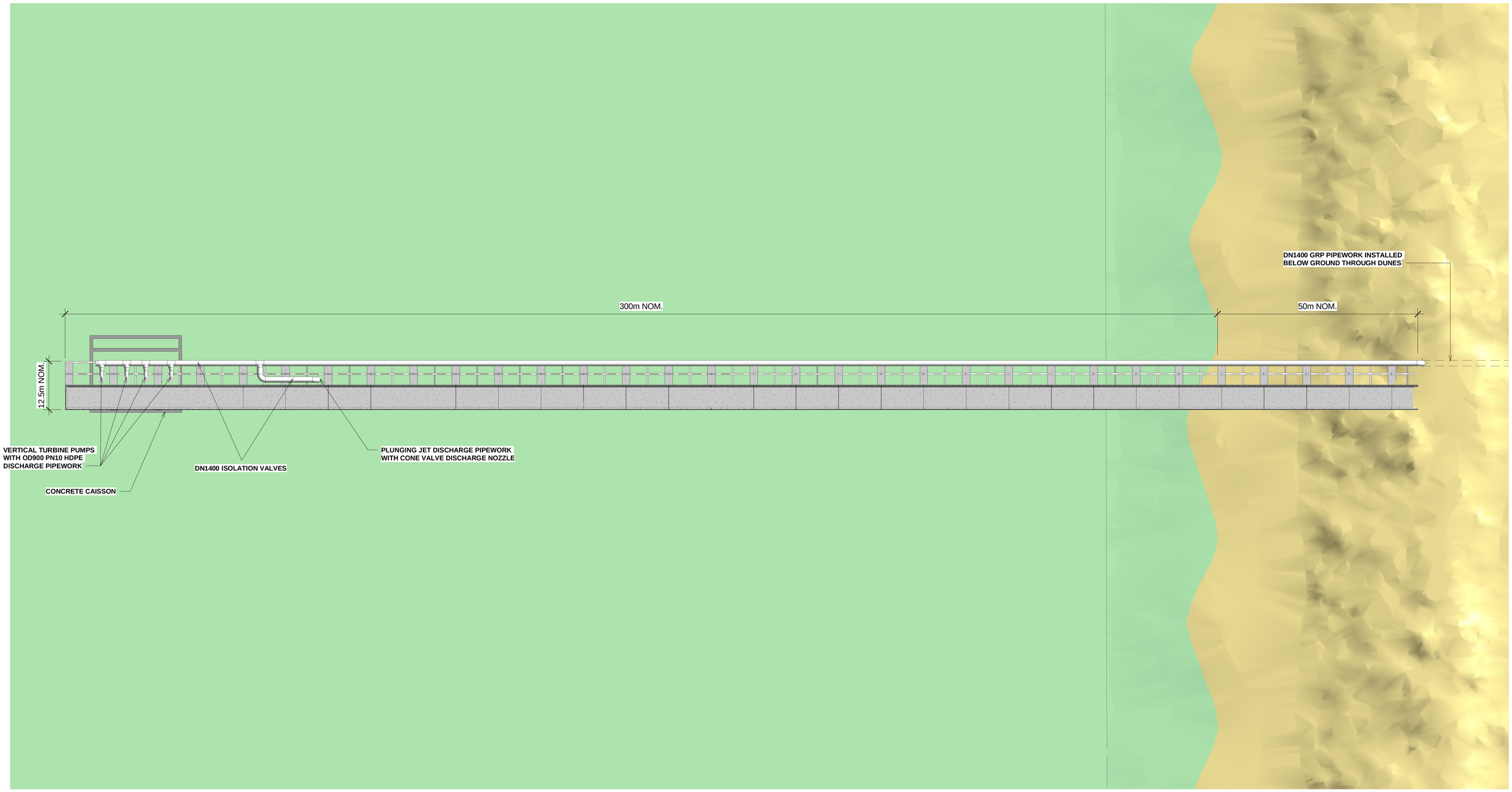
Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 4A - BI-DIRECTIONAL TWO PUMP STATIONS
KEY PLAN

DRAWING SCALE	ORIG. SIZE	DRAWING No.	REVISION
NOT TO SCALE	A1	AEG155-4000-TD-DRG-CV-1000	D

DRAFTER: M. MACIEL



5 0 5 10 15 20m

1 : 500 FULL SIZE @ A1

NOTE: THIS DRAWING IS TO BE READ / PRINTED IN COLOUR

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE
C	FINAL CONCEPT ISSUE	21/12/2021
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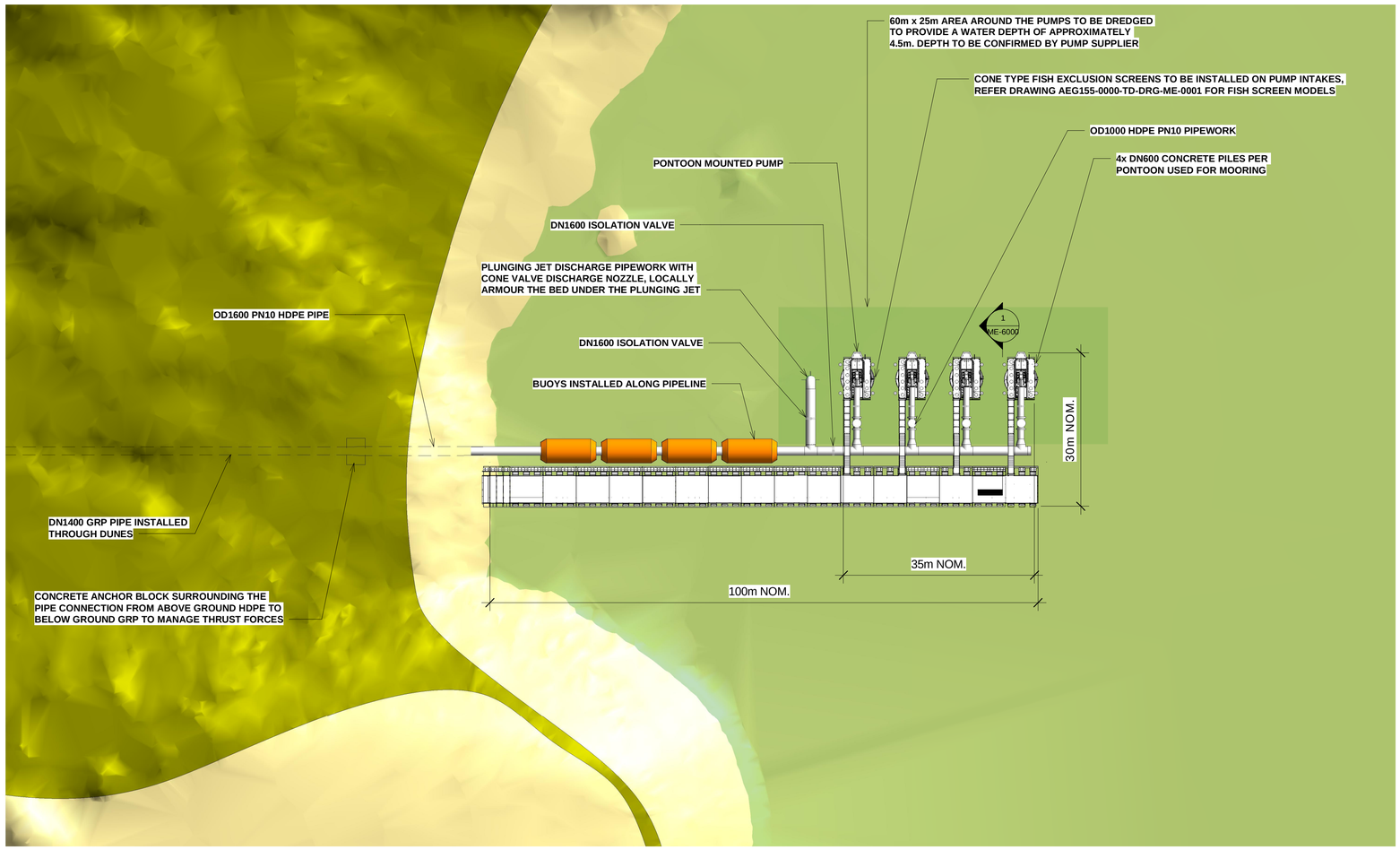
POSITION	NAME	SIGNATURE
DRAFTING CHECK	F. RAPONI	FR
ORIGINATE/ DESIGN	J. BOOTH	JB
INDEPENDENT CHECK	M. TOLCVAY	MT
TECHNICAL APPROVAL	P. STANIFORD	PS
PROJECT APPROVAL	P. STANIFORD	PS
CLIENT APPROVAL		

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 4A - BI-DIRECTIONAL TWO PUMP STATIONS
PLAN - SHEET 1

DRAWING SCALE	ORIG. SIZE	DRAWING No.	REVISION
1 : 500	A1	AEG155-4000-TD-DRG-CV-1001	C

DRAFTER: M. MACIEL



5 0 5 10 15 20m

1 : 500 FULL SIZE @ A1

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REV	DESCRIPTION	DATE	POSITION	NAME	SIGNATURE
			DRAFTING CHECK	F. RAPONI	FR
			ORIGINATE/ DESIGN	J. BOOTH	JB
			INDEPENDENT CHECK	M. TOLCVAY	MT
			TECHNICAL APPROVAL	P. STANIFORD	PS
C	FINAL CONCEPT ISSUE	21/12/2021	PROJECT APPROVAL	P. STANIFORD	PS
B	CONCEPT DESIGN ISSUE	01/12/2021	CLIENT APPROVAL		
A	ISSUED FOR REVIEW	28/10/2021			

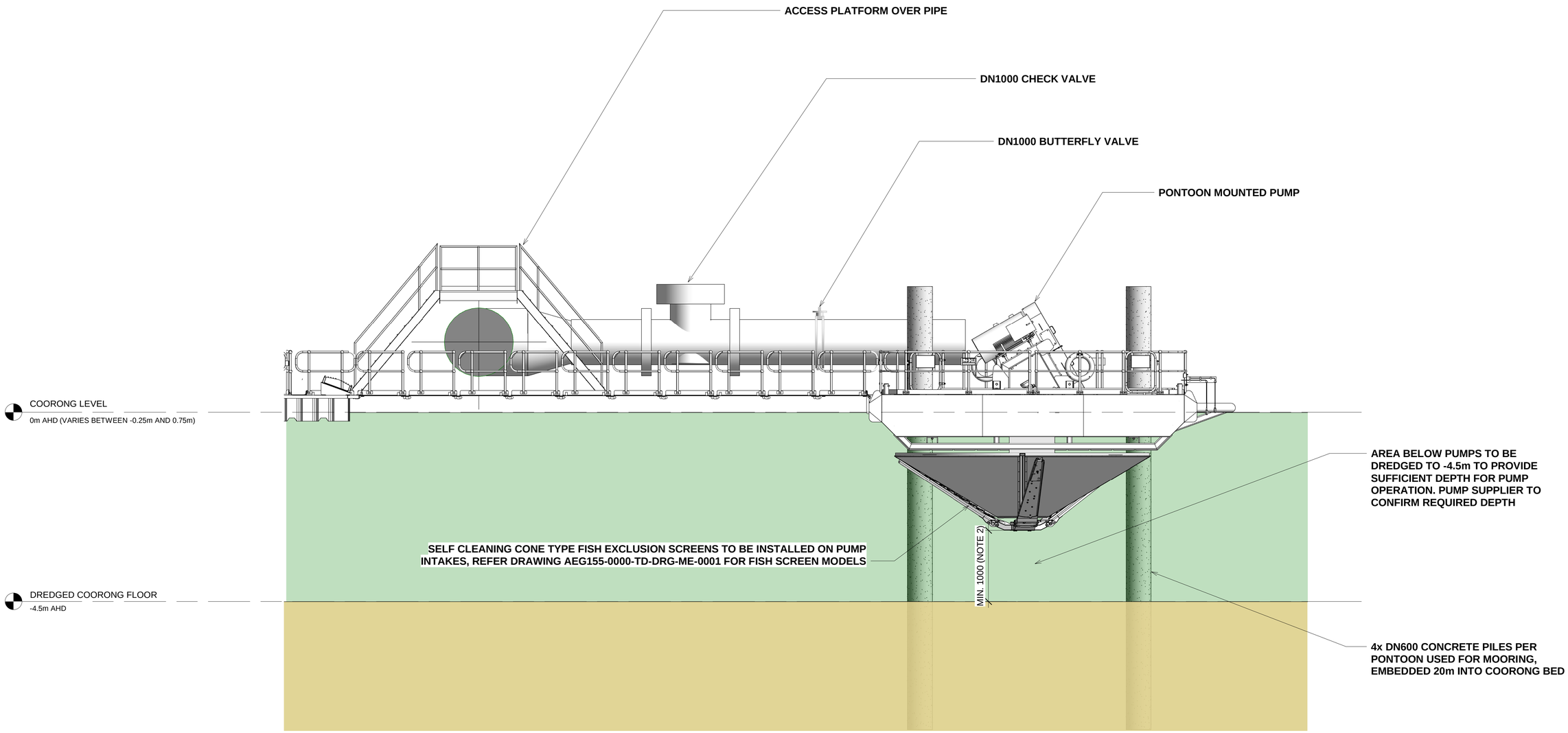
Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 4A - BI-DIRECTIONAL TWO PUMP STATIONS
PLAN - SHEET 2

DRAWING SCALE	ORIG. SIZE	DRAWING No.	REVISION
1 : 500	A1	AEG155-4000-TD-DRG-CV-1002	C

DRAFTER: M. MACIEL

NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
2. FISH EXCLUSION SCREEN CLEARANCES AND REQUIRED WATER DEPTHS TO BE CONFIRMED BY SUPPLIER DURING DETAILED DESIGN.



1 ME-6000 PONTOON PUMP SECTION
1 : 50

500 0 500 1000 1500 2000mm
1 : 50 FULL SIZE @ A1

NOTE: THIS DRAWING IS TO BE READ / PRINTED IN COLOUR

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	POSITION	NAME	SIGNATURE
			DRAFTING CHECK	F. RAPONI	FR
			ORIGINATE/ DESIGN	J. BOOTH	JB
			INDEPENDENT CHECK	M. TOLCVAY	MT
			TECHNICAL APPROVAL	P. STANIFORD	PS
D	FINAL CONCEPT ISSUE	21/12/2021	PROJECT APPROVAL	P. STANIFORD	PS
C	CONCEPT DESIGN ISSUE	17/12/2021			
B	CONCEPT DESIGN ISSUE	01/12/2021	CLIENT APPROVAL		
A	ISSUED FOR REVIEW	28/10/2021			

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 4A - BI-DIRECTIONAL TWO PUMP STATIONS
PONTOON PUMP SECTION

DRAWING SCALE: 1 : 50
ORIG. SIZE: A1
DRAFTER: M. MACIEL
DRAWING No.: AEG155-4000-TD-DRG-ME-6000
REVISION: D

FILE: C:\Users\K061549\Documents\SURFACE_OPTION 4A_v2_TEST_K061549.rvt
DATE: 12/21/2021 1:30:07 PM

DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 4B - BI-DIRECTIONAL ONE PUMP STATION

DRAWING LIST: OPTION 4B - BI-DIRECTIONAL ONE PUMP STATION	
DRAWING No.	**DRAWING TITLE**
AEG155-0000-TD-DRG-CV-0001	PROJECT KEY PLAN
AEG155-0000-TD-DRG-CV-0900	BREAKWATER DETAILS
AEG155-4100-TD-DRG-CV-0001	COVER PAGE
AEG155-4100-TD-DRG-CV-0002	GENERAL NOTES
AEG155-4100-TD-DRG-CV-1000	KEY PLAN
AEG155-4100-TD-DRG-CV-1001	PLAN - SHEET 1
AEG155-4100-TD-DRG-CV-1002	PLAN - SHEET 2
AEG155-4100-TD-DRG-CV-1003	PLAN - SHEET 3
AEG155-4100-TD-DRG-CV-1004	PIPING SECTION
AEG155-4100-TD-DRG-EL-8000	SINGLE LINE DIAGRAM
AEG155-4100-TD-DRG-EL-8001	SCHEMATIC
AEG155-4100-TD-DRG-ME-6000	PUMP STATION SECTION
AEG155-4100-TD-DRG-ME-6001	PUMP STATION ISOMETRIC VIEW SHEET 1
AEG155-4100-TD-DRG-ME-6002	PUMP STATION ISOMETRIC VIEW SHEET 2
AEG155-4100-TD-DRG-ME-6003	INTAKE/DISCHARGE STRUCTURE DETAIL

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	POSITION	NAME	SIGNATURE
			DRAFTING CHECK	F. RAPONI	FR
			ORIGINATE/ DESIGN	J. BOOTH	JB
			INDEPENDENT CHECK	M. TOLCVAY	MT
			TECHNICAL APPROVAL	P. STANIFORD	PS
C	FINAL CONCEPT ISSUE	21/12/2021	PROJECT APPROVAL	P. STANIFORD	PS
B	CONCEPT DESIGN ISSUE	01/12/2021	CLIENT APPROVAL		
A	ISSUED FOR REVIEW	28/10/2021			

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 4B - BI-DIRECTIONAL ONE PUMP STATION
COVER PAGE

DRAWING SCALE: NOT TO SCALE
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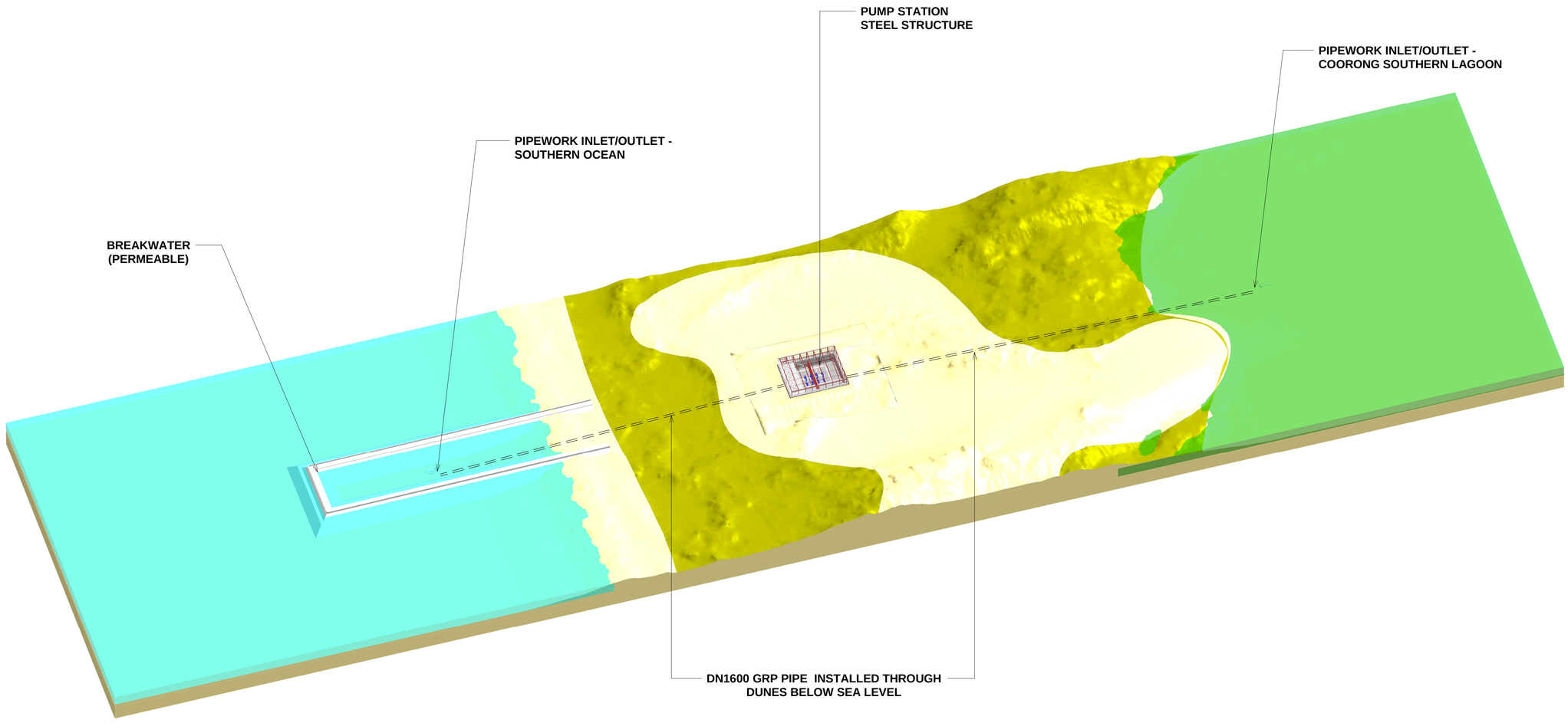
DRAWING No.: AEG155-4100-TD-DRG-CV-0001
REVISION: C
DRAFTER: M. MACIEL



NOTE: THIS DRAWING IS TO BE READ / PRINTED IN COLOUR

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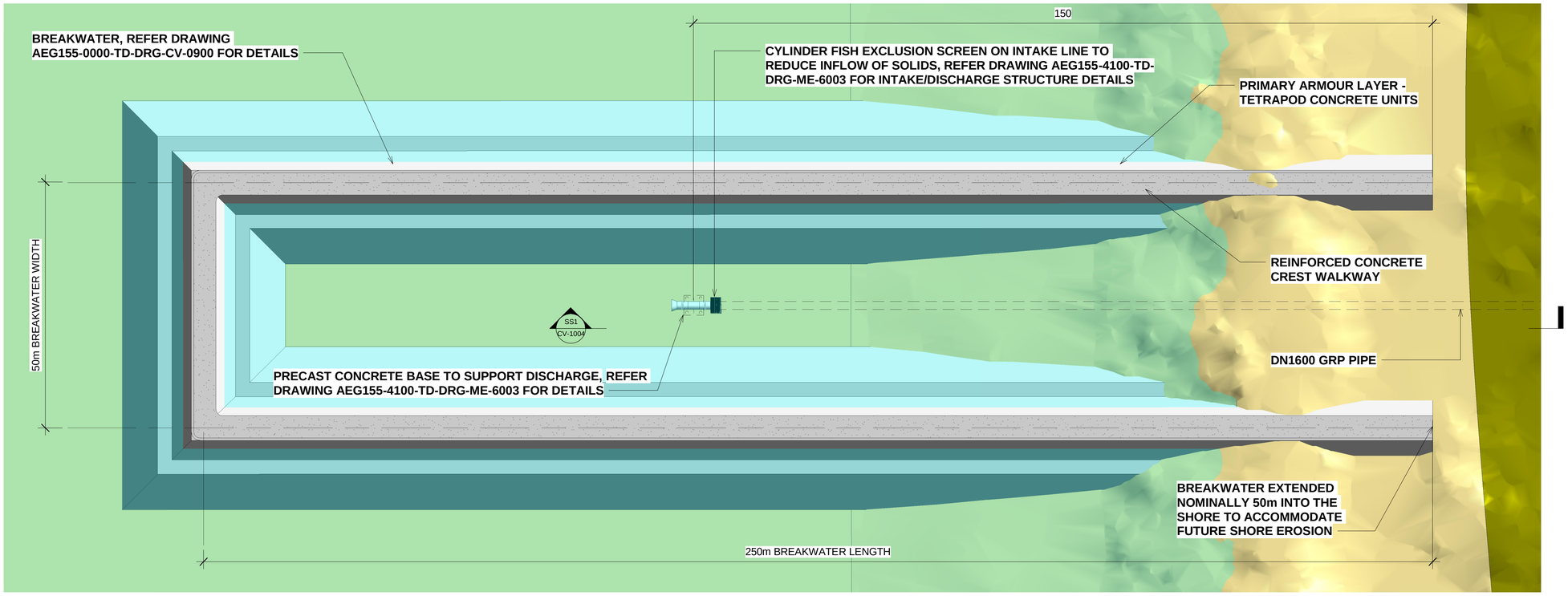
REV	DESCRIPTION	DATE
D	FINAL CONCEPT ISSUE	21/12/2021
C	CONCEPT DESIGN ISSUE	17/12/2021
B	CONCEPT DESIGN ISSUE	01/12/2021
A	ISSUED FOR REVIEW	28/10/2021

POSITION	NAME	SIGNATURE
DRAFTING CHECK	F. RAPONI	FR
ORIGINATE/ DESIGN	J. BOOTH	JB
INDEPENDENT CHECK	M. TOLCVAY	MT
TECHNICAL APPROVAL	P. STANIFORD	PS
PROJECT APPROVAL	P. STANIFORD	PS
CLIENT APPROVAL		

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 4B - BI-DIRECTIONAL ONE PUMP STATION
KEY PLAN

DRAWING SCALE: NOT TO SCALE
ORIG. SIZE: A1
DRAFTER: M. MACIEL
DRAWING No.: AEG155-4100-TD-DRG-CV-1000
REVISION: D



5 0 5 10 15 20m

1 : 500 FULL SIZE @ A1

NOTE: THIS DRAWING IS TO BE READ / PRINTED IN COLOUR

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REV	DESCRIPTION	DATE
C	FINAL CONCEPT ISSUE	21/12/2021
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DRAFTING CHECK	F. RAPONI	FR
ORIGINATE/ DESIGN	J. BOOTH	JB
INDEPENDENT CHECK	M. TOLCVAY	MT
TECHNICAL APPROVAL	P. STANIFORD	PS
PROJECT APPROVAL	P. STANIFORD	PS
CLIENT APPROVAL		

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 4B - BI-DIRECTIONAL ONE PUMP STATION
PLAN - SHEET 1

DRAWING SCALE	ORIG. SIZE	DRAWING No.	REVISION
1 : 500	A1	AEG155-4100-TD-DRG-CV-1001	C

DRAFTER: M. MACIEL

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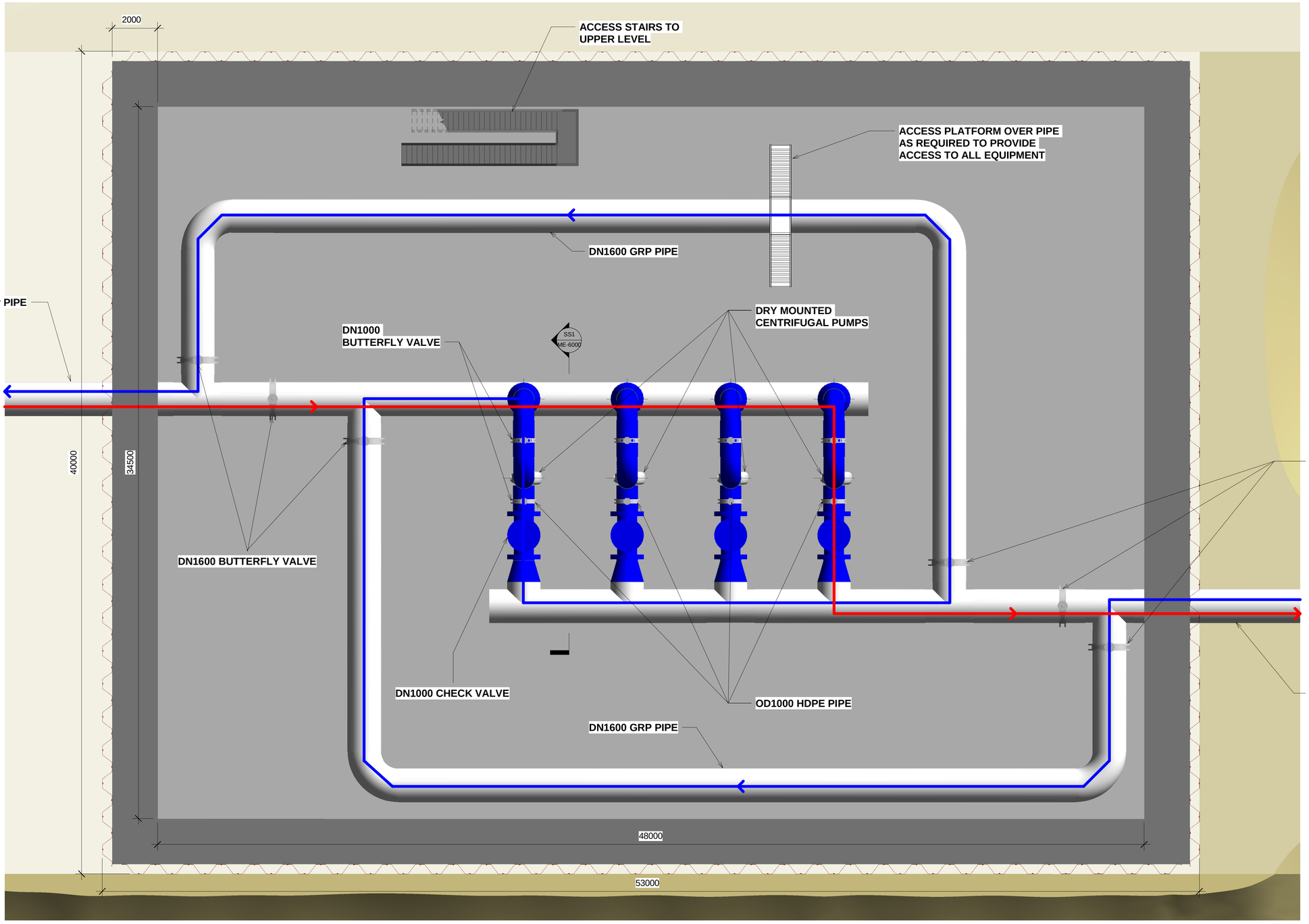

NOTES:

1. WALL REINFORCEMENT RATE 150kg/m^3
2. SLAB REINFORCEMENT RATE 200kg/m^3
3. SLAB THICKNESS 2000mm
4. FLOW PATHS SHOWN IN BLUE AND RED. BLUE PATH INDICATES THE FLOW OF WATER FROM THE COORONG TO THE SOUTHERN OCEAN AND THE RED PATH INDICATES THE FLOW PATH FROM THE SOUTHERN OCEAN TO THE COORONG. VALVES ARE REQUIRED TO BE MANUALLY OPENED AND CLOSED TO CONTROL FLOW PATHS
5. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE

1000 0 1000 2000 3000 4000mm

1 : 100 FULL SIZE @ A1

NOTE: THIS DRAWING IS TO BE READ / PRINTED IN COLOUR

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REV	DESCRIPTION	DATE
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C	CONCEPT DESIGN ISSUE	17/12/2021
B	CONCEPT DESIGN ISSUE	01/12/2021
A	ISSUED FOR REVIEW	28/10/2021

POSITION	NAME	SIGNATURE
DRAFTING CHECK	F. RAPONI	FR
ORIGINATE/ DESIGN	J. BOOTH	JB
INDEPENDENT CHECK	M. TOLCVAY	MT
TECHNICAL APPROVAL	P. STANIFORD	PS
PROJECT APPROVAL	P. STANIFORD	PS
CLIENT APPROVAL		

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 4B - BI-DIRECTIONAL ONE PUMP STATION
PLAN - SHEET 2

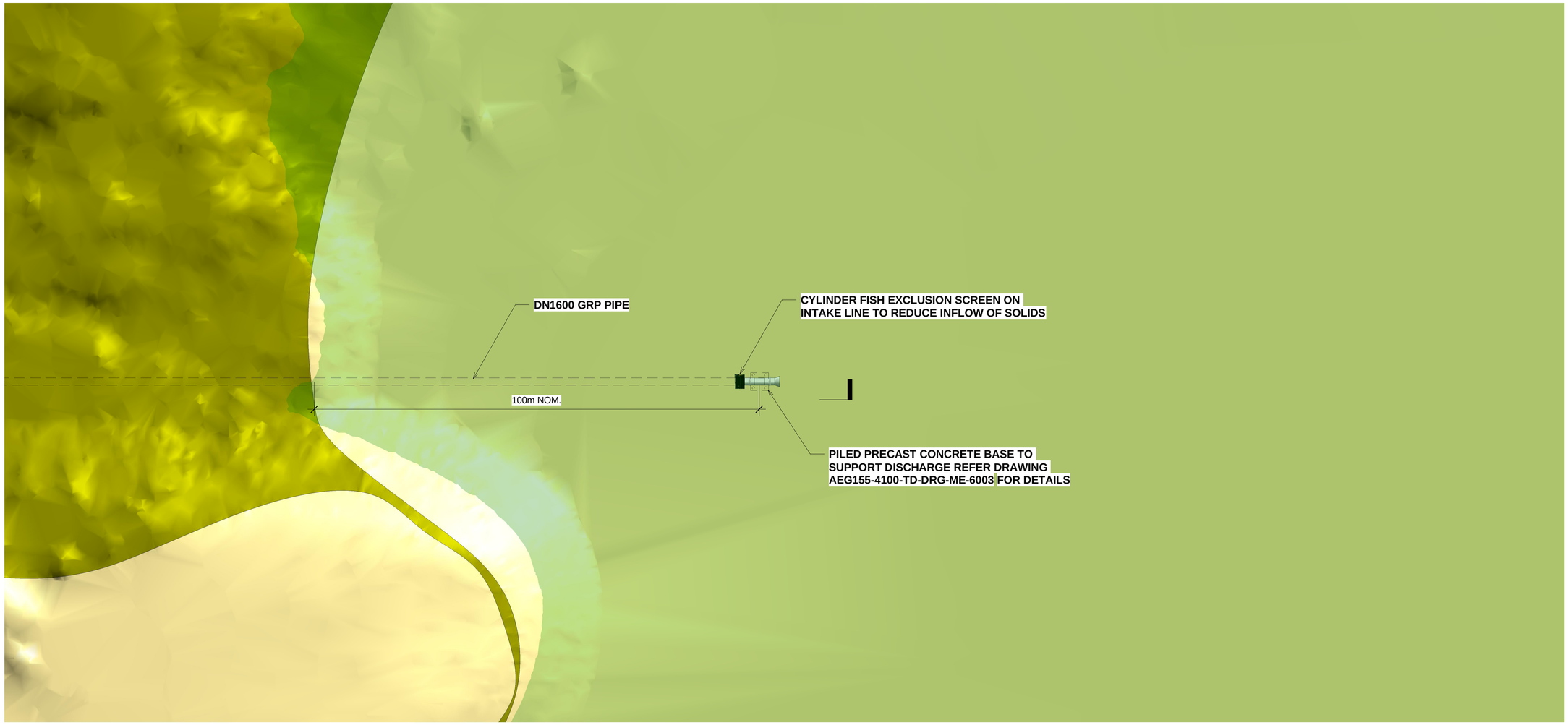
DRAWING SCALE 1 : 100

ORIG. SIZE A1

DRAFTER: M. MACIEL

DRAWING No. AEG155-4100-TD-DRG-CV-1002

REVISION D



SS2
CV-1002

5 0 5 10 15 20m
1 : 500 FULL SIZE @ A1

NOTE: THIS DRAWING IS TO BE READ / PRINTED IN COLOUR

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REV	DESCRIPTION	DATE
C	FINAL CONCEPT ISSUE	21/12/2021
B	CONCEPT DESIGN ISSUE	01/12/2021
A	ISSUED FOR REVIEW	28/10/2021

POSITION	NAME	SIGNATURE
DRAFTING CHECK	F. RAPONI	FR
ORIGINATE/ DESIGN	J. BOOTH	JB
INDEPENDENT CHECK	M. TOLCVAY	MT
TECHNICAL APPROVAL	P. STANIFORD	PS
PROJECT APPROVAL	P. STANIFORD	PS
CLIENT APPROVAL		

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 4B - BI-DIRECTIONAL ONE PUMP STATION
PLAN - SHEET 3

DRAWING SCALE: 1 : 500
ORIG. SIZE: A1
DRAFTER: M. MACIEL
DRAWING No.: AEG155-4100-TD-DRG-CV-1003
REVISION: C

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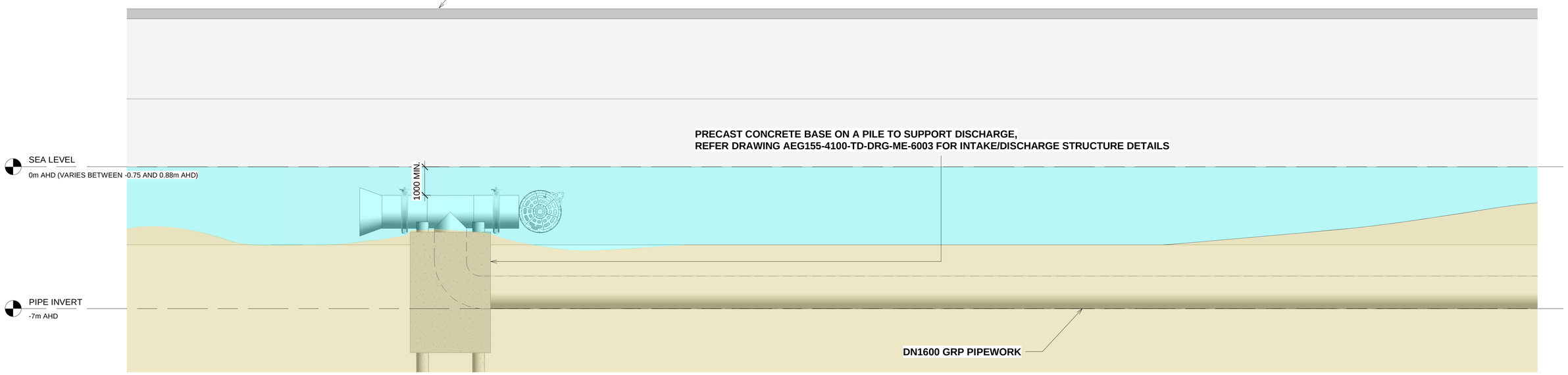
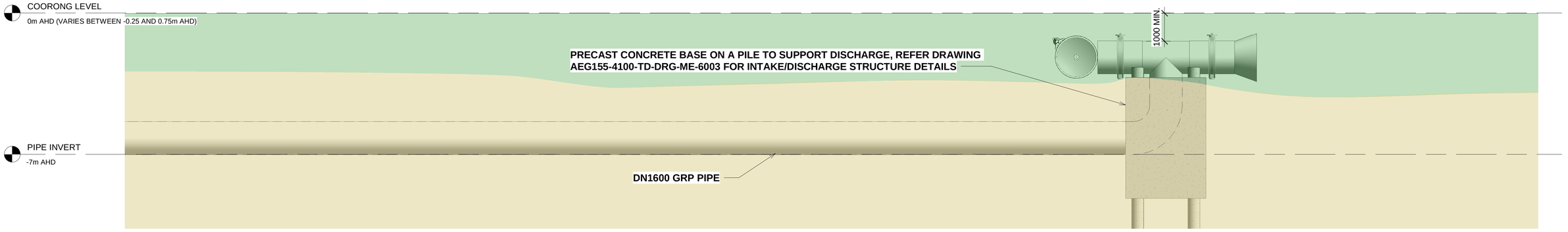
NOTE:
1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.



SS1 PIPING SECTION 1
1 : 100



SS2 PIPING SECTION 2
1 : 100

1000 0 1000 2000 3000 4000mm
1 : 100 FULL SIZE @ A1

NOTE: THIS DRAWING IS TO BE READ / PRINTED IN COLOUR

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	POSITION	NAME	SIGNATURE
			DRAFTING CHECK	F. RAPONI	FR
			ORIGINATE/ DESIGN	J. BOOTH	JB
			INDEPENDENT CHECK	M. TOLCVAY	MT
			TECHNICAL APPROVAL	P. STANIFORD	PS
D	FINAL CONCEPT ISSUE	21/12/2021	PROJECT APPROVAL	P. STANIFORD	PS
C	CONCEPT DESIGN ISSUE	17/12/2021	CLIENT APPROVAL		
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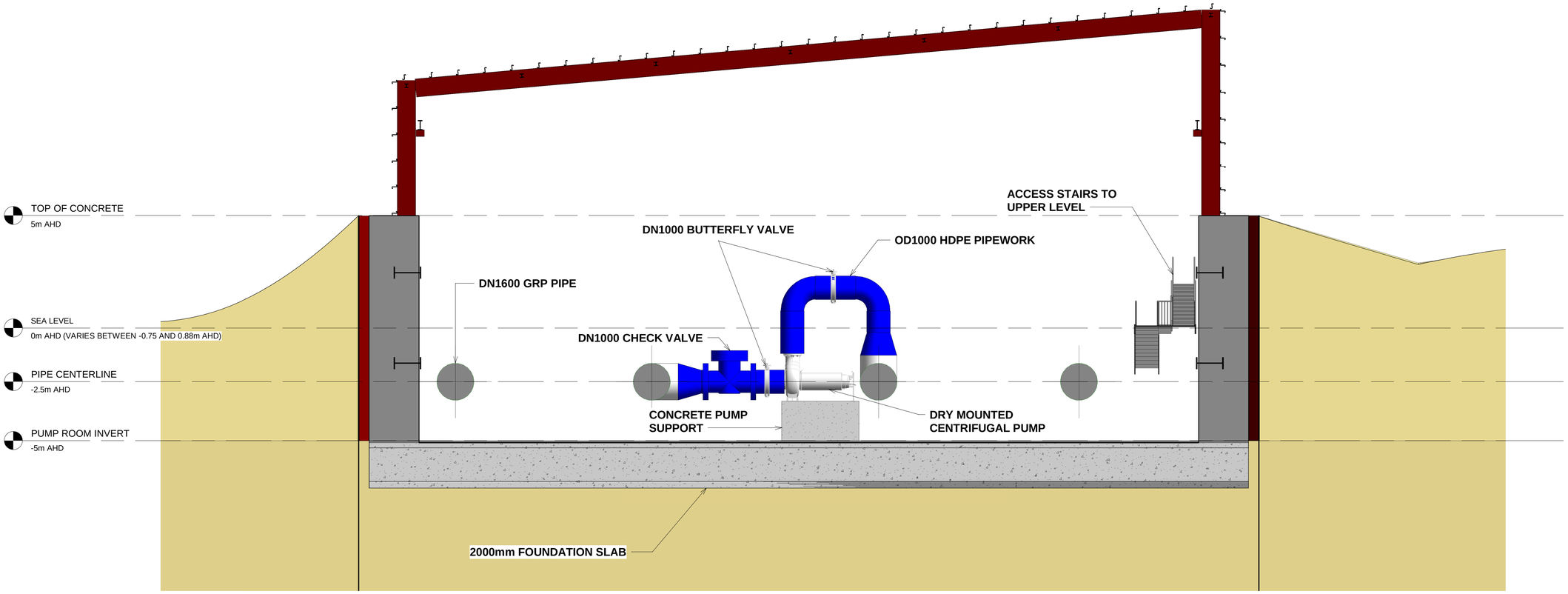
Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 4B - BI-DIRECTIONAL ONE PUMP STATION
PIPING SECTION

DRAWING SCALE: 1 : 100
ORIG. SIZE: A1
DRAFTER: M. MACIEL
DRAWING No.: AEG155-4100-TD-DRG-CV-1004
REVISION: D



SS1 1002 PUMP STATION SECTION

1 : 100

1000 0 1000 2000 3000 4000mm

1 : 100 FULL SIZE @ A1

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POSITION	NAME	SIGNATURE
DRAFTING CHECK	F. RAPONI	FR
ORIGINATE/ DESIGN	J. BOOTH	JB
INDEPENDENT CHECK	M. TOLCVAY	MT
TECHNICAL APPROVAL	P. STANIFORD	PS
PROJECT APPROVAL	P. STANIFORD	PS
CLIENT APPROVAL		

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 4B - BI-DIRECTIONAL ONE PUMP STATION
PUMP STATION SECTION

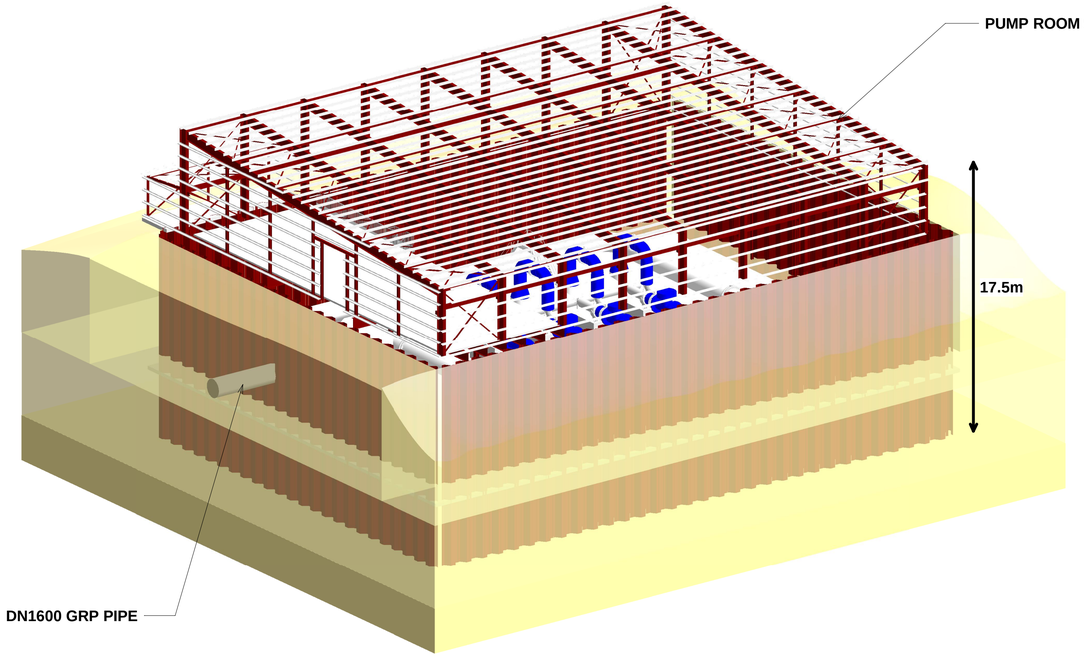
DRAWING SCALE 1 : 100

ORIG. SIZE A1

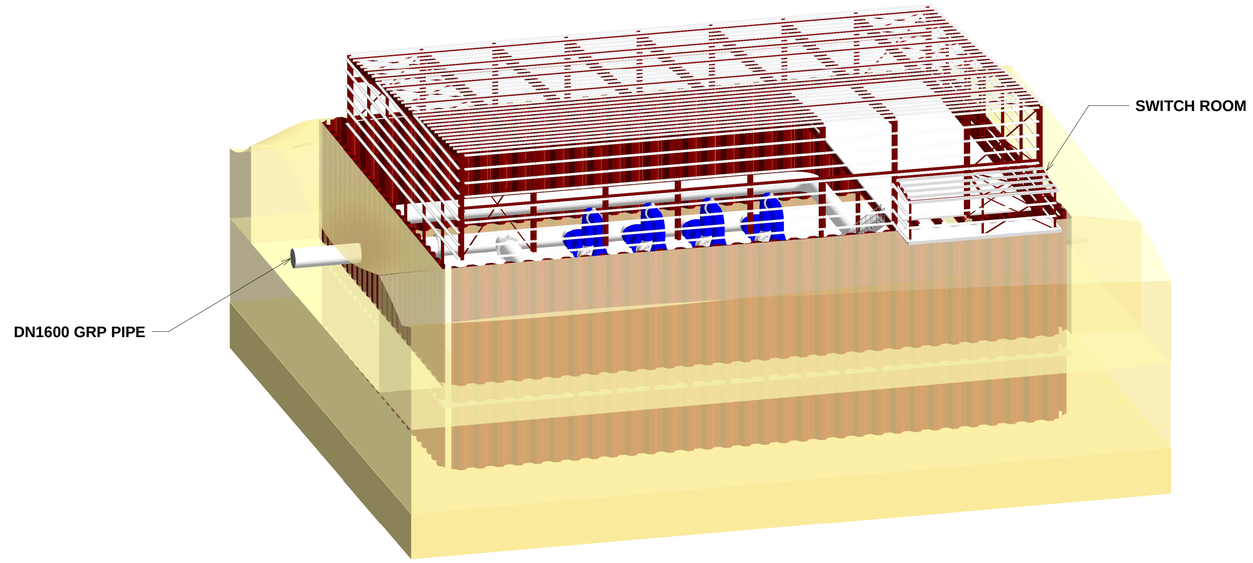
DRAFTER: M. MACIEL

DRAWING No. AEG155-4100-TD-DRG-ME-6000

REVISION D



1 3D VIEW - PUMP STATION



2 3D VIEW - PUMP STATION

NOTE: THIS DRAWING IS TO BE READ / PRINTED IN COLOUR

NOT FOR CONSTRUCTION

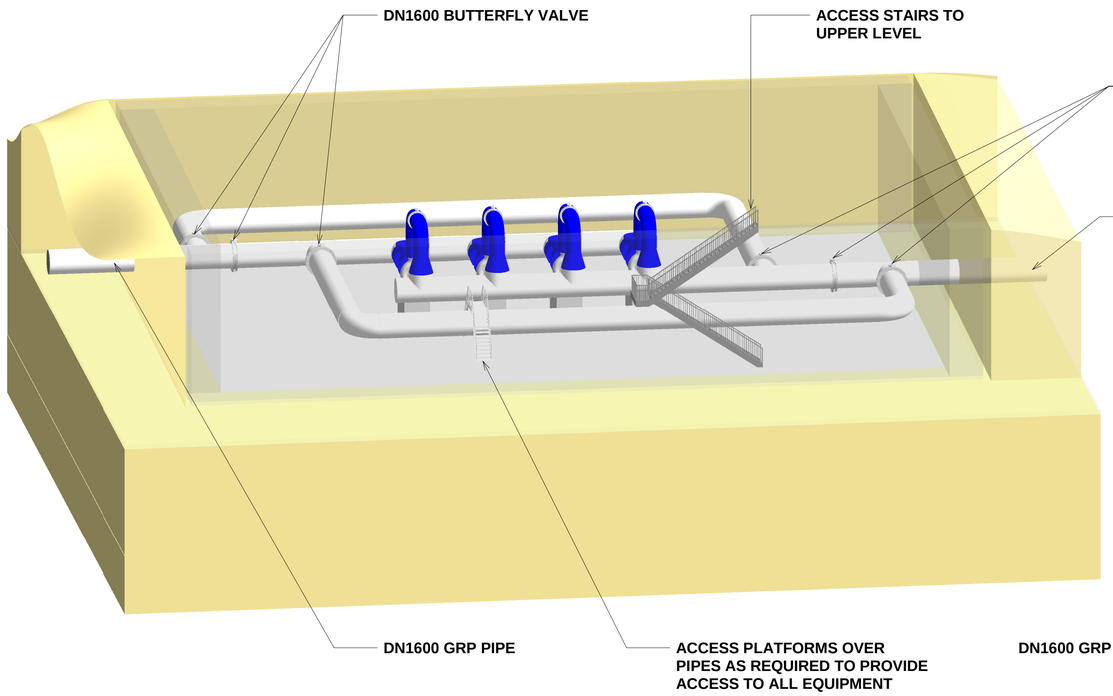
REV	DESCRIPTION	DATE	POSITION	NAME	SIGNATURE
			DRAFTING CHECK	F. RAPONI	FR
			ORIGINATE/ DESIGN	J. BOOTH	JB
			INDEPENDENT CHECK	M. TOLCVAY	MT
			TECHNICAL APPROVAL	P. STANIFORD	PS
C	FINAL CONCEPT ISSUE	21/12/2021	PROJECT APPROVAL	P. STANIFORD	PS
B	CONCEPT DESIGN ISSUE	17/12/2021	CLIENT APPROVAL		
A	CONCEPT DESIGN ISSUE	01/12/2021			

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 4B - BI-DIRECTIONAL ONE PUMP STATION
PUMP STATION ISOMETRIC VIEW - SHEET 1

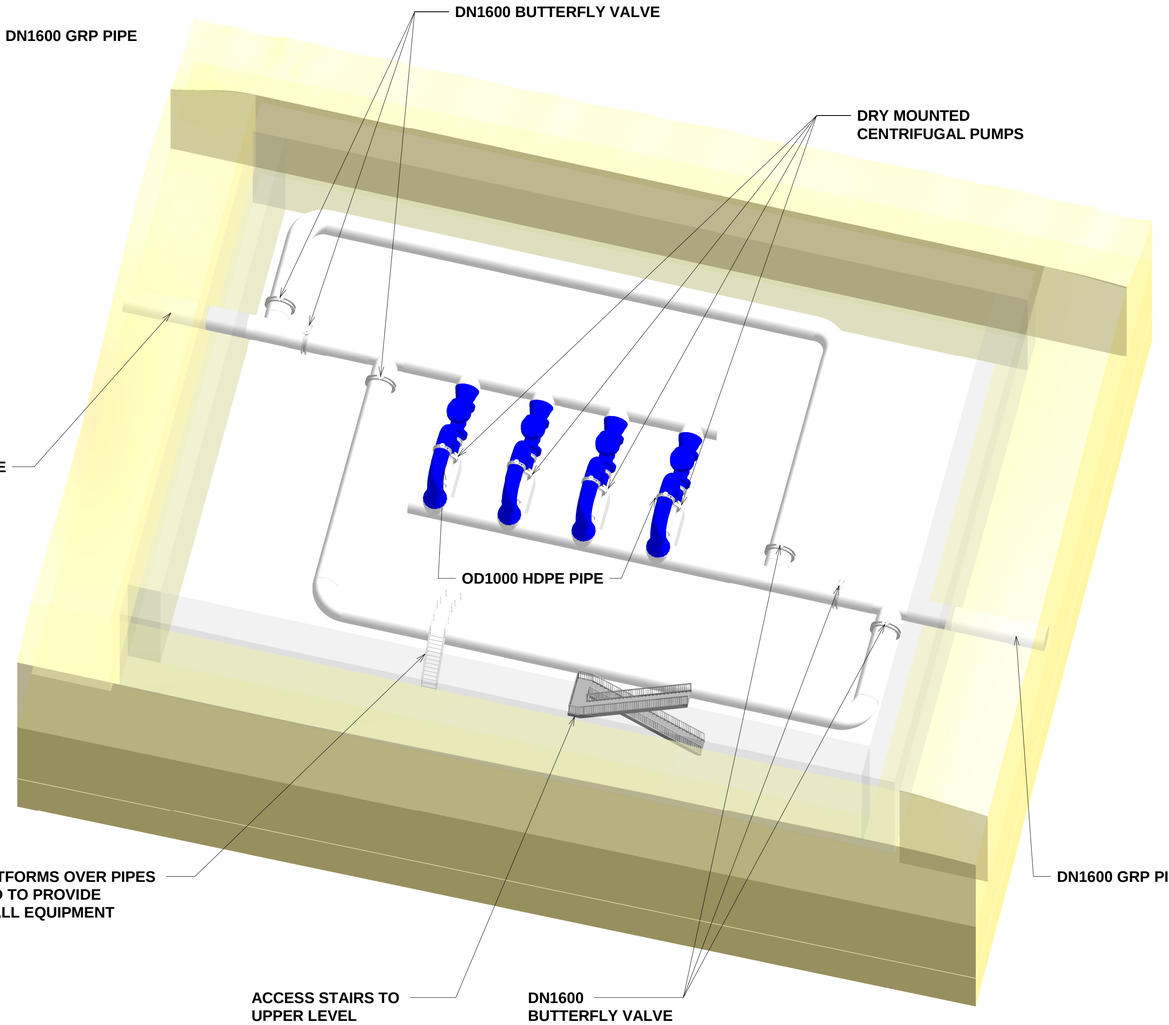
DRAWING SCALE	ORIG. SIZE	DRAWING No.	REVISION
NOT TO SCALE	A1	AEG155-4100-TD-DRG-ME-6001	C

DRAFTER: M. MACIEL



3 3D VIEW - PUMP STATION

NOTES:
1. WALL REINFORCEMENT RATE 150kg/m^3
2. SLAB REINFORCEMENT RATE 200kg/m^3
3. SLAB THICKNESS 2000mm



4 3D VIEW - PUMP STATION

NOTE: THIS DRAWING IS TO BE READ / PRINTED IN COLOUR

NOT FOR CONSTRUCTION

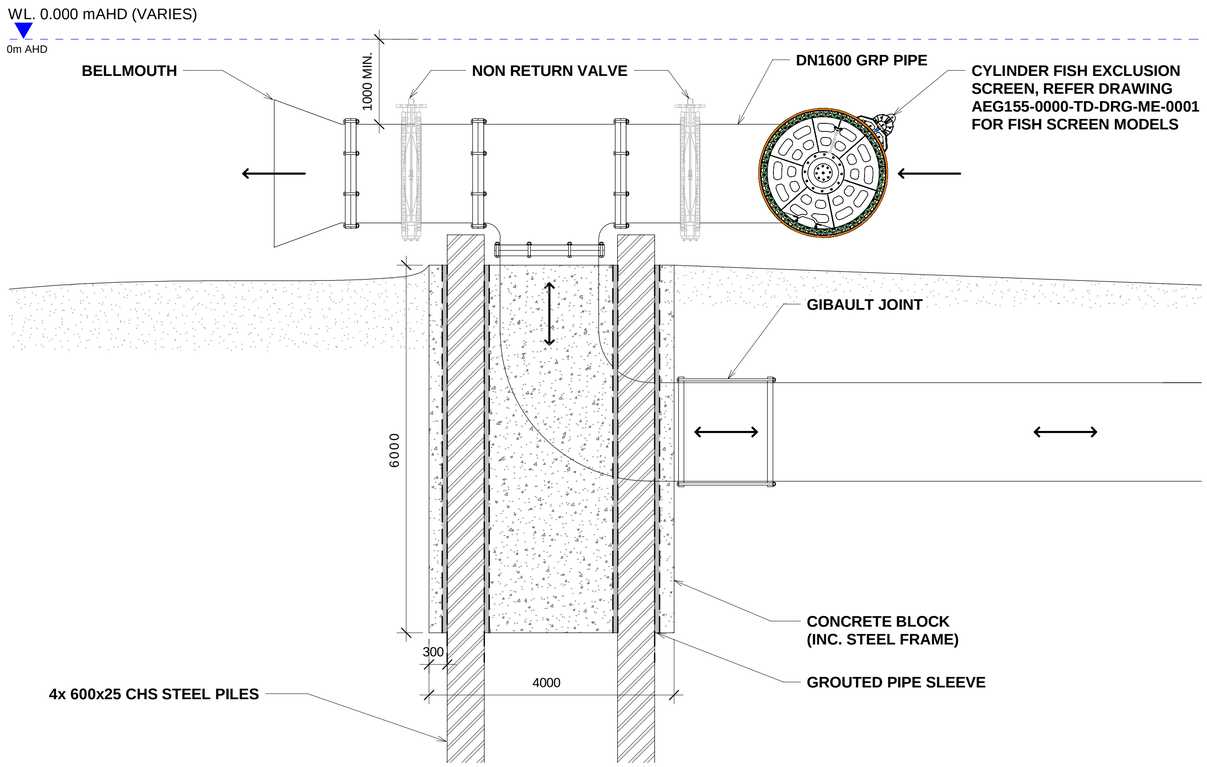
REV	DESCRIPTION	DATE	POSITION	NAME	SIGNATURE
			DRAFTING CHECK	F. RAPONI	FR
			ORIGINATE/ DESIGN	J. BOOTH	JB
			INDEPENDENT CHECK	M. TOLCVAY	MT
			TECHNICAL APPROVAL	P. STANIFORD	PS
D	FINAL CONCEPT ISSUE	21/12/2021	PROJECT APPROVAL	P. STANIFORD	PS
C	CONCEPT DESIGN ISSUE	17/12/2021	CLIENT APPROVAL		
B	CONCEPT DESIGN ISSUE	01/12/2021			
A	ISSUED FOR REVIEW	28/10/2021			

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 4B - BI-DIRECTIONAL ONE PUMP STATION
PUMP STATION ISOMETRIC VIEW - SHEET 2

DRAWING SCALE: NOT TO SCALE
ORIG. SIZE: A1
DRAFTER: M. MACIEL
DRAWING No.: AEG155-4100-TD-DRG-ME-6002
REVISION: D

NOTE:
1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.



INTAKE/DISCHARGE STRUCTURE - SECTION

1 : 50

500 0 500 1000 1500 2000mm
1 : 50 FULL SIZE @ A1

NOTE: THIS DRAWING IS TO BE READ / PRINTED IN COLOUR

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE
C	FINAL CONCEPT ISSUE	21/12/2021
B	CONCEPT DESIGN ISSUE	01/12/2021
A	ISSUED FOR REVIEW	28/10/2021

POSITION	NAME	SIGNATURE
DRAFTING CHECK	F. RAPONI	FR
ORIGINATE/ DESIGN	J. BOOTH	JB
INDEPENDENT CHECK	M. TOLCVAY	MT
TECHNICAL APPROVAL	F. RAPONI	PS
PROJECT APPROVAL	P. STANIFORD	PS
CLIENT APPROVAL		

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 4B - BI-DIRECTIONAL ONE PUMP STATION
INTAKE/DISCHARGE STRUCTURE DETAIL

DRAWING SCALE	ORIG. SIZE	DRAWING No.	REVISION
1 : 50	A1	AEG155-4100-TD-DRG-ME-6003	C

DRAFTER: M. MACIEL

DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 5A - SIMULTANEOUS PUMP IN, PUMP OUT ON JETTY

DRAWING LIST: OPTION 5A - SIMULTANEOUS PUMP IN, PUMP OUT ON JETTY	
DRAWING No.	**DRAWING TITLE**
AEG155-0000-TD-DRG-CV-0001	PROJECT KEY PLAN
AEG155-0000-TD-DRG-CV-0200	TYPICAL JETTY GENERAL ARRANGEMENT
AEG155-0000-TD-DRG-CV-0201	TYPICAL JETTY SECTION
AEG155-0000-TD-DRG-CV-0300	TYPICAL DISCHARGE JETTY GENERAL ARRANGEMENT
AEG155-0000-TD-DRG-CV-0301	TYPICAL DISCHARGE JETTY SECTION
AEG155-0000-TD-DRG-CV-0600	DISCHARGE STRUCTURE - SECTION
AEG155-0000-TD-DRG-CV-1000	CAISSON STRUCTURE GENERAL ARRANGEMENT
AEG155-0000-TD-DRG-CV-1001	CAISSON STRUCTURE SECTION
AEG155-0000-TD-DRG-ME-0001	FISH SCREEN DETAIL
AEG155-5000-TD-DRG-CV-0001	COVER PAGE
AEG155-5000-TD-DRG-CV-0002	GENERAL NOTES
AEG155-5000-TD-DRG-CV-1000	PARNKA POINT LOCATION KEY PLAN
AEG155-5000-TD-DRG-CV-1001	PARNKA POINT LOCATION PLAN - SHEET 1
AEG155-5000-TD-DRG-CV-1002	PARNKA POINT LOCATION PLAN - SHEET 2
AEG155-5000-TD-DRG-CV-1004	WOODS WELL LOCATION KEY PLAN
AEG155-5000-TD-DRG-CV-1005	WOODS WELL LOCATION PLAN - SHEET 1
AEG155-5000-TD-DRG-CV-1006	WOODS WELL LOCATION PLAN - SHEET 2
AEG155-5000-TD-DRG-ME-6000	PONTOON PUMP SECTION

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	POSITION	NAME	SIGNATURE
			DRAFTING CHECK	F. RAPONI	FR
			ORIGINATE/ DESIGN	J. BOOTH	JB
			INDEPENDENT CHECK	M. TOLCVAY	MT
			TECHNICAL APPROVAL	P. STANIFORD	PS
C	FINAL CONCEPT ISSUE	21/12/2021	PROJECT APPROVAL	P. STANIFORD	PS
B	CONCEPT DESIGN ISSUE	01/12/2021	CLIENT APPROVAL		
A	ISSUED FOR REVIEW	28/10/2021			

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 5A - SIMULTANEOUS PUMP IN, PUMP OUT ON JETTY
COVER PAGE

DRAWING SCALE	ORIG. SIZE	DRAWING No.	REVISION
NOT TO SCALE	A1	AEG155-5000-TD-DRG-CV-0001	C

DRAFTER: M. MACIEL

NOTE: THIS DRAWING IS TO BE READ / PRINTED IN COLOUR

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE
C	FINAL CONCEPT ISSUE	21/12/2021
B	CONCEPT DESIGN ISSUE	01/12/2021
A	ISSUED FOR REVIEW	28/10/2021

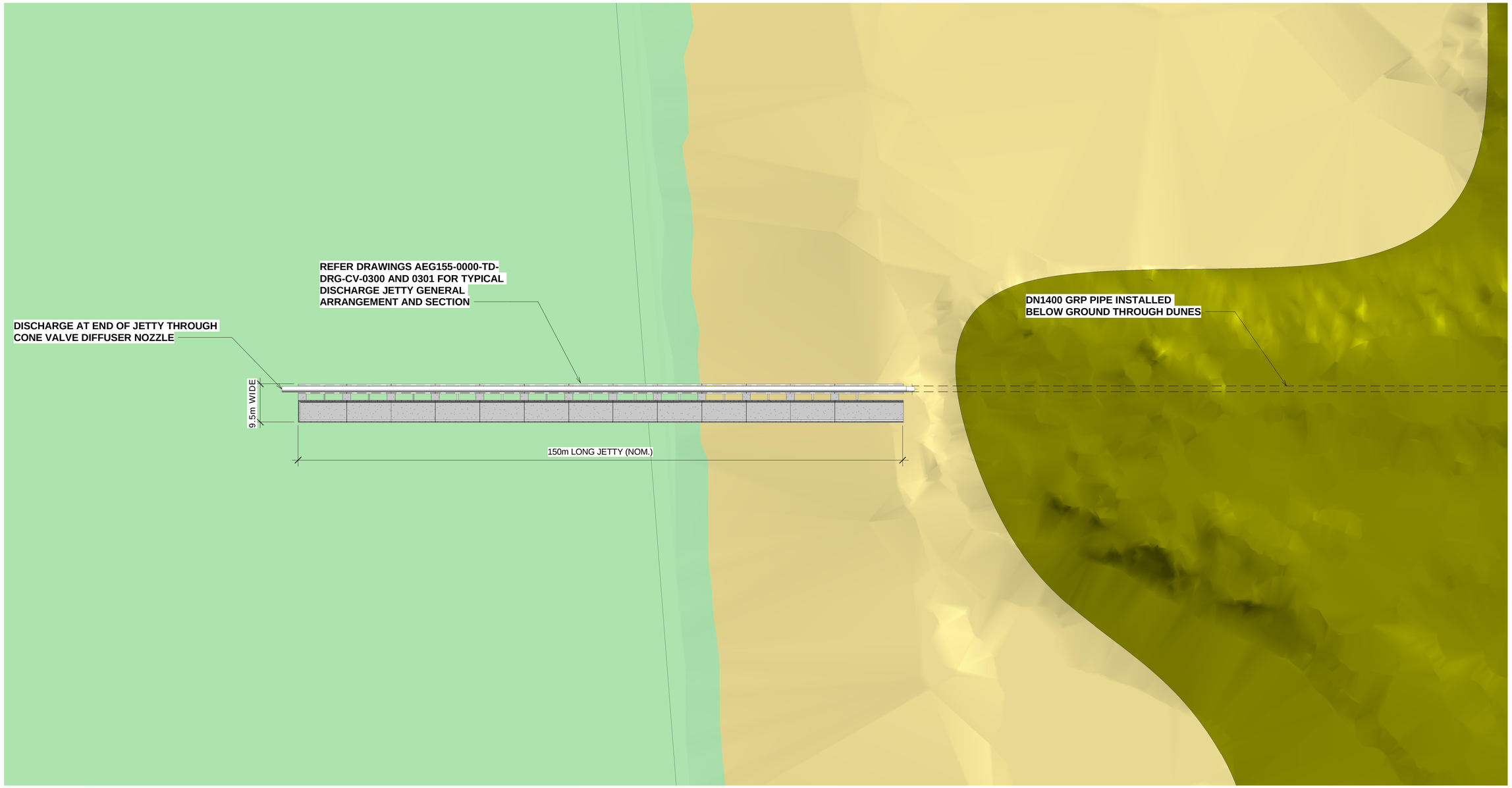
POSITION	NAME	SIGNATURE
DRAFTING CHECK	F. RAPONI	FR
ORIGINATE/ DESIGN	J. BOOTH	JB
INDEPENDENT CHECK	M. TOLCVAY	MT
TECHNICAL APPROVAL	P. STANIFORD	PS
PROJECT APPROVAL	P. STANIFORD	PS
CLIENT APPROVAL		

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 5A - SIMULTANEOUS PUMP IN, PUMP OUT ON JETTY
PARNKA POINT LOCATION KEY PLAN

DRAWING SCALE	ORIG. SIZE	DRAWING No.	REVISION
NOT TO SCALE	A1	AEG155-5000-TD-DRG-CV-1000	C

DRAFTER: M. MACIEL



5 0 5 10 15 20m

1 : 500 FULL SIZE @ A1

NOTE: THIS DRAWING IS TO BE READ / PRINTED IN COLOUR

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE
C	FINAL CONCEPT ISSUE	21/12/2021
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A	ISSUED FOR REVIEW	28/10/2021

POSITION	NAME	SIGNATURE
DRAFTING CHECK	F. RAPONI	FR
ORIGINATE/ DESIGN	J. BOOTH	JB
INDEPENDENT CHECK	M. TOLCVAY	MT
TECHNICAL APPROVAL	P. STANIFORD	PS
PROJECT APPROVAL	P. STANIFORD	PS
CLIENT APPROVAL		

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 5A - SIMULTANEOUS PUMP IN, PUMP OUT ON JETTY
PARNKA POINT LOCATION PLAN - SHEET 1

DRAWING SCALE: 1 : 500
ORIG. SIZE: A1
DRAWING No.: AEG155-5000-TD-DRG-CV-1001
REVISION: C
DRAFTER: M. MACIEL

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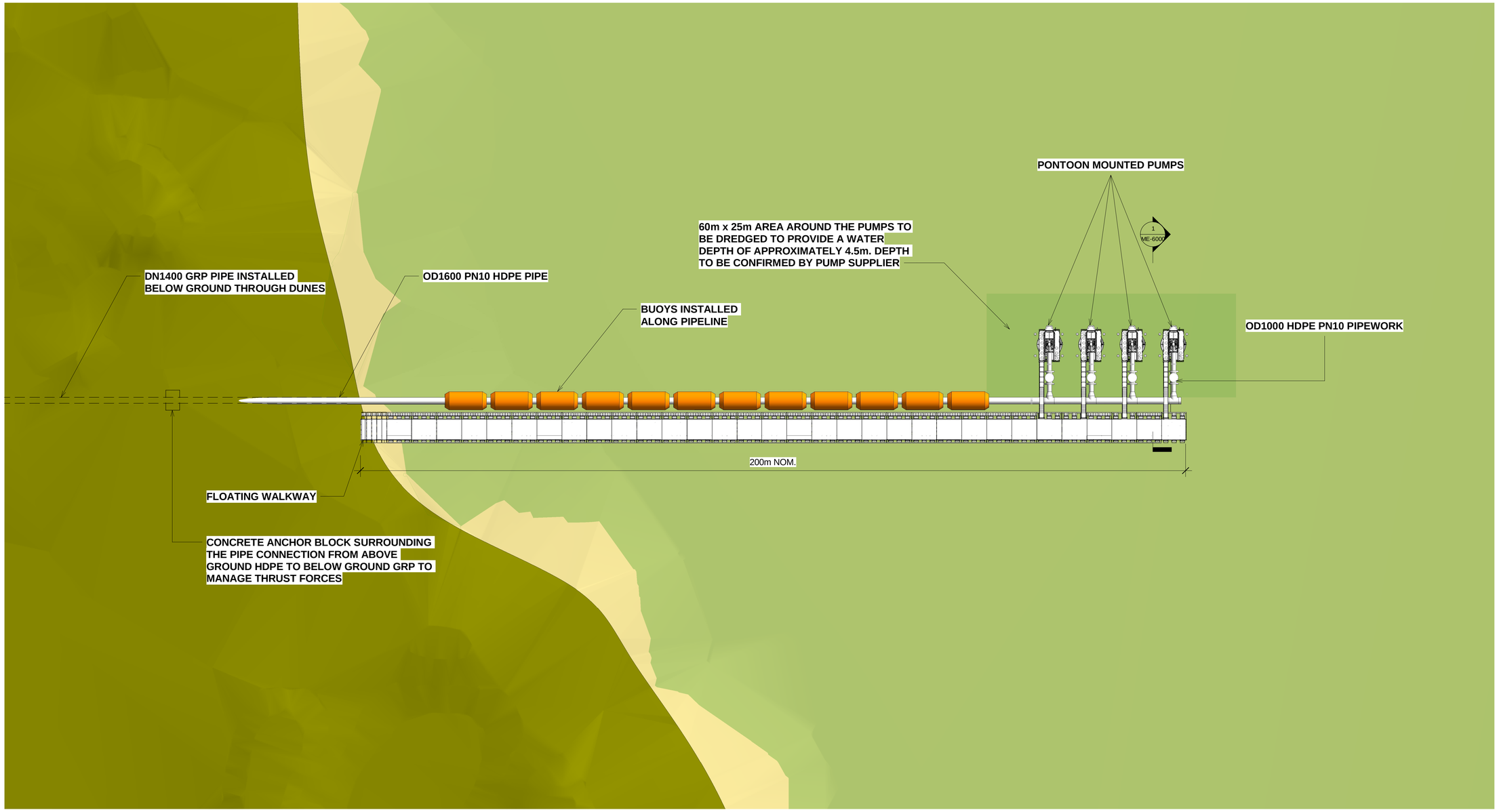
DATE: 12/21/2021 12:43:31 PM



5 0 5 10 15 20m

1 : 500 FULL SIZE @ A1

NOTE: THIS DRAWING IS TO BE READ / PRINTED IN COLOUR

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REV	DESCRIPTION	DATE
C	FINAL CONCEPT ISSUE	21/12/2021
B	CONCEPT DESIGN ISSUE	01/12/2021
A	ISSUED FOR REVIEW	28/10/2021

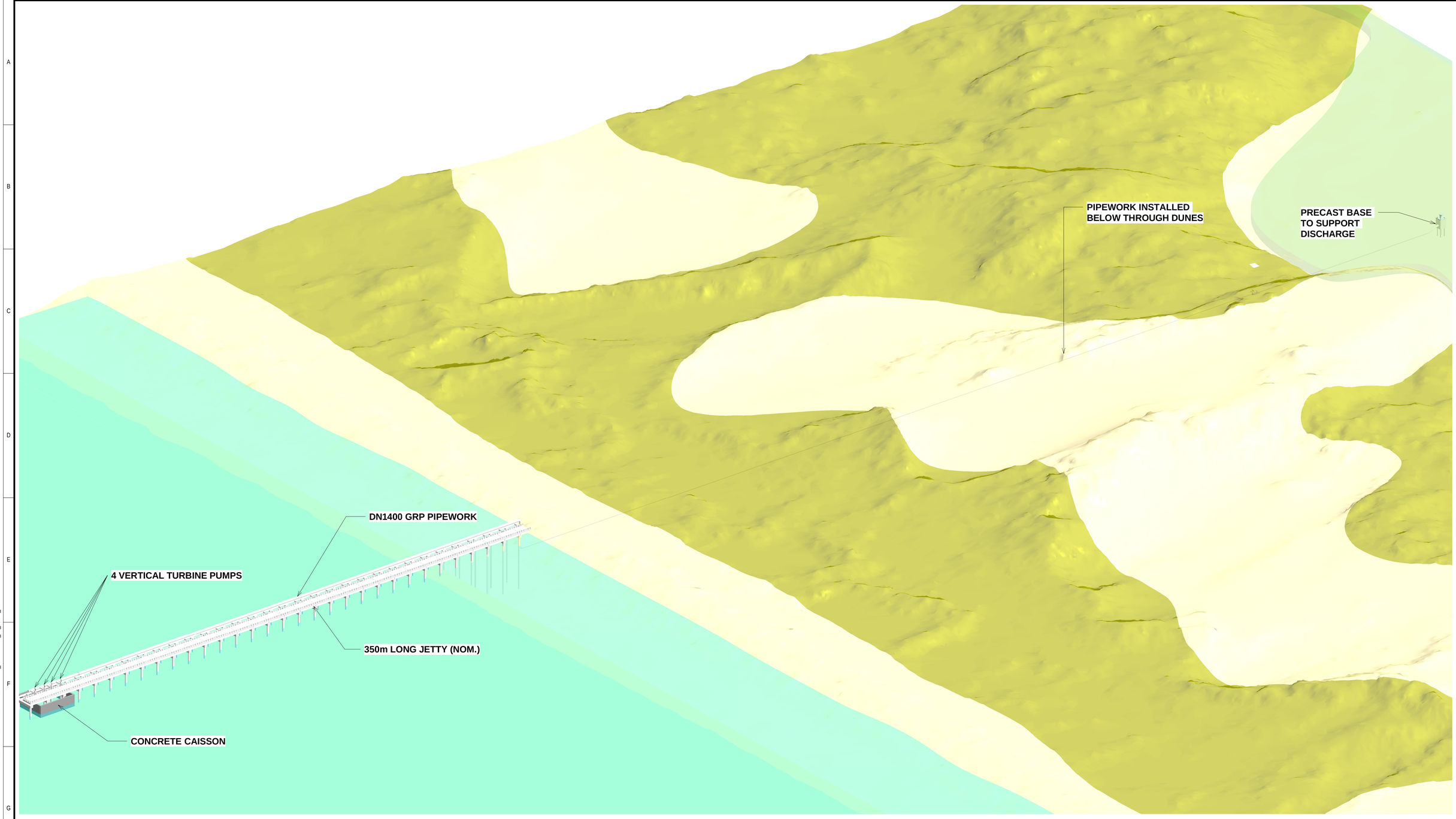
POSITION	NAME	SIGNATURE
DRAFTING CHECK	F. RAPONI	FR
ORIGINATE/ DESIGN	J. BOOTH	JB
INDEPENDENT CHECK	M. TOLCVAY	MT
TECHNICAL APPROVAL	P. STANIFORD	PS
PROJECT APPROVAL	P. STANIFORD	PS
CLIENT APPROVAL		

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 5A - SIMULTANEOUS PUMP IN, PUMP OUT ON JETTY
PARNKA POINT LOCATION PLAN - SHEET 2

DRAWING SCALE	ORIG. SIZE	DRAWING No.	REVISION
1 : 500	A1	AEG155-5000-TD-DRG-CV-1002	C

DRAFTER: M. MACIEL



NOTE: THIS DRAWING IS TO BE READ / PRINTED IN COLOUR

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE
C	FINAL CONCEPT ISSUE	21/12/2021
B	CONCEPT DESIGN ISSUE	01/12/2021
A	ISSUED FOR REVIEW	28/10/2021

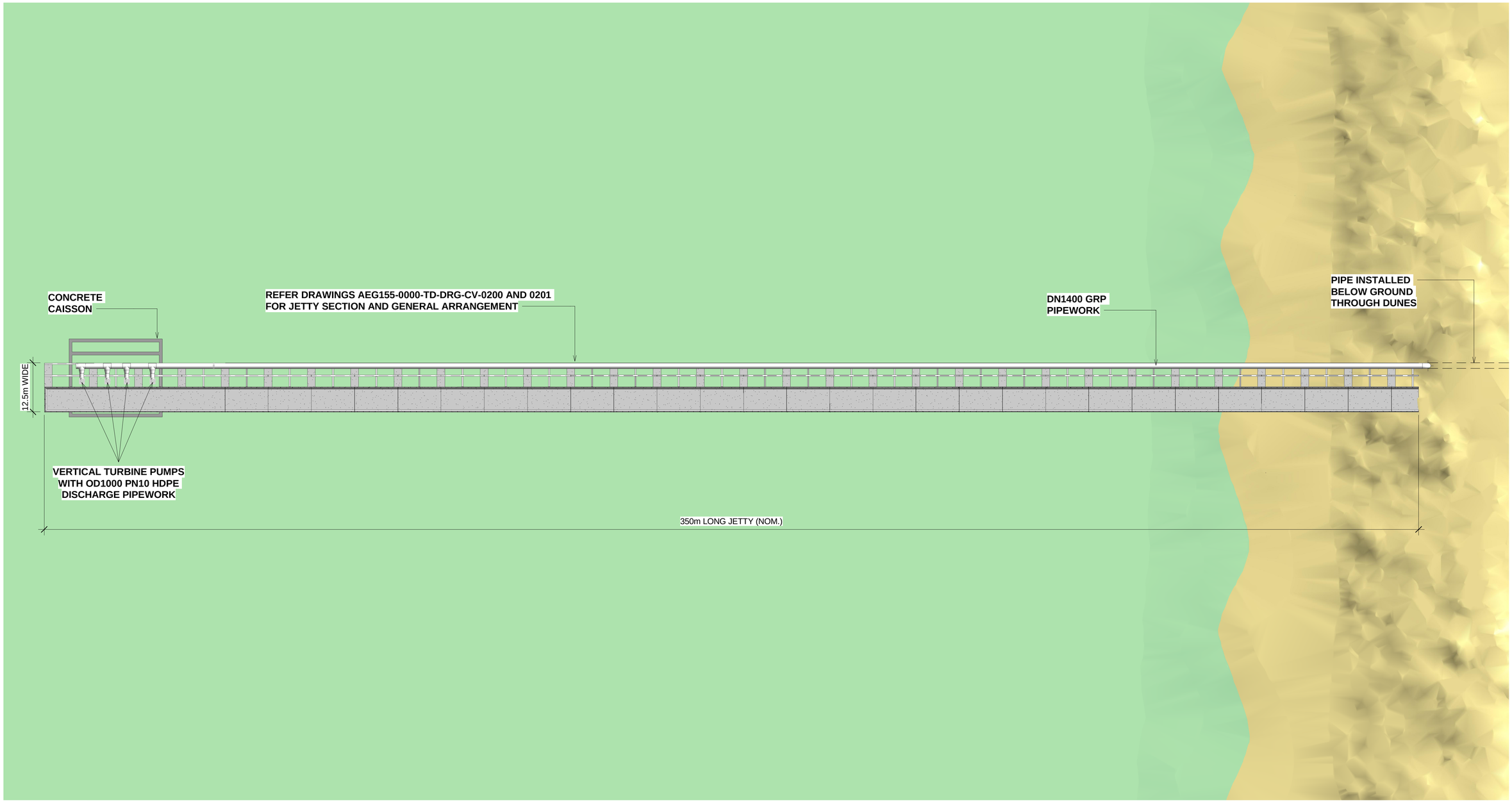
POSITION	NAME	SIGNATURE
DRAFTING CHECK	F. RAPONI	FR
ORIGINATE/ DESIGN	J. BOOTH	JB
INDEPENDENT CHECK	M. TOLCVAY	MT
TECHNICAL APPROVAL	P. STANIFORD	PS
PROJECT APPROVAL	P. STANIFORD	PS
CLIENT APPROVAL		

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 5A - SIMULTANEOUS PUMP IN, PUMP OUT ON JETTY
WOODS WELL LOCATION KEY PLAN

DRAWING SCALE	ORIG. SIZE	DRAWING No.	REVISION
NOT TO SCALE	A1	AEG155-5000-TD-DRG-CV-1004	C

DRAFTER: D. ROSITANO



NOTE: THIS DRAWING IS TO BE READ / PRINTED IN COLOUR

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REV	DESCRIPTION	DATE
C	FINAL CONCEPT ISSUE	21/12/2021
B	CONCEPT DESIGN ISSUE	01/12/2021
A	ISSUED FOR REVIEW	28/10/2021

POSITION	NAME	SIGNATURE
DRAFTING CHECK	F. RAPONI	FR
ORIGINATE/ DESIGN	J. BOOTH	JB
INDEPENDENT CHECK	M. TOLCVAY	MT
TECHNICAL APPROVAL	P. STANIFORD	PS
PROJECT APPROVAL	P. STANIFORD	PS
CLIENT APPROVAL		

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 5A - SIMULTANEOUS PUMP IN, PUMP OUT ON JETTY WOODS WELL LOCATION PLAN - SHEET 1

DRAWING SCALE	ORIG. SIZE	DRAWING No.	REVISION
1 : 500	A1	AEG155-5000-TD-DRG-CV-1005	C

DRAFTER: M. MACIEL

2 0 2 4 6 8m

1 : 200 FULL SIZE @ A1

NOTE: THIS DRAWING IS TO BE READ / PRINTED IN COLOUR

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE
C	FINAL CONCEPT ISSUE	21/12/2021
B	CONCEPT DESIGN ISSUE	01/12/2021
A	ISSUED FOR REVIEW	28/10/2021

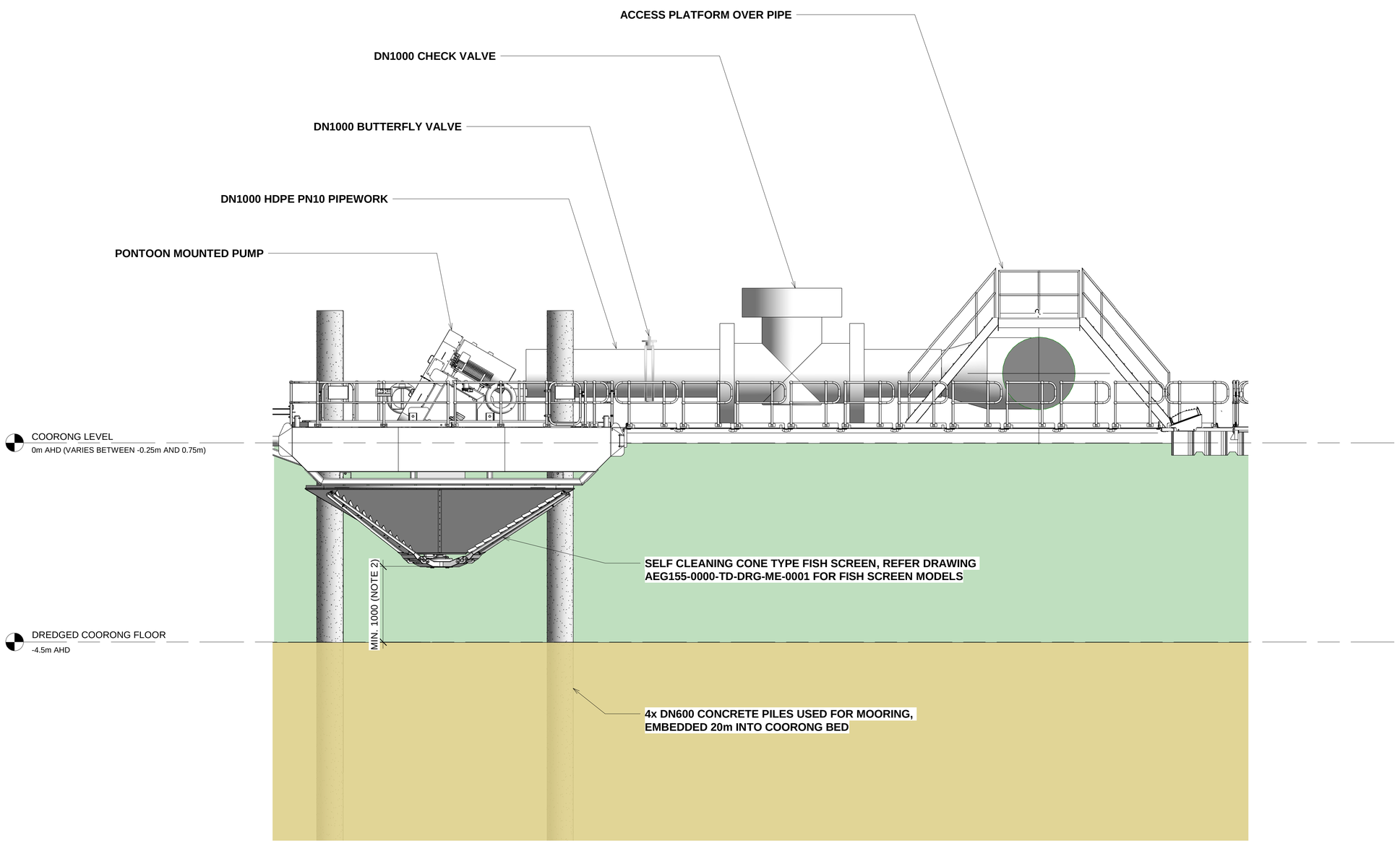
POSITION	NAME	SIGNATURE
DRAFTING CHECK	F. RAPONI	FR
ORIGINATE/ DESIGN	J. BOOTH	JB
INDEPENDENT CHECK	M. TOLCVAY	MT
TECHNICAL APPROVAL	P. STANIFORD	PS
PROJECT APPROVAL	P. STANIFORD	PS
CLIENT APPROVAL		

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 5A - SIMULTANEOUS PUMP IN, PUMP OUT ON JETTY
WOODS WELL LOCATION PLAN - SHEET 2

DRAWING SCALE: 1 : 200
ORIG. SIZE: A1
DRAFTER: D. ROSITANO
DRAWING No.: AEG155-5000-TD-DRG-CV-1006
REVISION: C

NOTE:
1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
2. FISH EXCLUSION SCREEN CLEARANCES AND REQUIRED WATER DEPTHS TO BE CONFIRMED BY SUPPLIER DURING DETAILED DESIGN



1 / CV-1002 PONTOON PUMP SECTION
1 : 50

500 0 500 1000 1500 2000mm
1 : 50 FULL SIZE @ A1

NOTE: THIS DRAWING IS TO BE READ / PRINTED IN COLOUR

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE
D	FINAL CONCEPT ISSUE	21/12/2021
C	CONCEPT DESIGN ISSUE	17/12/2021
B	CONCEPT DESIGN ISSUE	01/12/2021
A	ISSUED FOR REVIEW	28/10/2021

POSITION	NAME	SIGNATURE
DRAFTING CHECK	F. RAPONI	FR
ORIGINATE/ DESIGN	J. BOOTH	JB
INDEPENDENT CHECK	M. TOLCVAY	MT
TECHNICAL APPROVAL	P. STANIFORD	PS
PROJECT APPROVAL	P. STANIFORD	PS
CLIENT APPROVAL		

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 5A - SIMULTANEOUS PUMP IN, PUMP OUT ON JETTY
PONTOON PUMP SECTION

DRAWING SCALE	ORIG. SIZE	DRAWING No.	REVISION
1 : 50	A1	AEG155-5000-TD-DRG-ME-6000	D

DRAFTER: M. MACIEL

DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 5B -
SIMULTANEOUS PUMP IN, PUMP OUT TO NEARSHORE

DRAWING LIST: OPTION 5B - SIMULTANEOUS PUMP IN, PUMP OUT TO NEARSHORE

DRAWING No.	DRAWING TITLE
AEG155-0000-TD-DRG-CV-0001	PROJECT KEY PLAN
AEG155-0000-TD-DRG-CV-0200	TYPICAL JETTY GENERAL ARRANGEMENT
AEG155-0000-TD-DRG-CV-0201	TYPICAL JETTY SECTION
AEG155-0000-TD-DRG-CV-0300	TYPICAL DISCHARGE JETTY GENERAL ARRANGEMENT
AEG155-0000-TD-DRG-CV-0301	TYPICAL DISCHARGE JETTY SECTION
AEG155-0000-TD-DRG-CV-0600	DISCHARGE STRUCTURE - SECTION
AEG155-0000-TD-DRG-CV-1000	CAISSON STRUCTURE GENERAL ARRANGEMENT
AEG155-0000-TD-DRG-CV-1001	CAISSON STRUCTURE SECTION
AEG155-0000-TD-DRG-ME-0001	FISH SCREEN DETAIL
AEG155-5100-TD-DRG-CV-0001	COVER PAGE
AEG155-5100-TD-DRG-CV-0002	GENERAL NOTES
AEG155-5100-TD-DRG-CV-1000	PARNKA POINT LOCATION KEY PLAN
AEG155-5100-TD-DRG-CV-1001	PARNKA POINT LOCATION PLAN - SHEET 1
AEG155-5100-TD-DRG-CV-1002	PARNKA POINT LOCATION PLAN - SHEET 2
AEG155-5100-TD-DRG-CV-1003	WOODS WELL LOCATION KEY PLAN
AEG155-5100-TD-DRG-CV-1004	WOODS WELL LOCATION PLAN - SHEET 1
AEG155-5100-TD-DRG-CV-1005	WOODS WELL LOCATION PLAN - SHEET 2
AEG155-5100-TD-DRG-ME-6000	PONTOON PUMP SECTION

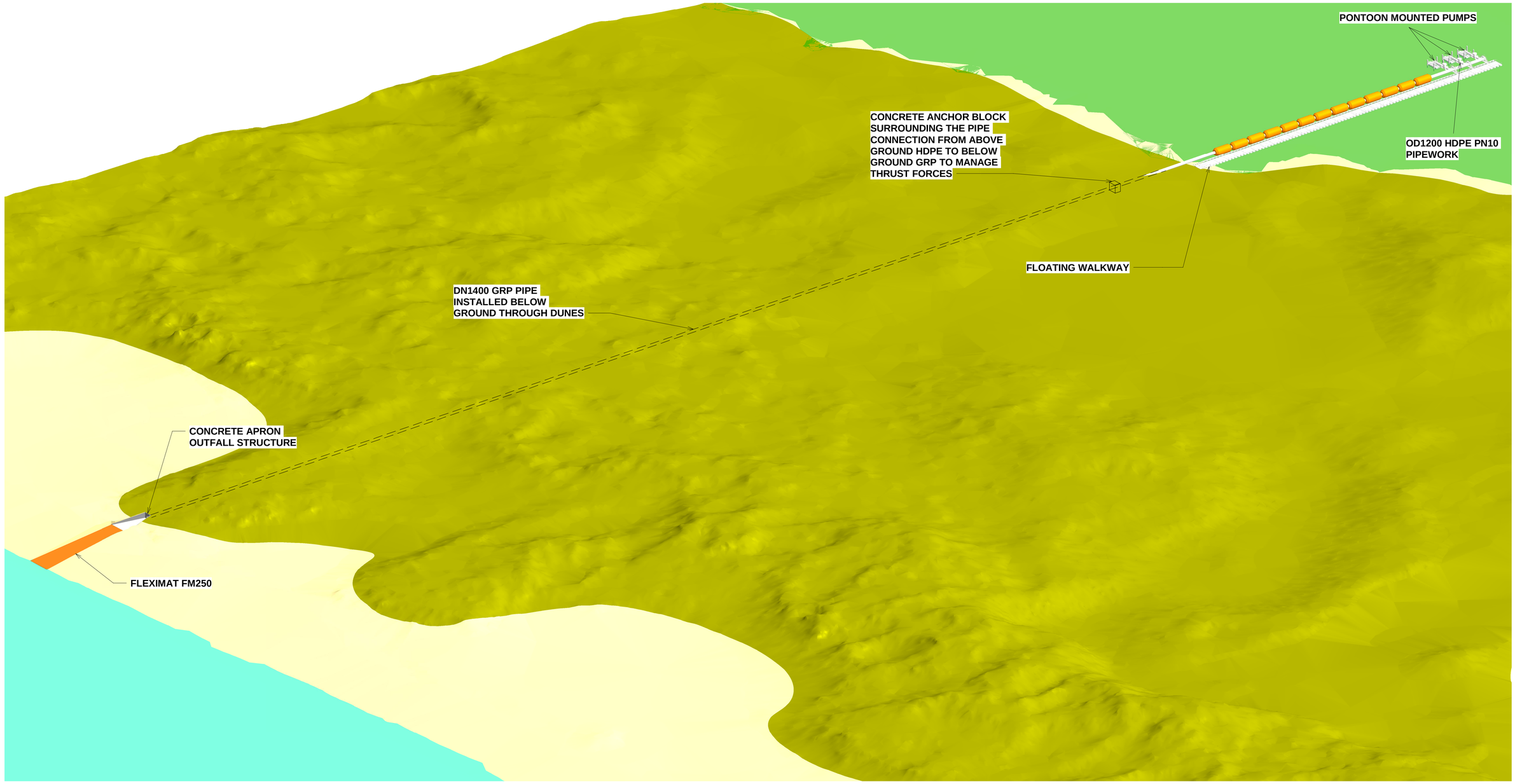
NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	POSITION	NAME	SIGNATURE
			DRAFTING CHECK	F. RAPONI	FR
			ORIGINATE/ DESIGN	J. BOOTH	JB
			INDEPENDENT CHECK	M. TOLCVAY	MT
			TECHNICAL APPROVAL	F. RAPONI	PS
C	FINAL CONCEPT ISSUE	21/12/2021	PROJECT APPROVAL	P. STANIFORD	PS
B	CONCEPT DESIGN ISSUE	01/12/2021	CLIENT APPROVAL		
A	ISSUED FOR REVIEW	28/10/2021			

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 5B - SIMULTANEOUS PUMP IN, PUMP OUT TO NEARSHORE
COVER PAGE

DRAWING SCALE: NOT TO SCALE
ORIG. SIZE: A1
DRAFTER: M. MACIEL
DRAWING No.: AEG155-5100-TD-DRG-CV-0001
REVISION: C



NOTE: THIS DRAWING IS TO BE READ / PRINTED IN COLOUR

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	POSITION	NAME	SIGNATURE
			DRAFTING CHECK	F. RAPONI	FR
			ORIGINATE/ DESIGN	J. BOOTH	JB
			INDEPENDENT CHECK	M. TOLCVAY	MT
			TECHNICAL APPROVAL	P. STANIFORD	PS
C	FINAL CONCEPT ISSUE	21/12/2021	PROJECT APPROVAL	P. STANIFORD	PS
B	CONCEPT DESIGN ISSUE	01/12/2021	CLIENT APPROVAL		
A	ISSUED FOR REVIEW	28/10/2021			

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 5B - SIMULTANEOUS PUMP IN, PUMP OUT TO NEARSHORE
PARNKA POINT LOCATION KEY PLAN

DRAWING SCALE: NOT TO SCALE
ORIG. SIZE: A1
DRAFTER: M. MACIEL
DRAWING No.: AEG155-5100-TD-DRG-CV-1000
REVISION: C

5 0 5 10 15 20m

1 : 500 FULL SIZE @ A1

NOTE: THIS DRAWING IS TO BE READ / PRINTED IN COLOUR

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE
C	FINAL CONCEPT ISSUE	21/12/2021
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A	ISSUED FOR REVIEW	28/10/2021

POSITION	NAME	SIGNATURE
DRAFTING CHECK	F. RAPONI	FR
ORIGINATE/ DESIGN	J. BOOTH	JB
INDEPENDENT CHECK	M. TOLCVAY	MT
TECHNICAL APPROVAL	P. STANIFORD	PS
PROJECT APPROVAL	P. STANIFORD	PS
CLIENT APPROVAL		

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE

DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 5B - SIMULTANEOUS PUMP IN, PUMP OUT TO NEARSHORE
PARNKA POINT LOCATION PLAN - SHEET 1

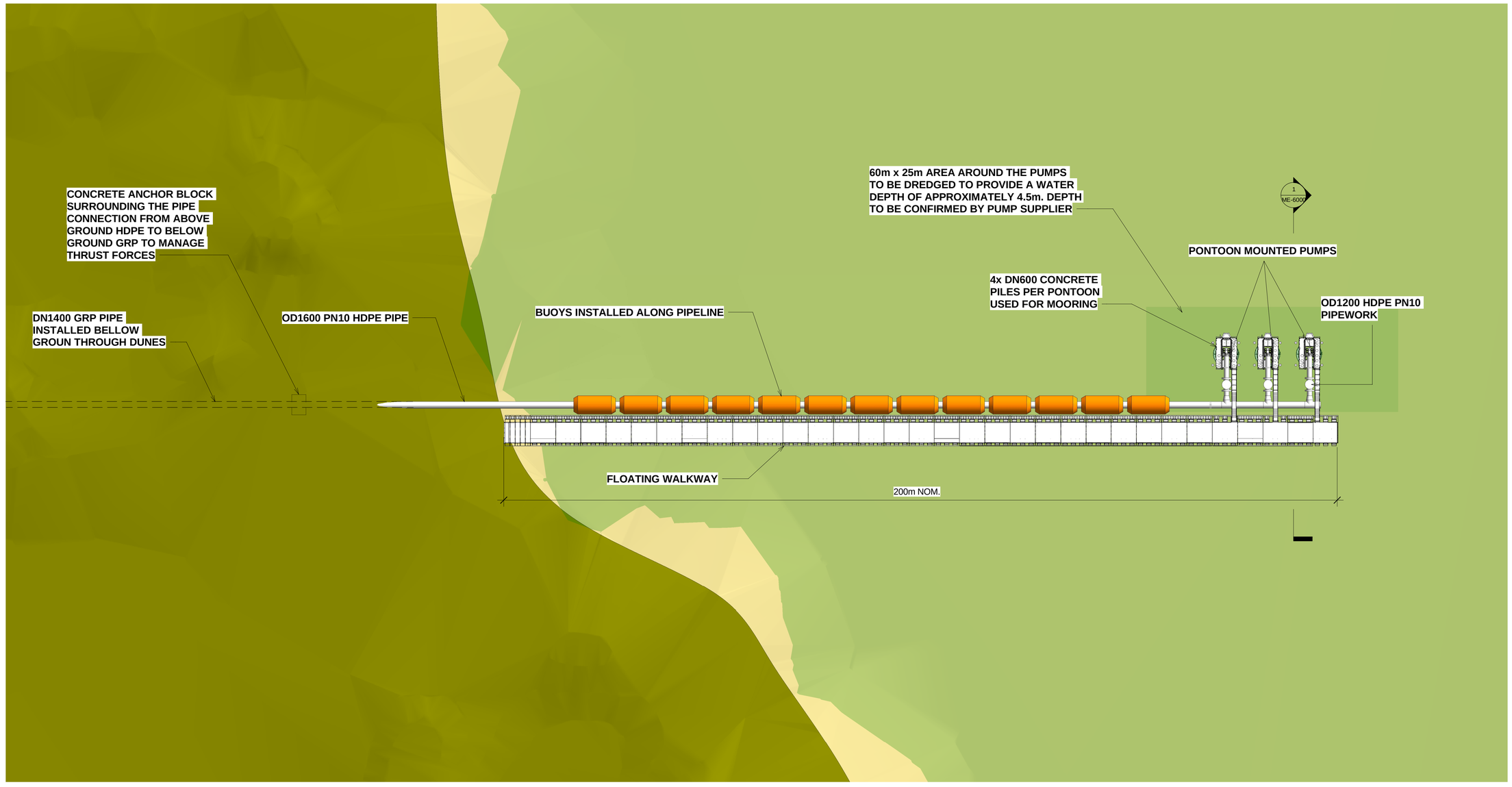
DRAWING SCALE: 1 : 500

ORIG. SIZE: A1

DRAWING No.: AEG155-5100-TD-DRG-CV-1001

REVISION: C

DRAFTER: M. MACIEL



5 0 5 10 15 20m

1 : 500 FULL SIZE @ A1

NOTE: THIS DRAWING IS TO BE READ / PRINTED IN COLOUR

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REV	DESCRIPTION	DATE
C	FINAL CONCEPT ISSUE	21/12/2021
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A	ISSUED FOR REVIEW	28/10/2021

POSITION	NAME	SIGNATURE
DRAFTING CHECK	F. RAPONI	FR
ORIGINATE/ DESIGN	J. BOOTH	JB
INDEPENDENT CHECK	M. TOLCVAY	MT
TECHNICAL APPROVAL	P. STANIFORD	PS
PROJECT APPROVAL	P. STANIFORD	PS
CLIENT APPROVAL		

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 5B - SIMULTANEOUS PUMP IN, PUMP OUT TO NEARSHORE
PARNKA POINT LOCATION PLAN - SHEET 2

DRAWING SCALE	ORIG. SIZE	DRAWING No.	REVISION
1 : 500	A1	AEG155-5100-TD-DRG-CV-1002	C

DRAFTER: M. MACIEL

NOTE: THIS DRAWING IS TO BE READ / PRINTED IN COLOUR

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REV	DESCRIPTION	DATE
C	FINAL CONCEPT ISSUE	21/12/2021
B	CONCEPT DESIGN ISSUE	01/12/2021
A	ISSUED FOR REVIEW	28/10/2021

POSITION	NAME	SIGNATURE
DRAFTING CHECK	F. RAPONI	FR
ORIGINATE/ DESIGN	J. BOOTH	JB
INDEPENDENT CHECK	M. TOLCVAY	MT
TECHNICAL APPROVAL	P. STANIFORD	PS
PROJECT APPROVAL	P. STANIFORD	PS
CLIENT APPROVAL		

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 5B - SIMULTANEOUS PUMP IN, PUMP OUT TO NEARSHORE WOODS WELL LOCATION KEY PLAN

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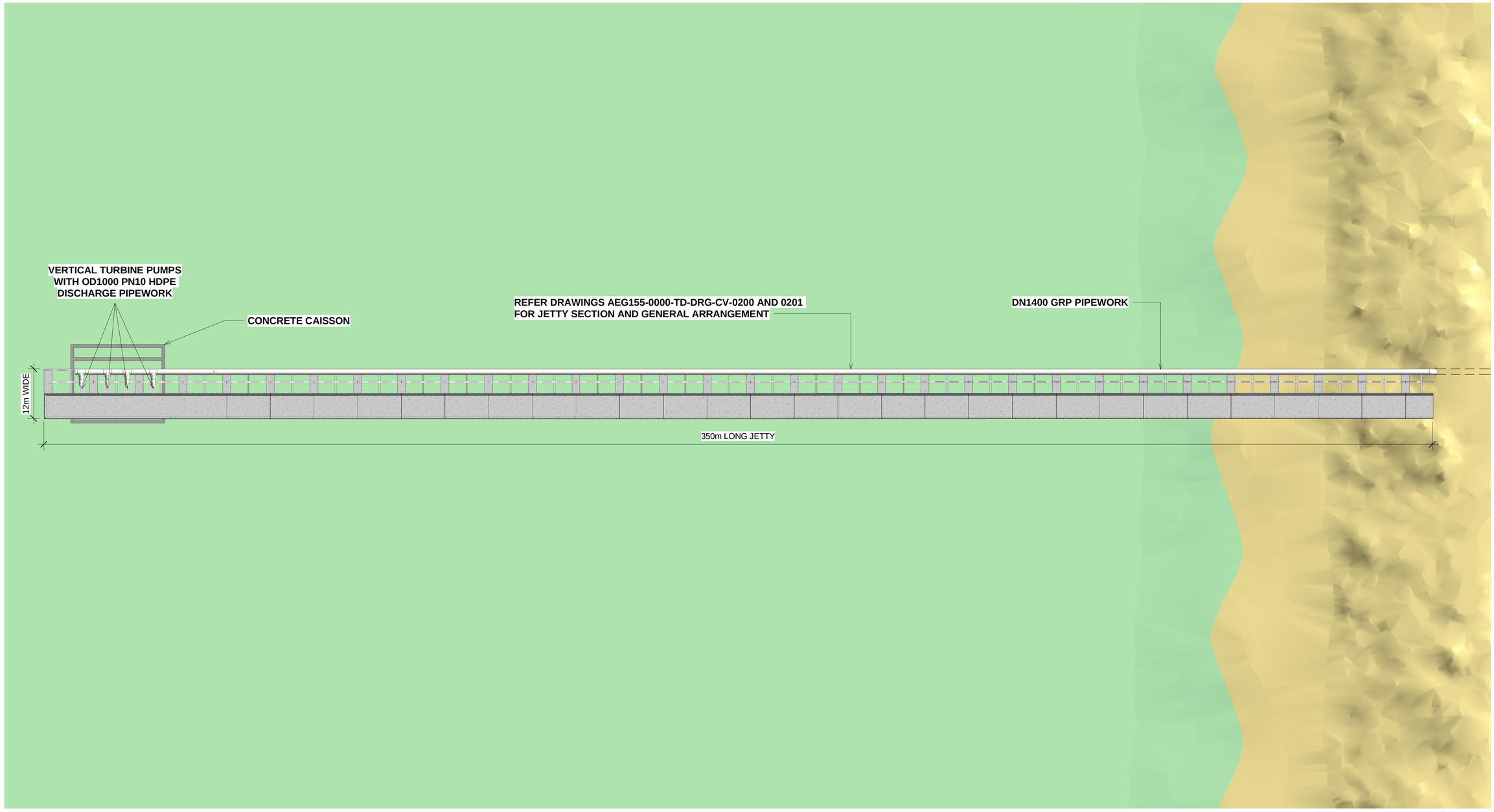
DRAFTER: D. ROSITANO



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ORIGINATE/ DESIGN	J. BOOTH	JB
INDEPENDENT CHECK	M. TOLCVAY	MT
TECHNICAL APPROVAL	P. STANIFORD	PS
PROJECT APPROVAL	P. STANIFORD	PS
CLIENT APPROVAL		

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 5B - SIMULTANEOUS PUMP IN, PUMP OUT TO NEARSHORE WOODS WELL LOCATION PLAN - SHEET 1

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DRAWING No.: AEG155-5100-TD-DRG-CV-1004
REVISION: C
DRAFTER: D. ROSITANO

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A	ISSUED FOR REVIEW	28/10/2021

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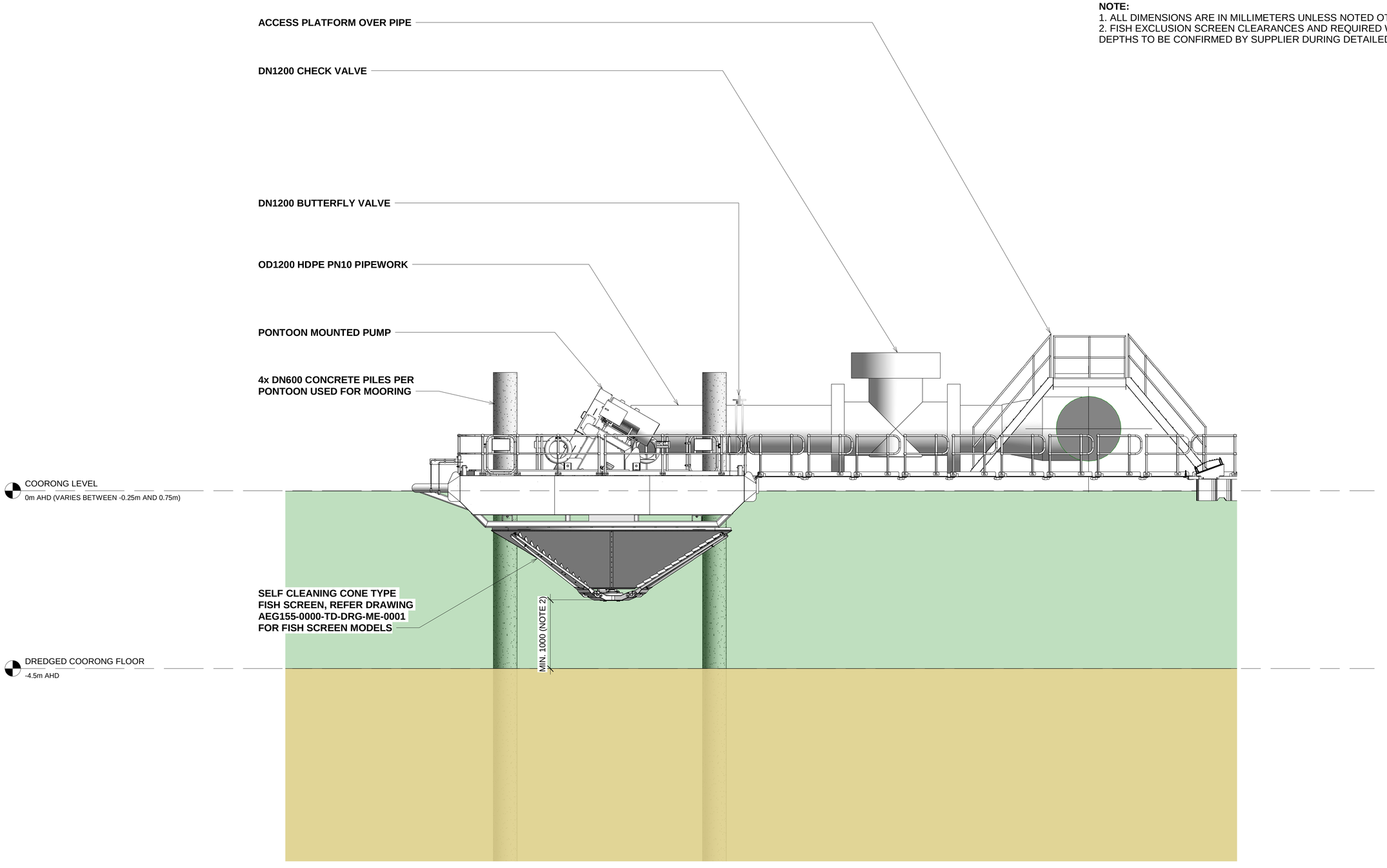
DRAFTING CHECK	F. RAPONI	FR
ORIGINATE/ DESIGN	J. BOOTH	JB
INDEPENDENT CHECK	M. TOLCVAY	MT
TECHNICAL APPROVAL	P. STANIFORD	PS
PROJECT APPROVAL	P. STANIFORD	PS
CLIENT APPROVAL		

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 5B - SIMULTANEOUS PUMP IN, PUMP OUT TO NEARSHORE WOODS WELL LOCATION PLAN - SHEET 2

DRAWING SCALE: 1 : 200
ORIG. SIZE: A1
DRAFTER: D. ROSITANO
DRAWING No.: AEG155-5100-TD-DRG-CV-1005
REVISION: C

NOTE:
1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
2. FISH EXCLUSION SCREEN CLEARANCES AND REQUIRED WATER DEPTHS TO BE CONFIRMED BY SUPPLIER DURING DETAILED DESIGN.



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NOTE: THIS DRAWING IS TO BE READ / PRINTED IN COLOUR

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REV	DESCRIPTION	DATE
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ORIGINATE/ DESIGN	J. BOOTH	JB
INDEPENDENT CHECK	M. TOLCVAY	MT
TECHNICAL APPROVAL	P. STANIFORD	PS
PROJECT APPROVAL	P. STANIFORD	PS
CLIENT APPROVAL		

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 5B - SIMULTANEOUS PUMP IN, PUMP OUT TO NEARSHORE
PONTOON PUMP SECTION

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DRAFTER: M. MACIEL

DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 6 - PASSIVE PIPEWORK CSL IN/OUT WITH BREAKWATER

DRAWING LIST: OPTION 6 - PASSIVE PIPEWORK CSL IN/OUT WITH BREAKWATER

DRAWING No.	DRAWING TITLE
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AEG155-0000-TD-DRG-CV-0900	BREAKWATER DETAILS
AEG155-6000-TD-DRG-CV-0001	COVER PAGE
AEG155-6000-TD-DRG-CV-0002	GENERAL NOTES
AEG155-6000-TD-DRG-CV-1000	KEY PLAN
AEG155-6000-TD-DRG-CV-1001	PLAN - SHEET 1
AEG155-6000-TD-DRG-CV-1002	PLAN - SHEET 2
AEG155-6000-TD-DRG-CV-1003	PASSIVE INTAKE/OUTFALL STRUCTURE - SECTION
AEG155-6000-TD-DRG-CV-5000	PIPING SECTION

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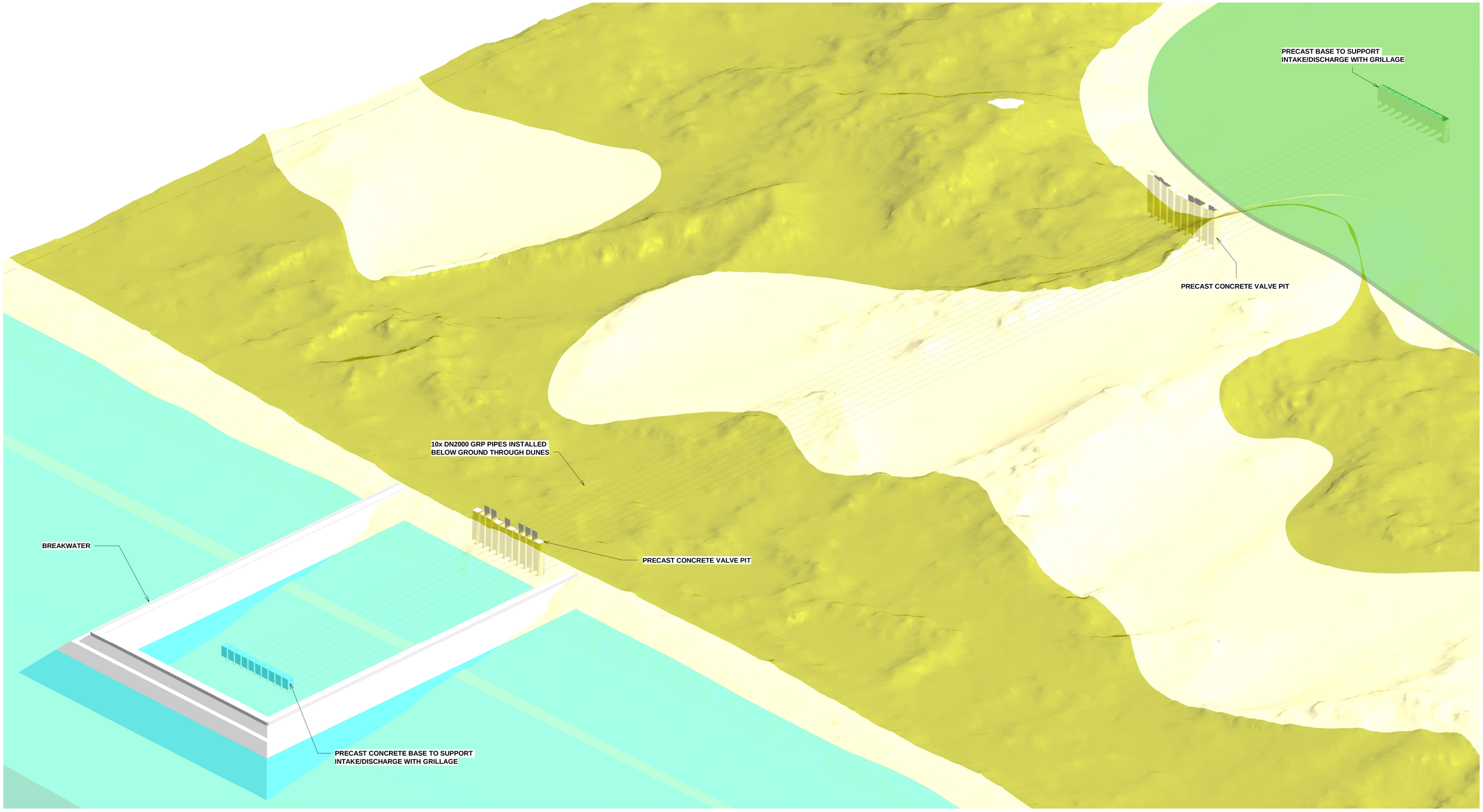
ORIGINATE/ DESIGN	J. BOOTH	JB
INDEPENDENT CHECK	M. TOLCVAY	MT
TECHNICAL APPROVAL	P. STANIFORD	PS
PROJECT APPROVAL	P. STANIFORD	PS
CLIENT APPROVAL		

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 6 - PASSIVE PIPEWORK CSL IN/OUT WITH BREAKWATER
COVER PAGE

DRAWING SCALE: NOT TO SCALE
ORIG. SIZE: A1
DRAFTER: M. MACIEL
DRAWING No.: AEG155-6000-TD-DRG-CV-0001
REVISION: C



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C	FINAL CONCEPT ISSUE	21/12/2021	PROJECT APPROVAL	P. STANIFORD	PS
B	CONCEPT DESIGN ISSUE	01/12/2021	CLIENT APPROVAL		
A	ISSUED FOR REVIEW	28/10/2021			

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 6 - PASSIVE PIPEWORK CSL IN/OUT WITH BREAKWATER
KEY PLAN

DRAWING SCALE: NOT TO SCALE
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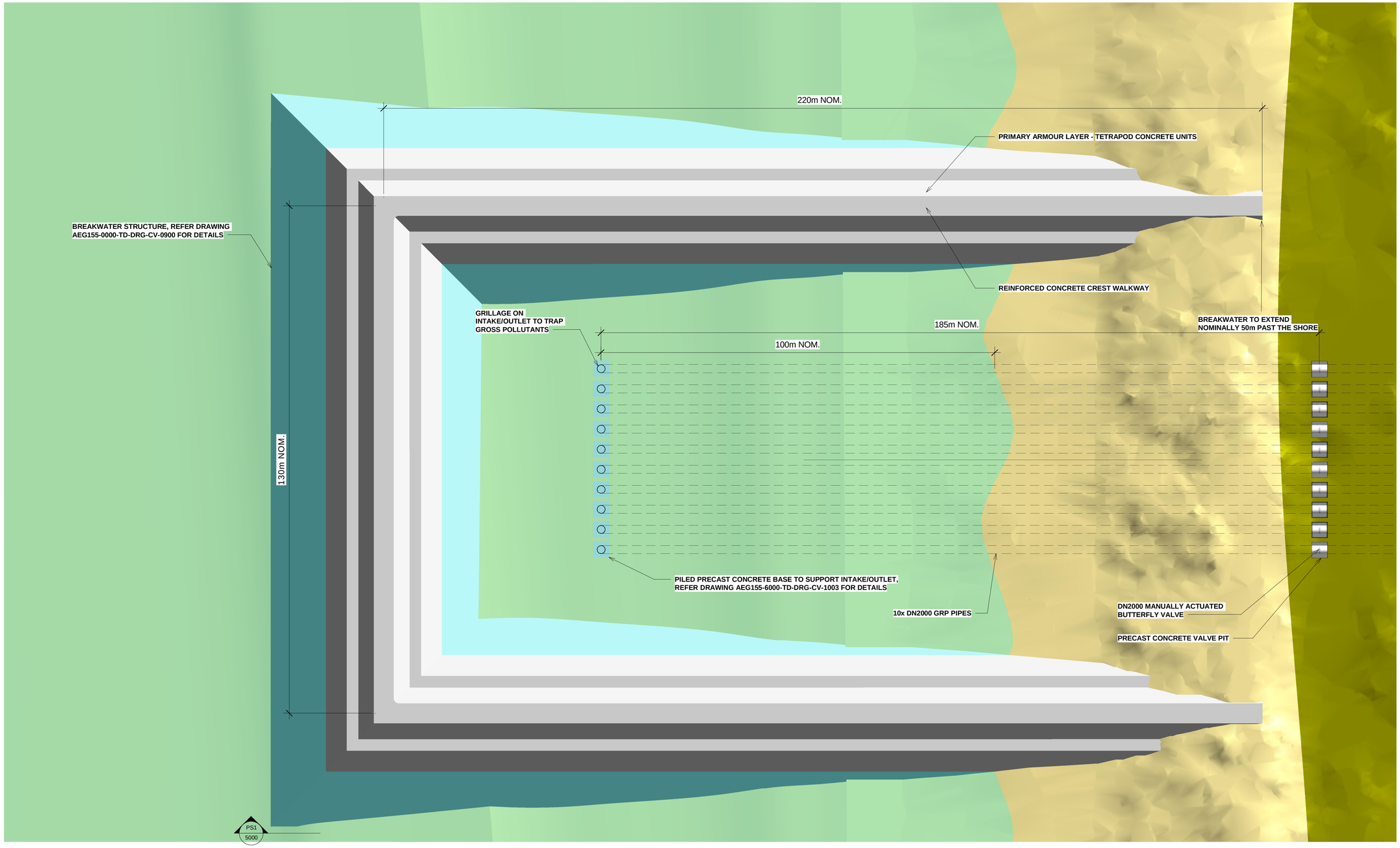
DRAFTER: M. MACIEL
DRAWING No.: AEG155-6000-TD-DRG-CV-1000
REVISION: C



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NOTE: THIS DRAWING IS TO BE READ / PRINTED IN COLOUR

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TECHNICAL APPROVAL	P. STANIFORD	PS
PROJECT APPROVAL	P. STANIFORD	PS
CLIENT APPROVAL		

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

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ORIG. SIZE: A1

DRAFTER: M. MACIEL

TITLE: DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 6 - PASSIVE PIPEWORK CSL IN/OUT WITH BREAKWATER
PLAN - SHEET 1

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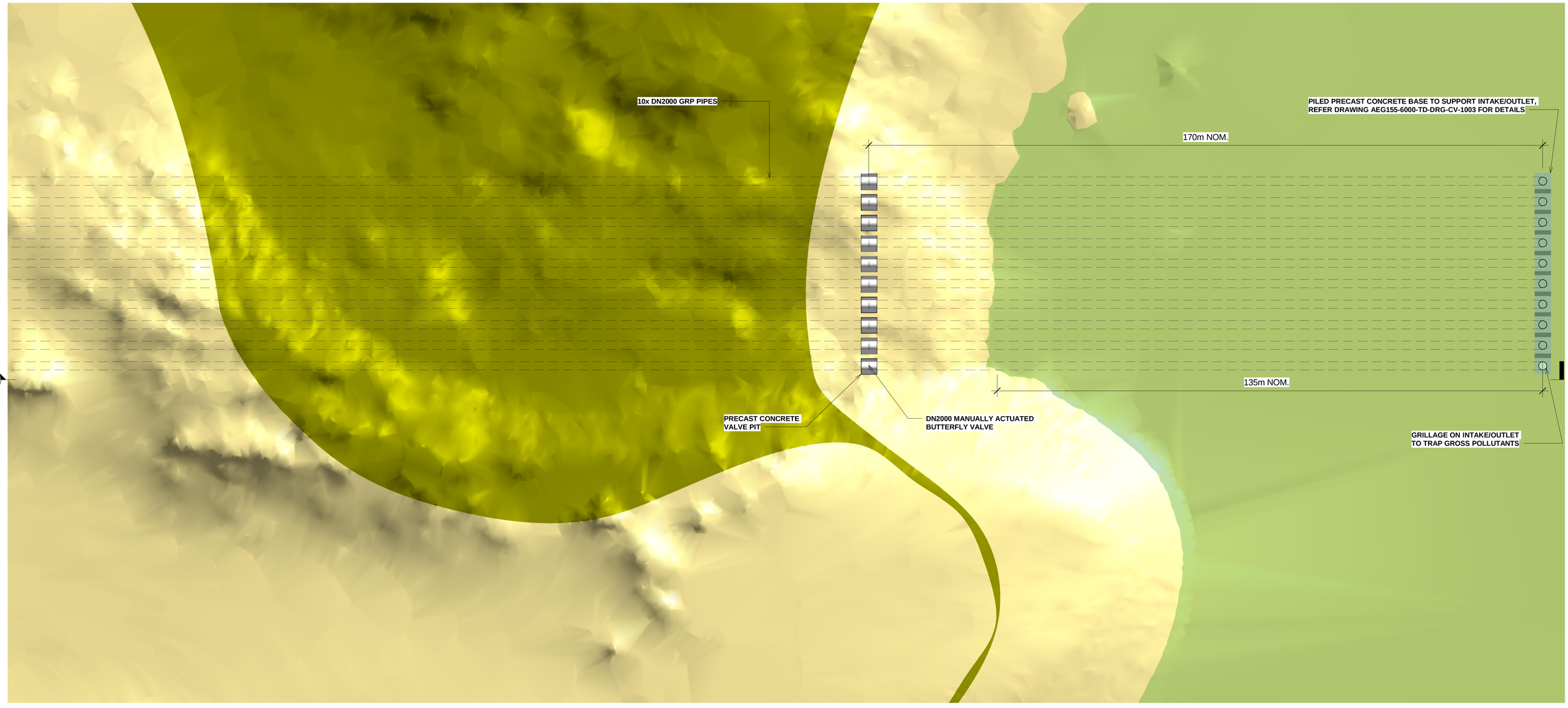

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C	FINAL CONCEPT ISSUE	21/12/2021	PROJECT APPROVAL	P. STANIFORD	PS
B	CONCEPT DESIGN ISSUE	01/12/2021	CLIENT APPROVAL		
A	ISSUED FOR REVIEW	28/10/2021			

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 6 - PASSIVE PIPEWORK CSL IN/OUT WITH BREAKWATER
PLAN - SHEET 2

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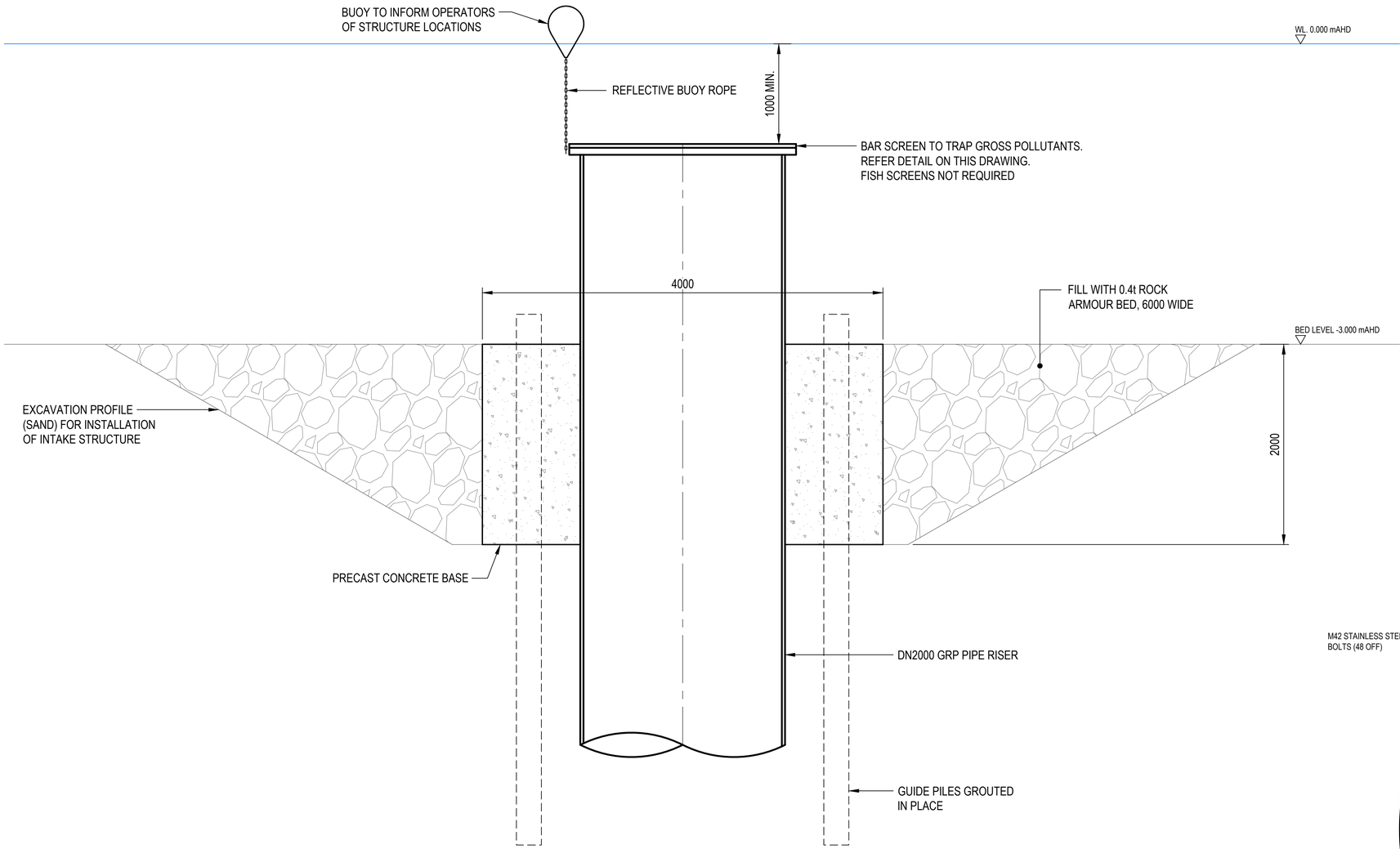

PASSIVE INTAKE / OUTFALL STRUCTURE - SECTION

SCALE 1 : 25

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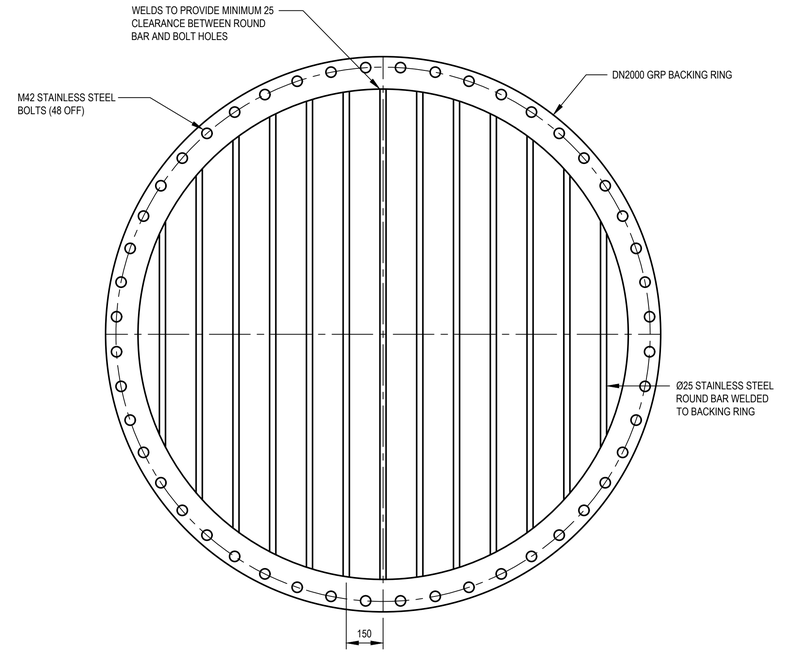

BAR SCREEN DETAIL

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			INDEPENDENT CHECK	M. TOLCVAY	M.T.
			TECHNICAL APPROVAL	P. STANIFORD	P.J.S.
			PROJECT APPROVAL	P. STANIFORD	P.J.S.
B	FINAL CONCEPT ISSUE	21.12.2021	CLIENT APPROVAL		
A	CONCEPT DESIGN ISSUE	1.12.2021			

0 250 500 750 1000
SCALE 1: 12.5 SCALE IN mm

0 500 1000 1500 2000
SCALE 1: 25 SCALE IN mm

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 6 - PASSIVE PIPEWORK CSL IN/OUT WITH BREAKWATER
PASSIVE INTAKE / OUTFALL STRUCTURE - SECTION

DRAWING SCALE	ORIG. SIZE	DRAWING No.	REVISION
AS SHOWN	A1	AEG155-6000-TD-DRG-CV-1003	B

DRAFTER: F. RAPONI

DATE: Monday, 20 December 2021 4:52:10 PM
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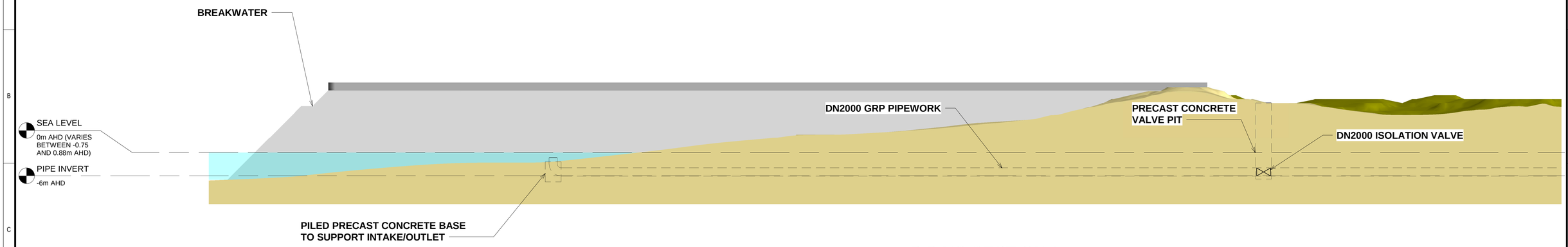

PS1 / 5000

PIPING SECTION 1

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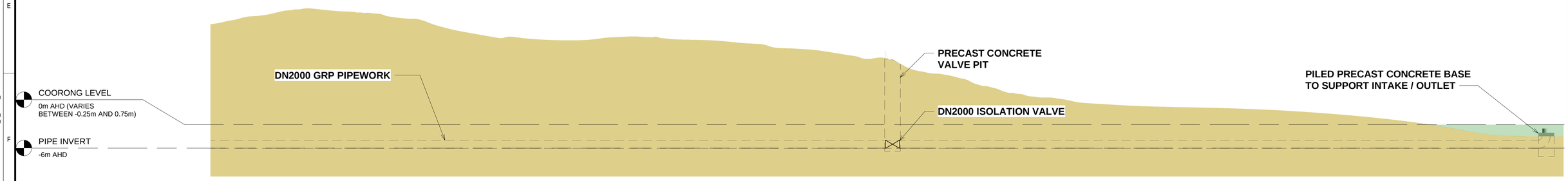

PS2 / 5000

PIPING SECTION 2

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1 : 500 FULL SIZE @ A1

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CLIENT APPROVAL		

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DEPARTMENT FOR ENVIRONMENT AND WATER
COORONG INFRASTRUCTURE INVESTIGATIONS PROJECT
OPTION 6 - PASSIVE PIPEWORK CSL IN/OUT WITH BREAKWATER
PIPING SECTION

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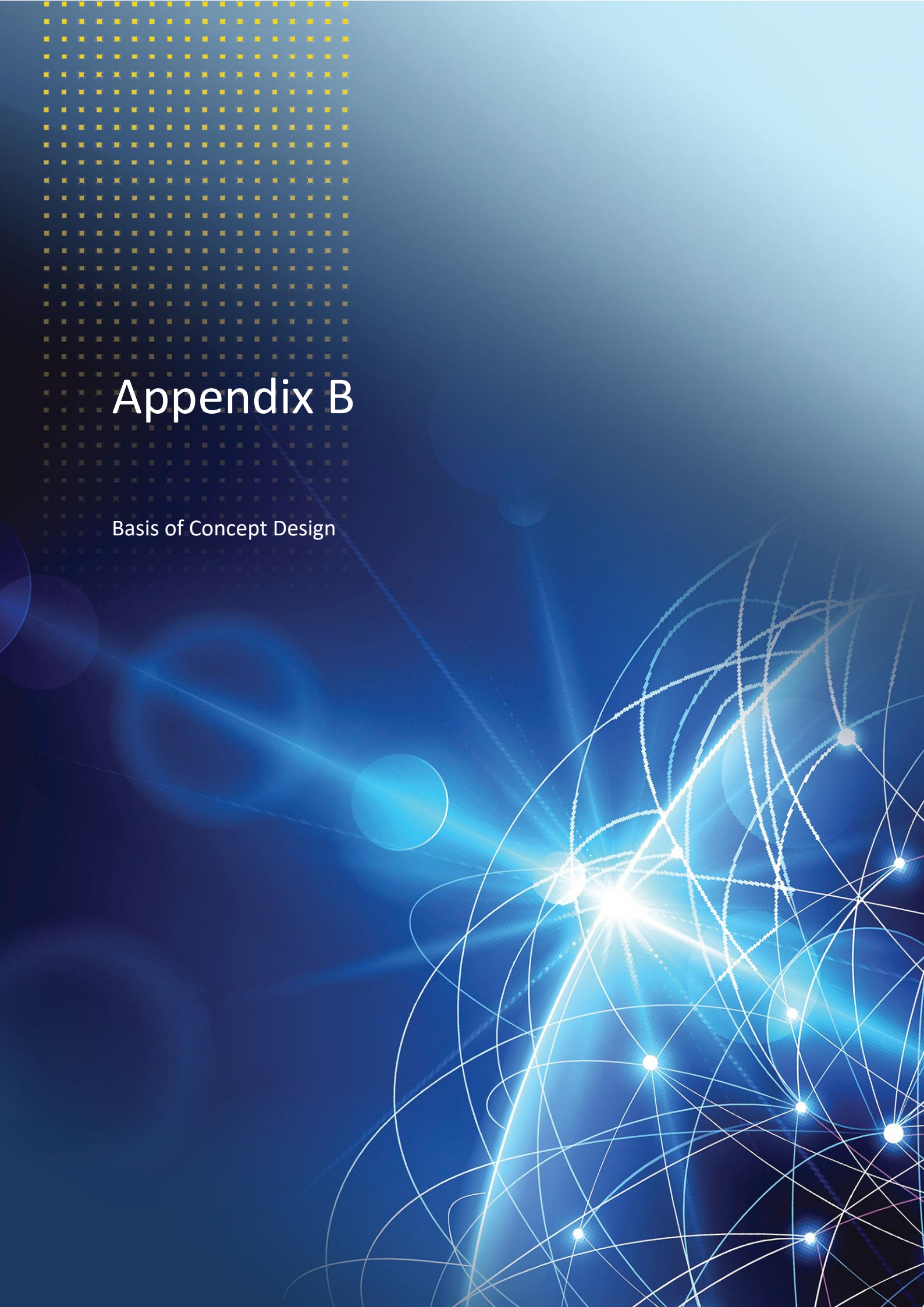
DRAFTER: M. MACIEL

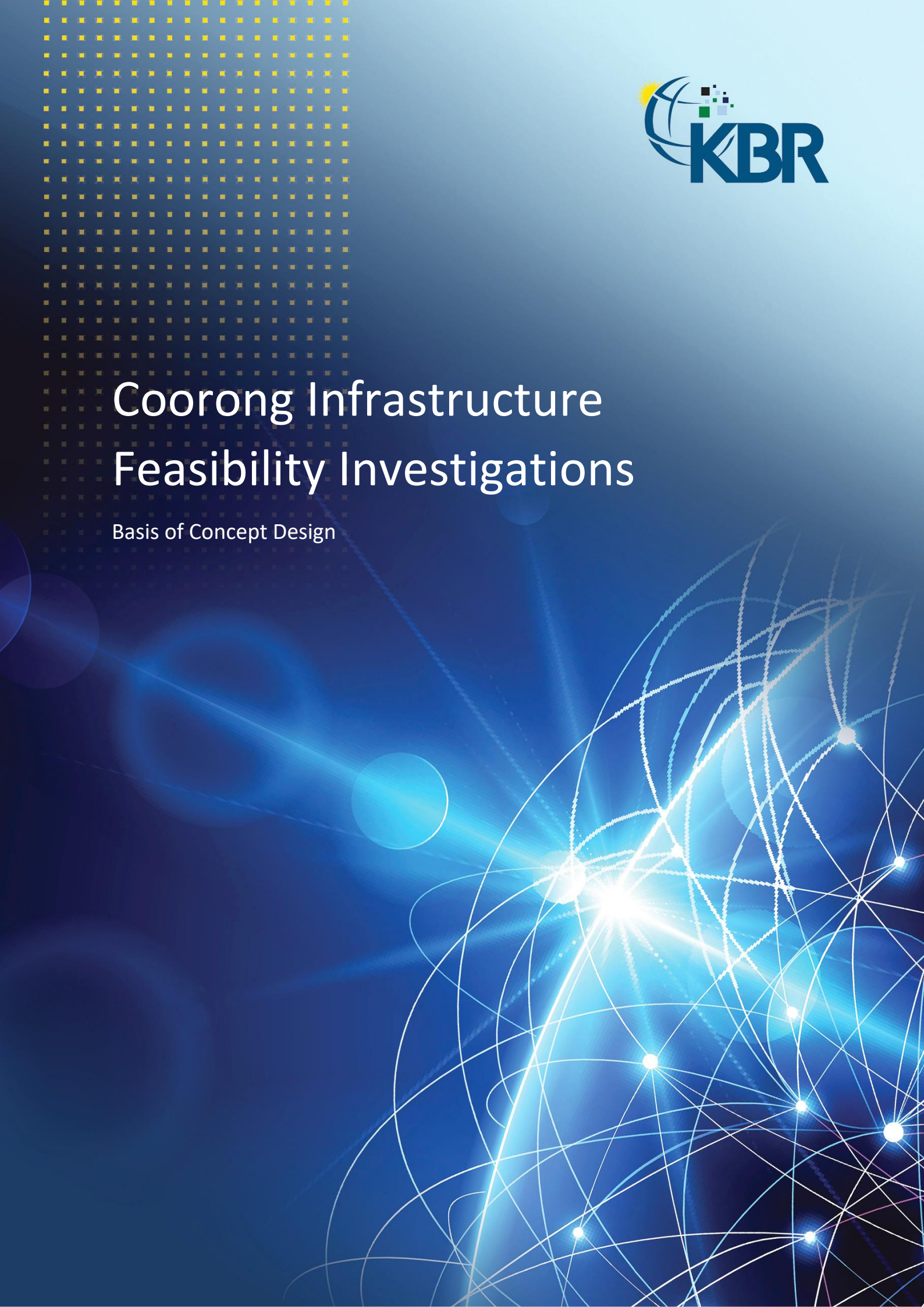
Appendix B

Basis of Concept Design



Coorong Infrastructure Feasibility Investigations

Basis of Concept Design



Coorong Infrastructure Feasibility Investigations

Basis of Concept Design

Prepared for:
DEPARTMENT FOR ENVIRONMENT AND WATER
81-95 Waymouth Street
ADELAIDE SA 5000

Prepared by:
Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317
186 Greenhill Road | Parkside SA 5063 | Australia
GPO Box 2702 | Adelaide SA 5001 | Australia

1 December 2021

AEG155-01-TD-WR-DBA-0001-Rev. 2

Limitations Statement

The sole purpose of this report and the associated services performed by Kellogg Brown & Root Pty Ltd (KBR) is to **document the design basis for the concept design** in accordance with the scope of services set out in the contract between KBR and **Department for Environment & Water** ('the Client'). That scope of services was defined by the requests of the Client, by the time and budgetary constraints imposed by the Client, and by the availability of access to the site.

KBR derived the data in this report primarily from **visual inspections, examination of records either provided by Department for Environment & Water or in the public domain, interviews with individuals with information about the site, and a limited amount of sub-surface explorations**. The passage of time, manifestation of latent conditions or impacts of future events may require further exploration at the site and subsequent data analysis, and re-evaluation of the findings, observations and conclusions expressed in this report.

In preparing this report, KBR has relied upon and presumed accurate certain information (or absence thereof) relative to **the sites considered and the surrounding environments** provided by government officials and authorities, the Client and others identified herein. Except as otherwise stated in the report, KBR has not attempted to verify the accuracy or completeness of any such information.

The findings, observations and conclusions expressed by KBR in this report are not, and should not be considered, an opinion concerning **the final scope of works for each option and associated capital and operating costs**. No warranty or guarantee, whether express or implied, is made with respect to the data reported or to the findings, observations and conclusions expressed in this report. Further, such data, findings, observations and conclusions are based solely upon **site conditions, information and drawings supplied by the Client and gained from our site visit** in existence at the time of the investigation.

This report has been prepared on behalf of and for the exclusive use of the Client, and is subject to and issued in connection with the provisions of the agreement between KBR and the Client. KBR accepts no liability or responsibility whatsoever for or in respect of any use of or reliance upon this report by any third party

Revision History

Revision	Date	Comment	Signatures			
			Originated by	Checked by	Technical Approval	Project Approval
0	06/08/21	Issued for Use	SAW	PJS	PJS	PJS
1	06/10/21	Issued for Use	SAW	PDC	PJS	PJS
2	1/12/21	Issued for Use	SAW	PDC	PJS	PJS

Contents

List of tables

1 Introduction

1.1 PURPOSE OF THIS REPORT

This report outlines the basis of concept design for the Coorong Infrastructure Investigations Project (CIIP) Engineering Services engagement. The purpose of the basis of design is to:

- Communicate the basis of design information to the Client for their agreement.
- Summarise proposed design standards, manuals, and technical documents applicable to the design of the infrastructure relevant to the CIIP engagement.
- Document the target design and performance criteria for the infrastructure options.
- Document constraints having a bearing on the design of the infrastructure options.

1.2 PROJECT BACKGROUND

The CIIP forms part of the Healthy Coorong, Healthy Basin (HCHB) program. As part of the CIIP, Kellogg Brown & Root Pty Ltd (KBR) has been engaged by Department for Environment & Water (DEW) to investigate the engineering feasibility of long term infrastructure and management regimes to improve the ecological health of the Coorong, provide the opportunity for habitat restoration and to sustain the ecosystem for many years to come.

The Coorong as a system has a special connection to many community members, and importantly the Traditional Owners, as a place of recreation, natural beauty, education, and sustainment of livelihoods. DEW is focused on engagement of the community in decision making as part of the CIIP and has already sought feedback from the community on preferred options for improvement of the ecological health of the Coorong South Lagoon in particular. This list of options has guided development of the infrastructure options that will now be considered in this feasibility and concept design study.

The CIIP Engineering Services engagement will allow engineering assessment of these shortlisted infrastructure options to determine potential suites of infrastructure that will achieve the objectives set by the HCHB program and provide confidence in the expected outcomes of the infrastructure to be implemented.

1.3 SHORTLISTED INFRASTRUCTURE OPTIONS AND SCOPE OF WORKS

As part of the CIIP Engineering Services engagement, KBR will complete options assessment and concept design for a range of potential infrastructure options aimed at better managing inflows and outflows from the Coorong South Lagoon (CSL) to improve its ecological health. These designs will be used to inform the feasibility assessment reporting and justification of the proposed long term infrastructure and management regimes ahead of implementation.

The shortlisted infrastructure options and a high level summary of their scope of works is summarised in Table 1.

Table 1 Scope of works for shortlisted infrastructure options

Option	Description
1A	Passive open channel connection between Lake Albert and Coorong North Lagoon: 1,000 ML/d passive connection between Lake Albert and Coorong North Lagoon via an open channel with regulator structure.

Option	Description
1B	**Passive piped connection between Lake Albert and Coorong North Lagoon:** 1,000 ML/d passive connection between Lake Albert and Coorong North Lagoon via one or more closed conduits (pipes) with regulator structure.
2	**Dredge Parnka Point:** 18.5 km long to a target depth of between -1.2 mAHD and -1.4 mAHD centred around Parnka Point to varying width.
3A	**Intermittent pumped connection out of Coorong South Lagoon – near shore discharge structure:** 1,000 ML/d pumped connection out of Coorong South Lagoon via pumps on a pontoon structure adjacent Younghusband Peninsula to a near shore discharge structure (within Southern Ocean).
3B	**Intermittent pumped connection out of Coorong South Lagoon – low visual impact discharge structure:** 1,000 ML/d pumped connection out of Coorong South Lagoon via pumps on a pontoon structure adjacent Younghusband Peninsula to a beach discharge structure (likely within tidal zone).
3C	**Pumped connection out of Coorong South Lagoon – near shore discharge structure:** 250 ML/d pumped connection out of Coorong South Lagoon via pumps on a pontoon structure adjacent Younghusband Peninsula to a near shore discharge structure (within Southern Ocean).
3D	**Pumped connection out of Coorong South Lagoon – low visual impact discharge structure:** 250 ML/d pumped connection out of Coorong South Lagoon via pumps on a pontoon structure adjacent Younghusband Peninsula to a beach discharge structure (likely within tidal zone).
4A	**Bi-directional pumped Southern Ocean connection – one location, separate pumping stations, pump in location with caisson structure:** 350 ML/d bi-directional pumped connection into and out of Coorong South Lagoon via jetty mounted pumps on 300 m long jetty in the Southern Ocean with caisson structure and pumps on a pontoon structure in Coorong South Lagoon. Pumping can only occur in one direction at any one time.
4B	**Bi-directional pumped Southern Ocean connection – one location, one common pumping station, near shore discharge / intake protected by breakwater:** 350 ML/d bi-directional pumped connection into and out of Coorong South Lagoon via a common dry well pumping station positioned within Younghusband Peninsula with reversible flow pipes and a single set of pumps. Pumping can only occur in one direction at any one time. Near shore protected discharge / intake provided.
5A	**Simultaneous pumped Southern Ocean connection – two locations, separate pumping stations, pump in location with caisson structure and pump out location with a near shore discharge structure:** 350 ML/d simultaneous pumped connection into and out of Coorong South Lagoon via jetty mounted pumps on 300 m long jetty in the Southern Ocean with caisson structure and pumps on a pontoon structure in Coorong South Lagoon with infrastructure positioned at two separate locations allowing circulation of flows within Coorong South Lagoon (i.e. pumping in at Parnka Point and pumping out at Woods Well). Pumping can occur concurrently through each pumping station.

Option	Description
5B	**Simultaneous pumped Southern Ocean connection – two locations, separate pumping stations, pump in location with caisson structure and pump out location with a low visual impact discharge structure:** 350 ML/d simultaneous pumped connection into and out of Coorong South Lagoon via jetty mounted pumps on 300 m long jetty in the Southern Ocean with caisson structure and pumps on a pontoon structure in Coorong South Lagoon with infrastructure positioned at two separate locations allowing circulation of flows within Coorong South Lagoon (i.e. pumping in at Parnka Point and pumping out at Woods Well). Pumping can occur concurrently through each pumping station.
6	**Passive open channel connection between Lake Albert and Coorong North Lagoon:** 1,000 ML/d passive connection between Lake Albert and Coorong North Lagoon via an open channel with regulator structure.

1.4 EXCLUSIONS FROM THE SCOPE OF WORK

The CIIP design scope of work excludes the following:

- Improvements to the ecological state of the Coorong North Lagoon or Lake Albert.
- Review and assessment of the River Murray mouth dredging regime and flow conditions.

1.5 REFERENCE DOCUMENTS AND INPUT DATA

In parallel with the CIIP Engineering Services engagement, several additional technical studies have been or are being undertaken by DEW to provide guidance and information to assist in selection of the preferred concept designs. These parallel studies have included:

1.5.1 Completed surveys and studies

- Hydrodynamic modelling study (completed by DEW, reference DEW Technical Report v2.1, December 2020).
- Hydrodynamic, biogeochemical and habitat modelling study (completed by BMT, reference R.10780.0001.00, May 2021).
- Bathymetric survey of the Coorong lagoons in the vicinity of the locations proposed for dredging.
- Hydrological assessment of the yield of the South East Flows Augmentation.

1.5.2 Ongoing or future surveys and studies

- Stage 2 hydrodynamic modelling scenarios.
- Stage 2 hydrodynamic, biogeochemical and habitat modelling scenarios.
- Geotechnical investigations associated with the engineering services required under this engagement (engaged and coordinated by KBR).
- Engineering survey associated with the engineering services required under this engagement (engaged and coordinated by KBR).
- Geophysical survey in the Southern Ocean for a proposed infrastructure alignment (4 km long x 1 km wide expected survey extent).
- Geophysical survey in the Parnka Narrows (dredge alignment) to determine if there is a historical channel that has been infilled with soft materials or sediments over time (pending approval).

- Geophysical survey of one or more proposed infrastructure alignments through Younghusband Peninsula to investigate expected geology of dune system (pending approval).
- Additional surveys or investigations identified in the gap analysis memorandum (pending approval).

2 List of Principal design codes

2.1 APPLICATION OF STANDARDS AND DESIGN CODES

All standards, specifications and design codes referenced, and all applicable national and international standards and codes, local and statutory regulations, and written instructions will be complied with.

If any dispute arises between standards, design codes or other regulations, the following order of precedence will apply:

- Government legislation, principally the current South Australian Workplace Health and Safety Act and its Regulations and any associated Codes of Practice.
- Standards or codes of practice nominated by the Principal and approved in writing by the Superintendent.
- The Principal's own engineering and safety standards.
- The contents of the technical specification and drawings prepared as part for this project.
- Australian Standards.
- International Standards.
- Other standards or codes of practice relevant to the scope of works.

2.2 DESIGN STANDARDS

2.2.1 Australian Standards

The Australian standards in Table 2, will be referenced in development of design documentation.

Table 2 Australian standards and other reference codes

Code	Title
BCA (2019)	Building Code of Australia (2019) (contained within the National Construction Code, NCC)
NCC (2019)	National Construction Code
AS 1100 Set	Technical drawing
AS 1101 Set	Graphic symbols for general engineering
AS 1170.0-2002	Structural design actions - Part 0: General Principals
AS 1170.1-2002	Structural design actions - Part 1: Permanent, imposed and other actions
AS 1170.2-2011	Structural design actions - Part 2: Wind actions
AS 1170.4-2007	Structural design actions - Part 4: Earthquake actions in Australia
AS 1181-1982	Methods of measurement of civil engineering quantities
AS 1345-1995	Identification of the contents of pipes, conduits and ducts
AS 1428.1-2009	Design for access and mobility - Part 1: General requirements for access - New building work

Code	Title
AS 1428.2-1992 R2015	Design for access and mobility- Part 2: Enhanced and additional requirements—Buildings and facilities
AS 1477-2006	PVC pipes and fittings for pressure applications
AS 1597.1-1996	Precast reinforced box culverts – Small culverts (not exceeding 1,200 mm span and 1,200 mm height)
AS 1597.2-1996	Precast reinforced concrete box culverts - Large culverts (from 1,500 mm span and up to and including 4,200 mm span and 4,200 height)
AS 1627 Set	Metal finishing
AS 1646-2007 (R2018)	Elastomeric seals for waterworks purposes—general requirements
AS 1657-2018	Fixed platforms, walkways, stairways and ladders - Design, construction and installation
AS/NZS 1664-1997	Aluminium structures code
AS 2033-2008	Installation of polyethylene pipe systems
AS 2129-2000	Flanges for pipe, valves and fittings
AS 2159-2009	Piled footings design and installation
AS 2200-2006	Design charts for water supply and sewerage
AS/NZS 2280-2012	Ductile iron pipe and fittings
AS 2312.1-2014	Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings – Part 1 Paint coatings
AS 2566 Set	Buried flexible pipelines
AS 2638.2-2011	Gate valves for water works purposes – resilient seated
AS 2067-2016	Substations and high voltage installations exceeding 1kV AC
AS 2832 Set	Cathodic protection of metals
AS 2870-2011	Residential slabs and footings
AS/NZS 3000-2018	Wiring Rules
AS 3571 Set	Plastics Piping Systems – glass-reinforced thermoplastics (GRP) systems based on unsaturated polyester (UP) resin
AS 3600-2018	Concrete structures
AS 3679-2010	Structural steel – Hot rolled bars and sections
AS 3678-2011	Structural steel – Hot rolled plates, floorplates and slabs
AS 3798-2007	Guidelines on earthworks for commercial and residential developments
AS 3962-2020	Guidelines for the design of marinas
AS/NZS 3735-2001	Concrete structures for retaining liquids

Code	Title
AS/NZS 4024 Set	Safety of machinery
AS/NZS 4058-2007	Precast concrete pipes – Pressure and non-pressure
AS 4087-2004	Metallic flanges for waterworks purposes
AS 4100-2020	Steel structures
AS/NZS 4129	Fittings for Polyethylene (PE) pipes for pressure applications
AS/NZS 4130	Polyethylene (PE) pipes for pressure applications
AS/NZS 4441-2017	Oriented PVC (PVC-O) pipes for pressure applications
AS 4671-2001	Steel reinforcing materials
AS 4678-2002	Earth-retaining structures
AS 4991-2004	Lifting devices
AS 4997-2005	Guidelines for the design of maritime structures
AS 5100 Set	Bridge Design
AS/NZS 7000-2016	Overhead Line Design

2.2.2 International standards

The international standards in Table 3 will be referenced in development of design documentation.

Table 3 International standards

Code	Title
ISO 21650:2007(E)	Actions from waves and currents on coastal structures
BS 6349-1-2016	Maritime Structures, Part 1: Code of Practice for General Criteria
ASTM A312/A312M-21	Standard Specification for Seamless, Welded and Heavily Cold Worked Austenitic Stainless Steel Pipes
ASTM A666-15	Standard Specification for Annealed or Cold Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bars
ASTM F593-17	Standard Specification for Stainless Steel Bolts, Hex Cap Nuts, Screws and Studs
AWS D1.6-2017	Structural Welding (stainless steel)
ISO 3514	Chlorinate polyvinyl chloride (CPVC) pipes and fittings – specification and determination of density
IECA (international Erosion control Association)	Best Practice Erosion and Sediment Control (BPESC) document
IALA 0139	Marking Man-Made Offshore Structures

2.2.3 Other applicable standards and specifications

The following standards and specifications listed in Table 4 will be referenced in development of design documentation.

Table 4 Other applicable standards and specifications

Code	Title
SA Water TS 4	Packing sand (pipe embedment and trench fill sand)
SA Water TS 27	Bolt tightening procedure for mechanical plant
SA Water TS 15	Protection of steelwork in submersible environments.
SA Water TS 16	Protection of steelwork in atmospheric environments
SA Water TS 18	Protection of steelwork in buried environments
SA Water TS 0132	Operating and maintenance manuals
SA Water TS 0133	Requirements for asset labelling
SA Water TS 0146b	Requirements for pump specification, procurement and testing and the preparation of pump datasheets
SA Water TS 0204	Colour coding of pipework
SA Water TS 0230	Gate and butterfly valve requirements
SA Water TS 0300	Supply and installation of low voltage equipment
SA Water TS 0302	Stand-alone solar power supply systems
SA Water TS 0340	Design, supply, installation and testing of high voltage equipment
SA Water TS 0600	Water tightness testing of liquid retaining structures
SA Water TS 0630	Coarse aggregates for civil works
SA Water TS 0710	Concrete
SA Power Networks	Service and installation rules – Manual No. 32
WSAA WSA-01	Polyethylene Pipeline Code
WSAA WSA-03	Water Supply Code of Australia
Australasian Society for Trenchless Technology	Standard for Micro tunnelling & Pipe Jacking

2.2.4 Guidelines and manuals

A non-exhaustive list of the guidelines and manuals that will be referenced in development of design documentation includes:

- CIRIA, CUR, CETMEF (2007). 'The Rock Manual. The use of rock in hydraulic engineering' (2nd Ed.). C683, CIRIA, London, United Kingdom.

- EurOtop (2018). 'Manual on wave overtopping of sea defences and related structures: An overtopping manual largely based on European research, but for worldwide application' (2nd Ed.), van der Meer et. al., December 2018.
- US Army Corps of Engineers (2008). 'EM 1110-2-1100 – Coastal Engineering Manual'. Washington, DC, USA.
- Australian Pipelines and Gas Association Ltd: Code of Environmental Practice.
- Environment Project Authority SA: A guide to managing acid sulphate soil risks in South Australian River Murray wetlands.
- Safe Work Australia – Noise.

2.2.5 Other documents and reports

The current version of the following Standards, Manuals, Acts and Guidelines will be consulted where appropriate:

- Environmental Planning, Department of Environment and Heritage Protection (2013). 'Coastal hazard technical guide - Determining coastal hazard areas'.
- Environmental Planning and Policy, Department of Environment and Science (2018). 'Guideline: State Development Assessment Provisions State Code 8: Coastal development and tidal works'.
- Gourlay, M.R. (1996a), 'Wave set-up on coral reefs. 1. Set-up and wave-generated flow on an idealised two dimensional horizontal reef', Coastal Engineering 27, pp161-193.
- Gourlay, M.R. (1996b), 'Wave set-up on coral reefs. 2. Set-up on reefs with various profiles', Coastal Engng 28, pp17-55.
- Neville, A.M. (2012), 'Properties of concrete', 5th ed, Pearson, Harlow UK.
- Pilarczyk (1998) 'Structural Response' Design of revetments (Dutch Public Works Department (RWS)).
- Spangler, M.G. & Handy, R.L. (1973), 'Soil engineering', 3rd ed, Harper & Row, NY.
- Whitehouse (1998), 'Scour at marine structures', HRWallingford, DETR.
- Battjes, J.A. and Groenendijk, H.W. [2000] Wave height distributions on shallow foreshores, Coastal Engineering, 40 (2000) 161-182.
- SafeWork SA (2020) Excavation work, Code of practice.
- South Australia Power Networks Technical Standards.
- Australian Government Department of the Environment and Energy 2017: NATIONAL GREENHOUSE ACCOUNTS FACTORS.
- Australian Government, Department of the Environment, Matters of National Environmental Significance, Significant Impact Guidelines 1.1.
- Australian Government, Department of the Environment, National Assessment Guidelines for Dredging 2009.
- Aurecon (2009a) Data Collation Review and Preliminary Ecological Assessment Coorong, Prepared for SA Murray Darling Basin NRM Board.
- Aurecon (2009b) Preliminary Hydrodynamic Modelling Report Coorong Temporary Saline Water Discharge Prepared for SA Murray Darling Basin NRM Board.

2.2.6 Acts

Acts relevant to the engineering design include:

Commonwealth

- Environment Protection and Biodiversity Conservation Act 1999.
- Environment Protection (Sea Dumping) Act 1981.
- Underwater Cultural Heritage Act 2018 (replacing Historic Shipwrecks Act 1976).
- National Greenhouse and Energy Reporting Act 2007.
- National Environment Protection Council Act 1994 (specifically National Environment Protection (Assessment of Site Contamination) Measure 1999).
- Native Title Act 1993.
- Water Act 2007.

South Australia

- Aboriginal Heritage Act 1988.
- Work Health and Safety Act 2012.
- Work Health and Safety Regulations 2012.
- Native Vegetation Act 1991.
- Landscape South Australia Act 2019.
- Local Government Act 1999.
- Construction Industry Training Fund Act 1993.
- Crown Land Management Act 2009.
- Heritage Places Act 1993.
- Harbors and Navigation Act 1993.
- Electricity Act 1996.
- Electricity (General) Regulations 2012.
- Environment Protection Act 1993.
- Environment Protection Regulations 2009.
- Mining Act 1971.
- River Murray Act 2003.
- National Parks & Wildlife Act 1972.
- Planning, Development and Infrastructure Act 2016.
- Native Title (South Australia) Act 1994.
- Marine Parks Act 2007.

3 Performance requirements

3.1 FLOW METRICS

The target flow metrics summarised in Table 5 form the design basis for the project, and consequently inform scale of infrastructure required for each design option. Some refinement to the parameters stated in this table will be required as engineering design and documentation progresses.

Table 5 Design basis flow metrics

Option	Description	Water Source	Maximum daily target flow yield	Maximum annual target flow yield	Minimum flow required	Typical flow days	Frequency of Transfers
1	Passive connection between Lake Albert and Coorong North Lagoon	Bascombe Bay, Lake Albert	1,000 ML/d (with 0.5 mAHD in Lake Albert and 0.3 mAHD in Coorong North Lagoon)	89 GL (dry) – 196 GL (typical) (dependent on Lower Lakes inflows)	0	Between 143 days (with climate change) and 241 days (current conditions)	Typically, when flow over barrages is greater than 2,000 ML/d.
2	Dredge Parnka Point alignment	Coorong North Lagoon	n/a (complementary action)	n/a (complementary action)	n/a	365	Permanent operation (24 hours per day, 365 days per year).
3	Pumped connection out of Coorong South Lagoon	Southern Ocean	1,000 ML/d (intermittent operation only when Coorong South Lagoon water level > 0.3 mAHD) 250 ML/d (permanent operation)	To be confirmed	0	Between 137 days (current conditions) and 189 days (with climate change) @1000 ML/d 365 days @ 250 ML/d	Permanent operation (24 hours per day, 365 days per year). Permanent operation (24 hours per day, 365 days per year).
4	Bi-directional pumped Southern Ocean connection – one location, separate pumping stations	Southern Ocean	350 ML/d (max out) 350 ML/d (max in)	128 GL (total transfer volume at 350 ML/d flow rate)	0	365	Permanent operation (24 hours per day, 365 days per year) with pumping directions alternating.
5	Bi-directional pumped Southern Ocean connection – two locations, separate pumping stations	Southern Ocean	350 ML/d (max out) 350 ML/d (max in)	128 GL (in and out at 350 ML/d flow rate)	0	Between 222 days (current conditions) and 166 days (with climate change) @ 350 ML/d pump in 365 days @ 350 ML/d pump out	Intermittent operation for pump in (dependent on Coorong water levels) and permanent operation for pump out (24 hours per day, 365 days per year).
6	Bi-directional passive piped connection into and out of Coorong South Lagoon	Southern Ocean	4,000 ML/d (maximum for ten x DN2000 pipes flowing into Coorong South Lagoon)	To be confirmed (total transferred volume)	0	365	Permanent operation (24 hours per day, 365 days per year).

3.2 CIVIL DESIGN

3.2.1 Geotechnical information

Existing geotechnical information is available from previous design assessment completed for the South East Flows Restoration Project and Lake Albert Connector Investigations. These previous investigations will be referenced as part of design development to inform the desktop studies and field investigations to be completed. Relevant parameters can be incorporated within the basis of design once identified.

At this stage of design, specific geotechnical information is not available within the Younghusband Peninsula. Geophysical survey will be completed to assist in better understanding geotechnical conditions.

3.2.2 Open channel design philosophy

In the design of open channels, consideration will be given to maintaining the existing drainage of the landscape through which it flows. In general, the water surface will be kept below existing ground level where reasonably and practically possible. Where this cannot be achieved, flows will be contained by levees and catch drains will be provided to accommodate runoff from the local catchment or flow will be allowed to spill into other confined areas (as may be preferred). Sediment and erosion control planning will be incorporated here to minimise the impacts of sediment, nutrient loads and turbidity exiting the channel.

In areas where native vegetation is identified as being of high ecological value or sites of cultural significance are identified, the location of the spoil bank will be considered to minimise, where possible, the impact to these communities and the impact to cultural sites/values.

Batter slopes will be nominated to allow for safe vehicle and fauna access within a grass-lined channel, assuming the channel is constructed within existing farmland. This may be steepened dependent on geotechnical conditions and final adopted channel alignment. Fencing to channel alignment will be provided.

Crossing structures will be provided where required to allow local landholder or public road access requirements to be maintained. Crossing structures will be designed to utilise precast concrete culvert or pipe sections.

The following requirements will be adopted for the open channel design:

- A batter slope of 1V:4H will be adopted for all new open channels.
- Minimum bed width of 2 m will be adopted.
- A minimum top width of any levee or spoil mounds will be 3 m.
- A minimum access track width of 5 m will be provided adjacent to all open channels on both sides. Proposed track to be formed of natural materials but unsurfaced. Proposed design vehicle is a four wheel drive utility with no public access.
- At regulator structure, a hardstand will be provided allowing crane access and for other operational purposes.
- Rock armouring will be provided at the inlet and outlet of flow regulator and inlet and discharge headwalls to assist in erosion mitigation.
- A minimum crossing width of 4.5 m and a minimum load rating of 10 t will be adopted to suit access by emergency services vehicles (including CFS vehicles).
- A maximum height of any spoil mound will be 2 m.

- The open channel gradient will be selected considering local topography and design flow requirements ensuring the target flow rate can be achieved for the designed cross sectional area.
- Maximum permissible velocity for open channel: 0.5 m/s.
- Target velocity for culverts: 1 m/s.

3.2.3 Open channel hydraulic roughness

The following Manning's roughness coefficients (Manning's 'n') will be assumed for the hydraulic design of open channel infrastructure:

- Earthen open channel 0.030 – 0.035
- Box culvert or pipe 0.011 – 0.013 (reinforced concrete).

3.2.4 Open channel freeboard

Minimum freeboard within open channels will be set to 200 mm where the design water level is below the existing ground level (may vary slightly depending on final alignment).

3.2.5 Hydraulic boundary conditions

Table 6 presents a summary of hydraulic boundary conditions to be adopted for design.

Table 6 Hydraulic boundary conditions

Location	Boundary condition (mAHD)	Comment/description	Reference
Coorong North Lagoon (max)	1.00	Expected maximum operating water level	Adopted from review of water.data.sa.gov.au data
Coorong North Lagoon (min)	-0.25	Adopted minimum water level	Adopted from review of water.data.sa.gov.au data
Coorong South Lagoon (max)	1.10	Adopted maximum water level	Adopted from review of water.data.sa.gov.au data
Coorong South Lagoon (min)	-0.40	Adopted minimum water level	Adopted from review of water.data.sa.gov.au data
Lake Albert (max)	1.20	Adopted maximum water level	Adopted from review of water.data.sa.gov.au data
Lake Albert (min)	0.40	Expected minimum operating water level	Adopted from review of water.data.sa.gov.au data
Southern Ocean (max)	0.876	Highest Astronomical Tide	Bureau of Meteorology tidal planes
Southern Ocean (min)	-0.747	Lowest Astronomical Tide	Bureau of Meteorology tidal planes

3.2.6 Dredging parameters

For the dredge design option within the Coorong Estuary, the following design parameters will be adopted:

- Dredging tolerance/survey uncertainty: - 200 mm/+ 0 mm (i.e. over-dredge of up to 200 mm and under-dredge of up to 0 mm).
- Batter slopes for dredge profile: 1V:5H (may vary due to geotechnical conditions).

Until advised otherwise, dredgate is assumed to not be re-useable (i.e. unsuitable for beach nourishment or other beneficial reuse purposes). This will be reviewed following geotechnical investigations and testing.

Dredgate is assumed to contain potential acid sulphate soils (PASS). Any material that does not remain in a saturated state and is placed on land will require treatment as part of the material management and ultimate disposal process. This will be reviewed following geotechnical investigations and testing.

For any material to be placed on land, treatment ponds or bunds will be required to be >2 times the dredge volume in situ to allow for decant water.

It is assumed that any decant water will be returned to the Coorong.

The provision of channel markers are likely and will be reviewed through the safety in design process.

3.2.7 Pipeline loading

For the structural design of buried pipelines, the following design parameters for flexible pipe design to AS 2566.1 will be adopted:

- Live loading: A160 axle load (16 t axle load) (W80 wheel load – 8 t wheel load) in accordance with AS 5100.2.
- Unit weight of dry soil of 20 kN/m^3.
- Minimum pipe cover of 750 mm.
- All pipelines supplied by a pump will be assessed under full vacuum conditions (98 kPa).
- Live load and vacuum will be applied concurrently to assess the potential for buckling within easements and roadways (very low probability elsewhere).

Key pipeline design criteria are:

- Pressure pipelines (pumped flow) designed assuming full pipe flow with reference to Colebrook White roughness coefficients and the Colebrook-White equation. It is noted that due to the hydraulic grade under certain flow conditions the pipeline will operate partially full and will drain when the pumps stop pumping.
- Gravity pipelines or conduits (no pumped flow or passive pipe systems) will be assessed assuming partial pipe or full pipe flow with reference to either Manning or Colebrook White roughness coefficients used within the Manning equation (partial pipe flow) or the Colebrook White equation (full pipe flow).
- The minimum falling grade on the pipeline sections that operate under partially full conditions will be 0.4%. However, it is important to note that the modelled scenarios by DEW assume a horizontal grade of 0% under full pipe flow conditions.
- The minimum design pipeline velocity under partially full conditions will be a self-cleaning velocity of 0.7 m/s.
- The minimum operating flow rate and velocity for pipelines under pressurised conditions will be determined following selection of appropriate sand entrainment mitigation features.
- Pipes will be designed for entrained air transport, to prevent air accumulating within pipes.
- Pressure pipeline diameters will be set targeting a velocity of greater than 2.0 m/s minimising potential accumulation of marine growth and ensuring efficient pipe diameter selection.

- Pipeline head loss calculations will be completed in accordance with AS 2200 (Design charts for water supply and sewerage). Proposed roughness values will be increased from the values provided in AS 2200 to account for marine growth that will be experienced in seawater.
- Detailed surge analysis will only be undertaken during the detailed design stage. An allowance of 1.75 times of operating pressure will be considered through concept design.
- Pipe temperature range will be 0˚C - 20˚C for all buried pipes and pipes submerged in water.

3.2.8 Pipeline hydraulic roughness

The following Colebrook White roughness coefficients (k) will be assumed for the hydraulic design of pipeline infrastructure. These values are noted to exceed the values presented in AS 2200, which has been adopted to account for potential marine growth:

- High density polyethylene 0.015 mm – 0.030 mm
- Reinforced concrete 0.60 mm
- Glass reinforced plastic (GRP) 0.035 mm

No defined pig launching stations will be provided.

3.2.9 Temperature de-rating

Generally, it is expected that the infrastructure will be regularly operated assisting in maintaining a pipe wall temperature similar to the water temperature being conveyed (up to 30ºC). Where intermittent operation is expected (e.g. Option 3A & Option 3B), pipe wall temperatures may increase but the pipe will not be under pressure at these elevated temperatures.

A reduction factor of 50% of the pipe pressure class will be applied for GRP pipe based on guidance from Clover Pipe (Superlit GRP Pipe & Fittings – GRP Pipeline System Version 1.0). This allows for a pipe wall temperature of up to 50ºC. A minimum GRP pressure class of PN10 will be adopted to accommodate this temperature de-rating.

3.2.10 Trench requirements

Pipe embedment design will be completed to the requirements of AS 2566.1, with the following assumptions:

- The allowable horizontal bearing pressure of 50 kPa (subject to refinement following receipt of geotechnical investigation results).
- The allowable vertical bearing pressure of 100 kPa (subject to refinement following receipt of geotechnical investigation results).
- Native soil modulus as per Table 7 (subject to refinement following receipt of geotechnical investigation results).

Table 7 Native soil modulus

Location	Native soil modulus	Reference
Bascombe Bay, Lake Albert	5 MPa	CMW Geosciences Investigation Report, ADL2021-0001AD Rev 0, 31 August 2021.
Coorong Estuary	1 MPa	Adopted based on industry minimum.
Younghusband Peninsula	3 MPa	Adopted assuming dense sand at depth.

- Groundwater is assumed to be encountered at mean sea level through Younghusband Peninsula (to be confirmed following geotechnical investigation).
- Embedment soil modulus of 7 MPa.
- Trench widths will be in accordance with AS 2566.1.
- Minimum clearance between water mains and underground services will be designed as per WSA 03-2011, as per Table 8.

Table 8 Minimum clearances between underground services

.	Minimum Horizontal Clearance		Minimum Vertical Clearance
	≤ DN200	> DN200	
Water mains > DN375	600	600	300
Water mains ≤ DN375	300	600	300
Telecommunication conduits and cables	300	600	150
Electricity conduits and cables	500	1000	225

3.3 MECHANICAL DESIGN

3.3.1 Mechanical equipment

In the selection and placement of equipment, the designer will ensure that access and egress requirements are maintained in accordance with the South Australian Work Health and Safety Regulations. The equipment will also be procured, installed and maintained in accordance with the relevant Australian Standards.

Plinths for equipment will be located with consideration to operating and maintenance access. Manufacturer's recommendations for minimum maintenance access will be followed.

A minimum clearance of 900 mm will be maintained between equipment, including concrete plinths, for personnel access.

A minimum clearance of 1,200 mm will be maintained between equipment, including concrete plinths, where maintenance is required.

All equipment will be installed in accordance with the Work Health and Safety Act, supported by the Work Health and Safety Regulations, in respect to noise levels. In addition, all equipment will be installed in accordance with mechanical equipment datasheets and manufacturer's specifications. All equipment will have a maximum allowable sound pressure level (SPL) of 85 dB(A) at a distance of 1 m in accordance with the Safe Work Australia guidelines.

3.3.2 Pumps

Where possible, pumps will be sized so that duty points correspond with pumps readily available in the marketplace. Variable speed drives and mechanical seals will be considered in the design.

Equipment bases for pumps (where required) will be designed based on the following:

- Equipment bases will be rigidly constructed of fabricated steel unless otherwise approved.
- Equipment will be assembled and mounted on the base in the shop prior to delivery where applicable.
- Tapped holes will not be used in bases for mounting components.

- Bases will be designed to avoid the accumulation of foreign matter such as dirt or water.

Pump intakes will be designed based on the following:

- Where primary screens are included, they will be designed to exclude gross debris, have approximate aperture size of 25 mm and be removable for maintenance and cleaning.
- Intakes will be located >500 mm above the sand bed after accounting for sand accretion.
- Intakes will be located where there is minimal suspended sand in the water column where possible. This will involve locating intakes in the Southern Ocean at a point where the water depth exceeds 12 m (TBC) or locating them within a structure that removes suspended sand.
- It is assumed that there is minimal sand (or other suspended solids) in suspension in the Coorong.
- Pump well floors will be sloped to allow for sand accumulation away from the intakes and for easy removal of sand.
- To avoid air entrainment, the intakes will be >1.0 m below the low water level in the Coorong and >1.5 m (TBC) below low tide plus the design wave trough in the Southern Ocean.

3.3.3 Valves

Valving will be designed based on the following points:

- All valving will be designed for easy operational and maintenance access.
- Manual isolation valves will be included on pipework where required to enable the process requirements to be achieved.
- Valve selection will consider corrosion issues, sedimentation and possible blockages.
- Non-return valves will be included in horizontal sections of pipework and in general will have the same nominal diameter as the pipework.
- Non-return valves will have low inertia, low friction and short travel to closure.
- Pneumatic valve actuators will be sized based on an instrument air pressure of 690 kPa(g).
- All actuators will include limit switches to remotely indicate valve position.

3.4 ELECTRICAL DESIGN

3.4.1 Source of Power

Source of power (including power generation) will be investigated but it is expected to be an SAPN mains power network extension and/or one or more renewable sources. The use of diesel-powered equipment (or generators) will not be specified unless utilised as a hybrid solution with renewable sources for power reliability.

Estimates of the diurnal and seasonal load profiles will be considered when evaluating any sources of electrical power.

Currently there are 33 kV overhead lines available some 50 km away via the SAPN 33 kV overhead lines at Tintinara or Meningie. This will require an overhead network extension to a location in proximity to the pump station.

Step down transformer/s will be required to step down from 33 kV to the required motor voltage & LV. Transformer & switchgear enclosures will be suitable for a marine environment.

3.4.2 Pump Motors

All motor drives, particularly those that are direct online, will be started in a sequential pattern so that there will be no co-incident starting of large motor drives. Variable speed drives (VSDs) will be included for pump starting allowing ramp up from low speed to the set point speed to minimise the electrical starting loads.

For maintenance purposes, each motor drive may be switched into local control and stopped or started from the respective motor control centre.

The point of isolation of motor drives will be at the respective motor control centre. Locking facilities will be provided on each motor isolator with safety interlocks fitted to each module door.

Harmonic filtering and power factor correction will be provided for compliance with Australian standard requirements and/or SAPN requirements where an SAPN grid connection is proposed.

3.4.3 Remote Monitoring and Control

Remote control and remote monitoring requirements will be confirmed throughout the design, but this is likely to be a Cloud based SCADA system. It is expected that a combination of manual operation and remote operation will be incorporated to strike a balance between overly complex control systems and simplified operation of the infrastructure. However, it is expected for each motor drive, the following control and indication facilities will be provided at the operator workstations generally in accordance with SA Water TS 0350 design philosophy & SA Water TS 0351 functionality requirements:

- Drive status.
- Availability indication.
- Fault status.
- Start drive.
- Stop drive.
- Speed & current status (for VSD and SS).
- Speed reference (for VSD and SS).

3.4.4 Local control stations

A local control station will be mounted adjacent to the motors to facilitate maintenance operations. Each local control station will include a start and stop pushbutton or key switch.

The requirement for local control stations will be assessed on a case-by-case basis.

3.4.5 Cathodic protection of electrical supplies

Cathodic protection is not required at this point; however, should active cathodic protection system(s) be required (refer Section 6.2.6), the design will consider electrical power supplies for their cathodic protection controllers.

3.5 MARINE STRUCTURE CHARACTERISTICS

3.5.1 Jetty intake / outfall structures

Jetty structures will be proposed as ‘over the top’ construction due to persistent heavy wave action in the Southern Ocean.

Jetty structures proposed in the Coorong will also assume to be constructed via the same method for convenience of construction.

Jetty structures will comprise the following:

- Short spans (i.e. 10 m) to minimise the size of the cantilever pile guide.
- Tubular steel piles.
- Deck is assumed precast concrete headstocks, steel beams and precast concrete deck. The deck will be a minimum of 4.5 m wide (single lane) to suit construction and maintenance cranes.
- Deck loads and design allowances will be per the design criteria Table 9.

It is assumed that public access to a jetty structure will be permitted (unless the facility is manned to prevent public access). However, no provisions for vessel berthing will be incorporated.

3.5.2 Pontoon structures and access gangways

Pontoons are only feasible in the Coorong South Lagoon and not in the Southern Ocean due to the high energy metocean conditions.

Pontoon structures and gangways will be designed in accordance with AS 3962.

Pontoons will comprise the following:

- Steel pontoons assumed.
- Pontoons to have a minimum of four watertight compartments.
- Galvanic cathodic protection assumed.
- Automatic bilge pumps are required within the pontoons.
- Gangways will provide access to the shore which can be accessed by pedestrians.

It is assumed that public access to a pontoon structure will be permitted (unless the facility is manned to prevent public access). However, no provisions for vessel berthing will be incorporated.

3.5.3 Submarine trench requirements

It is assumed submerged pipe construction within the Coorong can be floated in and sunk with concrete weights. It is assumed that the Coorong has no meaningful surf zone.

It is assumed that a submarine pipe will have to be buried through the surf zone within the Southern Ocean (weighting of exposed pipes is not feasible due to the high current velocities encountered). It is assumed that the wave plus currents will be too severe to allow floating pipeline installation methods to be used.

It is assumed protection of submerged pipes against ship's anchors and fishing equipment is not required (refer Section 3.6.8).

3.6 MARINE DESIGN CRITERIA

The design will comply with the listed criteria and take account the provided information as described in Table 9.

Table 9 Design Criteria

Parameter	Value	Reference/comment
Deck load classification	15 kPa	AS 4997 Cl 5.3 imposed actions (live loads) Class 15 (15 kPa) for Bridge design code (W7, W8, A160, T44 loading) Small mobile crane up to 20 t SWL

Parameter	Value	Reference/comment
		Horizontal load applied at deck level, of at least 2.5% of the maximum permanent and imposed vertical actions
Design Wind Speeds	Regional gust wind speed: 1-year ARI (63.2% AEP): V = 28 m/s 100-year ARI (1% AEP): V= 44 m/s 1000-year ARI (0.1% AEP): V= 50 m/s	AS/NZS 1170.2 - Structural Design Wind Actions
Sea Level Rise (SLR)	1.0 m by 2100 (sea level rise to end of design life to be reconsidered during the life of the structure).	South Australian Coast Protection Board Policy (2016) – 29 July 2016
Design Storm Tide Event (DSTE) still water level	Ambient water level condition MSL = +0.747 mLAT Extreme water level condition (100-year ARI or 1% AEP): DSTE = +2.200 mLAT	Cape Jaffa Tidal Planes by BOM. Cape Jaffa EIS (2005). For design conditions
Design Waves	Ambient offshore wave condition Hs = 2.00 m, Tp = 13.00 s Design offshore wave condition (1000-year ARI or 0.1% AEP): Hs = 9.36 m, Tp = 25.85 s	Data provided by NOAA Wavewatch III for [-36.5,139.5]. AS 4997, for a design working life of 100 years in combination with an Importance Level of 2 for normal structures the design wave event is 1/1000 years. Offshore wave conditions must be transformed to inshore locations and considerations made to depth limiting wave heights.
Current Speeds	Wind driven current speed: 1-year ARI (63% AEP): 0.53 m/s 100-year ARI (1% AEP): 0.84 m/s 1000-year ARI (0.1% AEP): 0.96 m/s	Calculated using Sorenson (2006) Basic coastal eq. 5.28 Aurecon. (2009C), Coorong Temporary Saline Water Discharge SA Murray Darling Basin NRM Board - Preliminary Hydrodynamic Modelling Report
Hmax / Hs ratio	1.7	AS 4997, CL 5.9.2 Design wave heights
Seawater properties (Southern Ocean)	Water temperature: 12°C to 20°C Salinity: 35 to 36 ppt Density: 1,025 kg/m^3	Density assumed to be constant over this temperature range. Aurecon (2009a) Salinity typically fluctuates 35.6 to 35.7 ppt
Coorong South Lagoon water properties	Water temperature: 12°C to 30°C Salinity: 40 – 165 ppt Density: 1,120 kg/m^3	Density assumed to be constant over this temperature range Peak salinity on 3 March 2010 obtained from water.data.sa.gov.au, accessed 4 October 2021.
Wind loads	Wind loads on auxiliary structures shall be calculated in accordance with AS 1170: Part 2	
Wave loads	Wave loads shall be calculated in accordance with J.R, Morison. (1950) and Pilarczyk, K. (1998), Section 3.	

Parameter	Value	Reference/comment
Current loads	Current loads on piles and/or the deck of marine structures will be calculated in accordance with Clause 5.5 of AS 4997-2005. Drag coefficients shall be taken from AS 4997 and BS 6349.	
Buoyancy loads	Buoyancy loads shall include the uplift due to submergence in seawater considering a specific gravity of 1.025 t/m^3 for seawater. Buoyancy loads may be ignored where it can be demonstrated that buoyancy of submerged structural components does not contribute to higher stress levels in the structure. The buoyant weight of structural elements shall be used as appropriate in determining loading.	
Earthquake loads	Design earthquake loads shall be developed in accordance with AS 4997-2005 Section 5.1 (which references AS 1170.4). Note that for this design event the structure is considered to have an Importance Level of 2 as people may be on the structure during an earthquake (i.e. a warning to evacuate prior to an earthquake is not possible) Within offshore, sand medium full depth will be assumed. Within surf zone, dense sand full depth will be assumed. The design earthquake loading to AS 1170.4 is as follows: - Importance level: 2 - Probability factor, kp: 0.5 - Hazard factor, Z: 0.10 - Subsoil class: De (deep or soft soil site) - Earthquake design category: II	
Fauna	Consideration will be given to minimisation of harm to marine fauna (e.g. whales, fish, etc.). This may include provision of fish screens and minimisation of any snags that may entrap marine fauna.	
Shipping boating	Consideration will be given to provision of navigational aids as may be required to minimise potential for impacts to passing vessels (refer Section 3.6.8).	

3.6.1 Combined wave and water levels

All offshore wave conditions presented in Table 9 will be transformed to the relevant location using Battjes, & Groenendijk (2000).

Ultimate Limit States (ULS)

For structural design purposes (such as the determination of member sizing and ultimate design loads for structural elements) the ultimate limit state (ULS) design conditions will be applied.

Battjes, J.A. (1974), "Surf similarity" will be applied to the location of the wave and structure and checked against the transformed offshore wave.

It may also be conservatively assumed that depth-limited wave conditions occur inshore at the site under all ULS's. Therefore the ULS water level will be perfectly coincident with the ULS waves, for both the structural and hydraulic ULS's.

Deck levels of structures (i.e. jetties) will be set in accordance with Section 3.5.2.

Serviceability Limit States (SLS)

Serviceability limit state conditions relate to typical conditions that may be experienced during the life of the structure. SLS conditions will be considered for the assessment of overtopping and for the establishment of crest elevations.

Frequent event: This event will assume a MSL water level (plus allowance for SLR) combined.

3.6.2 Deck levels

Deck levels for offshore structures will be as low as practicable for functional access, considering sea level rise, storm tide and wave crest levels during frequent (SLS) and ultimate (ULS) events.

The deck height of a fixed structure will be above the ULS event still water level plus an allowance for:

- Wave crest level with air gap.
- Depth of structure deck.

Where this is not practical, Clause 3.1, AS 4997-2005 allows for jetties / marine structures in locations subject to storm surge situations to allow for periodic inundation provided the structure has been designed to withstand lateral loads and uplift from elevated water levels.

3.6.3 Design load factors and combinations

Load factors and combinations will be applied in accordance with AS 4997-2007 Section 5.12 and AS 1170.0 for limit state design.

3.6.4 Dead loads

The following dead loads (self-weights) will be adopted.

Table 10 Dead load (self-weight) unit weights

Material	Unit Weight
Concrete	24.5 kN/m³
Carbon Steel	78.5 kN/m³
Stainless Steel	80.0 kN/m³
Seawater	10.07 kN/m³
Timber	10.8 kN/m³

The buoyant weight of elements will be taken into account where it would otherwise increase structure resistance to a design action.

Live loads

As per AS 4997 a design live load of 15.0 kPa will be applied to the deck surface.

A Class 15 maritime structure is deemed suitable given methods of construction may involve mobile cranes.

3.6.5 Piles

Pile design and analysis will be in accordance with AS 4100, AS 2159 and AS 4997. The design will allow for long-term scour of the seabed at the pile locations.

Piles will be designed to resist design axial and lateral loading requirements, and will be developed with coordination between structural and geotechnical designers.

Assessment of appropriate design geotechnical reduction factors will be based on AS 2159 guidelines, to adequately represent geotechnical uncertainty.

Driveability for piles will be assessed based on wave equation analysis.

Dynamic wave analysis pile testing will be assumed as part of the pile driving quality assurance practices requiring regular testing of pile capacity.

3.6.6 Overtopping

Run-up and overtopping estimates for the SLS's only will be guided by the EurOtop (2018) *Manual on wave overtopping of sea defences and related structures*. The wave overtopping design performance targets (Refer Note 1 below) for the 'Frequent' and 'Extreme' SLS's are summarised below:

- SLS: 250 mL/day.
- USL: not relevant given the structure will be designed to survive and not operate in such extreme events with signage to warn pedestrians to keep clear.

3.6.7 Toe scour

The designs will consider the possibility of failure by scouring under the coastal structure toe and if it is found that the integrity of the structure could be affected by such scour, mitigation measures will be introduced into the design.

Toe scour dimensions will be estimated using the methods in Whitehouse 1998, Section 7.6, with the incident wave height 'H' in this reference assumed to be the significant wave height 'Hs'.

3.6.8 Marine traffic

The Southern Ocean coastline is not frequently accessed by marine traffic. Main navigation routes are >30 km offshore. Navigational changes shall be advised through issuance of a Notice to Mariners for both construction activities and for any permanent marine structures. Marine structures may be marked with a lighted beacon or marker as required. The requirement for markers will follow recommendations in IALA 0139 *Marking Man-Made Offshore Structures*.

3.6.9 Ocean intake and outfalls

Intakes and outfalls are to be located 500 mm above the maximum expected sand accumulation level.

Intake to be located where there is minimal suspended sand in the water column. In the Southern Ocean this is either in water more than 15 m deep (i.e. beyond the depth of closure), or else inside a structure that excludes suspended sand. In the Coorong, it is assumed that there is minimal sand in suspension.

Submerged outfalls in open ocean locations will be equipped with one-way duckbill valves (Tideflex or equivalent) to prevent ingestion of sand and debris during no and low-flow periods and prevent the formation of an internal salt wedge during the discharge of brine. This applies to Option 3 and Option 5 discharge outfalls only.

4 Design inputs

4.1 SURVEY AND DATUM

4.1.1 Units of measure

All drawings will be produced in metric units.

4.1.2 Coordinate system

For new drawings the coordinate system Map Grid of Australia (MGA2020) will be used. The project area is within MGA2020 Zone 54 South.

4.1.3 Levels

The vertical datum adopted will be the Australian Height Datum (AHD).

Limited tidal level information is available for the site. The proposed tide planes are adopted from Cape Jaffa (SA_TP012) and were provided by BOM, as this is the nearest, non-estuarine tidal station located near the Coorong, as described in Table 11.

Table 11 Southern Ocean tidal plane

Tidal Plane	mCD / mLAT	mAHD
Highest Astronomical Tide (HAT)	1.623	0.876
Mean High Water Springs (MHWS)	1.215	0.468
Mean High Water Neaps (MHWN)	0.932	0.185
Mean Sea Level (MSL)	0.747	0
Mean Low Water Neaps (MLWN)	0.562	-0.185
Mean Low Water Springs (MLWS)	0.279	-0.468
Lowest Astronomical Tide (LAT) / Chart Datum (CD)	0.00	-0.747

4.2 BATHYMETRY

Offshore bathymetry will be derived from Australian Hydrographic Charts and Naval Charts available from the Naval Hydrographic Office.

It is assumed over the design life that the offshore bathymetry does not alter significantly as it is not feasible to predict broader morphological changes over a 100-year design life.

Designs within the Coorong Estuary will rely on a combination of existing bathymetry survey files (Maritime Constructions 2021) and additional data acquired under this project to complete any gaps.

4.3 GEOTECHNICAL

No geotechnical information is currently available for the marine elements of design. The geotechnical conditions will be assumed to be medium sand at full depth for offshore and dense sand within the surf zone.

Initial stages of pile design will use five multiplied by the pile diameter for depth of fixity.

Liquefaction assessment under the design earthquake should be undertaken in detailed design.

5 Environment and sustainability

5.1 SUSTAINABLE DESIGN

5.1.1 Environmental protection methodology

Detailed design of the infrastructure options will aim to minimise environmental impact through:

- Minimising the extent and footprint of the works (including construction) in areas of native vegetation and Land Management Agreement areas.
- Construction during time periods which will minimise impacts to local species (e.g. migratory birds, nesting season etc).
- Minimising resource use, including minimisation of imported quarry materials and those required for ongoing operation and maintenance.
- Reuse of waste products including spoil or pipes/culverts where possible.
- Maximising opportunities to divert water for environmental benefit where possible, including retention and upgrade of existing wetland diversion and spill provisions (appropriate for open channel infrastructure options).
- Making use of existing infrastructure wherever possible.
- Renewable electrical power generation systems will be considered as part of the power supply arrangement.

During construction, works will be conducted in accordance with a Construction Environmental Management Plan (CEMP), to be prepared by the construction contractor. Protection of the environment will be provided through appropriate:

- Sediment and erosion controls.
- Spoil and stockpile management.
- Stormwater management.
- Water quality management.
- Terrestrial and aquatic/marine flora and fauna management.
- Management of dredged material.
- Management and treatment of actual or potential acid sulphate soils.
- Indigenous and non-indigenous cultural heritage management and protection.
- Storage of materials, chemicals, fuels and waste in appropriate facilities.
- Management of noise and air quality.
- Vehicle access, controlled vehicle access tracks.
- Allocation of laydown areas for construction.
- Minimisation of extent of temporary works.

The design process will identify requirements and constraints for the above which will be included in design reporting and drawings.

The design of infrastructure will also consider how environmental impact caused by operational and maintenance activities can be minimised. Consideration will be given to required infrastructure maintenance and operation activities, specifically access to the sites and the type of activities and frequency required.

5.1.2 Sustainability requirements

The design is to incorporate sustainability by:

- Aiming to minimise transport of material through sourcing local materials (where possible).
- Considering greenhouse gas emissions resulting from operational requirements.
- Incorporating recycled materials (where possible).
- Optimising design to reduce extent of works (where possible).
- Optimising design to reduce impact to native vegetation or sites of cultural significance (where possible).

5.2 ENVIRONMENTAL CONSIDERATIONS

5.2.1 Land management agreements

The proposed infrastructure options may require interaction with landholders as part of construction works and potentially the final infrastructure option and its nominated location. The extents and boundaries of these areas will be further defined during the design period.

5.2.2 Native vegetation

The extent of impact on native vegetation will be limited in so far as possible by the appropriate location of infrastructure. Potential offset areas may be required dependent on level of disturbed vegetation. This will be considered during the design process.

5.2.3 Aboriginal heritage

At present it is known that culturally significant areas are present along the Younghusband Peninsula (including Parnka Point), and the land parcels between Bascombe Bay and the Coorong North Lagoon.

Cultural heritage surveys will be completed during design development and any findings will be addressed within design documentation as appropriate.

5.2.4 Ramsar Wetland

The proposed infrastructure options occur within the Coorong and Lakes Alexandrina and Albert Ramsar Wetland site.

Ramsar wetlands are recognised as a matter of national environmental significance under the EPBC Act. Consequently, as the design progresses, any works that will have, or is likely to have, a significant impact on the ecological character of a Ramsar wetland must be referred to the Commonwealth.

5.2.5 Coastal processes

Consideration of coastal processes, including storms, waves, currents, tides, climate change and sea level rise is required during concept design as these will affect the design process and the ability to construct any of the proposed infrastructure options.

5.2.6 Sediment characteristics

Disturbance of actual or potential acid sulphate soils is likely given the locality and nature of sediments within the project area. Management and potential treatment of acid sulphate soils will be considered further during the concept design process.

5.2.7 Water quality

Majority of the proposed infrastructure options will result in the discharge of hypersaline water to the marine environment. The potential effects of this on baseline water quality conditions, marine ecology and benthic habitats will be considered further as part of the environmental impact review process.

5.2.8 Protected flora and fauna species

During the concept design process, potential risks to protected flora and fauna species will be identified through a preliminary environmental impact review process. Outcomes of the review will be used to inform the design processes and to avoid and/or minimise potential impacts where possible. This will be considered for all proposed infrastructure options covering marine, Coorong, Younghusband Peninsula and Lake Albert infrastructure.

5.2.9 Fishway

A passive fishway will be incorporated within the Lake Albert Connector Option 1A allowing target fish species to migrate from Coorong North Lagoon into Lake Albert bypassing the regulator positioned at Narrung Road. This fishway will be a rock riffle style fishway with a hydraulic gradient allowing 100 mm fall between resting pools. Design operating water levels for the fishway will allow passage of fish species between a top water level in Lake Albert of 1.2 mAHD and a low water level in Lake Albert of 0.4 mAHD (in line with the water level range specified in Table 6.

5.2.10 Fish exclusion screens

Fish exclusions screens will be fitted to all pump intakes to prevent aquatic life from being entrained into the pumping systems. The screens will be designed in accordance with the below:

- Approach water velocities under 0.12 m/s.
- Screens to have automatic self-cleaning functionality
- Fine mesh to protect fish adults, juveniles, larvae and eggs
- Maximum gridmesh size ≤ 3 mm.

5.2.11 Site access

The following site access constraints will be considered in the design:

- Driving access along beach to be facilitated.
- Boating access from North to South lagoons to be facilitated.
- Access to Younghusband Peninsula is assumed to be northwards along the beach from an access near 42 Mile Crossing or Tea Tree Crossing.
- Marine work using boats in the Southern Ocean will be minimised where possible due to unsafe and rough metocean conditions
- No scuba diving in the Southern Ocean will be proposed for construction or maintenance activities due to unsafe and rough metocean conditions.

6 Durability and life cycle requirements

6.1 DESIGN LIFE

The project specific design lives for the various elements are summarised in Table 12.

Table 12 Design life of project equipment and structures

Component	Design life (years)
Marine structures	100
Civil works and concrete structures	100
Valves, penstocks and flow control gates	30
Pumps	30
Control Equipment (SCADA, PLCs, VSD's)	15
Electrical equipment, transformers, switchgear	20
Above ground pipework (metallic)	30
Above ground pipework (plastic)	30
Buried pipework	50
Structural steel, stairs, platforms (with coating protection system and regular maintenance)	40
Stainless steel furniture and fixings	50
Steel grating and mesh, furniture and fixings	20

6.2 MATERIAL SELECTION

Material selection during design will be completed in consideration of material compatibility, environmental conditions, use of coatings, the application, minimum design lives and the repair and maintenance strategies.

6.2.1 Mechanical design

In order to achieve the intended design life, the minimum material requirements shown in Table 13 will be adopted.

Table 13 Minimum standard for materials and finishes

Element	Minimum standard
Structural steelwork	Hot dip galvanised steel with additional corrosion protection measures as may be required for the installation environment
Piping	u-PVC Series 1 in accordance with AS 1477 m-PVC Series 1 in accordance with AS 1477 c-PVC in accordance with ISO 3514 o-PVC in accordance with AS 4441 Glass reinforced plastic (GRP) in accordance with AS 3571 HDPE PE100 Series 1 in accordance with AS 4130 Grade 316 Stainless Steel

Element	Minimum standard
	Grade 2205 Duplex Stainless Steel Grade 2507 Super Duplex Stainless Steel
Fittings	u-PVC in accordance with AS 1477 c-PVC in accordance with ISO 3514 m-PVC in accordance with AS 1477 o-PVC in accordance with AS 1477 HDPE in accordance with AS 4129 Grade 316 Stainless Steel Grade 2205 Duplex Stainless Steel Grade 2507 Super Duplex Stainless Steel Ductile iron in accordance with AS 2280
Ball Valves	Polyethylene or polypropylene bodies, polyethylene or polypropylene wetted parts c-PVC Grade 316 Stainless Steel Grade 2205 Duplex Stainless Steel Grade 2507 Super Duplex Stainless Steel
Butterfly Valves	Ductile iron with fusion bonded polymeric coating bodies, rubber lined with 316 stainless steel internal disc and stem
Check Valves	Ductile iron, fusion bonded polymeric coating and rubber coated, ductile iron disc
Gate Valves (DN80 or greater)	Wafer check valves with stainless steel disk, and cast iron or stainless steel body
Knife-Gate Valves	Ductile iron with fusion bonded polymeric coating bodies, rubber coated or 316 stainless steel internal components, in accordance with AS 2638.2
Air valves (clean water)	316 stainless steel cast body and disc
Pumps	In accordance with SA Water Technical Standard TS 146b Diesel pumps are not permitted; pumps will be electrically driven but may be powered by a diesel generator
Non-pressurised tanks	Polyethylene

6.2.2 Concrete design

Reinforced concrete structures will be designed and specified in accordance with Australian Standards AS 4997and AS 3600.

The following properties in Table 14 will be applied.

Table 14 Concrete design properties

Property	Value
Exposure classification	C1 (Exposure Condition: Spray) or C2 (Tidal) In accordance with AS 5100.5 and AS 3600.
Concrete strength	50 MPa
	As per Table 6.4 and 6.5 of AS 4997

Property	Value
Reinforcement cover Concrete finishes	Trafficked areas: Stiff broom, steel trowel along edges Non-trafficked: Wood float or plastic coated ply off-form Stairs and ramps: Non-slip surface products/coating Stair nosings: Non-slip high visibility corrosion resistant nosing 10 mm arris/chamfer to all exposed edges Stair and handrail geometry as per AS 1657
Concrete cracks	Plastic shrinkage cracking will not occur if the specified curing regime and design mixed is applied by the constructor. The crack widths will be controlled by application of the requirements of AS 4997 Table 6.6 in the case of reinforced concrete. Reading this code together with AS 3600 an average surface crack width of 0.25 mm is implied in the AS 4997 Table 6.6 requirements. Assuming that prototype surface crack widths will vary randomly around this mean, crack widths up to 0.5 mm will be deemed to be satisfactory from durability and aesthetic viewpoints. If prototype surface crack widths greater than 0.5 mm are observed, they will be sealed with Xypex paste, after which they will be deemed to be satisfactory from durability and aesthetic viewpoints. Jointing and underlay quality will be used to control the occurrence of cracks in unreinforced concrete.

6.2.3 Steelwork design

Steelwork design for marine structures will be in accordance with AS 4100 and AS 4997.

6.2.4 Handrails, Furniture and Steel fixings

All fixings will be duplex stainless steel Grade 2205 to meet the required design life.

All handrails will be duplex stainless steel Grade 2205 acid pickled and polished to prevent ‘tea staining’. Stainless steel handrails are selected as they are more durable against corrosion from salt water/salty air compared with aluminium handrails. Aluminium handrails will require regular maintenance and replacement as it has a limited resistance against corrosion (mainly pitting) in the marine environment.

Safety ladders will be specified as required under AS 4997 Cl 3.4.5.

If exposed non-stainless steel is proposed it will be protected with a marine epoxy paint system. Galvanised coatings will not be used in a marine or hypersaline environment because the chlorides in seawater will prematurely dissolve away the zinc content of the galvanising.

No cathodic protection is proposed for handrails, furniture and steel fixings.

6.2.5 Marine growth

The design will consider the effects of marine growth on both structural and ancillary items with consideration given to safety, structural capacity and integrity, durability and whole of life costs.

At a minimum, marine growth will be assumed to be a nominal 150 mm thickness and will be applied to all exposed faces between MSL and the seabed level when designing structural elements.

6.2.6 Corrosion allowance

It is envisioned that steel CHS piles will be required. An allowance for corrosion protection will be made in the design of all steel structures on the basis that no cathodic protection (CP) or protective coatings will be provided for the concept design. This also applies to other steel members in the maritime environment.

The corrosion allowances are based on a design life of the particular element, assuming normal levels of maintenance.

The design will be performed based on the corroded section properties and checked for strength based on a corrosion allowance. Corrosion rate allowances in Table 15 will be applied.

Table 15 Corrosion rates

Exposure Condition	Australian Standard	Exposure Classification	Corrosion rate allowance – external (mm/year)
Atmospheric	4312	C5-M: Marine	0.08 – 0.2
Splash	2159 (Table 6.5.2 & 6.5.3)	Very Severe	0.1*
	5100.3		0.16
Submerged	4997	Strong	0.1
	2159 (Table 6.5.2 & 6.5.3)	Severe	0.04 – 0.1

Internal corrosion allowance for piles is assumed to be 0 mm/year as all oxygen internal to the sealed pile is consumed.

Alternative corrosion prevention measures such as coatings are not considered due to the remoteness of the site and the need for frequent maintenance over the life of the structure. Cathodic protection (CP) systems may be considered to reduce corrosion rates as design of final infrastructure progresses (e.g. impressed current or sacrificial anode).

Cathodic protection

CP is generally the accepted method of addressing the shortcomings in protective coatings as it is able to mitigate corrosion at locations where coating breakdown or holidays exist, particularly in submerged or buried regions of a structure.

In instances where full corrosion allowances are uneconomical, cathodic protection (i.e. impressed current cathodic protection) may be specified during future detailed design works. Should active cathodic protection system(s) be required, the design must provide electrical power supplies for their cathodic protection controllers.

The corrosion allowances for the piles and steel members may be reduced, assuming normal levels of maintenance and assuming that the cathodic protection and protective treatment remains effective for the life of the structure.

7 Operations and maintenance requirements

7.1 GENERAL

During the design process, suitable consideration will be given to issues associated with ongoing operation and maintenance of the designed infrastructure. The design phase will impact on operational flexibility and product quality, plant availability and ongoing operation, maintenance and whole of life costs.

7.2 OPERATING ENVIRONMENT

The design will consider the operating environment (and any predicted changes to this environment, e.g. sea level rise) and select suitable equipment and materials to achieve the required design life. Pipework and pumps will be subject to saline (or hypersaline) water within the Coorong Southern Lagoon (hypersaline) as well as the Southern Ocean (saline).

Equipment must also withstand local environmental conditions, which may involve significant stress associated with considerably high summer temperatures, extremes of cold and high winds.

7.3 EQUIPMENT LOCATION

Consideration will be given to where equipment is to be located such that:

- The area can be freely evacuated should the need arise.
- Equipment installed in dry wells need to consider the implication of flooding. Alternatively, electric motors will be located above the flood level or equipment is selected to operate in a submerged environment (e.g. dry well submersible pumpset).
- Equipment installed in a wave environment will need to consider access provisions to allow effective operation and maintenance under incident waves. Alternately, operable elements will be located above wave and water levels or equipment can be removed to complete maintenance activities.
- Electrical switchboards, PLC cabinets, SCADA servers and the like will be located above the flood level and above wave and water levels.
- Where it is least likely to collect pondweed and other floating debris at pump intake sites.

7.4 OPERATION

The infrastructure options will be designed to operate unmanned.

Special care needs to be taken in the design of these facilities to minimise risk of ongoing operational problems and expense.

The control system will be provided with a level of remote monitoring and control to enable the pump systems to operate continuously with the planned level of attendance.

7.5 LABELLING

All mechanical, electrical, instrumentation and control equipment, enclosures and openings, civil, platforms and gratings, pipework, valves, cabling and wiring will be labelled.

Typically, these will take the form of equipment tags, certificates, name plates, energy type labels, and direction of movement arrows, hazard & safety notices, material types and asset location plates.

Asset location and identification labels are required for equipment at pumping stations and will reference SA Water TS 0133 Requirements for asset labelling.

Details on the requirements for labelling of mechanical and electrical equipment are located in SA Water TS 0300 Supply and Installation of Low Voltage Electrical Equipment.

The requirement for labelling of pipework is located in SA Water TS 0204 Colour Coding of pipework and AS 1345 Identification of pipes, conduits and ducts.

All other labelling requirements (e.g. those for work health & safety, environment & security) will be compliant with SA Water Technical Standards and/or relevant AS/NZ standards.

7.6 SITE SECURITY

Site security covers all aspects of security pertaining to securing pumping station sites. Site security includes:

- Perimeter fences.
- Perimeter gates.

Site security will be agreed with DEW and could include both physical barriers and CCTV systems to ensure an appropriate level of security is provided at all project infrastructure sites.

7.7 ENERGY EFFICIENCY

The design of pumping options will consider the energy efficiency of the process, plant and equipment to optimise ongoing operating costs associated with power. These costs will be considered in context with the whole of life costs.

A sensitivity analysis will be conducted to eliminate inefficiencies in the whole of life cycle cost analysis.

7.8 PLANT EQUIPMENT SELECTION

Equipment reliability and the availability of spare parts will be considered during the design phase to minimise maintenance costs and reduce disruption to plant operation. Preference will be given to Australian manufactured equipment where possible, both within the design and when proposed by the Contractor. Special tools for routine plant inspection and maintenance and any critical spares will be agreed with DEW and supplied with plant equipment.

The Contractor will provide the following information to DEW for all major items of equipment once the preferred option has been selected and detailed design and equipment selection has been completed.

- Estimated repair lead time of equipment.
- Estimated supply lead time of spare part.
- Recommended quantity of spares.
- Estimated price of spares.
- Anticipated date of obsolescence.

When selecting common items of equipment such as pumps, preference will be given to a single manufacturer supplying all of the items to minimise the quantity of spares kept on site. If the duty of two sets of equipment (e.g., pumps in different areas) are similar, then consideration will be given to the pump of the higher duty being used for both installations to minimise the inventory of spares kept on site.

7.9 OPERATING AND MAINTENANCE MANUALS

Operation and maintenance manuals will comply with SA Water TS 0132 Operating and Maintenance Manuals.

7.10 DECOMMISSIONING REQUIREMENTS

Throughout design, consideration will also be given to decommissioning requirements ensuring a safe method of decommissioning can be achieved. This will include identification of any elements that may cause harm to personnel, equipment or the environment during decommissioning and will be determined through detailed design.

7.11 REDUNDANCY

Consideration will be given in the design to enable equipment to be isolated for maintenance. Where possible, the pumping options will be designed to allow isolation of a single pump for maintenance while allowing the system to continue operating. Additional equipment will be provided for redundancy in accordance with Table 16.

Table 16 Equipment unit redundancy

Equipment	Redundancy
Vertical Turbine Pumps	N+1
Pontoon Mounted Pumps	N+1
Submersible Pumps	N+1

8 Safety in design considerations

8.1 HEALTH AND SAFETY OBJECTIVES

The South Australian *Work Health and Safety Act 2012* and Regulations require that persons who have a duty to ensure health and safety to 'manage risks' by eliminating health and safety risks so far as reasonably practical, and if it is not practical to do so, to minimise those risks so far as is reasonably practicable.

Throughout design development, a *Hazard and Risk Assessment* will be completed to identify potential hazards and associated risks in the designed infrastructure. These risks will be reviewed and design modifications incorporated to provide a safe workplace for Contractors, employees, visitors and the public.

This *Hazard and Risk Assessment* will provide a qualitative risk assessment of potential hazards identified during the design and nominate responsible parties to take carriage of risks in the future stages of the project.

8.2 SAFETY IN DESIGN

Safety in Design will be considered throughout the design phase. A safety in design report will be prepared and is legally required under the *Work Health and Safety Act 2012* and Regulation 295 of the *Work Health and Safety Regulations 2012*.

The report is to identify the hazards of the design, as far as the design engineer is reasonably aware, that:

- Creates a risk to the health or safety of persons who are involved in the construction, operation, maintenance and decommissioning of the project.
- Is specific to the project.

The report does not seek to identify all construction site hazards commonly encountered with projects of this nature, for which the identification and management remains the responsibility of the contractor. The residual risks that need to be managed by the contractor, operator, maintenance personnel or demolisher (as appropriate) are to be summarised.

The Project Manager is to provide a copy of this report to the principal contractors tendering for project works, maintenance personnel and other infrastructure users.

8.3 PUBLIC ACCESS RISKS

It is recognised that with construction of infrastructure in areas accessible by the public that certain safety provisions will be required to ensure safe operation of the assets minimising the risk of safety incident impacting members of the public. The following list of inclusions are examples of safety precautions that will be included within concept design documentation:

- Provision of bollards and signage defining exclusion areas around potential hazards associated with beach discharge structure (or other structures on the beach).
- Provision of guardrails each side of the regulator structures required for Option 1A and Option 1B.
- Provision of ladders at a nominated spacing to all jetty structures allowing for personnel recovery.

- Fencing of regulator and channel sites to assist in exclusion of livestock or native animals and members of the public from constructed infrastructure.

8.4 HEALTH AND SAFETY HAZARDS

The following key identified residual risks that require further consideration throughout the design, construction and operational stages are summarised as follows:

- Site access and performing the works during construction, operation and maintenance.
- Materials used.
- Pedestrian/public safety.
- Pedestrian/public access to facilities and around them (e.g. driving along beach, boating though the lagoons).
- Marine/boating considerations in Southern Ocean.
- First Nations peoples and their continuing connection to the land, water, flora and fauna species.

8.5 CONSTRUCTABILITY AND MAINTENANCE

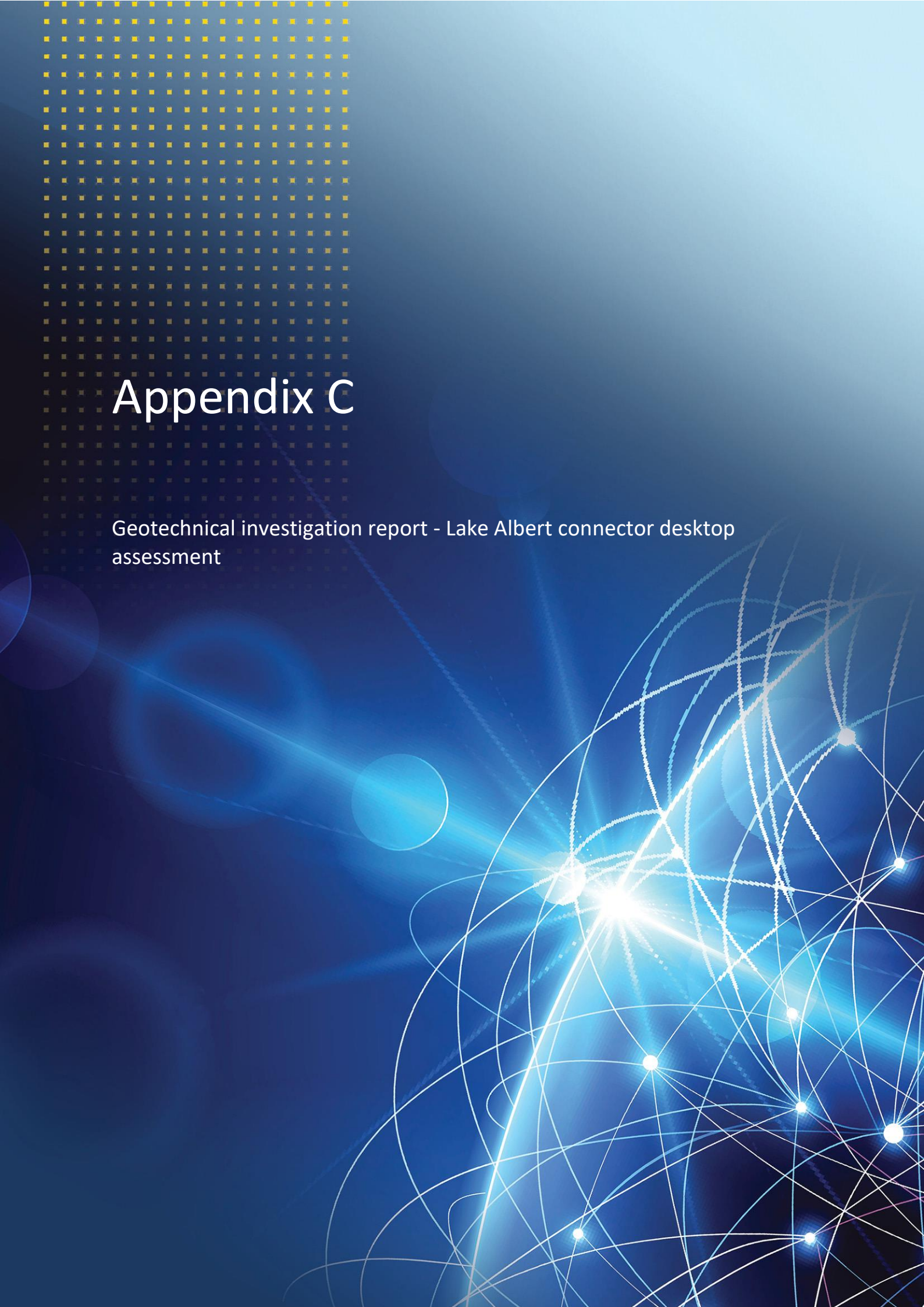
Access to the Younghusband Peninsula is assumed to be northwards along the beach from an access near 42 Mile Crossing or Tea Tree Crossing.

The following actions will be taken to reduce constructions risks:

- Marine work using boats in the Southern Ocean will be minimised or eliminated where possible due to unsafe and rough metocean conditions.
- Scuba diving in the Southern Ocean will be minimised or eliminated where possible due to unsafe and rough metocean conditions.
- Any construction equipment required to be transported across the Coorong by a vehicle larger than a standard ute is expected to be transported across the Coorong via a barge with temporary mooring and berthing facilities as required.

Appendix C

Geotechnical investigation report - Lake Albert connector desktop assessment



14 July 2021

COORONG INFRASTRUCTURE FEASIBILITY ASSESSMENT: INFRASTRUCTURE OPTION 1 - LAKE ALBERT TO COORONG CONNECTOR

GEOTECHNICAL DESKTOP STUDY

Kellogg Brown and Root

Date	Revision	Comments
14 July 2021	0	Initial Report

Table of Contents

DRAWINGS

Appendices

1 INTRODUCTION

CMW Geosciences (CMW) was authorised by KBR to carry out a geotechnical desktop review for the Infrastructure Option 1 – Lake Albert – Coorong Connector.

The scope of work undertaken was generally consistent with our proposal letter referenced ADL2020-0001AA, Rev0 dated 18 January 2021.

Herein is a desktop study of existing information related to the Lake Albert – Coorong Connector.

2 PROJECT APPRECIATION

Due to historically low River Murray flows, water levels in the Lower Lakes reached a record low of one metre below sea level. This reduction in water level has led to an increase in salinity and threatened the ecology of Lake Albert, the local economy (particularly the agricultural sector) and dependent communities. Potential acid sulfate soil (PASS) has become exposed to oxygen resulting in changes to the ecological characteristics of the region. A number of government investigations, interventions and on-ground works and measures were initiated in response.

Lake Albert is a terminal lake with no direct connectivity to the sea, so the ability for salt to be naturally exported from the system is limited. The lake's main water inflow comes from Lake Alexandrina via the Narrung Narrows. Despite improvements in water levels and flows since the drought, salinity levels declined but have not returned to pre-drought levels.

A number of management options have been proposed to alleviate the increased salinity in Lake Albert including;

- Construction of an open channel between Basecombe Bay and Coorong North lagoon (herein referred to as Coorong Connector – Alignment 1, and Coorong Connector – Alignment 2): and

- The installation of a pipeline to pump water between Lake Albert and Coorong North Lagoon (referred to herein as Coorong Connector – Alignment 3). It is noted that although this option has been listed as undesirable due to intensive energy demand during operation, it has still been included in the desktop study of the region.

3 SCOPE OF WORKS

This desk top assessment presents a review of published and provided geological and geotechnical information for the Lake Albert – Coorong Connector . This report includes a compilation of relevant geotechnical information, potential construction issues and presents our recommended scope for further intrusive geotechnical investigation relevant to the proposed structures.

4 REFERENCE DOCUMENTS

A number of previous reports have been provided to CMW to assist in the desktop study. These reports include environmental reports detailing the environmental modelling completed as well as geotechnical reports investigating some of the proposed infrastructure options.

Other published online resources have also been used in the desktop study, such as geology maps, groundwater well data, topographical information, Acid Sulphate Soil risk maps and aerial images.

1. SKM, November 2013, "Lake Albert & Narung Narrows – Field Investigations Report – Final", Report No. VE23811 Version B;

2. SKM, February 2014, “Engineering Feasibility of Potential Management Actions, Lake Albert and Narung Narrows”, Report No. VE23776;
3. Tonkin, April 2020, “Coorong Infrastructure Investigations – Technical Review”, Report No. 20200306R001 Rev1;
4. Government of South Australia, February 2010, “Managing Salinity in the Coorong – pumping hypersaline water out of the Southern Lagoon”;
5. Government of South Australia, August 2014, “Lake Albert Scoping Study Options Paper”;

5 DESKTOP STUDY

5.1 Engineering Description

Figure 1 depicts the three potential alignments investigated by SKM in 2013 for the Lake Albert – Coorong Connector.

Figure 1: SKM 2013 Investigation Locations

Alignment 1 and Alignment 2: Construction of an open channel between Basecombe Bay and Coorong North lagoon extends from near the south-western extremity of Lake Albert approximately 1.7 km to the Northern Lagoon. The channel would be trapezoidal in shape comprising a 13m wide base with side slopes of approximately 1V:4H. Maximum cut depth of the channels is expected to be up to 9.4m based on previous assessments.

It is understood that dredging into both Basecombe Bay and the Northern lagoon would be required to extend approximately 700m into Coorong North lagoon, and approximately 200m into Basecombe Bay. An aerial overview extracted from the SKM Engineering Feasibility report, including a proposed channel configuration as shown in Figure 2.

Figure 2: General Overview of Alignment 1 and 2

Alignment 3: Involves construction of a pipeline to pump water between Lake Albert and the Coorong North Lagoon. Based on the volume of water required (up to 1GL/day), three DN2400 pipes have ben proposed. At the time of writing this report, this option is understood to be the least desirable based on the intensive energy requirements to maintain pumping operations.

5.2 Previous Investigation Findings

The following details have been extracted from the SKM 2013 report Lake Albert & Narung Narrows – Field Investigations Report – Final", Report No. VE23811 Version B.

5.2.1 Topography / Geomorphology

The open channel alignments and the formerly considered pipe alignment traverse cleared paddocks utilised for cropping and pasture. From topographical maps of the area, it appears that the area is generally flat with some local undulation in the terrain with heights ranging from 0mAHD to approximately 14.5mAHD between the Coorong North Lagoon, Lake Albert and Basecombe Bay.

5.2.2 Regional Geology

The Geological Survey of South Australia 1:250,000 geological map Sheet 1 54-13 "Barker" Sheet indicates that the geology at the Narrung Narrows and proposed Coorong Connector alignments is Quaternary kunkarised dunes, sand spreads and kunkar related to calcareous rock. Kunkar soil profiles typically comprise nodular calcium carbonate soils formed in semi-arid regions with alluvial flats.

An excerpt from the SARIG 1:100,000 geological overlay is presented in Figure 3 and illustrates the expected geological units and their distribution. Quaternary alluvial flat deposits are present locally, immediately adjacent to Lake Albert, with shallow depressions expected to contain Holocene Lacustrine Sediments. The southern portion (Coorong Side) of the Ichthus is expected to comprise

Bridgewater Formation materials (calcareous cross-bedded sand dunes with calcrete capping).

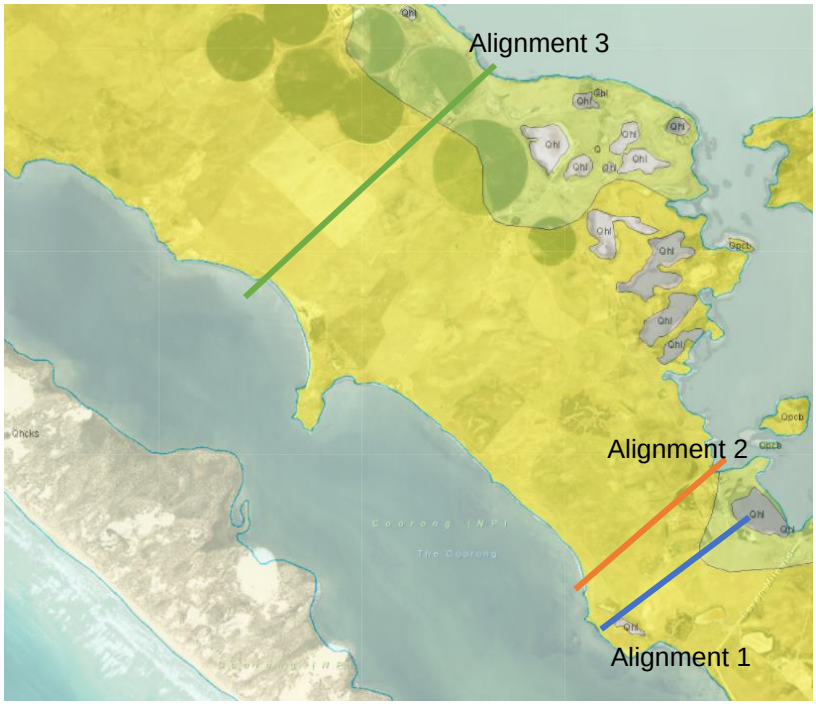


Figure 3: Regional Geology of Alignment Options

5.2.3 Local Subsurface

A number of boreholes were drilled as part of the 2013 SKM Investigation. In general, the boreholes along the Coorong Connector alignment encountered reasonably consistent subsurface profiles, comprising of shallow topsoil overlying fine to coarse grained sand, with varying degrees of cementation.

The sands are of marine origin, calcareous and contain traces of gravels and shell fragments. The geotechnical report notes that the cemented sand has the strength of a very weak rock and could not be broken by hand but was penetrable by the hollow auger.

Clay was only encountered in borehole BH06, which is the borehole nearest to the lake, between -12.6 m AHD to the end of the borehole at -15.2 m AHD.

The borehole plan is marked up on Figure 4, below.

Figure 4: Borehole Location Plan

The generalised subsurface profile along the Coorong Connector alignments is shown in Table 1. CMW consider this is broadly consistent with the expected regional geology.

Table 1: Generalised Subsurface Profile for Coorong Connector Alignments

Level from (m AHD)	Level to (m AHD)	Thickness (m)	Description	Typical SPT Value
+1.6 to +14.5 (Ground Level)	+1.5 to +14.4	0.1 to 1.2	Fill or Topsoil	NA
+1.5 to +14.4	+3.5 to -23.5 (end of Borehole)	10 to 27	Very Loose to Very Dense sand, calcareous, variably cemented	1 to Refusal

It is noted that at the time of field investigation, BH09 was not able to be drilled due to unfavourable soft ground conditions for safe operation of the drill rig.

The borehole logs are presented in the Appendix A to Appendix C of this report.

5.2.4 ASS/PASS

During the SKM 2013 investigation, field pH testing was undertaken on soil samples taken from the boreholes drilled from each alignment. In general, low to medium reactions with hydrochloric acid and hydrogen peroxide were noted. pH changes of less than 4 were generally recorded indicating a low probability of ASS/PASS. This low probability corresponds with publicly available information available from the Australian Soil Resource Information System (ASRIS), shown in Figure 5 below.

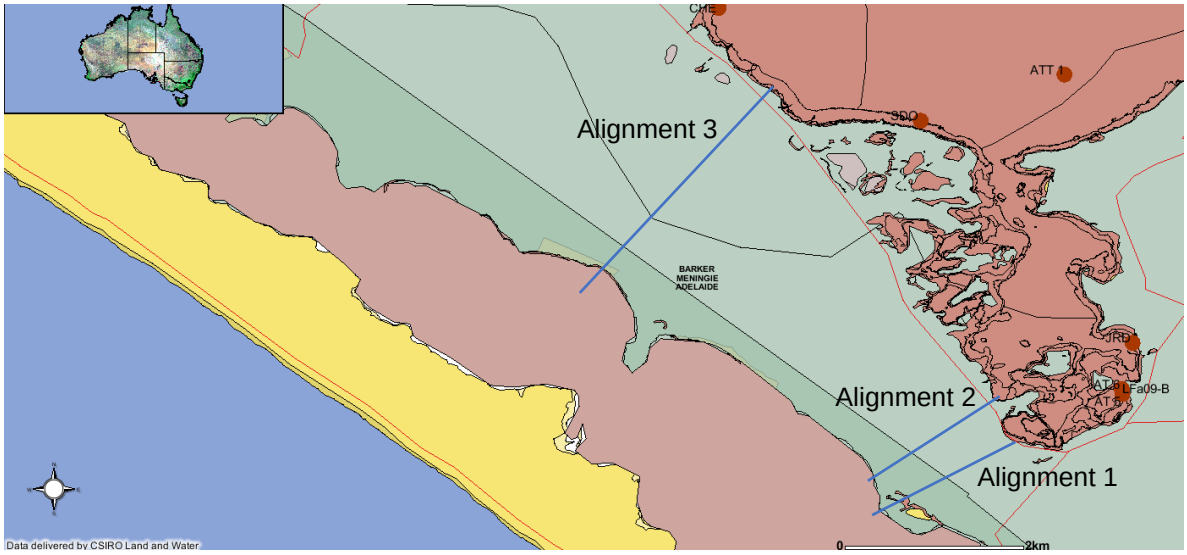


Figure 5: ASRIS Probability Map for Occurrence of ASS

No tests were undertaken in the inundated soils of both the Coorong North Lagoon and the southern end of Lake Albert, as no drilling over water has yet been completed. According to the ASRIS ASS/PASS probability map, these soils have a have a high probability of being ASS/PASS and would need to be investigated further during field works.

5.2.5 Groundwater

Groundwater was encountered at varying depths during the 2013 borehole investigation. It is noted that these levels are expected to undergo significant seasonal variations relative to the amount of rainfall, lake water levels and local topography. The existence of separate fresh and saline water tables is also a possibility due to the relative immiscibility of the two fluids.

No water chemistry testing has been undertaken in the 2013 SKM investigation, so it is not possible to determine the salinity of the water encountered.

The groundwater levels encountered during the investigation are summarised in the table on the following page (Table 2).

Table 2: Summary of Groundwater Strikes in Alignment 3 Investigations

Borehole ID	GWL (mBGL)	GWL (mRL)
BH04	3.0	-0.5
BH05	5.0	0.0
BH06	2.5	0.3
BH07	5.0	-1.5
BH08	7.0	0.3
BH09	Not drilled due to unsuitable ground conditions	
BH10	8.0	0.1
BH11	Groundwater Not Encountered – Borehole Terminated 11mBGL (3.5mRL)	

Table 2: Summary of Groundwater Strikes in Alignment 3 Investigations		
Borehole ID	**GWL (mBGL)**	**GWL (mRL)**
BH12	13.0	0.0
BH13	2.5	1.5
BH14	0.5	1.1
Notes: GWL – Groundwater Level, BGL – Below Ground Level, RL – Reduced Level		

5.3 Potential Construction Issues

Based on a review of the supplied information as well as publicly available information, we advise that following issues may potentially be encountered during construction and should be taken into account during planning of works:

- Presence of calcrete causing difficult excavation conditions. During the drilling investigation, cemented layers were able to be penetrated with hollow auger drilling techniques and would be expected to be excavatable. Based on previous experience on sites underlain by calcrete, within this region, significant resistance to excavations can be encountered during excavation and dredging that in some cases would necessitate the use of hydraulic breakers and ripping attachments;
- The boundary of the land and lacustrine environment may be difficult for construction trafficking and for equipment to be launched into the water. Select and deliberate investigations and working platform designs would need to be considered.
- There is a high probability that material excavated from the North Coorong Lagoon and the southern portion of Lake Albert are acid sulfate soils which will require consideration and a management plan prior to construction activities.

5.4 Further Investigation

At present, no information is available regarding the ground conditions where dredging activities are proposed. It is recommended that field investigations be completed to quantify the likely ground conditions at these locations. Potential investigation options include drilling boreholes from a floating platform (hovercraft, jack-up barge), vibrocore sampling or geophysical survey techniques such as Multi-Channel Analysis of Surface Waves (MASW).

We note that investigation over or in water can be extremely expensive. The type and extent of investigation will need to be considerate of the design stage of the project.

CMW have proposed a scope of works in our proposal ADL2021-0001AA Rev0 that could be undertaken but at the time of writing this report, the scope of construction works is not well defined. Some discussion would need to take place to ensure an investigation takes place which is sufficient relative to the design objectives.

6 LIMITATIONS

The findings contained within this report are the result of a desktop review of the supplied limited discrete investigations, and publicly available information online. To the best of our knowledge, they represent a reasonable interpretation of the general condition of the site. Under no circumstances, can it be considered that these findings represent the actual state of the ground conditions away from the provided investigation locations.

This report has been prepared for use by KBR in relation to the proposed Coorong Connector option which forms part of a larger investigation into remediation and management of Salinity and water levels in the Coorong region, in accordance with generally accepted consulting practice. No other warranty, expressed or implied, is made as to the professional advice included in this report. Use of this report by parties other than KBR and their respective consultants and contractors is at their risk as it may not contain sufficient information for any other purposes.

7 CLOSURE

Should there be any questions in relation to this report, please contact the undersigned.

For and on behalf of
CMW Geosciences

Prepared by:	**Reviewed/Authorised by:**
Paolo Mercorella	John Slade
Geotechnical Engineer	**Principal Geotechnical Engineer, CPEng**

Distribution: 1 copy to KBR (electronic)
Original held by CMW Geosciences

Drawings

LEGEND

- Borehole
- Proposed Borehole

Client:	**KBR**
Project:	**Healthy Coorong**
Description:	**Coorong Connector Alignment Options**
Project No:	**ADL2021-0158**
Date:	**31/05/21**

CMW Geosciences

Appendix A
Engineering Logs – Alignment 1

SOIL LOG

HOLE NO: **BH04**
PAGE : 1 OF 2

PROJECT : Geotechnical & ASS Inv., Lake Albert	SURFACE ELEVATION : 2.47 m (AHD)	JOB NO : VE23811.1
POSITION : E: 341328, N: 6043457 (MGA94)	SURFACE CONDITIONS : Topsoil/ Grass	LOCATION : Meningie - Alignment 1
RIG TYPE : MK5 Investigator	CONTRACTOR : Drilling Solutions	DIP / AZIMUTH : 90°
DATE DRILLED : 23/9/13 to 23/9/13	LOGGED BY : AL CHECKED BY : IC	STANDARD : AS 1726-1993

DRILLING & WATER DETAIL	FIELD DATA pHF	pHFOX	Reaction Rate	Change in pH	SAMPLES & SPT DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION (Classification Symbol) SOIL NAME: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Structure, Additional Observations	MOISTURE	CONSISTENCY / DENSITY	COMMENTS Field Test Data & Other Observations
	7.32	7.30	L	0.02					Topsoil, Silty SAND (SM); fine to medium grained subangular to subrounded sand, dark brown-black, trace organic matter (root fibres), organic odour	D	L	
									0.30m SAND (SW); fine to coarse grained subangular to subrounded sand, dark brown-black, calcareous, organic odour			
					0.60m				0.60m			
	8.50	7.61	L	0.89					SAND (SW); fine to coarse grained subangular to subrounded sand, white mottled grey/brown/orange, with shell fragments up to 6mm, with silt, calcareous		VD	
	8.45	7.65	L	0.8	1.00m SPT 50/50mm N=R 1.05m	1.5 1.0						1.00: Very hard to dig at 1 m bgl; SPT Recovery: 0 m
									1.30m SAND (SW); fine to coarse grained subangular to subrounded sand, orange-brown, with shell fragments up to 6mm, calcareous			
	8.37	7.58	L	0.79	1.50m D 1.5 - 2m				Weakly cemented layer (10mm), with increased number of shell fragments			
									1.80m SAND (SW); fine to coarse grained subangular to subrounded sand, grey-black, with shell fragments up to 6mm, calcareous			
					2.00m	0.5 2.0						
	8.32	7.41	L	0.91	2.20m D 2.2 - 3m				Weakly cemented layer (10mm), with increased number of shell fragments			
					2.50m SPT 50/50mm N*=R 2.55m				Weakly cemented layer (10mm), with increased number of shell fragments			2.50: SPT Recovery: 0.51 m
									Weakly cemented layer (10mm), with increased number of shell fragments			
HAD 23/09/13	8.30	7.42	L	0.88	3.00m	-0.5 3.0				W		3.00: Groundwater encountered
									Weakly cemented layer (10mm), with increased number of shell fragments			
									3.80m SAND (SP); coarse grained subangular to subrounded sand, grey mottled white/yellow, with fine subangular gravel, with shell fragments up to 6mm, calcareous			
	8.22	7.48	L	0.74	4.00m SPT 27, 50/50mm N*=R 4.20m	-1.5 4.0						4.00: SPT Recovery: 0.42 m
	8.47	7.54	L	0.93	5.00m	-2.5 5.0						
	8.89	7.35	L	1.54	5.50m SPT 13, 28, 50/100mm N*=R				5.50m SAND (SP); fine grained sand, dark grey, trace silt, calcareous			5.50: SPT Recovery: 0.4 m
					5.90m							
					6.00m				6.00m			

DRILLING

HA	Hand Auger	HQ	HQ Coring
HAD	Hollow Auger Drilling	NQ	NQ Coring
WB	Washbore	PQ	PQ Coring
RR	Rock Rolling	NMLC	NMLC Coring
AH	Air Hammer		

GROUNDWATER SYMBOLS

▼ = Water level (static)
▽ = Water level (during drilling)
► = Water inflow
◄ = Water outflow

SAMPLES & FIELD TESTS

D Disturbed Sample	SPT SPT Sample
B Bulk Sample	U U50 Sample
ES Env Soil Sample	W Water Sample
EW Env Water Sample	

MOISTURE CONDITION
D = Dry M = Moist W = Wet

PP Hand Penetrometer
SV Hand Vane Shear
(P: Peak Su R: Residual Su)
N SPT blows per 300mm

REACTION RATE - PEROXIDE
L slight effervescence
M moderate reaction
H vigorous reaction
X volcanic, very vigorous reaction

DENSITY (N-value)

VL	Very Loose	0 - 4
L	Loose	4 - 10
MD	Medium Dense	10 - 30
D	Dense	30 - 50
VD	Very Dense	50 - 100

CONSISTENCY (Su) {N-value}

VS	Very Soft	< 12 kPa {0-2}
S	Soft	12 - 25 {2-4}
F	Firm	25 - 50 {4-8}
St	Stiff	50 - 100 {8-15}
VSt	Very Stiff	100 - 200 {15-30}
H	Hard	> 200 kPa {>30}

SOIL LOG

HOLE NO: **BH04**
PAGE : 2 OF 2

PROJECT : Geotechnical & ASS Inv., Lake Albert	SURFACE ELEVATION : 2.47 m (AHD)	JOB NO : VE23811.1
POSITION : E: 341328, N: 6043457 (MGA94)	SURFACE CONDITIONS : Topsoil/ Grass	LOCATION : Meningie - Alignment 1
RIG TYPE : MK5 Investigator	CONTRACTOR : Drilling Solutions	DIP / AZIMUTH : 90°
DATE DRILLED : 23/9/13 to 23/9/13	LOGGED BY : AL CHECKED BY : IC	STANDARD : AS 1726-1993

DRILLING & WATER DETAIL	FIELD DATA pHF	pHFOX	Reaction Rate	Change in pH	SAMPLES & SPT DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION (Classification Symbol) SOIL NAME: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Structure, Additional Observations	MOISTURE	CONSISTENCY / DENSITY	COMMENTS Field Test Data & Other Observations
HAD	8.52	7.16	L	1.36					SAND (SW); fine to coarse grained subangular to subrounded sand, grey, with shell fragments up to 6mm, with fine to medium grained subrounded gravel, calcareous	W	VD	
	8.75	7.17	L	1.58	7.00m SPT 34, 50/100mm N*=R 7.25m	-4.5	7.0		Gravelly SAND (SW); fine to coarse grained subangular to subrounded sand, pale grey, fine to medium grained subrounded gravel, calcareous			7.00: SPT Recovery: 0.41 m
	8.83	7.01	L	1.82	7.50m				SAND (SP); fine to medium grained subangular to subrounded sand, grey, calcareous			
	8.47	6.98	L	1.49	8.00m	-5.5	8.0		Gravelly SAND (SW); fine to coarse grained subangular to subrounded sand, grey, fine grained subrounded gravel, trace shell fragments up to 2mm, calcareous			
					8.50m SPT 22, 24, 26 N*=50							8.50: SPT Recovery: 0.48 m
	8.63	7.14	L	1.49	8.95m 9.00m	-6.5	9.0					
	8.27	7.21	L	1.06	9.50m				SAND (SP); fine to medium grained subangular to subrounded sand, grey, calcareous			
					10.00m SPT 22, 29, 31 N*=60	-7.5	10.0					10.00: SPT Recovery: 0.35 m
					10.45m				Silty SAND (SM); fine grained sand, white-yellow, calcareous			
						-8.5	11.0		EOH at 11 m bgl			

DRILLING

HA	Hand Auger	HQ	HQ Coring
HAD	Hollow Auger Drilling	NQ	NQ Coring
WB	Washbore	PQ	PQ Coring
RR	Rock Rolling	NMLC	NMLC Coring
AH	Air Hammer		

GROUNDWATER SYMBOLS
= Water level (static)
= Water level (during drilling)
= Water inflow
= Water outflow

SAMPLES & FIELD TESTS

D	**Disturbed Sample**	SPT	SPT Sample
B	**Bulk Sample**	U	U50 Sample
ES	**Env Soil Sample**	W	Water Sample
EW	**Env Water Sample**		

MOISTURE CONDITION
PP Hand Penetrometer D = Dry M = Moist W = Wet
SV Hand Vane Shear
(P: Peak Su R: Residual Su)
N SPT blows per 300mm

REACTION RATE - PEROXIDE
L slight effervescence
M moderate reaction
H vigorous reaction
X volcanic, very vigorous reaction

DENSITY (N-value)

VL	Very Loose	0 - 4
L	Loose	4 - 10
MD	Medium Dense	10 - 30
D	Dense	30 - 50
VD	Very Dense	50 - 100

CONSISTENCY (Su) {N-value}

VS	Very Soft	< 12 kPa {0-2}
S	Soft	12 - 25 {2-4}
F	Firm	25 - 50 {4-8}
St	Stiff	50 - 100 {8-15}
VSt	Very Stiff	100 - 200 {15-30}
H	Hard	> 200 kPa {>30}

SOIL LOG

HOLE NO: **BH05**
PAGE : 1 OF 3

PROJECT : Geotechnical & ASS Inv., Lake Albert	SURFACE ELEVATION : 4.95 m (AHD)	JOB NO : VE23811.1
POSITION : E: 341951, N: 6043557 (MGA94)	SURFACE CONDITIONS : Topsoil/ Grass	LOCATION : Meningie - Alignment 1
RIG TYPE : MK5 Investigator	CONTRACTOR : Drilling Solutions	DIP / AZIMUTH : 90°
DATE DRILLED : 23/9/13 to 23/9/13	LOGGED BY : AL CHECKED BY : IC	STANDARD : AS 1726-1993

DRILLING & WATER DETAIL	FIELD DATA pHF	pHFOX	Reaction Rate	Change in pH	SAMPLES & SPT DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION (Classification Symbol) SOIL NAME: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Structure, Additional Observations	MOISTURE	CONSISTENCY / DENSITY	COMMENTS Field Test Data & Other Observations
HAD	8.17	6.84	L	1.33					Topsoil, SAND (SP); fine grained sand, brown, trace organic matter (root fibres to 0.2 m bgl), organic odour	D	L	
									0.20m		VD	
	8.43	7.20	L - M	1.23	0.50m	4.5	0.5		SAND (SP); fine to medium grained subangular to subrounded sand, orange-brown, calcareous			
									0.90m			
	7.98	7.68	L	0.3	0.95m				0.95m Silty SAND (SM); fine grained sand, pale brown, weakly cemented, calcareous			
					1.00m SPT 6, 17, 50/100mm N*=67	4.0	1.0		SAND (SP); fine to medium grained subangular to subrounded sand, black - dark brown grading into brown, with silt, calcareous, organic odour			1.00: SPT Recovery: 0.39 m
	8.49	8.04	L	0.45	1.20m				As above, mottled white/pale brown, weakly cemented			
									As above, black-dark brown mottled pale brown, organic odour			
					1.40m				As above, mottled white/pale brown, weakly cemented			
	8.48	7.78	L	0.7	1.60m	3.5	1.5		As above, black-dark brown mottled white, trace fine to medium grained subangular to subrounded gravel			
					1.90m				1.90m			
	8.08	7.70	L	0.38		3.0	2.0		Gravelly SAND (SW); fine to coarse grained subangular to subrounded sand, mottled white/pale brown, fine to medium grained subrounded gravel, trace silt, calcareous			
						2.5	2.5					
					3.00m				3.00m			
	8.87	7.36	L	1.51		2.0	3.0		SAND (SP); fine to medium grained subangular to subrounded sand, pale brown mottled yellow, calcareous		MD - VD	
									3.40m			
						1.5	3.5		SAND (SW); fine to coarse grained subangular to subrounded sand, pale brown mottled yellow, with shell fragments up to 2mm, trace fine to medium grained subrounded gravel, calcareous			
	7.76	7.64	L - M	0.12	4.00m SPT 6, 8, 8 N*=16	1.0	4.0					4.00: SPT Recovery: 0.33 m
					4.45m							
						0.5	4.5		As above, pale brown mottled white, with shell fragments up to 2mm, trace fine to medium grained subrounded gravel			
23/09/13					5.00m							
	8.46	7.73	L - M	0.73		0.0	5.0			M - W		5.00: Groundwater encountered

DRILLING

HA	Hand Auger	HQ	HQ Coring
HAD	Hollow Auger Drilling	NQ	NQ Coring
WB	Washbore	PQ	PQ Coring
RR	Rock Rolling	NMLC	NMLC Coring
AH	Air Hammer		

GROUNDWATER SYMBOLS

= Water level (static)
= Water level (during drilling)
= Water inflow
= Water outflow

SAMPLES & FIELD TESTS

D	Disturbed Sample	SPT	SPT Sample
B	Bulk Sample	U	U50 Sample
ES	Env Soil Sample	W	Water Sample
EW	Env Water Sample		

PP Hand Penetrometer
SV Hand Vane Shear
(P: Peak Su R: Residual Su)
N SPT blows per 300mm

MOISTURE CONDITION
D = Dry M = Moist W = Wet

REACTION RATE - PEROXIDE
L slight effervescence
M moderate reaction
H vigorous reaction
X volcanic, very vigorous reaction

DENSITY (N-value)

VL	Very Loose	0 - 4
L	Loose	4 - 10
MD	Medium Dense	10 - 30
D	Dense	30 - 50
VD	Very Dense	50 - 100

CONSISTENCY (Su) {N-value}

VS	Very Soft	< 12 kPa {0-2}
S	Soft	12 - 25 {2-4}
F	Firm	25 - 50 {4-8}
St	Stiff	50 - 100 {8-15}
VSt	Very Stiff	100 - 200 {15-30}
H	Hard	> 200 kPa {>30}

SOIL LOG

HOLE NO: **BH05**
PAGE : 2 OF 3

PROJECT : Geotechnical & ASS Inv., Lake Albert	SURFACE ELEVATION : 4.95 m (AHD)	JOB NO : VE23811.1
POSITION : E: 341951, N: 6043557 (MGA94)	SURFACE CONDITIONS : Topsoil/ Grass	LOCATION : Meningie - Alignment 1
RIG TYPE : MK5 Investigator	CONTRACTOR : Drilling Solutions	DIP / AZIMUTH : 90°
DATE DRILLED : 23/9/13 to 23/9/13	LOGGED BY : AL CHECKED BY : IC	STANDARD : AS 1726-1993

DRILLING & WATER DETAIL	FIELD DATA pHF	pHFOX	Reaction Rate	Change in pH	SAMPLES & SPT DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION (Classification Symbol) SOIL NAME: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Structure, Additional Observations	MOISTURE	CONSISTENCY / DENSITY	COMMENTS Field Test Data & Other Observations
HAD									SAND (SW); fine to coarse grained subangular to subrounded sand, pale brown mottled yellow, with shell fragments up to 2mm, trace fine to medium grained subrounded gravel, calcareous *(continued)*	M - W	MD - VD	
									As above, with increased gravel content			
	7.96	7.68	L	0.28	6.00m D 6 - 6.5m	-1.1	6.0					
					6.50m	-1.6	6.5					
	8.13	7.55	L	0.58	7.00m SPT 34, 33, 40 N*=73	-2.1	7.0				VD	7.00: SPT Recovery: 0.35 m
	7.93	7.48	L - M	0.45	7.45m 7.50m	-2.6	7.5		7.50m Silty SAND (SM); fine grained sand, mottled pale brown/white, calcareous			
	8.16	7.66	L	0.5	8.00m	-3.1	8.0		8.00m SAND (SW); fine to coarse grained subangular to subrounded sand, pale brown, trace fine to medium grained subrounded gravel, trace shell fragments up to 2mm, calcareous			
						-3.6	8.5					
						-4.1	9.0					
						-4.6	9.5					
					10.00m SPT 18, 26, 26 N*=52	-5.1	10.0					10.00: SPT Recovery: 0.35 m
					10.45m	-5.6	10.5					
					11.00m				10.90m 11.00m Silty SAND (SM); fine grained sand, mottled pale brown/white, calcareous			

DRILLING

HA	Hand Auger	HQ	HQ Coring
HAD	Hollow Auger Drilling	NQ	NQ Coring
WB	Washbore	PQ	PQ Coring
RR	Rock Rolling	NMLC	NMLC Coring
AH	Air Hammer		

GROUNDWATER SYMBOLS
= Water level (static)
= Water level (during drilling)
= Water inflow
= Water outflow

SAMPLES & FIELD TESTS

D	**Disturbed Sample**	SPT	SPT Sample
B	**Bulk Sample**	U	U50 Sample
ES	**Env Soil Sample**	W	Water Sample
EW	**Env Water Sample**		

PP Hand Penetrometer
SV Hand Vane Shear
(P: Peak Su R: Residual Su)
N SPT blows per 300mm

MOISTURE CONDITION
D = Dry M = Moist W = Wet

REACTION RATE - PEROXIDE
L slight effervescence
M moderate reaction
H vigorous reaction
X volcanic, very vigorous reaction

DENSITY (N-value)

VL	Very Loose	0 - 4
L	Loose	4 - 10
MD	Medium Dense	10 - 30
D	Dense	30 - 50
VD	Very Dense	50 - 100

CONSISTENCY (Su) {N-value}

VS	Very Soft	< 12 kPa {0-2}
S	Soft	12 - 25 {2-4}
F	Firm	25 - 50 {4-8}
St	Stiff	50 - 100 {8-15}
VSt	Very Stiff	100 - 200 {15-30}
H	Hard	> 200 kPa {>30}

SOIL LOG

HOLE NO: **BH05**
PAGE : 3 OF 3

PROJECT : Geotechnical & ASS Inv., Lake Albert	SURFACE ELEVATION : 4.95 m (AHD)	JOB NO : VE23811.1
POSITION : E: 341951, N: 6043557 (MGA94)	SURFACE CONDITIONS : Topsoil/ Grass	LOCATION : Meningie - Alignment 1
RIG TYPE : MK5 Investigator	CONTRACTOR : Drilling Solutions	DIP / AZIMUTH : 90°
DATE DRILLED : 23/9/13 to 23/9/13	LOGGED BY : AL CHECKED BY : IC	STANDARD : AS 1726-1993

DRILLING & WATER DETAIL	FIELD DATA: pHF	pHFOX	Reaction Rate	Change in pH	SAMPLES & SPT DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION (Classification Symbol) SOIL NAME: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Structure, Additional Observations	MOISTURE	CONSISTENCY / DENSITY	COMMENTS Field Test Data & Other Observations
HAD					D 11 - 12m	-6.6	11.5		SAND (SW); fine to coarse grained subangular to subrounded sand, pale brown, trace fine to medium grained subrounded gravel, trace shell fragments up to 2mm, calcareous	M - W	VD	
					12.00m	-7.1	12.0		12.00m			
									12.10m Silty SAND (SM); fine grained sand, mottled pale brown/white, calcareous			
						-7.6	12.5		SAND (SW); fine to coarse grained subangular to subrounded sand, pale brown, trace fine to medium grained subrounded gravel, trace shell fragments up to 2mm, calcareous			
					13.00m SPT 37, 50/100mm N*=R 13.25m	-8.1	13.0					13.00: SPT Recovery: 0.25 m
						-8.6	13.5					
						-9.1	14.0		14.00m			
									EOH at 14 m bgl			
						-9.6	14.5					
						-10.1	15.0					
						-10.6	15.5					
						-11.1	16.0					

DRILLING

HA	Hand Auger	HQ	HQ Coring
HAD	Hollow Auger Drilling	NQ	NQ Coring
WB	Washbore	PQ	PQ Coring
RR	Rock Rolling	NMLC	NMLC Coring
AH	Air Hammer		

GROUNDWATER SYMBOLS
= Water level (static)
= Water level (during drilling)
= Water inflow
= Water outflow

SAMPLES & FIELD TESTS

D	**Disturbed Sample**	SPT	SPT Sample
B	**Bulk Sample**	U	U50 Sample
ES	**Env Soil Sample**	W	Water Sample
EW	**Env Water Sample**		

MOISTURE CONDITION
D = Dry M = Moist W = Wet

PP Hand Penetrometer
SV Hand Vane Shear
(P: Peak Su R: Residual Su)
N SPT blows per 300mm

REACTION RATE - PEROXIDE
L slight effervescence
M moderate reaction
H vigorous reaction
X volcanic, very vigorous reaction

DENSITY (N-value)

VL	Very Loose	0 - 4
L	Loose	4 - 10
MD	Medium Dense	10 - 30
D	Dense	30 - 50
VD	Very Dense	50 - 100

CONSISTENCY (Su) {N-value}

VS	Very Soft	< 12 kPa {0-2}
S	Soft	12 - 25 {2-4}
F	Firm	25 - 50 {4-8}
St	Stiff	50 - 100 {8-15}
VSt	Very Stiff	100 - 200 {15-30}
H	Hard	> 200 kPa {>30}

SOIL LOG

HOLE NO: **BH06**
PAGE : 1 OF 4

PROJECT : Geotechnical & ASS Inv., Lake Albert	SURFACE ELEVATION : 2.76 m (AHD)	JOB NO : VE23811.1
POSITION : E: 342551, N: 6044016 (MGA94)	SURFACE CONDITIONS : Topsoil/ Grass	LOCATION : Meningie - Alignment 1
RIG TYPE : MK5 Investigator	CONTRACTOR : Drilling Solutions	DIP / AZIMUTH : 90°
DATE DRILLED : 20/9/13 to 20/9/13	LOGGED BY : AL CHECKED BY : IC	STANDARD : AS 1726-1993

DRILLING & WATER DETAIL	FIELD DATA pHF	pHFOX	Reaction Rate	Change in pH	SAMPLES & SPT DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION (Classification Symbol) SOIL NAME: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Structure, Additional Observations	MOISTURE	CONSISTENCY / DENSITY	COMMENTS Field Test Data & Other Observations
HAD	7.56	7.10	L	0.46					0.05m Topsoil, Silty SAND (SM); fine grained sand, dark brown, with fine to medium grained subangular to subrounded gravel, trace organic matter (root fibres), organic odour	D	L	
									0.20m FILL, Gravelly SAND (SW); fine to medium grained subangular to subrounded sand, pale brown-yellow mottled white, fine to coarse grained subangular gravel			
	7.74	7.38	L	0.36	0.50m	2.3	0.5		FILL, SAND (SP); fine to medium grained subangular to subrounded sand, dark brown, with silt			
	8.65	7.46	L	1.19	1.00m SPT 2, 4, 23 N*=27	1.8	1.0				MD	1.00: SPT Recovery: 0.34 m
	8.52	6.76	L	1.76	1.30m				1.30m Silty SAND (SM); fine to medium grained subangular to subrounded sand, mottled white/orange/yellow, with fine to coarse grained subangular gravel, weakly cemented, calcareous	D - M		
	8.62	8.34	L	0.28	1.45m 1.50m	1.3	1.5		1.50m SAND (SP); fine to medium grained subangular to subrounded sand, brown, trace silt, calcareous			
	8.51	7.30	L	1.21	1.60m				1.60m Gravelly SAND (SW); fine to medium grained subangular to subrounded sand, white mottled orange/yellow, fine to coarse subangular gravel, with silt, calcareous	M		
	8.31	8.27	L	0.04	2.00m	0.8	2.0		2.00m Gravelly SAND (SW); fine to coarse grained subangular to subrounded sand, pale brown mottle dorange, fine to coarse subangular gravel, trace silt, trace shell fragments up to 2mm, calcareous			
20/09/13					2.50m SPT 2, 5, 10 N*=15	0.3	2.5		As above, mottled brown/grey	W		2.50: Groundwater encountered; SPT Recovery: 0.45 m
	8.22	7.31	L	0.91	2.95m 3.00m	-0.2	3.0					
						-0.7	3.5					
	7.62	7.52	L	0.1	4.00m SPT 4, 3, 7 N*=10	-1.2	4.0		As above, grey			4.00: SPT Recovery: 0.31 m
	7.75	7.54	L	0.21	4.45m 4.50m	-1.7	4.5		As above, pale brown			
	7.96	7.30	L	0.66	4.80m				4.80m SAND (SP); fine to medium grained subangular to subrounded sand, grey with black/white flecks, trace fine to coarse subangular gravel, trace silt, calcareous			
					5.50m	-2.2	5.0					

DRILLING

HA	Hand Auger	HQ	HQ Coring
HAD	Hollow Auger Drilling	NQ	NQ Coring
WB	Washbore	PQ	PQ Coring
RR	Rock Rolling	NMLC	NMLC Coring
AH	Air Hammer		

GROUNDWATER SYMBOLS
= Water level (static)
= Water level (during drilling)
= Water inflow
= Water outflow

SAMPLES & FIELD TESTS

D	Disturbed Sample	SPT	SPT Sample
B	Bulk Sample	U	U50 Sample
ES	Env Soil Sample	W	Water Sample
EW	Env Water Sample		

MOISTURE CONDITION
D = Dry M = Moist W = Wet

PP	Hand Penetrometer
SV	Hand Vane Shear
(P: Peak Su R: Residual Su)	
N	SPT blows per 300mm

REACTION RATE - PEROXIDE
L slight effervescence
M moderate reaction
H vigorous reaction
X volcanic, very vigorous reaction

DENSITY (N-value)

VL	Very Loose	0 - 4
L	Loose	4 - 10
MD	Medium Dense	10 - 30
D	Dense	30 - 50
VD	Very Dense	50 - 100

CONSISTENCY (Su) {N-value}

VS	Very Soft	< 12 kPa {0-2}
S	Soft	12 - 25 {2-4}
F	Firm	25 - 50 {4-8}
St	Stiff	50 - 100 {8-15}
VSt	Very Stiff	100 - 200 {15-30}
H	Hard	> 200 kPa {>30}

SOIL LOG

HOLE NO: **BH06**
PAGE : 2 OF 4

PROJECT : Geotechnical & ASS Inv., Lake Albert	SURFACE ELEVATION : 2.76 m (AHD)	JOB NO : VE23811.1
POSITION : E: 342551, N: 6044016 (MGA94)	SURFACE CONDITIONS : Topsoil/ Grass	LOCATION : Meningie - Alignment 1
RIG TYPE : MK5 Investigator	CONTRACTOR : Drilling Solutions	DIP / AZIMUTH : 90°
DATE DRILLED : 20/9/13 to 20/9/13	LOGGED BY : AL CHECKED BY : IC	STANDARD : AS 1726-1993

DRILLING & WATER DETAIL	FIELD DATA pHF	pHFOX	Reaction Rate	Change in pH	SAMPLES & SPT DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION (Classification Symbol) SOIL NAME: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Structure, Additional Observations	MOISTURE	CONSISTENCY / DENSITY	COMMENTS Field Test Data & Other Observations
HAD					SPT 8, 5, 6 N*=11				SAND (SP); fine to medium grained subangular to subrounded sand, grey with black/white flecks, trace fine to coarse subangular gravel, trace silt, calcareous *(continued)*	W	MD	5.50: SPT Recovery: 0.38 m
					5.95m							
	7.63	7.52	L	0.11	6.00m	-3.2	6.0					
						-3.7	6.5					
					7.00m							
	8.68	6.92	L	1.76	SPT 10, 20, 38 N*=58	-4.2	7.0				VD	7.00: SPT Recovery: 0.42 m
					7.30m				7.30m			
	8.64	7.46	L	1.18					Silty SAND (SM); fine grained sand, grey-blue, organic odour			
					7.45m							
					7.50m	-4.7	7.5		7.50m			
					D 7.5 - 7.8m				Gravelly SAND (SW); fine to medium grained subangular to subrounded sand, mottled grey/brown, fine to coarse grained subangular gravel, with silt, calcareous			
					7.80m							
	8.25	7.30	L	0.95	8.00m	-5.2	8.0					
					8.50m				8.50m			
					SPT 20, 23, 19 N*=42	-5.7	8.5		Silty SAND (SM); fine grained sand, grey-blue, organic odour		D	8.50: SPT Recovery: 0.41 m
					8.95m							
					9.00m	-6.2	9.0		9.00m			
	8.27	6.93	L	1.34					SAND (SW); fine to medium grained subangular to subrounded sand, mottled grey/brown, with fine to coarse grained subangular gravel, with silt, calcareous			
						-6.7	9.5		9.50m			
									Silty SAND (SM); fine grained sand, grey-blue, organic odour			
									9.70m			
									Gravelly SAND (SW); fine to coarse grained subangular to subrounded sand, grey with black flecks, fine to medium grained subrounded to subangular gravel, trace silt, calcareous			
					10.00m				10.00m			
	8.42	7.23	L	1.19	SPT 14, 15, 13 N*=28	-7.2	10.0		SAND (SW); fine to coarse grained subangular to subrounded sand, grey, with silt, calcareous		MD	10.00: SPT Recovery: 0.43 m
					10.45m							
						-7.7	10.5					

DRILLING

HA	Hand Auger	HQ	HQ Coring
HAD	Hollow Auger Drilling	NQ	NQ Coring
WB	Washbore	PQ	PQ Coring
RR	Rock Rolling	NMLC	NMLC Coring
AH	Air Hammer		

GROUNDWATER SYMBOLS

= Water level (static)
= Water level (during drilling)
= Water inflow
= Water outflow

SAMPLES & FIELD TESTS

D Disturbed Sample	SPT SPT Sample
B Bulk Sample	U U50 Sample
ES Env Soil Sample	W Water Sample
EW Env Water Sample	

MOISTURE CONDITION
D = Dry M = Moist W = Wet

PP Hand Penetrometer
SV Hand Vane Shear
(P: Peak Su R: Residual Su)
N SPT blows per 300mm

REACTION RATE - PEROXIDE
L slight effervescence
M moderate reaction
H vigorous reaction
X volcanic, very vigorous reaction

DENSITY (N-value)

VL	Very Loose	0 - 4
L	Loose	4 - 10
MD	Medium Dense	10 - 30
D	Dense	30 - 50
VD	Very Dense	50 - 100

CONSISTENCY (Su) {N-value}

VS	Very Soft	< 12 kPa {0-2}
S	Soft	12 - 25 {2-4}
F	Firm	25 - 50 {4-8}
St	Stiff	50 - 100 {8-15}
VSt	Very Stiff	100 - 200 {15-30}
H	Hard	> 200 kPa {>30}

SOIL LOG

HOLE NO: **BH06**
PAGE : 3 OF 4

PROJECT : Geotechnical & ASS Inv., Lake Albert	SURFACE ELEVATION : 2.76 m (AHD)	JOB NO : VE23811.1
POSITION : E: 342551, N: 6044016 (MGA94)	SURFACE CONDITIONS : Topsoil/ Grass	LOCATION : Meningie - Alignment 1
RIG TYPE : MK5 Investigator	CONTRACTOR : Drilling Solutions	DIP / AZIMUTH : 90°
DATE DRILLED : 20/9/13 to 20/9/13	LOGGED BY : AL CHECKED BY : IC	STANDARD : AS 1726-1993

DRILLING & WATER DETAIL	FIELD DATA: pHF	pHFOX	Reaction Rate	Change in pH	SAMPLES & SPT DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION (Classification Symbol) SOIL NAME: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Structure, Additional Observations	MOISTURE	CONSISTENCY / DENSITY	COMMENTS Field Test Data & Other Observations
HAD									SAND (SW); fine to coarse grained subangular to subrounded sand, grey, with silt, calcareous *(continued)*	W	MD	
					11.50m SPT 15, 14, 16 N*=30	-8.7	11.5					11.50: SPT Recovery: 0.43 m
									11.80m SAND (SP); fine grained sand, white-yellow, with silt, calcareous			
					11.95m	-9.2	12.0		12.00m SAND (SW); fine to coarse grained subangular to subrounded sand, grey, with silt, calcareous			
						-9.7	12.5		12.80m SAND (SP); fine grained sand, white-yellow, with silt, calcareous			
					13.00m SPT 24, 24, 16 N*=40	-10.2	13.0				D	13.00: SPT Recovery: 0.4 m
					13.45m	-10.7	13.5					
					14.00m	-11.2	14.0		14.20m Gravelly SAND (SW); fine to medium grained subangular to subrounded sand, yellow-white, fine to coarse subangular gravel, with silt, calcareous		H	
					14.50m SPT 9, 15, 14 N*=29	-11.7	14.5		14.50m Silty CLAY (CI); medium plasticity clay, grey mottles white, white mottles composed of fine to coarse grained subangular to subrounded sand and silt, calcareous	M	MD	14.50: SPT Recovery: 0.5 m
					14.95m	-12.2	15.0		15.00m Silty SAND (SM); fine grained sand, yellow-pale brown, trace fine to medium grained subangular gravel, calcareous	W		
									15.40m 15.50m Silty CLAY (CL); low plasticity clay, grey, calcareous	M	VSt	
						-12.7	15.5		Silty SAND (SM); fine grained sand, yellow-pale brown, trace fine to medium grained subangular gravel , calcareous	W	D	
					16.00m SPT 7, 7, 10 N*=17	-13.2	16.0		16.00m CLAY (CH); high plasticity clay, grey mottled orange, calcareous	M	VSt	16.00: SPT Recovery: 0.43 m
					16.45m 16.50m							

DRILLING

HA	Hand Auger	HQ	HQ Coring
HAD	Hollow Auger Drilling	NQ	NQ Coring
WB	Washbore	PQ	PQ Coring
RR	Rock Rolling	NMLC	NMLC Coring
AH	Air Hammer		

GROUNDWATER SYMBOLS

= Water level (static)
= Water level (during drilling)
= Water inflow
= Water outflow

SAMPLES & FIELD TESTS

D	Disturbed Sample	SPT	SPT Sample
B	Bulk Sample	U	U50 Sample
ES	Env Soil Sample	W	Water Sample
EW	Env Water Sample		

PP Hand Penetrometer
SV Hand Vane Shear
(P: Peak Su R: Residual Su)
N SPT blows per 300mm

MOISTURE CONDITION
D = Dry M = Moist W = Wet

REACTION RATE - PEROXIDE
L slight effervescence
M moderate reaction
H vigorous reaction
X volcanic, very vigorous reaction

DENSITY (N-value)

VL	Very Loose	0 - 4
L	Loose	4 - 10
MD	Medium Dense	10 - 30
D	Dense	30 - 50
VD	Very Dense	50 - 100

CONSISTENCY (Su) {N-value}

VS	Very Soft	< 12 kPa {0-2}
S	Soft	12 - 25 {2-4}
F	Firm	25 - 50 {4-8}
St	Stiff	50 - 100 {8-15}
VSt	Very Stiff	100 - 200 {15-30}
H	Hard	> 200 kPa {>30}

SOIL LOG

HOLE NO: **BH06**
PAGE : 4 OF 4

PROJECT : Geotechnical & ASS Inv., Lake Albert	SURFACE ELEVATION : 2.76 m (AHD)	JOB NO : VE23811.1
POSITION : E: 342551, N: 6044016 (MGA94)	SURFACE CONDITIONS : Topsoil/ Grass	LOCATION : Meningie - Alignment 1
RIG TYPE : MK5 Investigator	CONTRACTOR : Drilling Solutions	DIP / AZIMUTH : 90°
DATE DRILLED : 20/9/13 to 20/9/13	LOGGED BY : AL CHECKED BY : IC	STANDARD : AS 1726-1993

DRILLING & WATER DETAIL	FIELD DATA: pHF	pHFOX	Reaction Rate	Change in pH	SAMPLES & SPT DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION (Classification Symbol) SOIL NAME: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Structure, Additional Observations	MOISTURE	CONSISTENCY / DENSITY	COMMENTS Field Test Data & Other Observations
HAD					D 16.5 - 17m				CLAY (CH); high plasticity clay, grey mottled orange, calcareous *(continued)*	M	VSt	
					17.00m	14.2	17.0					
					17.50m SPT 5, 8, 12 N*=20	14.7	17.5					17.50: SPT Recovery: 0.48 m
					17.95m							
						15.2	18.0		18.00m EOH at 18 m bgl			
						15.7	18.5					
						16.2	19.0					
						16.7	19.5					
						17.2	20.0					
						17.7	20.5					
						18.2	21.0					
						18.7	21.5					

DRILLING

HA	Hand Auger	HQ	HQ Coring
HAD	Hollow Auger Drilling	NQ	NQ Coring
WB	Washbore	PQ	PQ Coring
RR	Rock Rolling	NMLC	NMLC Coring
AH	Air Hammer		

GROUNDWATER SYMBOLS
= Water level (static)
= Water level (during drilling)
= Water inflow
= Water outflow

SAMPLES & FIELD TESTS

D Disturbed Sample	SPT SPT Sample
B Bulk Sample	U U50 Sample
ES Env Soil Sample	W Water Sample
EW Env Water Sample	

MOISTURE CONDITION
D = Dry M = Moist W = Wet

PP Hand Penetrometer
SV Hand Vane Shear
(P: Peak Su R: Residual Su)
N SPT blows per 300mm

REACTION RATE - PEROXIDE
L slight effervescence
M moderate reaction
H vigorous reaction
X volcanic, very vigorous reaction

DENSITY (N-value)

VL	Very Loose	0 - 4
L	Loose	4 - 10
MD	Medium Dense	10 - 30
D	Dense	30 - 50
VD	Very Dense	50 - 100

CONSISTENCY (Su) {N-value}

VS	Very Soft	< 12 kPa {0-2}
S	Soft	12 - 25 {2-4}
F	Firm	25 - 50 {4-8}
St	Stiff	50 - 100 {8-15}
VSt	Very Stiff	100 - 200 {15-30}
H	Hard	> 200 kPa {>30}

Appendix B
Engineering Logs – Alignment 2

SOIL LOG

HOLE NO: **BH07**
PAGE : 1 OF 5

PROJECT : Geotechnical & ASS Inv., Lake Albert	SURFACE ELEVATION : 3.53 m (AHD)	JOB NO : VE23811.1
POSITION : E: 340714, N: 6044178 (MGA94)	SURFACE CONDITIONS : Topsoil/ Grass	LOCATION : Meningie - Alignment 2
RIG TYPE : MK5 Investigator	CONTRACTOR : Drilling Solutions	DIP / AZIMUTH : 90°
DATE DRILLED : 22/9/13 to 22/9/13	LOGGED BY : AL CHECKED BY : IC	STANDARD : AS 1726-1993

DRILLING & WATER DETAIL	FIELD DATA pHF	pHFOX	Reaction Rate	Change in pH	SAMPLES & SPT DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION (Classification Symbol) SOIL NAME: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Structure, Additional Observations	MOISTURE	CONSISTENCY / DENSITY	COMMENTS Field Test Data & Other Observations
HAD	7.74	6.50	L	1.24					Topsoil, Silty SAND (SM); fine to medium grained sand, dark brown, with fine to medium grained subangular gravel, trace organic matter (root fibres), organic odour	D	L	
					0.30m				0.30m			
	8.62	7.50	L	1.12		3.0	0.5		SAND (SW); fine to coarse grained subangular to subrounded sand, pale yellow-white, with shell fragments up to 12mm, trace fine to coarse grained subangular gravel, weakly cemented, calcareous			
					1.00m	2.5	1.0		1.00m			
	9.01	8.34	L - M	0.67	SPT 47, 50/120mm N*=R 1.27m				SAND (SW); fine to coarse grained subangular to subrounded sand, pale yellow, with shell fragments up to 6mm, calcareous		VD	1.00: SPT Recovery: 0.34 m
	8.81	7.92	L - M	0.89					1.30m			
					1.50m	2.0	1.5		SAND (SW); fine to coarse grained subangular to subrounded sand, pale yellow - brown, with fine to medium grained subangular gravel, with shell fragments up to 10mm, cemented, calcareous 1.50m			
	8.71	8.61	L - M	0.1								
	8.95	8.25	L	0.7	1.60m				1.60m Silty SAND (SM); fine grained sand, white-pale yellow, trace fine grained subrounded gravel, calcareous			
						1.5	2.0		Gravelly SAND (SW); fine to coarse grained subangular to subrounded sand, pale brown, fine to coarse grained subrounded gravel, with shell fragments up to 6mm, calcareous As above, orange-brown As above, pale brown			
									As above, with increased gravel content			
									As above, cemented layer 2.2 - 2.5 m bgl			
						1.0	2.5					
					2.70m				2.70m			
	8.88	7.16	L	1.72					Sandy GRAVEL; shell fragments up to 60mm, mottled white/yellow/brown, with fine to coarse grained subangular to subrounded sand, cemented, calcareous			
						0.5	3.0					
					3.30m				3.30m			
	8.77	7.15	L	1.62					SAND (SW); medium to coarse grained subangular to subrounded sand, white mottled yellow/brown, with shell fragments up to 10mm, trace silt, calcareous			
					3.50m	0.0	3.5					
					D 3.5 - 4.2m							
					4.00m							
					SPT 50/150mm N=R 4.20m	-0.5	4.0		As above, mottled grey/white			4.00: SPT Recovery: 0 m
	8.20	7.52	L	0.68					4.20m			
									SAND (SW); medium to coarse grained subangular to subrounded sand, pale brown, with fine grained subangular to subrounded gravel, trace silt, cemented 4.2 - 4.5 m bgl, calcareous			
						-1.0	4.5					
22/09/13					5.00m	-1.5	5.0		5.00m			
	8.18	7.47	L	0.71	D 5 - 6m				SAND (SP); fine to medium grained subangular to subrounded sand, pale brown-yellow, trace fine grained subrounded gravel, calcareous	W		5.00: Groundwater encountered

DRILLING

HA	Hand Auger	HQ	HQ Coring
HAD	Hollow Auger Drilling	NQ	NQ Coring
WB	Washbore	PQ	PQ Coring
RR	Rock Rolling	NMLC	NMLC Coring
AH	Air Hammer		

GROUNDWATER SYMBOLS

▼ = Water level (static)
▽ = Water level (during drilling)
► = Water inflow
◄ = Water outflow

SAMPLES & FIELD TESTS

D	**Disturbed Sample**	SPT	SPT Sample
B	**Bulk Sample**	U	U50 Sample
ES	**Env Soil Sample**	W	Water Sample
EW	**Env Water Sample**		

PP Hand Penetrometer
SV Hand Vane Shear
(P: Peak Su R: Residual Su)
N SPT blows per 300mm

MOISTURE CONDITION
D = Dry M = Moist W = Wet

REACTION RATE - PEROXIDE
L slight effervescence
M moderate reaction
H vigorous reaction
X volcanic, very vigorous reaction

DENSITY (N-value)

VL	Very Loose	0 - 4
L	Loose	4 - 10
MD	Medium Dense	10 - 30
D	Dense	30 - 50
VD	Very Dense	50 - 100

CONSISTENCY (Su) {N-value}

VS	Very Soft	< 12 kPa {0-2}
S	Soft	12 - 25 {2-4}
F	Firm	25 - 50 {4-8}
St	Stiff	50 - 100 {8-15}
VSt	Very Stiff	100 - 200 {15-30}
H	Hard	> 200 kPa {>30}

SOIL LOG

HOLE NO: **BH07**
PAGE : 2 OF 5

PROJECT : Geotechnical & ASS Inv., Lake Albert	SURFACE ELEVATION : 3.53 m (AHD)	JOB NO : VE23811.1
POSITION : E: 340714, N: 6044178 (MGA94)	SURFACE CONDITIONS : Topsoil/ Grass	LOCATION : Meningie - Alignment 2
RIG TYPE : MK5 Investigator	CONTRACTOR : Drilling Solutions	DIP / AZIMUTH : 90°
DATE DRILLED : 22/9/13 to 22/9/13	LOGGED BY : AL CHECKED BY : IC	STANDARD : AS 1726-1993

DRILLING & WATER DETAIL	FIELD DATA pHF	pHFOX	Reaction Rate	Change in pH	SAMPLES & SPT DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION (Classification Symbol) SOIL NAME: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Structure, Additional Observations	MOISTURE	CONSISTENCY / DENSITY	COMMENTS Field Test Data & Other Observations
HAD									SAND (SP); fine to medium grained subangular to subrounded sand, pale brown-yellow, trace fine grained subrounded gravel, calcareous *(continued)*	W	VD	
	8.45	7.71	L - M	0.74	6.00m	-2.5	6.0		6.00m SAND (SW); fine to coarse grained subangular to subrounded sand, pale brown, calcareous			
	8.44	7.68	L	0.76	7.00m SPT 50/120mm N*=R 7.12m	-3.5	7.0		7.00m SAND (SP); fine to medium grained subangular to subrounded sand, pale brown, trace shell fragments up to 2mm, calcareous			7.00: SPT Recovery: 0.41 m
	8.87	7.50	L - M	1.37	8.00m	-4.5	8.0					
	8.41	7.28	L	1.13	9.00m	-5.5	9.0					
	8.18	7.48	L	0.7	9.60m	-6.0	9.5		9.60m 9.70m Silty SAND (SM); fine grained sand, white-pale yellow, calcareous SAND (SP); fine to medium grained subangular to subrounded sand, pale brown, trace shells fragments up to 2mm, calcareous			
					10.00m SPT 47, 28, 34 N*=62	-6.5	10.0					10.00: SPT Recovery: 0.43 m
					10.45m	-7.0	10.5					

SKM-GEO-MELB-LIBRARY AL 2013.GLB Log SKM SOIL LOG V3 (ASS TEST) VE23811_SOIL LOGS_REV0.GPJ <<DrawingFile>> 30/10/2013 09:34

DRILLING

HA	Hand Auger	HQ	HQ Coring
HAD	Hollow Auger Drilling	NQ	NQ Coring
WB	Washbore	PQ	PQ Coring
RR	Rock Rolling	NMLC	NMLC Coring
AH	Air Hammer		

GROUNDWATER SYMBOLS

▼ = Water level (static)
▽ = Water level (during drilling)
▶ = Water inflow
◀ = Water outflow

SAMPLES & FIELD TESTS

D	Disturbed Sample	SPT	SPT Sample
B	Bulk Sample	U	U50 Sample
ES	Env Soil Sample	W	Water Sample
EW	Env Water Sample		

PP Hand Penetrometer
SV Hand Vane Shear
(P: Peak Su R: Residual Su)
N SPT blows per 300mm

MOISTURE CONDITION
D = Dry M = Moist W = Wet

REACTION RATE - PEROXIDE
L slight effervescence
M moderate reaction
H vigorous reaction
X volcanic, very vigorous reaction

DENSITY (N-value)

VL	Very Loose	0 - 4
L	Loose	4 - 10
MD	Medium Dense	10 - 30
D	Dense	30 - 50
VD	Very Dense	50 - 100

CONSISTENCY (Su) {N-value}

VS	Very Soft	< 12 kPa {0-2}
S	Soft	12 - 25 {2-4}
F	Firm	25 - 50 {4-8}
St	Stiff	50 - 100 {8-15}
VSt	Very Stiff	100 - 200 {15-30}
H	Hard	> 200 kPa {>30}

SOIL LOG

HOLE NO: **BH07**
PAGE : 3 OF 5

PROJECT : Geotechnical & ASS Inv., Lake Albert	SURFACE ELEVATION : 3.53 m (AHD)	JOB NO : VE23811.1
POSITION : E: 340714, N: 6044178 (MGA94)	SURFACE CONDITIONS : Topsoil/ Grass	LOCATION : Meningie - Alignment 2
RIG TYPE : MK5 Investigator	CONTRACTOR : Drilling Solutions	DIP / AZIMUTH : 90°
DATE DRILLED : 22/9/13 to 22/9/13	LOGGED BY : AL CHECKED BY : IC	STANDARD : AS 1726-1993

DRILLING & WATER DETAIL	FIELD DATA: pHF	pHFOX	Reaction Rate	Change in pH	SAMPLES & SPT DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION (Classification Symbol) SOIL NAME: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Structure, Additional Observations	MOISTURE	CONSISTENCY / DENSITY	COMMENTS Field Test Data & Other Observations
HAD						-8.0	11.5		SAND (SP); fine to medium grained subangular to subrounded sand, pale brown, trace shells fragments up to 2mm, calcareous *(continued)*	W	VD	
						-8.5	12.0					
						-9.0	12.5				MD	
					13.00m SPT 13, 17, 3 N*=20	-9.5	13.0					13.00: SPT Recovery: 0.42 m
					13.45m	-10.0	13.5		13.80m			
									Silty SAND (SM); fine grained sand, white-pale yellow, calcareous			
						-10.5	14.0					
						-11.0	14.5					
						-11.5	15.0		15.00m			
									SAND (SW); fine to coarse grained subangular to subrounded sand, pale brown, calcareous			
						-12.0	15.5		15.60m			
									Silty SAND (SM); fine to medium grained subangular to subrounded sand, white-pale brown motttled red/brown/yellow, calcareous			
					16.00m SPT 4, 10, 18 N*=28	-12.5	16.0		16.00m			16.00: SPT Recovery: 0.4 m
					16.45m				Gravelly SAND (SW); fine to medium grained subangular to subrounded sand, pale brown, fine to medium grained subrounded gravel, with silt, calcareous			

DRILLING

HA	Hand Auger	HQ	HQ Coring
HAD	Hollow Auger Drilling	NQ	NQ Coring
WB	Washbore	PQ	PQ Coring
RR	Rock Rolling	NMLC	NMLC Coring
AH	Air Hammer		

GROUNDWATER SYMBOLS

▼ = Water level (static)
▽ = Water level (during drilling)
▶ = Water inflow
◀ = Water outflow

SAMPLES & FIELD TESTS

D	Disturbed Sample	SPT	SPT Sample
B	Bulk Sample	U	U50 Sample
ES	Env Soil Sample	W	Water Sample
EW	Env Water Sample		

PP Hand Penetrometer
SV Hand Vane Shear
(P: Peak Su R: Residual Su)
N SPT blows per 300mm

MOISTURE CONDITION
D = Dry M = Moist W = Wet

REACTION RATE - PEROXIDE
L slight effervescence
M moderate reaction
H vigorous reaction
X volcanic, very vigorous reaction

DENSITY (N-value)

VL	Very Loose	0 - 4
L	Loose	4 - 10
MD	Medium Dense	10 - 30
D	Dense	30 - 50
VD	Very Dense	50 - 100

CONSISTENCY (Su) {N-value}

VS	Very Soft	< 12 kPa {0-2}
S	Soft	12 - 25 {2-4}
F	Firm	25 - 50 {4-8}
St	Stiff	50 - 100 {8-15}
VSt	Very Stiff	100 - 200 {15-30}
H	Hard	> 200 kPa {>30}

SOIL LOG

HOLE NO: **BH07**
PAGE : 4 OF 5

PROJECT : Geotechnical & ASS Inv., Lake Albert	SURFACE ELEVATION : 3.53 m (AHD)	JOB NO : VE23811.1
POSITION : E: 340714, N: 6044178 (MGA94)	SURFACE CONDITIONS : Topsoil/ Grass	LOCATION : Meningie - Alignment 2
RIG TYPE : MK5 Investigator	CONTRACTOR : Drilling Solutions	DIP / AZIMUTH : 90°
DATE DRILLED : 22/9/13 to 22/9/13	LOGGED BY : AL CHECKED BY : IC	STANDARD : AS 1726-1993

DRILLING & WATER DETAIL	FIELD DATA: pHF	pHFOX	Reaction Rate	Change in pH	SAMPLES & SPT DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION (Classification Symbol) SOIL NAME: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Structure, Additional Observations	MOISTURE	CONSISTENCY / DENSITY	COMMENTS Field Test Data & Other Observations
HAD									Gravelly SAND (SW); fine to medium grained subangular to subrounded sand, pale brown, fine to medium grained subrounded gravel, with silt, calcareous *(continued)*	W	MD	
									16.80m SAND (SP); fine to medium grained subangular to subrounded sand, pale brown mottled dark brown, trace fine to medium grained subrounded gravel, calcareous			
						13.5	17.0					
						14.0	17.5		As above, brown			
									As above, brown mottled grey			
						14.5	18.0		As above, brown mottled yellow			
						15.0	18.5		As above, with shell fragments (up to 8mm)			
					19.00m SPT 18, 12, 7 N*=19	15.5	19.0					19.00: SPT Recovery: 0.35 m
					19.45m	16.0	19.5		19.50m SAND (SW); fine to medium grained subangular to subrounded sand, brown-yellow, with fine grained subrounded gravel, with shell fragments up to 2mm, calcareous		VD	
						16.5	20.0					
						17.0	20.5					
						17.5	21.0					
						18.0	21.5					
					22.00m							

DRILLING

HA	Hand Auger	HQ	HQ Coring
HAD	Hollow Auger Drilling	NQ	NQ Coring
WB	Washbore	PQ	PQ Coring
RR	Rock Rolling	NMLC	NMLC Coring
AH	Air Hammer		

GROUNDWATER SYMBOLS
- = Water level (static)
- = Water level (during drilling)
- = Water inflow
- = Water outflow

SAMPLES & FIELD TESTS

D	Disturbed Sample	SPT	SPT Sample
B	Bulk Sample	U	U50 Sample
ES	Env Soil Sample	W	Water Sample
EW	Env Water Sample		

MOISTURE CONDITION
PP Hand Penetrometer D = Dry M = Moist W = Wet
SV Hand Vane Shear
(P: Peak Su R: Residual Su)
N SPT blows per 300mm

REACTION RATE - PEROXIDE
L slight effervescence
M moderate reaction
H vigorous reaction
X volcanic, very vigorous reaction

DENSITY (N-value)

VL	Very Loose	0 - 4
L	Loose	4 - 10
MD	Medium Dense	10 - 30
D	Dense	30 - 50
VD	Very Dense	50 - 100

CONSISTENCY (Su) {N-value}

VS	Very Soft	< 12 kPa {0-2}
S	Soft	12 - 25 {2-4}
F	Firm	25 - 50 {4-8}
St	Stiff	50 - 100 {8-15}
VSt	Very Stiff	100 - 200 {15-30}
H	Hard	> 200 kPa {>30}

SOIL LOG

HOLE NO: **BH07**
PAGE : 5 OF 5

PROJECT : Geotechnical & ASS Inv., Lake Albert	SURFACE ELEVATION : 3.53 m (AHD)	JOB NO : VE23811.1
POSITION : E: 340714, N: 6044178 (MGA94)	SURFACE CONDITIONS : Topsoil/ Grass	LOCATION : Meningie - Alignment 2
RIG TYPE : MK5 Investigator	CONTRACTOR : Drilling Solutions	DIP / AZIMUTH : 90°
DATE DRILLED : 22/9/13 to 22/9/13	LOGGED BY : AL CHECKED BY : IC	STANDARD : AS 1726-1993

DRILLING & WATER DETAIL	FIELD DATA: pHF	pHFOX	Reaction Rate	Change in pH	SAMPLES & SPT DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION (Classification Symbol) SOIL NAME: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Structure, Additional Observations	MOISTURE	CONSISTENCY / DENSITY	COMMENTS Field Test Data & Other Observations
HAD					SPT 33, 50/130mm N*=R 22.28m	19.0	22.5		SAND (SW); fine to medium grained subangular to subrounded sand, brown-yellow, with fine grained subrounded gravel, with shell fragments up to 2mm, calcareous *(continued)*	W	VD	22.00: SPT Recovery: 0.18 m
						19.5	23.0		As above, with increase in gravel content			
						20.0	23.5					
						20.5	24.0					
						21.0	24.5					
					25.00m SPT 40, 50/140mm N*=R 25.29m	21.5	25.0		As above, with decrease in gravel content			25.00: SPT Recovery: 0.36 m
						22.0	25.5					
						22.5	26.0					
						23.0	26.5					
						23.5	27.0		27.00m EOH at 27 m bgl			

DRILLING

HA	Hand Auger	HQ	HQ Coring
HAD	Hollow Auger Drilling	NQ	NQ Coring
WB	Washbore	PQ	PQ Coring
RR	Rock Rolling	NMLC	NMLC Coring
AH	Air Hammer		

GROUNDWATER SYMBOLS

- = Water level (static)
- = Water level (during drilling)
- = Water inflow
- = Water outflow

SAMPLES & FIELD TESTS

D	Disturbed Sample	SPT	SPT Sample
B	Bulk Sample	U	U50 Sample
ES	Env Soil Sample	W	Water Sample
EW	Env Water Sample		

PP Hand Penetrometer
SV Hand Vane Shear
(P: Peak Su R: Residual Su)
N SPT blows per 300mm

MOISTURE CONDITION
D = Dry M = Moist W = Wet

REACTION RATE - PEROXIDE
L slight effervescence
M moderate reaction
H vigorous reaction
X volcanic, very vigorous reaction

DENSITY (N-value)

VL	Very Loose	0 - 4
L	Loose	4 - 10
MD	Medium Dense	10 - 30
D	Dense	30 - 50
VD	Very Dense	50 - 100

CONSISTENCY (Su) {N-value}

VS	Very Soft	< 12 kPa {0-2}
S	Soft	12 - 25 {2-4}
F	Firm	25 - 50 {4-8}
St	Stiff	50 - 100 {8-15}
VSt	Very Stiff	100 - 200 {15-30}
H	Hard	> 200 kPa {>30}

SOIL LOG

HOLE NO: **BH08**
PAGE : 1 OF 3

PROJECT : Geotechnical & ASS Inv., Lake Albert	SURFACE ELEVATION : 7.29 m (AHD)	JOB NO : VE23811.1
POSITION : E: 341362, N: 6044560 (MGA94)	SURFACE CONDITIONS : Topsoil/ Grass	LOCATION : Meningie - Alignment 2
RIG TYPE : MK5 Investigator	CONTRACTOR : Drilling Solutions	DIP / AZIMUTH : 90°
DATE DRILLED : 23/9/13 to 23/9/13	LOGGED BY : AL CHECKED BY : IC	STANDARD : AS 1726-1993

DRILLING & WATER DETAIL	FIELD DATA pHF	pHFOX	Reaction Rate	Change in pH	SAMPLES & SPT DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION (Classification Symbol) SOIL NAME: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Structure, Additional Observations	MOISTURE	CONSISTENCY / DENSITY	COMMENTS Field Test Data & Other Observations
HAD	8.49	7.85	L - M	0.64					Topsoil, SAND (SW); fine to medium grained sand, dark brown mottled white, with fine grained subrounded gravel, trace organic matter (root fibres), organic odour	D	L	
	9.24	7.49	L	1.75	0.30m				0.30m SAND (SP); fine to medium grained subangular to subrounded sand, white-yellow mottled orange/yellow, calcareous		MD	
						6.8	0.5					
	9.11	8.20	L	0.91	1.00m SPT 7, 12, 11 N*=23	6.3	1.0					1.00: SPT Recovery: 0.3 m
	8.91	8.53	L - M	0.38	1.45m 1.50m	5.8	1.5		As above, with fine grained subrounded gravel As above, pale brown			
	8.98	8.32	L	0.66	2.00m	5.3	2.0					
					2.50m SPT 9, 19, 24 N*=43	4.8	2.5		As above, yellow-brown		D	2.50: SPT Recovery: 0.46 m
	8.65	8.58	L	0.07	2.95m 3.00m	4.3	3.0					
						3.8	3.5		As above, white-yellow			
	8.98	8.62	L	0.36	4.00m SPT 50/150mm N*=R 4.15m	3.3	4.0		As above, weakly cemented		VD	4.00: SPT Recovery: 0.16 m
						2.8	4.5		As above, yellow-brown mottled white			
	8.93	8.98	L - M	-0.05	5.00m	2.3	5.0					
					5.50m							

DRILLING

HA	Hand Auger	HQ	HQ Coring
HAD	Hollow Auger Drilling	NQ	NQ Coring
WB	Washbore	PQ	PQ Coring
RR	Rock Rolling	NMLC	NMLC Coring
AH	Air Hammer		

GROUNDWATER SYMBOLS

= Water level (static)
= Water level (during drilling)
= Water inflow
= Water outflow

SAMPLES & FIELD TESTS

D Disturbed Sample	SPT SPT Sample
B Bulk Sample	U U50 Sample
ES Env Soil Sample	W Water Sample
EW Env Water Sample	

MOISTURE CONDITION
D = Dry M = Moist W = Wet

PP Hand Penetrometer
SV Hand Vane Shear
(P: Peak Su R: Residual Su)
N SPT blows per 300mm

REACTION RATE - PEROXIDE
L slight effervescence
M moderate reaction
H vigorous reaction
X volcanic, very vigorous reaction

DENSITY (N-value)

VL	Very Loose	0 - 4
L	Loose	4 - 10
MD	Medium Dense	10 - 30
D	Dense	30 - 50
VD	Very Dense	50 - 100

CONSISTENCY (Su) {N-value}

VS	Very Soft	< 12 kPa {0-2}
S	Soft	12 - 25 {2-4}
F	Firm	25 - 50 {4-8}
St	Stiff	50 - 100 {8-15}
VSt	Very Stiff	100 - 200 {15-30}
H	Hard	> 200 kPa {>30}

SOIL LOG

HOLE NO: **BH08**
PAGE : 2 OF 3

PROJECT : Geotechnical & ASS Inv., Lake Albert	SURFACE ELEVATION : 7.29 m (AHD)	JOB NO : VE23811.1
POSITION : E: 341362, N: 6044560 (MGA94)	SURFACE CONDITIONS : Topsoil/ Grass	LOCATION : Meningie - Alignment 2
RIG TYPE : MK5 Investigator	CONTRACTOR : Drilling Solutions	DIP / AZIMUTH : 90°
DATE DRILLED : 23/9/13 to 23/9/13	LOGGED BY : AL CHECKED BY : IC	STANDARD : AS 1726-1993

DRILLING & WATER DETAIL	FIELD DATA: pHF	pHFOX	Reaction Rate	Change in pH	SAMPLES & SPT DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION (Classification Symbol) SOIL NAME: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Structure, Additional Observations	MOISTURE	CONSISTENCY / DENSITY	COMMENTS Field Test Data & Other Observations
					SPT 17, 27, 31 N*=58				SAND (SP); fine to medium grained subangular to subrounded sand, white-yellow mottled orange/yellow, calcareous *(continued)*	D	VD	5.50: SPT Recovery: 0.48 m
					5.95m				5.70m			
	8.69	8.43	L - M	0.26	6.00m	1.3	6.0		SAND (SW); fine to coarse grained subangular to subrounded sand, yellow-brown mottled white, trace shell fragments up to 6mm, weakly cemented, calcareous			
						0.8	6.5			D - M	MD	
23/09/13	8.10	7.90	L	0.2	7.00m SPT 8, 11, 6 N*=17	0.3	7.0			W		7.00: Groundwater encountered; SPT Recovery: 0.5 m
					7.45m	-0.2	7.5		7.80m			
	8.00	7.65	L	0.35	8.00m	-0.7	8.0		SAND (SP); fine to medium grained subangular to subrounded sand, yellow-brown, calcareous			
					8.50m SPT 6, 9, 22 N*=31	-1.2	8.5					8.50: SPT Recovery: 0.36 m
	8.08	7.55	L	0.53	8.95m 9.00m	-1.7	9.0		9.20m			
									SAND (SW); fine to coarse grained subangular to subrounded sand, brown-yellow, trace shell fragments up to 2mm, calcareous			
						-2.2	9.5		9.50m			
									SAND (SP); fine grained sand, brown-yellow, calcareous			
	8.75	7.54	L	1.21	10.00m SPT 50/150mm N*=R 10.15m	-2.7	10.0		As above, with increased sand size of fine to medium grained		VD	10.00: SPT Recovery: 0.34 m
						-3.2	10.5		As above, white-yellow			

HAD

DRILLING

HA	Hand Auger	HQ	HQ Coring
HAD	Hollow Auger Drilling	NQ	NQ Coring
WB	Washbore	PQ	PQ Coring
RR	Rock Rolling	NMLC	NMLC Coring
AH	Air Hammer		

GROUNDWATER SYMBOLS
= Water level (static)
= Water level (during drilling)
= Water inflow
= Water outflow

SAMPLES & FIELD TESTS

D Disturbed Sample	SPT SPT Sample
B Bulk Sample	U U50 Sample
ES Env Soil Sample	W Water Sample
EW Env Water Sample	

MOISTURE CONDITION
D = Dry M = Moist W = Wet

PP Hand Penetrometer
SV Hand Vane Shear
(P: Peak Su R: Residual Su)
N SPT blows per 300mm

REACTION RATE - PEROXIDE
L slight effervescence
M moderate reaction
H vigorous reaction
X volcanic, very vigorous reaction

DENSITY (N-value)

VL	Very Loose	0 - 4
L	Loose	4 - 10
MD	Medium Dense	10 - 30
D	Dense	30 - 50
VD	Very Dense	50 - 100

CONSISTENCY (Su) {N-value}

VS	Very Soft	< 12 kPa {0-2}
S	Soft	12 - 25 {2-4}
F	Firm	25 - 50 {4-8}
St	Stiff	50 - 100 {8-15}
VSt	Very Stiff	100 - 200 {15-30}
H	Hard	> 200 kPa {>30}

SOIL LOG

HOLE NO: **BH08**
PAGE : 3 OF 3

PROJECT : Geotechnical & ASS Inv., Lake Albert	SURFACE ELEVATION : 7.29 m (AHD)	JOB NO : VE23811.1
POSITION : E: 341362, N: 6044560 (MGA94)	SURFACE CONDITIONS : Topsoil/ Grass	LOCATION : Meningie - Alignment 2
RIG TYPE : MK5 Investigator	CONTRACTOR : Drilling Solutions	DIP / AZIMUTH : 90°
DATE DRILLED : 23/9/13 to 23/9/13	LOGGED BY : AL CHECKED BY : IC	STANDARD : AS 1726-1993

DRILLING & WATER DETAIL	FIELD DATA: pHF	pHFOX	Reaction Rate	Change in pH	SAMPLES & SPT DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION (Classification Symbol) SOIL NAME: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Structure, Additional Observations	MOISTURE	CONSISTENCY / DENSITY	COMMENTS Field Test Data & Other Observations
HAD					11.50m SPT 50/100mm N=R 11.60m	-4.2	11.5		SAND (SP); fine grained sand, brown-yellow, calcareous *(continued)* As above, with decreased sand size to fine grained, pale brown-yellow	W	VD	
												11.50: SPT Recovery: 0 m
						-4.7	12.0		As above, white-yellow As above, with increase sand size of fine to medium grained, pale brown-yellow			
						-5.2	12.5					
									As above, pale brown-yellow mottled white			
					13.00m SPT 44, 50/120mm N*=R 13.27m	-5.7	13.0					13.00: SPT Recovery: 0.26 m
						-6.2	13.5					
						-6.7	14.0		14.00m EOH at 14 m bgl			
						-7.2	14.5					
						-7.7	15.0					
						-8.2	15.5					
						-8.7	16.0					

DRILLING

HA	Hand Auger	HQ	HQ Coring
HAD	Hollow Auger Drilling	NQ	NQ Coring
WB	Washbore	PQ	PQ Coring
RR	Rock Rolling	NMLC	NMLC Coring
AH	Air Hammer		

GROUNDWATER SYMBOLS
= Water level (static)
= Water level (during drilling)
= Water inflow
= Water outflow

SAMPLES & FIELD TESTS

D	Disturbed Sample	SPT	SPT Sample
B	Bulk Sample	U	U50 Sample
ES	Env Soil Sample	W	Water Sample
EW	Env Water Sample		

PP Hand Penetrometer
SV Hand Vane Shear
(P: Peak Su R: Residual Su)
N SPT blows per 300mm

MOISTURE CONDITION
D = Dry M = Moist W = Wet

REACTION RATE - PEROXIDE
L slight effervescence
M moderate reaction
H vigorous reaction
X volcanic, very vigorous reaction

DENSITY (N-value)

VL	Very Loose	0 - 4
L	Loose	4 - 10
MD	Medium Dense	10 - 30
D	Dense	30 - 50
VD	Very Dense	50 - 100

CONSISTENCY (Su) {N-value}

VS	Very Soft	< 12 kPa {0-2}
S	Soft	12 - 25 {2-4}
F	Firm	25 - 50 {4-8}
St	Stiff	50 - 100 {8-15}
VSt	Very Stiff	100 - 200 {15-30}
H	Hard	> 200 kPa {>30}

Appendix C
Engineering Logs – Alignment 3

SOIL LOG

HOLE NO: **BH10**
PAGE : 1 OF 3

PROJECT : Geotechnical & ASS Inv., Lake Albert	SURFACE ELEVATION : 8.09 m (AHD)	JOB NO : VE23811.1
POSITION : E: 338224, N: 6046273 (MGA94)	SURFACE CONDITIONS : Topsoil/ Grass	LOCATION : Meningie - Alignment 3
RIG TYPE : MK5 Investigator	CONTRACTOR : Drilling Solutions	DIP / AZIMUTH : 90°
DATE DRILLED : 17/9/13 to 17/9/13	LOGGED BY : AL CHECKED BY : IC	STANDARD : AS 1726-1993

DRILLING & WATER DETAIL	FIELD DATA pHF	pHFOX	Reaction Rate	Change in pH	SAMPLES & SPT DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION (Classification Symbol) SOIL NAME: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Structure, Additional Observations	MOISTURE	CONSISTENCY / DENSITY	COMMENTS Field Test Data & Other Observations
HAD	7.85	6.38	L	1.47					0.10m Topsoil, Silty SAND (SM); fine to medium grained subangular to subrounded sand, brown, trace organic matter (root fibres), organic odour	D	L	
									Silty SAND (SM); fine to coarse grained subangular to subrounded sand, brown, calcareous			
	6.98	6.60	L	0.38	0.50m	7.6	0.5		As above, dark brown mottled grey			
					0.90m				0.90m			
	7.26	6.37	L	0.89	1.00m SPT 2, 3, 4 N*=7	7.1	1.0		SAND (SW), fine to coarse grained subangular to subrounded sand, brown, calcareous	D - M		1.00: SPT Recovery: 0.42 m
					1.45m				As above, yellow-brown			
	8.20	6.69	L	1.51	1.50m	6.6	1.5					
	7.49	6.42	L	1.07	2.00m	6.1	2.0					
					2.50m SPT 2, 4, 4 N*=8	5.6	2.5					2.50: SPT Recovery: 0.41 m
	8.11	6.55	L	1.56	2.95m 3.00m	5.1	3.0		As above, orange-yellow mottled brown			
						4.6	3.5					
	8.33	6.67	L	1.66	4.00m SPT 3, 5, 5 N*=10	4.1	4.0					4.00: SPT Recovery: 0.43 m
					4.45m	3.6	4.5					
									4.80m Silty SAND (SM); fine to coarse grained subangular to subrounded sand, mottled red/brown, with shell fragments up to 5mm, calcareous			
	8.35	7.29	L	1.06	5.00m	3.1	5.0		5.00m SAND (SW); fine to coarse grained subangular to subrounded sand, white, with shell fragments up to 12mm, trace fine to medium grained subangular gravel, calcareous		VD	
					5.50m							

DRILLING
HA Hand Auger; HAD Hollow Auger Drilling; WB Washbore; RR Rock Rolling; AH Air Hammer
HQ HQ Coring; NQ NQ Coring; PQ PQ Coring; NMLC NMLC Coring

GROUNDWATER SYMBOLS
▼ = Water level (static)
▽ = Water level (during drilling)
▶— = Water inflow
—◀ = Water outflow

SAMPLES & FIELD TESTS
D Disturbed Sample; B Bulk Sample; ES Env Soil Sample; EW Env Water Sample
SPT SPT Sample; U U50 Sample; W Water Sample
MOISTURE CONDITION
D = Dry M = Moist W = Wet
PP Hand Penetrometer
SV Hand Vane Shear
(P: Peak Su R: Residual Su)
N SPT blows per 300mm
REACTION RATE - PEROXIDE
L slight effervescence; M moderate reaction; H vigorous reaction; X volcanic, very vigorous reaction

DENSITY (N-value)

VL	Very Loose	0 - 4
L	Loose	4 - 10
MD	Medium Dense	10 - 30
D	Dense	30 - 50
VD	Very Dense	50 - 100

CONSISTENCY (Su) {N-value}

VS	Very Soft	< 12 kPa {0-2}
S	Soft	12 - 25 {2-4}
F	Firm	25 - 50 {4-8}
St	Stiff	50 - 100 {8-15}
VSt	Very Stiff	100 - 200 {15-30}
H	Hard	> 200 kPa {>30}

SOIL LOG

HOLE NO: **BH10**
PAGE : 2 OF 3

PROJECT : Geotechnical & ASS Inv., Lake Albert	SURFACE ELEVATION : 8.09 m (AHD)	JOB NO : VE23811.1
POSITION : E: 338224, N: 6046273 (MGA94)	SURFACE CONDITIONS : Topsoil/ Grass	LOCATION : Meningie - Alignment 3
RIG TYPE : MK5 Investigator	CONTRACTOR : Drilling Solutions	DIP / AZIMUTH : 90°
DATE DRILLED : 17/9/13 to 17/9/13	LOGGED BY : AL CHECKED BY : IC	STANDARD : AS 1726-1993

DRILLING & WATER DETAIL	FIELD DATA: pHF	pHFOX	Reaction Rate	Change in pH	SAMPLES & SPT DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION (Classification Symbol) SOIL NAME: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Structure, Additional Observations	MOISTURE	CONSISTENCY / DENSITY	COMMENTS Field Test Data & Other Observations
HAD					SPT 21, 35, 52 N*=87				SAND (SW); fine to coarse grained subangular to subrounded sand, white, with shell fragments up to 12mm, trace fine to medium grained subangular gravel, calcareous *(continued)*	D - M	VD	5.50: SPT Recovery: 0.39 m
	8.72	7.77	L	0.95	5.95m 6.00m	2.1	6.0					
						1.6	6.5					
	8.42	7.51	L - M	0.91	7.00m SPT 50/150mm N*=R 7.15m	1.1	7.0		As above, with increased number of shell fragments, cemented			7.00: SPT Recovery: 0.1 m
						0.6	7.5		7.50m Sandy GRAVEL (SW); shell fragments up to 15mm, mottled white/yellow, with fine to coarse grained subangular to subrounded sand, calcareous			
	8.25	7.57	L	0.68	8.00m	0.1	8.0		8.00m Gravelly SAND (SW); fine to coarse grained subangular to subrounded sand, yellow-white, fine grained subangular to subrounded gravel, with shell fragments up to 10mm, calcareous	W		8.00: Groundwater encountered
					8.50m SPT 50/150mm N*=R 8.65m	-0.4	8.5					8.50: SPT Recovery: 0.12 m
	8.60	7.50	L	1.1	9.00m	-0.9	9.0					
						-1.4	9.5			D		
	8.67	7.76	L	0.91	10.00m SPT 50/150mm N=R 10.15m	-1.9	10.0		10.00m SAND (SW); fine to coarse grained subangular to subrounded sand, yellow-brown, with fine grained subrounded gravel, with silt, calcareous	W		10.00: SPT Recovery: 0 m
						-2.4	10.5					

17/09/13

DRILLING

HA	Hand Auger	HQ	HQ Coring
HAD	Hollow Auger Drilling	NQ	NQ Coring
WB	Washbore	PQ	PQ Coring
RR	Rock Rolling	NMLC	NMLC Coring
AH	Air Hammer		

GROUNDWATER SYMBOLS

= Water level (static)
= Water level (during drilling)
= Water inflow
= Water outflow

SAMPLES & FIELD TESTS

D	**Disturbed Sample**	SPT	SPT Sample
B	**Bulk Sample**	U	U50 Sample
ES	**Env Soil Sample**	W	Water Sample
EW	**Env Water Sample**		

PP Hand Penetrometer
SV Hand Vane Shear
(P: Peak Su R: Residual Su)
N SPT blows per 300mm

MOISTURE CONDITION
D = Dry M = Moist W = Wet

REACTION RATE - PEROXIDE
L slight effervescence
M moderate reaction
H vigorous reaction
X volcanic, very vigorous reaction

DENSITY (N-value)

VL	Very Loose	0 - 4
L	Loose	4 - 10
MD	Medium Dense	10 - 30
D	Dense	30 - 50
VD	Very Dense	50 - 100

CONSISTENCY (Su) {N-value}

VS	Very Soft	< 12 kPa {0-2}
S	Soft	12 - 25 {2-4}
F	Firm	25 - 50 {4-8}
St	Stiff	50 - 100 {8-15}
VSt	Very Stiff	100 - 200 {15-30}
H	Hard	> 200 kPa {>30}

SOIL LOG

HOLE NO: **BH10**
PAGE : 3 OF 3

PROJECT : Geotechnical & ASS Inv., Lake Albert	SURFACE ELEVATION : 8.09 m (AHD)	JOB NO : VE23811.1
POSITION : E: 338224, N: 6046273 (MGA94)	SURFACE CONDITIONS : Topsoil/ Grass	LOCATION : Meningie - Alignment 3
RIG TYPE : MK5 Investigator	CONTRACTOR : Drilling Solutions	DIP / AZIMUTH : 90°
DATE DRILLED : 17/9/13 to 17/9/13	LOGGED BY : AL CHECKED BY : IC	STANDARD : AS 1726-1993

DRILLING & WATER DETAIL	FIELD DATA: pHF	pHFOX	Reaction Rate	Change in pH	SAMPLES & SPT DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION (Classification Symbol) SOIL NAME: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Structure, Additional Observations	MOISTURE	CONSISTENCY / DENSITY	COMMENTS Field Test Data & Other Observations
HAD					11.50m SPT 45, 50/150mm N*=R 11.80m	-3.4	11.5		SAND (SW); fine to coarse grained subangular to subrounded sand, yellow-brown, with fine grained subrounded gravel, with silt, calcareous *(continued)*	W	VD	11.50: SPT Recovery: 0.2 m
						-3.9	12.0					
						-4.4	12.5		12.50m SAND (SP); fine to medium grained subangular to subrounded sand, yellow-brown, trace shell fragments up to 2mm, calcareous			
									12.80m SAND (SW); fine to coarse grained subangular to subrounded sand, yellow-brown, with fine grained subrounded gravel, with silt, calcareous			
					13.00m SPT 22, 34, 40 N*=74 13.45m	-4.9	13.0					13.00: SPT Recovery: 0.41 m
						-5.4	13.5					
						-5.9	14.0		14.00m SAND (SP); fine grained sand, yellow-brown, with silt, calcareous			
					14.50m SPT 11, 17, 35 N*=52 14.95m	-6.4	14.5					14.50: SPT Recovery: 0.44 m
						-6.9	15.0					
						-7.4	15.5					
						-7.9	16.0		16.00m EOH at 16 m bgl			

DRILLING

HA	Hand Auger	HQ	HQ Coring
HAD	Hollow Auger Drilling	NQ	NQ Coring
WB	Washbore	PQ	PQ Coring
RR	Rock Rolling	NMLC	NMLC Coring
AH	Air Hammer		

GROUNDWATER SYMBOLS
= Water level (static)
= Water level (during drilling)
= Water inflow
= Water outflow

SAMPLES & FIELD TESTS

D	**Disturbed Sample**	SPT	SPT Sample
B	**Bulk Sample**	U	U50 Sample
ES	**Env Soil Sample**	W	Water Sample
EW	**Env Water Sample**		

MOISTURE CONDITION
D = Dry M = Moist W = Wet

PP Hand Penetrometer
SV Hand Vane Shear
(P: Peak Su R: Residual Su)
N SPT blows per 300mm

REACTION RATE - PEROXIDE
L slight effervescence
M moderate reaction
H vigorous reaction
X volcanic, very vigorous reaction

DENSITY (N-value)

VL	Very Loose	0 - 4
L	Loose	4 - 10
MD	Medium Dense	10 - 30
D	Dense	30 - 50
VD	Very Dense	50 - 100

CONSISTENCY (Su) {N-value}

VS	Very Soft	< 12 kPa {0-2}
S	Soft	12 - 25 {2-4}
F	Firm	25 - 50 {4-8}
St	Stiff	50 - 100 {8-15}
VSt	Very Stiff	100 - 200 {15-30}
H	Hard	> 200 kPa {>30}

SOIL LOG

HOLE NO: **BH11**
PAGE : 1 OF 2

PROJECT : Geotechnical & ASS Inv., Lake Albert	SURFACE ELEVATION : 14.52 m (AHD)	JOB NO : VE23811.1
POSITION : E: 339009, N: 6046552 (MGA94)	SURFACE CONDITIONS : Topsoil/ Grass	LOCATION : Meningie - Alignment 3
RIG TYPE : MK5 Investigator	CONTRACTOR : Drilling Solutions	DIP / AZIMUTH : 90°
DATE DRILLED : 17/9/13 to 17/9/13	LOGGED BY : AL CHECKED BY : IC	STANDARD : AS 1726-1993

DRILLING & WATER DETAIL	FIELD DATA pHF	pHFOX	Reaction Rate	Change in pH	SAMPLES & SPT DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION (Classification Symbol) SOIL NAME: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Structure, Additional Observations	MOISTURE	CONSISTENCY / DENSITY	COMMENTS Field Test Data & Other Observations
HAD	7.76	8.01	L-M	-0.25					0.10m Topsoil, Silty SAND (SM); fine to medium grained sand, dark brown, trace organic matter (root fibres), organic odour	D	L	
									Gravelly SAND (SW); fine to coarse grained subangular to subrounded sand, white-yellow with brown mottles, fine grained subrounded gravel, with silt, calcareous		MD	
	8.11	8.19	L-M	-0.08	0.50m				As above, with increase in gravel content, cemented		D	
	8.41	7.99	L-M	0.42	1.00m SPT 6, 10, 19 N*=29	13.5	1.0		1.00m SAND (SP); fine to medium grained subangular to subrounded sand, mottled white/brown/yellow, trace fine grained subrounded gravel, trace silt, calcareous			1.00: SPT Recovery: 0.45 m
	8.32	8.15	L-M	0.17	1.45m 1.50m							
	8.44	8.40	M	0.04	2.00m	12.5	2.0		2.00m SAND (SW); fine to coarse grained subangular to subrounded sand, yellow-white, with shell fragments, cemented, calcareous		MD	
									2.20m SAND (SP); fine to medium grained subangular to subrounded sand, brown-yellow, trace subrounded fine gravel, calcareous		MD - VD	
					2.50m SPT 14, 11, 10 N*=21							2.50: SPT Recovery: 0.41 m
	8.98	9.01	M	-0.03	2.95m 3.00m	11.5	3.0					
									As above, white-yellow			
	8.47	7.04	L	1.43	4.00m SPT 11, 21, 50 N*=71	10.5	4.0					4.00: SPT Recovery: 0.45 m
					4.45m				As above, brown-yellow			
	8.92	7.12	L	1.8	5.00m	9.5	5.0					
									As above, white-yellow			
					5.50m SPT 7, 36, 50 N*=86				As above, with increase in gravel content			5.50: SPT Recovery: 0.47 m
					5.95m 6.00m							

DRILLING

HA	Hand Auger	HQ	HQ Coring
HAD	Hollow Auger Drilling	NQ	NQ Coring
WB	Washbore	PQ	PQ Coring
RR	Rock Rolling	NMLC	NMLC Coring
AH	Air Hammer		

GROUNDWATER SYMBOLS
= Water level (static)
= Water level (during drilling)
= Water inflow
= Water outflow

SAMPLES & FIELD TESTS

D	Disturbed Sample	SPT	SPT Sample
B	Bulk Sample	U	U50 Sample
ES	Env Soil Sample	W	Water Sample
EW	Env Water Sample		

PP Hand Penetrometer
SV Hand Vane Shear
(P: Peak Su R: Residual Su)
N SPT blows per 300mm

MOISTURE CONDITION
D = Dry M = Moist W = Wet

REACTION RATE - PEROXIDE
L slight effervescence
M moderate reaction
H vigorous reaction
X volcanic, very vigorous reaction

DENSITY (N-value)

VL	Very Loose	0 - 4
L	Loose	4 - 10
MD	Medium Dense	10 - 30
D	Dense	30 - 50
VD	Very Dense	50 - 100

CONSISTENCY (Su) {N-value}

VS	Very Soft	< 12 kPa {0-2}
S	Soft	12 - 25 {2-4}
F	Firm	25 - 50 {4-8}
St	Stiff	50 - 100 {8-15}
VSt	Very Stiff	100 - 200 {15-30}
H	Hard	> 200 kPa {>30}

SOIL LOG

HOLE NO: **BH11**
PAGE : 2 OF 2

PROJECT : Geotechnical & ASS Inv., Lake Albert	SURFACE ELEVATION : 14.52 m (AHD)	JOB NO : VE23811.1
POSITION : E: 339009, N: 6046552 (MGA94)	SURFACE CONDITIONS : Topsoil/ Grass	LOCATION : Meningie - Alignment 3
RIG TYPE : MK5 Investigator	CONTRACTOR : Drilling Solutions	DIP / AZIMUTH : 90°
DATE DRILLED : 17/9/13 to 17/9/13	LOGGED BY : AL CHECKED BY : IC	STANDARD : AS 1726-1993

DRILLING & WATER DETAIL	FIELD DATA pHF	pHFOX	Reaction Rate	Change in pH	SAMPLES & SPT DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION (Classification Symbol) SOIL NAME: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Structure, Additional Observations	MOISTURE	CONSISTENCY / DENSITY	COMMENTS Field Test Data & Other Observations
HAD	8.95	7.64	L	1.31					SAND (SP); fine to medium grained subangular to subrounded sand, brown-yellow, trace subrounded fine gravel, calcareous *(continued)*	D	MD - VD	
	9.08	7.74	L	1.34	7.00m SPT 19, 50/130mm N*=R 7.28m	7.5	7.0					7.00: SPT Recovery: 0.38 m
	9.04	6.99	L	2.05	8.00m	6.5	8.0		As above, yellow-white			
					8.50m SPT 18, 50/150mm N*=R 8.80m							8.50: SPT Recovery: 0.37 m
	9.10	7.85	L	1.25	9.00m	5.5	9.0					
	9.00	6.52	L	2.48	10.00m SPT 21, 50/150mm N*=R 10.30m	4.5	10.0					10.00: SPT Recovery: 0.38 m
						3.5	11.0		11.00m EOH at 11 m bgl			11.00: Groundwater not encountered

DRILLING

HA	Hand Auger	HQ	HQ Coring
HAD	Hollow Auger Drilling	NQ	NQ Coring
WB	Washbore	PQ	PQ Coring
RR	Rock Rolling	NMLC	NMLC Coring
AH	Air Hammer		

GROUNDWATER SYMBOLS

- = Water level (static)
- = Water level (during drilling)
- = Water inflow
- = Water outflow

SAMPLES & FIELD TESTS

D Disturbed Sample	SPT SPT Sample
B Bulk Sample	U U50 Sample
ES Env Soil Sample	W Water Sample
EW Env Water Sample	

PP Hand Penetrometer
SV Hand Vane Shear
(P: Peak Su R: Residual Su)
N SPT blows per 300mm

MOISTURE CONDITION
D = Dry M = Moist W = Wet

REACTION RATE - PEROXIDE
L slight effervescence
M moderate reaction
H vigorous reaction
X volcanic, very vigorous reaction

DENSITY (N-value)

VL	Very Loose	0 - 4
L	Loose	4 - 10
MD	Medium Dense	10 - 30
D	Dense	30 - 50
VD	Very Dense	50 - 100

CONSISTENCY (Su) {N-value}

VS	Very Soft	< 12 kPa {0-2}
S	Soft	12 - 25 {2-4}
F	Firm	25 - 50 {4-8}
St	Stiff	50 - 100 {8-15}
VSt	Very Stiff	100 - 200 {15-30}
H	Hard	> 200 kPa {>30}

SOIL LOG

HOLE NO: **BH12**
PAGE : 1 OF 3

PROJECT : Geotechnical & ASS Inv., Lake Albert	SURFACE ELEVATION : 13.00 m (AHD)	JOB NO : VE23811.1
POSITION : E: 339702, N: 6047158 (MGA94)	SURFACE CONDITIONS : Topsoil/ Grass	LOCATION : Meningie - Alignment 3
RIG TYPE : MK5 Investigator	CONTRACTOR : Drilling Solutions	DIP / AZIMUTH : 90°
DATE DRILLED : 18/9/13 to 18/9/13	LOGGED BY : AL CHECKED BY : IC	STANDARD : AS 1726-1993

DRILLING & WATER DETAIL	FIELD DATA pHF	pHFOX	Reaction Rate	Change in pH	SAMPLES & SPT DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION (Classification Symbol) SOIL NAME: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Structure, Additional Observations	MOISTURE	CONSISTENCY / DENSITY	COMMENTS Field Test Data & Other Observations
HAD	7.72	6.74	L	0.98					Topsoil, Silty SAND (SM); fine to medium grained sand, dark brown, trace organic matter (root fibres), organic odour	D	L	
									0.20m			
									Silty SAND (SM); fine to medium grained subangular to subrounded sand, dark brown, organic odour			
	8.37	8.08	L	0.29	0.50m	12.5	0.5					
									As above, pale brown mottled white			
	8.00	7.34	L	0.66	1.00m	12.0	1.0					
	8.15	7.52	L	0.63	1.50m	11.5	1.5					
	7.99	7.26	L	0.73	2.00m	11.0	2.0					
						10.5	2.5		As above, red-brown		MD	
	7.90	6.96	L	0.94	3.00m	10.0	3.0					
						9.5	3.5					
	8.26	8.22	L	0.04	4.00m	9.0	4.0		As above, yellow-brown			
						8.5	4.5					
	7.89	7.63	L	0.26	4.80m				4.80m			
						8.0	5.0		Sandy CLAY (CL); low plasticity clay, mottled white/grey, fine to medium grained subangular to subrounded sand, calcareous		St	
	8.53	7.33	L	1.2	5.20m				5.20m			
									Clayey SAND (SC); fine to medium grained subangular to subrounded sand, grey, medium plasticity clay, calcareous		MD	
									5.50m			

DRILLING

HA	Hand Auger	HQ	HQ Coring
HAD	Hollow Auger Drilling	NQ	NQ Coring
WB	Washbore	PQ	PQ Coring
RR	Rock Rolling	NMLC	NMLC Coring
AH	Air Hammer		

GROUNDWATER SYMBOLS

▼ = Water level (static)
▽ = Water level (during drilling)
▶ = Water inflow
◀ = Water outflow

SAMPLES & FIELD TESTS

D	Disturbed Sample	SPT	SPT Sample
B	Bulk Sample	U	U50 Sample
ES	Env Soil Sample	W	Water Sample
EW	Env Water Sample		

PP Hand Penetrometer
SV Hand Vane Shear
(P: Peak Su R: Residual Su)
N SPT blows per 300mm

MOISTURE CONDITION
D = Dry M = Moist W = Wet

REACTION RATE - PEROXIDE
L slight effervescence
M moderate reaction
H vigorous reaction
X volcanic, very vigorous reaction

DENSITY (N-value)

VL	Very Loose	0 - 4
L	Loose	4 - 10
MD	Medium Dense	10 - 30
D	Dense	30 - 50
VD	Very Dense	50 - 100

CONSISTENCY (Su) {N-value}

VS	Very Soft	< 12 kPa {0-2}
S	Soft	12 - 25 {2-4}
F	Firm	25 - 50 {4-8}
St	Stiff	50 - 100 {8-15}
VSt	Very Stiff	100 - 200 {15-30}
H	Hard	> 200 kPa {>30}

SOIL LOG

HOLE NO: **BH12**
PAGE : 2 OF 3

PROJECT : Geotechnical & ASS Inv., Lake Albert	SURFACE ELEVATION : 13.00 m (AHD)	JOB NO : VE23811.1
POSITION : E: 339702, N: 6047158 (MGA94)	SURFACE CONDITIONS : Topsoil/ Grass	LOCATION : Meningie - Alignment 3
RIG TYPE : MK5 Investigator	CONTRACTOR : Drilling Solutions	DIP / AZIMUTH : 90°
DATE DRILLED : 18/9/13 to 18/9/13	LOGGED BY : AL CHECKED BY : IC	STANDARD : AS 1726-1993

DRILLING & WATER DETAIL	FIELD DATA: pHF	pHFOX	Reaction Rate	Change in pH	SAMPLES & SPT DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION (Classification Symbol) SOIL NAME: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Structure, Additional Observations	MOISTURE	CONSISTENCY / DENSITY	COMMENTS Field Test Data & Other Observations
HAD	8.76	8.53	L	0.23	6.00m	7.0	6.0		SAND (SP); fine to medium grained subangular to subrounded sand, yellow-brown mottled orange, with silt, calcareous	D	MD	
						6.5	6.5		As above, pale brown	M		
	8.32	8.04	L	0.28	7.00m	6.0	7.0				MD - D	
						5.5	7.5					
	8.52	7.93	L	0.59	8.00m	5.0	8.0					
						4.5	8.5		As above, yellow-white			
	8.75	7.43	L	1.32	9.00m	4.0	9.0					
						3.5	9.5					
	8.52	7.96	L	0.56	10.00m	3.0	10.0					
						2.5	10.5				D	

DRILLING

HA	Hand Auger	HQ	HQ Coring
HAD	Hollow Auger Drilling	NQ	NQ Coring
WB	Washbore	PQ	PQ Coring
RR	Rock Rolling	NMLC	NMLC Coring
AH	Air Hammer		

GROUNDWATER SYMBOLS

- = Water level (static)
- = Water level (during drilling)
- = Water inflow
- = Water outflow

SAMPLES & FIELD TESTS

D Disturbed Sample	SPT SPT Sample
B Bulk Sample	U U50 Sample
ES Env Soil Sample	W Water Sample
EW Env Water Sample	

MOISTURE CONDITION
D = Dry M = Moist W = Wet

PP Hand Penetrometer
SV Hand Vane Shear
(P: Peak Su R: Residual Su)
N SPT blows per 300mm

REACTION RATE - PEROXIDE
L slight effervescence
M moderate reaction
H vigorous reaction
X volcanic, very vigorous reaction

DENSITY (N-value)

VL	Very Loose	0 - 4
L	Loose	4 - 10
MD	Medium Dense	10 - 30
D	Dense	30 - 50
VD	Very Dense	50 - 100

CONSISTENCY (Su) {N-value}

VS	Very Soft	< 12 kPa {0-2}
S	Soft	12 - 25 {2-4}
F	Firm	25 - 50 {4-8}
St	Stiff	50 - 100 {8-15}
VSt	Very Stiff	100 - 200 {15-30}
H	Hard	> 200 kPa {>30}

SOIL LOG

HOLE NO: **BH12**
PAGE : 3 OF 3

PROJECT : Geotechnical & ASS Inv., Lake Albert	SURFACE ELEVATION : 13.00 m (AHD)	JOB NO : VE23811.1
POSITION : E: 339702, N: 6047158 (MGA94)	SURFACE CONDITIONS : Topsoil/ Grass	LOCATION : Meningie - Alignment 3
RIG TYPE : MK5 Investigator	CONTRACTOR : Drilling Solutions	DIP / AZIMUTH : 90°
DATE DRILLED : 18/9/13 to 18/9/13	LOGGED BY : AL CHECKED BY : IC	STANDARD : AS 1726-1993

DRILLING & WATER DETAIL	FIELD DATA: pHF	pHFOX	Reaction Rate	Change in pH	SAMPLES & SPT DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION (Classification Symbol) SOIL NAME: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Structure, Additional Observations	MOISTURE	CONSISTENCY / DENSITY	COMMENTS Field Test Data & Other Observations
HAD						1.5	11.5		SAND (SP); fine to medium grained subangular to subrounded sand, yellow-brown mottled orange, with silt, calcareous *(continued)*	M	D	
						1.0	12.0					
						0.5	12.5					
						0.0	13.0		As above, becoming fine to coarse grained sand	W		13.00: Groundwater encountered
						-0.5	13.5					
						-1.0	14.0		14.00m EOH at 14 m bgl			
						-1.5	14.5					
						-2.0	15.0					
						-2.5	15.5					
						-3.0	16.0					

DRILLING

HA	Hand Auger	HQ	HQ Coring
HAD	Hollow Auger Drilling	NQ	NQ Coring
WB	Washbore	PQ	PQ Coring
RR	Rock Rolling	NMLC	NMLC Coring
AH	Air Hammer		

GROUNDWATER SYMBOLS
= Water level (static)
= Water level (during drilling)
= Water inflow
= Water outflow

SAMPLES & FIELD TESTS

D	Disturbed Sample	SPT	SPT Sample
B	Bulk Sample	U	U50 Sample
ES	Env Soil Sample	W	Water Sample
EW	Env Water Sample		

PP Hand Penetrometer
SV Hand Vane Shear
(P: Peak Su R: Residual Su)
N SPT blows per 300mm

MOISTURE CONDITION
D = Dry M = Moist W = Wet

REACTION RATE - PEROXIDE
L slight effervescence
M moderate reaction
H vigorous reaction
X volcanic, very vigorous reaction

DENSITY (N-value)

VL	Very Loose	0 - 4
L	Loose	4 - 10
MD	Medium Dense	10 - 30
D	Dense	30 - 50
VD	Very Dense	50 - 100

CONSISTENCY (Su) {N-value}

VS	Very Soft	< 12 kPa {0-2}
S	Soft	12 - 25 {2-4}
F	Firm	25 - 50 {4-8}
St	Stiff	50 - 100 {8-15}
VSt	Very Stiff	100 - 200 {15-30}
H	Hard	> 200 kPa {>30}

SOIL LOG

HOLE NO: **BH13**
PAGE : 1 OF 2

PROJECT : Geotechnical & ASS Inv., Lake Albert	SURFACE ELEVATION : 4.00 m (AHD)	JOB NO : VE23811.1
POSITION : E: 340143, N: 6047660 (MGA94)	SURFACE CONDITIONS : Topsoil/ Grass	LOCATION : Meningie - Alignment 3
RIG TYPE : MK5 Investigator	CONTRACTOR : Drilling Solutions	DIP / AZIMUTH : 90°
DATE DRILLED : 18/9/13 to 18/9/13	LOGGED BY : AL CHECKED BY : IC	STANDARD : AS 1726-1993

DRILLING & WATER DETAIL	FIELD DATA pHF	pHFOX	Reaction Rate	Change in pH	SAMPLES & SPT DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION (Classification Symbol) SOIL NAME: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Structure, Additional Observations	MOISTURE	CONSISTENCY / DENSITY	COMMENTS Field Test Data & Other Observations
HAD	7.17	6.85	L	0.32					Topsoil, Silty SAND (SM); fine to medium grained sand, dark brown-black, trace organic matter (root fibres), organic odour	D	L	
									0.20m Silty SAND (SM); fine to medium grained subangular to subrounded sand, dark brown, organic odour			
	8.34	6.77	L - M	1.57	0.50m				0.80m			
					1.00m SPT 6, 14, 21 N*=35	3.0	1.0		SAND (SP); fine to medium grained subangular to subrounded sand, yellow-white, trace fine to medium grained subrounded gravel, trace pockets of clay/silt, calcareous		D	1.00: SPT Recovery: 0.43 m
	8.37	7.26	L	1.11	1.45m							
	7.97	7.52	L	0.45	1.50m				As above, yellow-white mottled orange			
	8.05	7.98	L	0.07	2.00m	2.0	2.0					
18/09/13					2.50m SPT 15, 21, 20 N*=41					W		2.50: Groundwater encountered; SPT Recovery: 0.38 m
					2.95m 3.00m	1.0	3.0		3.00m Gravelly SAND (SW); fine to medium grained subangular to subrounded sand, mottled yellow/white, fine to medium grained subrounded gravel, calcareous			
	7.85	7.60	L	0.25								
					4.00m SPT 11, 11, 9 N*=20	0.0	4.0		As above, with decreased gravel content		MD	4.00: SPT Recovery: 0.31 m
	7.69	7.44	L	0.25	4.45m				As above, mottled yellow/white/orange			
	8.09	7.63	L	0.46	5.00m	-1.0	5.0		5.00m SAND (SP); fine to medium grained subangular to subrounded sand, pale brown, with silt, calcareous			
					5.50m SPT 1, 1, 0 N*=1						L	5.50: SPT Recovery: 0.36 m
					5.95m 6.00m							

SKM-GEO-MELB-LIBRARY AL 2013.GLB Log SKM SOIL LOG V3 (ASS TEST) VE23811_SOIL LOGS_REV0.GPJ <<DrawingFile>> 30/10/2013 09:34

DRILLING

HA	Hand Auger	HQ	HQ Coring
HAD	Hollow Auger Drilling	NQ	NQ Coring
WB	Washbore	PQ	PQ Coring
RR	Rock Rolling	NMLC	NMLC Coring
AH	Air Hammer		

GROUNDWATER SYMBOLS

▼ = Water level (static)
▽ = Water level (during drilling)
▶ = Water inflow
◀ = Water outflow

SAMPLES & FIELD TESTS

D	Disturbed Sample	SPT	SPT Sample
B	Bulk Sample	U	U50 Sample
ES	Env Soil Sample	W	Water Sample
EW	Env Water Sample		

PP Hand Penetrometer
SV Hand Vane Shear
(P: Peak Su R: Residual Su)
N SPT blows per 300mm

MOISTURE CONDITION
D = Dry M = Moist W = Wet

REACTION RATE - PEROXIDE
L slight effervescence
M moderate reaction
H vigorous reaction
X volcanic, very vigorous reaction

DENSITY (N-value)

VL	Very Loose	0 - 4
L	Loose	4 - 10
MD	Medium Dense	10 - 30
D	Dense	30 - 50
VD	Very Dense	50 - 100

CONSISTENCY (Su) {N-value}

VS	Very Soft	< 12 kPa {0-2}
S	Soft	12 - 25 {2-4}
F	Firm	25 - 50 {4-8}
St	Stiff	50 - 100 {8-15}
VSt	Very Stiff	100 - 200 {15-30}
H	Hard	> 200 kPa {>30}

SOIL LOG

HOLE NO: **BH13**
PAGE : 2 OF 2

PROJECT : Geotechnical & ASS Inv., Lake Albert	SURFACE ELEVATION : 4.00 m (AHD)	JOB NO : VE23811.1
POSITION : E: 340143, N: 6047660 (MGA94)	SURFACE CONDITIONS : Topsoil/ Grass	LOCATION : Meningie - Alignment 3
RIG TYPE : MK5 Investigator	CONTRACTOR : Drilling Solutions	DIP / AZIMUTH : 90°
DATE DRILLED : 18/9/13 to 18/9/13	LOGGED BY : AL CHECKED BY : IC	STANDARD : AS 1726-1993

DRILLING & WATER DETAIL	FIELD DATA pHF	pHFOX	Reaction Rate	Change in pH	SAMPLES & SPT DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION (Classification Symbol) SOIL NAME: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Structure, Additional Observations	MOISTURE	CONSISTENCY / DENSITY	COMMENTS Field Test Data & Other Observations
HAD	8.33	7.76	L	0.57					SAND (SP); fine to medium grained subangular to subrounded sand, pale brown, with silt, calcareous *(continued)*	W	L	
	8.34	7.90	L	0.44	7.00m SPT 1, 1, 1 N=2 7.45m	-3.0	7.0					7.00: SPT Recovery: 0 m
						-4.0	8.0					
	8.11	7.75	L	0.36	8.50m SPT 4, 6, 14 N*=20 8.95m				8.50m SAND (SW); fine to coarse grained subangular to subrounded sand, yellow-white, with silt, calcareous		MD	8.50: SPT Recovery: 0.39 m
	8.05	7.68	L	0.37	9.05m	-5.0	9.0					
					10.00m SPT 31, 50/150mm N*=R 10.30m	-6.0	10.0				VD	10.00: SPT Recovery: 0.39 m
						-7.0	11.0		11.00m EOH at 11 m bgl			

DRILLING

HA	Hand Auger	HQ	HQ Coring
HAD	Hollow Auger Drilling	NQ	NQ Coring
WB	Washbore	PQ	PQ Coring
RR	Rock Rolling	NMLC	NMLC Coring
AH	Air Hammer		

GROUNDWATER SYMBOLS
= Water level (static)
= Water level (during drilling)
= Water inflow
= Water outflow

SAMPLES & FIELD TESTS

D	**Disturbed Sample**	SPT	SPT Sample
B	**Bulk Sample**	U	U50 Sample
ES	**Env Soil Sample**	W	Water Sample
EW	**Env Water Sample**		

PP Hand Penetrometer
SV Hand Vane Shear
(P: Peak Su R: Residual Su)
N SPT blows per 300mm

MOISTURE CONDITION
D = Dry M = Moist W = Wet

REACTION RATE - PEROXIDE
L slight effervescence
M moderate reaction
H vigorous reaction
X volcanic, very vigorous reaction

DENSITY (N-value)

VL	Very Loose	0 - 4
L	Loose	4 - 10
MD	Medium Dense	10 - 30
D	Dense	30 - 50
VD	Very Dense	50 - 100

CONSISTENCY (Su) {N-value}

VS	Very Soft	< 12 kPa {0-2}
S	Soft	12 - 25 {2-4}
F	Firm	25 - 50 {4-8}
St	Stiff	50 - 100 {8-15}
VSt	Very Stiff	100 - 200 {15-30}
H	Hard	> 200 kPa {>30}

SOIL LOG

HOLE NO: **BH14**
PAGE : 1 OF 2

PROJECT : Geotechnical & ASS Inv., Lake Albert	SURFACE ELEVATION : 1.58 m (AHD)	JOB NO : VE23811.1
POSITION : E: 340369, N: 6048318 (MGA94)	SURFACE CONDITIONS : Topsoil/ Grass	LOCATION : Meningie - Alignment 3
RIG TYPE : MK5 Investigator	CONTRACTOR : Drilling Solutions	DIP / AZIMUTH : 90°
DATE DRILLED : 18/9/13 to 18/9/13	LOGGED BY : AL CHECKED BY : IC	STANDARD : AS 1726-1993

DRILLING & WATER DETAIL	FIELD DATA pHF	pHFOX	Reaction Rate	Change in pH	SAMPLES & SPT DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION (Classification Symbol) SOIL NAME: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Structure, Additional Observations	MOISTURE	CONSISTENCY / DENSITY	COMMENTS Field Test Data & Other Observations
18/09/13 ▽	7.01	6.61	L	0.4	0.10m				0.10m Topsoil, Silty SAND (SM); fine to medium sand, dark brown, trace organic matter (root fibres), organic odour	D	L	
	8.41	8.70	L - M	-0.29					Sandy CLAY (CI); medium plasticity clay, dark brown mottled white/orange, fine to medium grained subangular to subrounded sand, calcareous		F	
	7.57	8.39	L - M	-0.82	0.50m	1.1	0.5		0.50m SAND (SP); fine to medium grained subangular to subrounded sand, brown mottled grey, with silt, calcareous	W	L - MD	0.50: Groundwater encountered
	7.88	8.11	L - M	-0.23	1.00m	0.6	1.0					
						0.1	1.5					
	7.60	7.18	L	0.42	2.00m	-0.4	2.0		2.00m Silty SAND (SM); fine to medium grained subangular to subrounded sand, grey-green, with pocket of mottled white/grey clay, calcareous		MD	
						-0.9	2.5					
	8.17	7.76	L	0.41	3.00m	-1.4	3.0		3.00m SAND (SP); fine to medium grained subangular to subrounded sand, grey with white/black flecks, with silt, calcareous			
						-1.9	3.5					
	7.85	7.29	L	0.56	4.00m	-2.4	4.0					
						-2.9	4.5					
	7.90	7.20	L	0.7	5.00m	-3.4	5.0					

HAD

DRILLING

HA	Hand Auger	HQ	HQ Coring
HAD	Hollow Auger Drilling	NQ	NQ Coring
WB	Washbore	PQ	PQ Coring
RR	Rock Rolling	NMLC	NMLC Coring
AH	Air Hammer		

GROUNDWATER SYMBOLS

▼ = Water level (static)
▽ = Water level (during drilling)
▶ = Water inflow
◀ = Water outflow

SAMPLES & FIELD TESTS

D Disturbed Sample	SPT SPT Sample
B Bulk Sample	U U50 Sample
ES Env Soil Sample	W Water Sample
EW Env Water Sample	

MOISTURE CONDITION
D = Dry M = Moist W = Wet

PP Hand Penetrometer
SV Hand Vane Shear
(P: Peak Su R: Residual Su)
N SPT blows per 300mm

REACTION RATE - PEROXIDE
L slight effervescence
M moderate reaction
H vigorous reaction
X volcanic, very vigorous reaction

DENSITY (N-value)

VL	Very Loose	0 - 4
L	Loose	4 - 10
MD	Medium Dense	10 - 30
D	Dense	30 - 50
VD	Very Dense	50 - 100

CONSISTENCY (Su) {N-value}

VS	Very Soft	< 12 kPa {0-2}
S	Soft	12 - 25 {2-4}
F	Firm	25 - 50 {4-8}
St	Stiff	50 - 100 {8-15}
VSt	Very Stiff	100 - 200 {15-30}
H	Hard	> 200 kPa {>30}

SOIL LOG

HOLE NO: **BH14**
PAGE : 2 OF 2

PROJECT : Geotechnical & ASS Inv., Lake Albert	SURFACE ELEVATION : 1.58 m (AHD)	JOB NO : VE23811.1
POSITION : E: 340369, N: 6048318 (MGA94)	SURFACE CONDITIONS : Topsoil/ Grass	LOCATION : Meningie - Alignment 3
RIG TYPE : MK5 Investigator	CONTRACTOR : Drilling Solutions	DIP / AZIMUTH : 90°
DATE DRILLED : 18/9/13 to 18/9/13	LOGGED BY : AL CHECKED BY : IC	STANDARD : AS 1726-1993

DRILLING & WATER DETAIL	FIELD DATA pHF	pHFOX	Reaction Rate	Change in pH	SAMPLES & SPT DATA	RL (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION (Classification Symbol) SOIL NAME: Plasticity or Particle Characteristics, Colour, Secondary and Minor Components, Structure, Additional Observations	MOISTURE	CONSISTENCY / DENSITY	COMMENTS Field Test Data & Other Observations
HAD									SAND (SP); fine to medium grained subangular to subrounded sand, grey with white/black flecks, with silt, calcareous *(continued)*	W	MD	
	7.91	7.39	L	0.52	6.00m	-4.4	6.0					
						-4.9	6.5					
	7.60	7.23	L	0.37	7.00m	-5.4	7.0					
						-5.9	7.5					
									7.90m			
	7.63	7.26	L	0.37	8.00m	-6.4	8.0		8.00m Silty SAND (SM); fine to medium grained subangular to subrounded sand, white, calcareous	M	D	
									SAND (SP); fine to medium grained subangular to subrounded sand, grey with white/black flecks, with silt, calcareous	W	MD	
						-6.9	8.5					
									8.80m			
	7.94	7.11	L	0.83	9.00m	-7.4	9.0		Silty SAND (SM); fine to medium grained subangular to subrounded sand, white, calcareous 9.00m	M	D	
									SAND (SP); fine to medium grained sand subangular to subrounded, grey with white/black flecks, with silt, calcareous	W	MD	
									9.30m			
									Silty SAND (SM); fine to medium grained subangular to subrounded sand, white, calcareous 9.50m	M	D	
						-7.9	9.5		SAND (SW); fine to coarse grained subangular to subrounded sand, yellow-white, with silt, calcareous	W	MD	
	7.80	7.04	L	0.76	10.00m	-8.4	10.0		10.00m EOH at 10 m bgl			
						-8.9	10.5					

DRILLING

HA	Hand Auger	HQ	HQ Coring
HAD	Hollow Auger Drilling	NQ	NQ Coring
WB	Washbore	PQ	PQ Coring
RR	Rock Rolling	NMLC	NMLC Coring
AH	Air Hammer		

GROUNDWATER SYMBOLS

= Water level (static)
= Water level (during drilling)
= Water inflow
= Water outflow

SAMPLES & FIELD TESTS

D Disturbed Sample	SPT SPT Sample
B Bulk Sample	U U50 Sample
ES Env Soil Sample	W Water Sample
EW Env Water Sample	

MOISTURE CONDITION
D = Dry M = Moist W = Wet

PP Hand Penetrometer
SV Hand Vane Shear
(P: Peak Su R: Residual Su)
N SPT blows per 300mm

REACTION RATE - PEROXIDE
L slight effervescence
M moderate reaction
H vigorous reaction
X volcanic, very vigorous reaction

DENSITY (N-value)

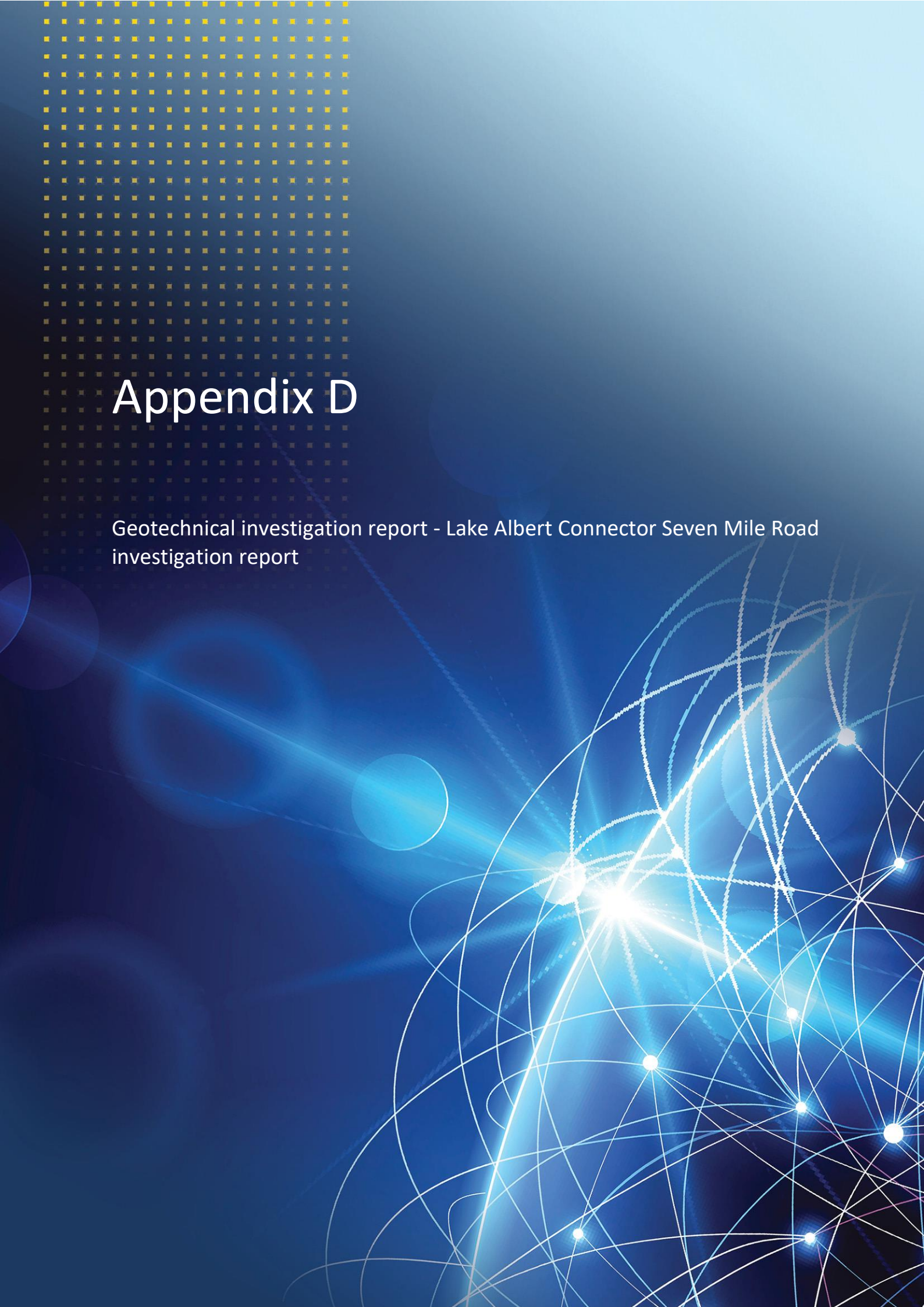
VL	Very Loose	0 - 4
L	Loose	4 - 10
MD	Medium Dense	10 - 30
D	Dense	30 - 50
VD	Very Dense	50 - 100

CONSISTENCY (Su) {N-value}

VS	Very Soft	< 12 kPa {0-2}
S	Soft	12 - 25 {2-4}
F	Firm	25 - 50 {4-8}
St	Stiff	50 - 100 {8-15}
VSt	Very Stiff	100 - 200 {15-30}
H	Hard	> 200 kPa {>30}

Appendix D

Geotechnical investigation report - Lake Albert Connector Seven Mile Road investigation report



31 August 2021

COORONG INFRASTRUCTURE FEASIBILITY ASSESSMENT: LAKE ALBERT TO COORONG CONNECTOR

SEVEN MILE ROAD, MENINGIE, SA 5264

GEOTECHNICAL INVESTIGATION REPORT

Kellog Brown and Root

ADL2021-0001AD Rev0

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1 EXECUTIVE SUMMARY

This report presents the results of the geotechnical and contamination site investigation carried out at Lake Albert – Coorong Connector alignment, at Seven Mile Road, Meningie, SA 5264. Key findings are summarised below.

- Uncontrolled fill was encountered generally at depths up to 0.3m but may extend up to 0.7 metres at the northern end of the alignment (corresponds to BH04);
- Site classification to AS2870-2011 for the site is Class A. However, due to the presence of Carbonate /Calcareous soil, BH01 and BH02 is classified as Class P.
- Pad foundations are considered to be a suitable, subject to recommendations provided herein.
- Groundwater was encountered at variable depth below ground level during the site investigation. Depth of Groundwater varies depending on the terrain and seasonal variation.

Contamination, PASS and ASS results are pending and will be reported separately.

2 INTRODUCTION

CMW Geosciences (CMW) was authorised by KBR to carry out a geotechnical investigation for the proposed infrastructure development options at the Lake Albert - Coorong Connector at Meningie, SA 5264.

The scope of work undertaken was generally consistent with our proposal letter referenced ADL2020-0001AA, Rev1 dated 30 July 2021.

The purpose of this report is to describe the investigation completed, the ground conditions encountered, to provide recommendations and geotechnical parameters and native soil modulus to aid the construction work involved with proposed developments at Lake Albert - Coorong Connector and recommendations for excavatibility, long term and short term excavation stability.

Limited environmental testing has been undertake and the results will be issued in a separate addendum to this report.

3 PROJECT APPRECIATION

Due to historically low River Murray flows, water levels in the Lower Lakes reached a record low of one metre below sea level. This reduction in water level has led to an increase in salinity and threatened the ecology of Lake Albert, the local economy (particularly the agricultural sector) and dependent communities. Potential acid sulphate soil (PASS) has become exposed to oxygen resulting in changes to the ecological characteristics of the region. A number of government investigations, interventions and on-ground works and measures were initiated in response.

Lake Albert is a terminal lake with no direct connectivity to the sea, so the ability for salt to be naturally exported from the system is limited. The lake's main water inflow comes from Lake Alexandrina via the Narrung Narrows. Despite improvements in water levels and flows since the drought, salinity levels declined but have not returned to pre-drought levels.

An option currently being considered is the installation of pipeline along the Seven Mile Road between Lake Albert and Coorong North Lagoon as shown in Figure 1. KBR requires an understanding of the ground condition within the proposed alignment for the potential development of the infrastructure. As such herein is our preliminary investigation report along this alignment.

Figure 1: Proposed alignment of pipeline along Seven Mile Road (extract from client supplied document).

4 SITE DESCRIPTION

The proposed development is located along the Seven Mile Road between Lake Albert and Coorong North Lagoon. The investigation locations are evenly distributed along the alignment with two locations at each end of the alignment as close as practical to the shoreline. The alignment along the Seven Mile Road is generally flat with few small hills (elevated sections) along the alignment.

The investigation location at BH01 is approximately 6m away from the shoreline of the Coorong North Lagoon. The ground level of the investigation location is approximately 0.5m above the water level. The surrounding surface consists of dune sand, with low height grass and scattered calcrete near to the water body. General view of BH01 is presented in Figure 2.

The investigation location BH04 is located at the northern end of the alignment located near the intersection of Narrung Road and Seven Mile Road. The investigation location is selected just south of the private property fence approximately 30 to 35m away from the water edge of the Lake Albert.

The investigation locations BH02 and BH03 is located at relatively higher ground upon Seven Mile Road. The location of BH02 is just near to the top of the hill and BH04 is located at a gradient from the top of the hill. General view of the location near BH02 is presented in Figure 3.

Figure 2 - Site photograph at BH01, Northern end of the proposed alignment.

Figure 1: Site photograph at BH02 near a small hill top (elevated section) along Seven Mile Road

5 FIELD INVESTIGATION

Following a dial before you dig search, and onsite service location, the field investigation was carried out on 13 August 2021. All fieldwork was carried out under the direction of CMW Geosciences in general accordance with AS1726 (2017), Geotechnical Site Investigations. The scope of fieldwork completed as follows:

- Completed a dial before you dig search and engaged a specialist service locator for locating the underground services before commencing the drilling work;
- Engaged a specialist traffic management sub-contractor to create Traffic Management Plans (TMPs) and provide Traffic Control services for the work undertaken on Council roads;
- Advance 4x boreholes denoted by BH01 to BH04 along Seven Mile Road alignment to a target depth of 6.0m below ground level or shallower upon practical refusal, using solid auger and pushtube drilling methods by a 4WD mounted drill rig. BH01 was refused early at 3.1m before reaching the target depth;
- Conducted a dynamic cone penetrometer (DCP) test adjacent each borehole location to a depth of 1.5m below ground level (DCP adjacent BH01 encountered shallow refusal);
- Collected sufficient soil samples for subsequent ASS and contamination laboratory testing, including:
    - 8 x samples for Potential Acid Sulphate Soils testing
    - 24x Soil samples in glass jar for contamination testing (SA Waste Screen suite, which includes 13 metals, total recoverable hydrocarbons (TRH), benzene, toluene, ethylbenzene, xylenes, naphthalene (BTEXN), polycyclic aromatic hydrocarbons (PAHs), phenols, organochlorine pesticides (OCP), polychlorinated biphenyls (PCBs) and total cyanide; As well as targeted pesticides and metals testing at the following depth below ground level:
        - 0.0 – 0.15m;
        - 0.1 to 0.15m depth of the top of natural material;
        - 0.5 to 0.6m;
        - 1.0 – 1.1m;
        - 1.5 to 1.6m; and
        - 2.0 to 2.1m

Collection of Duplicate soil samples after every 10 samples. Rinsate samples from the re-usable equipment is collected on a daily basis.

Engineering logs of the subsurface conditions, as well as graphical representation of DCP test results are presented in Appendix A. The approximate locations of the respective investigation sites referred to above are shown in the attached site investigation plan (Drawing 1).

The investigation locations were recorded using a hand-held GPS to the inherent accuracy of the unit (+/- 5m) and elevations were inferred based on the survey plan provided.

6 GROUND MODEL

6.1 Regional Geology

The Geological Survey of South Australia 1:250,000 geological map Sheet 1 54-13 “Barker” Sheet indicates that the geology at the Narrung Narrows and proposed Coorong Connector alignments is

Quaternary kunkarised dunes, sand spreads and kunkar related to calcareous rock. Kunkar soil profiles typically comprise nodular calcium carbonate soils formed in semi-arid regions with alluvial flats.
An excerpt from the SARIG 1:100,000 geological overlay is presented in Figure 4 and illustrates the expected geological units and their distribution. Quaternary alluvial flat deposits are present locally, immediately adjacent to Lake Albert, with shallow depressions expected to contain Holocene Lacustrine Sediments (Q). The southern portion (Coorong Side) is expected to comprise Bridgewater Formation materials (Qpcb) calcareous cross-bedded sand dunes with calcrete capping).

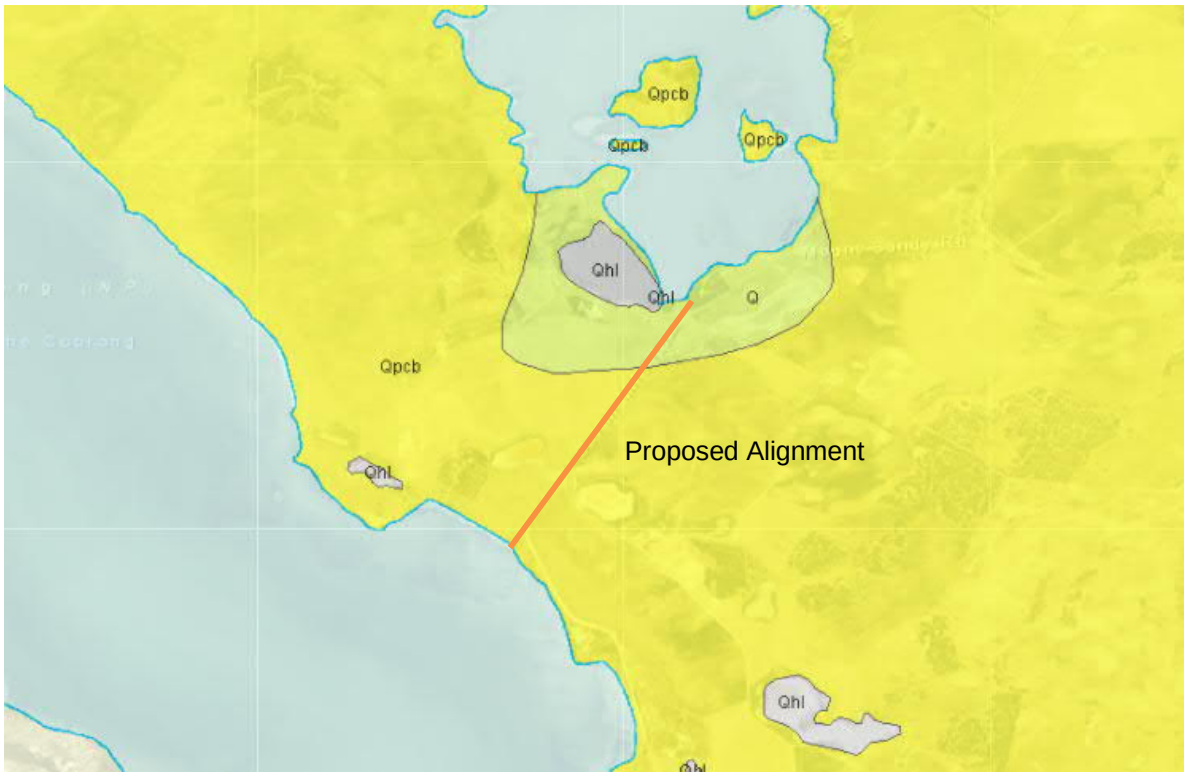


Figure 4: Regional Geology of Proposed Alignment (SARIG 2021)

6.2 Subsurface Conditions

The ground conditions encountered and inferred from the investigation were generally consistent with the published geology for the area. Towards the northern end of the alignment (BH01 and BH02) consists to Quarternary alluvial deposit while this unit is not present the southern end of the alignment at BH01 and BH02. The subsurface profile for site can be generalise as below

FILL / TOPSOIL	SAND; fine to medium grained, grey to dark grey, with root fibres.
CARBONATE GRAVELLY SAND; associated with road base within Seven Mile Road consists of fine to coarse grained, grey and white, medium to coarse grained gravel.	
SAND	fine to medium grained, pale grey to grey and pale brown. This unit is encountered in northern part of the Lake Albert – Coorong Connector alignment. QUARTERNARY ALLUVIAL
SAND / CALCAREOUS SAND / CARBONATE SAND; fine to coarse grained, pale brown, pale grey to white with fine to medium grained gravel, angular to subangular, trace low plasticity silt, often calcareous or carbonated. BRIDGEWATER FORMATION	

CALCAREOUS GRAVELLY SAND; medium to coarse grained, pale grey to white, fine to medium grained, angular to subangular, trace low plasticity silt.

A summary of the subsurface conditions encountered is provided in Table 1. The conditions encountered are described in more detail on the borehole logs presented in Appendix A.

Table 1: Summary of Subsurface Conditions

Description	Depth to base of layer (m)			
	BH01	BH02	BH03	BH04
FILL / TOPSOIL	0.05	0.20	0.30	0.70
SAND (QUATERNARY ALLUVIAL)	NE	NE	2.25	3.90
SAND/GRAVELLY SAND (BRIDGEWATER FORMATION)	3.10*	6.00*	6.00*	6.00*
Notes: * - termination depth of the borehole, NE – Not Encountered				

6.3 Groundwater

During the investigation, which was completed in August 2021 at the end of a wet season period), groundwater was encountered within the investigation depth. The summary of groundwater depth encountered in borehole locations are presented in Table 2.

Table 2: Summary of Groundwater Depth Below Ground Level

Borehole ID	BH01	BH02	BH03	BH04
Groundwater Depth (m)	0.6	5.5	NE	1.9
Note: NE – Not Encountered				

It is to be noted that the variation of depth of groundwater table is influenced by the level of ground surface at investigation locations. BH01 and BH04 is close to water body while BH02 and BH04 within the top of the hill along Seven Mile Road which have relatively higher ground level.

Based on regional geology maps (SARIG 2021) groundwater is expected between 2 and 5 metres below ground level. Should further information on permanent site groundwater levels be required, additional investigation would need to be carried out (i.e. installation of groundwater monitoring wells) with ongoing monitoring of levels.

7 GEOTECHNICAL ASSESSMENT AND RECOMMENDATIONS

7.1 Earthworks and Excavation Conditions

Earthworks may be required to remove existing uncontrolled fill, vegetation and any topsoil material encountered below the pavement and/or area related to the structure. Based on the ground conditions encountered within the boreholes, stripping depths are recommended to be generally 0.3m but may extend up to 0.7 metres at the southern end (corresponds to BH04) below existing surface level.

General guidelines relating to earthworks for foundations include:

- Remove any uncontrolled fill, loose surface soils and vegetation;

- Moisture condition the exposed subgrade as necessary;
- Proof roll the exposed surface as per AS3798 under the guidance of a suitable trained person;
- Any wet, soft, loose or heaving materials identified during proof rolling should be removed as directed by the geotechnical engineer or Level 1 Geotechnical Inspection and Testing Authority (GITA);
- Fill, where required, should be placed in layers not exceeding 250mm loose thickness and be compacted to the required standard density with each fill layer being level before placing the next layer. Thinner layers (i.e. 150mm to 200mm) may be required for smaller compaction equipment to ensure the required minimum compaction density is achieved. The recommended compaction levels would be:
    - Pavement Subgrades – 98% standard minimum dry density ratio at ±3% optimum moisture content
    - Pavement Materials – 98% modified minimum dry density ratio
    - Beneath Structures – 100% standard minimum dry density ratio at ±2% optimum moisture content

The technical and control requirements for engineered fill, including site observation and compaction testing, are outlined in AS3798. We recommend that this work is completed under the direction and control of a suitably experienced Geotechnical Engineer familiar with the contents of this report. CMW would be pleased to perform this function if required.

7.2 Site Classification – AS2870

Fill was encountered in all borehole locations, with depths ranging between 0.1 and 0.7 metres below ground level. It is assumed that the fill is uncontrolled.

Carbonate / Calcareous sand layers encountered within BH01 and BH02. Carbonate / Calcareous Soils are considered collapsible soil due to its unstable nature especially under the influence of moisture. Collapsing soils appear strong when dry but lose considerable strength on wetting and it is important that they are correctly identified during a site investigation. Characteristically, collapsing soils are of low density and low plasticity and are generally aeolian in origin.

Sites with collapsing soils are designated as Class ‘P’ as per AS2870-2011 “Residential Slabs and Footings” and require individual design consideration. The normal methods currently in use for designing a footing system on a swelling soil profile do not readily translate to a collapsing soil profile and there are no generally accepted design procedures for designing shallow stiffened footings on deep collapsing soils.

Based on the visual-tactile assessment and of the encountered soil, the following instability indexes have been assessed for the material encountered on site:

- The sand and gravel layers are assessed as non-reactive;

Based upon the design suction soil profile and recommendations in AS2870-2011 “Residential Slabs and Footings” a characteristic surface movement (y_s) has been assessed for the soil profile encountered in the borehole at the current surface level. The depth of design suction change (H_s) adopted in this assessment is 4m based on Table 2.4 in AS2870-2011 and in accordance with local practice, with a design suction change at ground surface of 1.2pF and crack depth of 3.0m.

A summary of indicative y_s values and assessed site classification is given in Table 3.

Table 3: Summary of Predicted ys (mm)				
Locations	**BH01**	**BH02**	**BH03**	**BH04**
y_s (mm)	0	0	0	0
Classification	P	P	A	A

A characteristic surface movement y_s assessed is 0 mm, with the shrink/swell potential considered to be **Class A** and described as mostly a sand and rock site with little or no ground movement from moisture changes. However, due to the presence of Carbonate / Calcareaous soil and potential for collapsing BH01 and BH02 is considered as **Class P**

Larger y_s values may occur when the future moisture content change in the soil exceeds design moisture content change as determined from AS2870, it is recommended that the site classification be reassessed.

7.3 Geotechnical Model

Based on the subsurface conditions encountered and results of field testing a generalised geotechnical model has been assessed for Lake Albert – Coorong Connector alignment and provided in Table 4.

Table 4: Preliminary Geotechnical Model							
Unit	**Depth range (mBGL)**		**Φ' (º)**	**c' (kPa)**	**C_u, (kPa)**	**γ (kN/m³)**	**E' (MPa)**
FILL*/ TOPSOIL	0	0.3	N/A	N/A	N/A	N/A	N/A
QUARTERNARY ALLUVIAL (SAND)*	0.3	3.0	25	-	-	17	15
BRIDGEWATER FORMATION (SAND/GRAVELLY SAND)**	3.0	6.0	32	-	-	18	30

Where; Φ' = angle of internal friction, c' – drained cohesion, c_u = Undrained shear strength γ = bulk unit weight, E = Youngs Modulus N/A – Not Applicable, uncontrolled fill not suitable founding layer

Note: *is expected to encounter in northern end of the alignment (BH03 and BH04).

** layer is expected below fill layer on the southern end of the alignment (BH01 and BH02) and expected below Quaternary Alluvial Sand.

7.4 Allowable Bearing Capacity

The design of available foundation bearing pressures for isolated strip and pad footings at this site has been carried out using the Terzaghi (1943) bearing capacity equation. Subject to completing the earthworks and foundation preparation recommendations provided herein, shallow strip or pad footings founded within natural high plasticity clay be designed based on the maximum allowable bearing pressures provided in Table 5 and Table 6 for Quaternary Alluvial Sand unit and Bridgewater Formation unit respectively.

Table 5: Summary of Allowable Bearing Capacity (Quaternary Alluvial Sand) - North				
Embedment Depth (m)	**Footing Width (m)**	**Footing Length (m)**	**Allowable Bearing Pressure (kPa)**	**Settlement (mm)**
0.5	0.5 strip		50	5
	1.0	1.0	55	5
	2.0	2.0	80	10
1.0	0.5 strip		85	10
	1.0	1.0	90	10
	2.0	2.0	120	15

Table 6: Summary of Allowable Bearing Capacity (Bridgewater Formation Sand) - South				
Embedment Depth (m)	**Footing Width (m)**	**Footing Length (m)**	**Allowable Bearing Pressure (kPa)**	**Settlement (mm)**
0.5	0.5 strip		110	5
	1.0	1.0	120	10
	2.0	2.0	160	15
1.0	0.5 strip		150	10
	1.0	1.0	160	10
	2.0	2.0	190	20

Notes: – Allowable bearing capacity is dependent not only on ground conditions but also footing dimensions, proximity to slopes and allowable settlement.

The values shown in Table 5 and Table 6 are based on a geotechnical strength reduction factor of 0.5 and an average load factor of 1.5 (Factor of Safety = 3.0). It should be noted that these bearing pressures assume isolated vertical, non-eccentric loads. Groundwater was encountered during the ground investigation and was therefore considered in calculating the values provided.

The assessed bearing capacity outlined above assumes that the bearing surfaces are adequately prepared, are clean and free from spoil and other soft and loose material, and free of water during the placement of concrete.

The settlement values presented in Table 5 and Table 6 are elastic settlement of the spread footing at the maximum allowable bearing pressure presented above. Much of the settlement is expected to be relatively immediate, with some time-dependent creep expected at locations of deeper fill.

7.5 Allowable Horizontal Bearing Capacity – Thrust Block

Allowable horizontal bearing pressure depends on the soil type, density and consistency of soil, the size and the average depth of the thrust block or the relevant structure. Table 7 presents a summary of the recommended allowable horizontal bearing pressure for loose to dense sandy soil

type encountered within the investigation locations. The allowable horizontal bearing pressure is estimated as per the SA Water Technical Guideline TG96 for thrust block design.

Table 7: Allowable Horizontal Bearing Pressure	
Soil Type	**Allowable Horizontal Bearing Pressure (kPa)**
Loose Sand	NR
Medium Dense Sand	50
Dense Sand	100
Note: NR – No Standard value	

7.6 Native Soil Modulus

Native soil is assumed to be the material present to a distance 2.5 diameter from the centre line of an embedded pipeline. A generalised assessment of the estimated native soil modulus (horizontal) for pipe embedment design as per Section 3.4 of AS 2566.1 and AWWA Manual M45 for the encountered soil is provided in Table 8.

Table 8: Native Soil Modulus		
Depth (mbgl)	**Unit**	**E'_n (MPa)**
0.0 - 0.3	FILL	-
0.3 – 3.0	QUATERNARY ALLUVIAL SAND	5
3.0 – 6.0	BRIDGEWATER FORMATION (MEDIUM DENSE SAND)	20
	BRIDGEWATER FORMATION (DENSE SAND)	35
E'_n – Native Soil Modulus		

7.7 Construction Issues

7.7.1 Trafficability

Trafficability for tyred vehicles on the natural soils is expected to become poor when wetted.

7.7.2 Excavatability

Based on the resistance to drilling penetration encountered and the DCP testing the resistance to excavation or drilling may vary across the site. Granular natural soils/fills are assessed to be excavatable using conventional earthmoving equipment such as backhoes and excavators. A hard calcrete layer was encountered at shallow depth of 0.6m in the southern end of the alignment (correspond to BH01). The hard layer is prone to very strong resistance to the conventional earthmoving equipment such as graders, excavators and backhoes and slower production rates during trenching are anticipated.

7.7.3 Site Drainage

The ground surface adjacent to the footings should be graded once the footing construction has been completed to provide at least 1 in 20 over the first 2m. Alternatively, all water run-offs should be collected and channelled away or pumped out from the footings area.

7.7.4 Excavation Stability

In accordance with the Occupational Health, Safety and Welfare Regulations 2010, all trench excavations deeper than 1.5 m will need to be supported, benched or assessed by an engineer.

Temporary excavations exceeding 0.5m depth should be continuously battered back at a slope no greater than 1V: 2H. Use of heavy machinery adjacent to open excavations must be avoided. Permanent cut fill batter slopes of 1V:3H may be adopted.

It is recommended that upon confirmation of the proposed construction methodology and where required as per the above guideline, geotechnical design advice is sought to ensure mitigation of geotechnical related hazards. CMW are able to assist in such an assessment.

8 FURTHER WORK

CMW has extensive experience in the detailed design of foundations, pad, shallow footings and deep foundations. We would be pleased to undertake this work to optimise the design solutions for the project. If required, CMW can assist in the detailed design or the review of designs prepared by other parties.

It is recommended that an experienced geotechnical engineer attend site to verify the validity of the assumptions made by the designer as to the subsurface conditions encountered.

9 CLOSURE

The findings contained within this report are the result of limited discrete investigations conducted in accordance with normal practices and standards. To the best of our knowledge, they represent a reasonable interpretation of the general condition of the site. Under no circumstances, can it be considered that these findings represent the actual state of the ground conditions away from our investigation locations.

If the ground conditions encountered during construction are significantly different from those described in this report and on which the conclusions and recommendations were based, then we must be notified immediately.

This report has been prepared for use for KBR in relation to the proposed development at Coorong Infrastructure Feasibility Assessment of Lake Albert to Coorong Connector Project at Seven Mile Road Road, Meningie SA 5264 in accordance with generally accepted consulting practice.

No other warranty, expressed or implied, is made as to the professional advice included in this report. Use of this report by parties other than KBR and their respective consultants and contractors is at their risk as it may not contain sufficient information for any other purposes.

For and on behalf of CMW Geosciences

Prepared by:	Reviewed and authorised by:
Abu Rabbi	John Slade
Project Geotechnical Engineer	**Principal Geotechnical Engineer, CPEng**

Distribution: 1 electronic copy to KBR via email
Original held at CMW Geosciences

10 REFERENCES

- AS 1726 (2017). “Geotechnical site investigations.” Standards Australia, Sydney, NSW 2001, Australia.
- AS 2870 (2011). “Residential slabs and footings.” Standards Australia, Sydney, NSW 2001, Australia.
- AS 3798 (2007). “Buried flexible pipelines Part 1: Structural Design.” Standards Australia, Sydney, NSW 2001, Australia.
- AS 2566.1 (1998). “Guidelines on earthworks for commercial and residential developments.” Standards Australia, Sydney, NSW 2001, Australia.
- AWWA (1996). “AWWA Manual M45 – Fibreglass pipe design.” American Water Works Association, Denver, CO 80235, USA.

Drawing 1
Site Plan

LEGEND:

BH01 APPROXIMATE BOREHOLE (BH) LOCATION

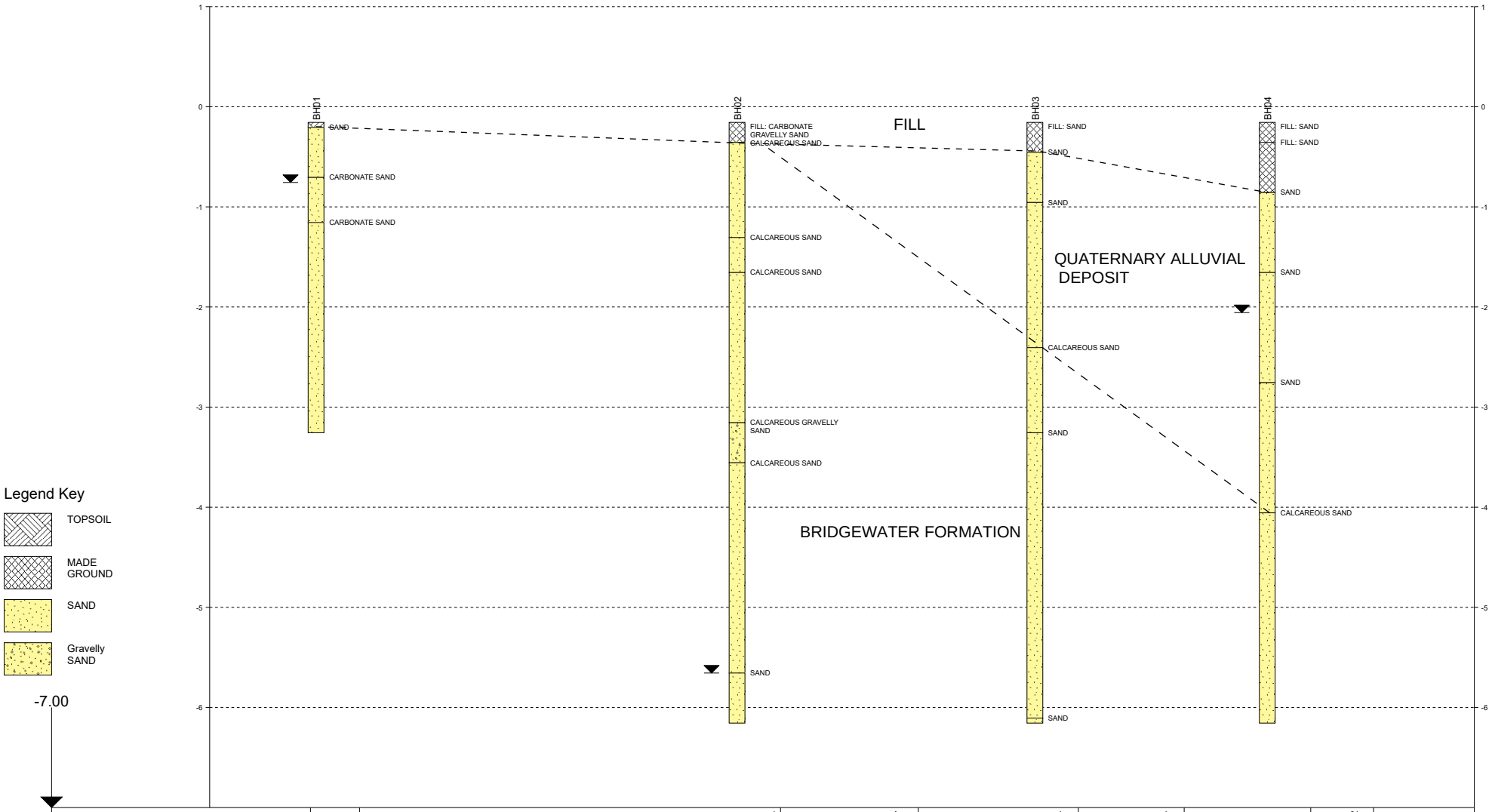
NOTES:

1. AERIAL FROM BING MAPS

1:15000 0 150 300 450 600 750 m

CMW Geosciences

CLIENT: KBR		DRAWN: DE	PROJECT: ADL2021-0001
PROJECT: COORONG INFRASTRUCTURE FEASIBILITY ASSESSMENT		CHECKED: AR	DRAWING: 01
		REVISION: A	SCALE: 1:15,000
TITLE: SITE INVESTIGATION PLAN - SHEET 1		DATE: 16.08.21	SHEET: A3 L



Legend Key

- TOPSOIL
- MADE GROUND
- SAND
- Gravelly SAND

-7.00

Chainage (m)	0.00	82.06	786.24	1016.71	1284.44	1461.45	1673.12	1778.23
Elevation (mAHD)								
Offset (m)	3.87		0.77		6.78		2.41	

CMW Geosciences

CLIENT:	KBR	DRAWN:	AR	PROJECT:	ADL2021-0001
PROJECT:	Coorong Infrastructure Feasibility Assessment Meningie, SA	CHECKED:	JVS	FIGURE:	1
		REVISION:	0	SCALE:	1:57 (V)
TITLE:	Geological Section	DATE:	17/08/2021	SHEET:	A3 L

Appendix A
Results of Field Investigation

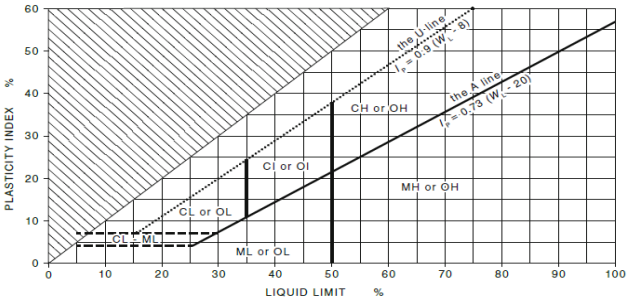
Explanatory Notes – Soil Description

CMW Geosciences

GRAVEL	Gravelly SAND	Sandy CLAY	FILL
SILTY GRAVEL	SILTY SAND	SILT	TOPSOIL
CLAYEY GRAVEL	CLAYEY SAND	Gravelly SILT	COBBLES & BOULDERS
Sandy GRAVEL	CLAY	Sandy SILT	CONCRETE
SAND	Gravelly CLAY	PEAT	NO CORE

GP	Poorly Graded Gravel	ML	Low Plasticity Silt
GW	Well Graded Gravel	MH	High Plasticity Silt
GM	Silty Gravel	CL	Low Plasticity Clay
GC	Clayey Gravel	CI	Medium Plasticity Clay
SP	Poorly Graded Sand	CH	High Plasticity Clay
SW	Well Graded Sand	OL	Organic Soils (LP)
SM	Silty Sand	OH	Organic Soils (HP)
SC	Clayey Sand	PT	Peat
	Fill		Cobbles & Boulders

Soil colours based on BGS Internal report IR/05/123 "A Revised scheme for coding unlithified deposits", 2006.



WATER	
Groundwater (Strike)	Groundwater (rise)

CLASSIFICATION AND INFERRED STRATIGRAPHY

Particle Size		
Major Division	Sub Division	Particle Size
Boulders		> 200 mm
Cobbles		63 to 200 mm
Gravel	Coarse	19 to 63 mm
	Medium	6.7 to 19 mm
	Fine	2.36 to 6.7 mm
Sand	Coarse	0.6 to 2.36 mm
	Medium	0.21 to 0.6 mm
	Fine	0.075 to 0.21 mm
Silt		0.002 to 0.075 mm
Clay		< 0.002 mm

SECONDARY/MINOR COMPONENTS	
TERMS FOR SANDS/GRAVELS (Less than 35% Particles < 0.075mm)	**TERMS FOR CLAYS/SILTS** (More than 35% Particles < 0.075mm)
trace… sand/gravel = <15% clay/silt = <5%	**trace…** sand/gravel = <15%
with… sand/gravel = >15%, <30% clay/silt = >5%, <12%	**with…** sand/gravel = >15%, <30%
Sandy… / Gravelly… >30%	**Sandy… / Gravelly…** >30%
Clayey… / Silty … >12%	

MOISTURE CONDITION (Cohesionless Soils)

Symbol	Term	Description
D	Dry	Looks and feels dry. Cohesionless and free-running.
M	Moist	No free water on remoulding. Soil feels cool, darkened in colour. Soil tends to cohere.
W	Wet	Free water on remoulding. Soil feels cool, darkened in colour. Soil tends to cohere.

MOISTURE CONDITION (Cohesive Soils)

Symbol	Term	Description
<PL	Dry	Looks and feels dry. Hard and friable or powdery, well dry of the plastic limit
≈PL	Moist	Soil feels cool, darkened in colour. Soil can be moulded. Near plastic limit.
>PL	Wet	Soils feels cool, darkened in colour. Usually weakened and free water forms when remoulding. Wet of plastic limit.

DENSITY (Cohesionless Soils)

Sym.	Term	Density Index (%)	SPT 'N'
VL	Very Loose	Less than 15	0 to 4
L	Loose	15 to 35	4 to 10
MD	Medium Dense	35 to 65	10 to 30
D	Dense	65 to 85	30 to 50
VD	Very Dense	Above 85	Above 50

STIFFNESS (Cohesive Soils)

Sym.	Term	Undrained Shear Strength
VS	Very Soft	0 to 12 kPa
S	Soft	12 to 25 kPa
F	Firm	25 to 50 kPa
St	Stiff	50 to 100 kPa
VSt	Very Stiff	100 to 200 kPa

SAMPLING AND LABORATORY / INSITU TESTING RESULTS

B	Bulk Disturbed Sample	U	Undisturbed Push-in Sample	CBR	California Bearing Ratio
BLK	Block Sample	W	Water Sample	UCS	Unconfined Compressive Strength
C	Core Sample	LL	Liquid Limit	PLI	Point Load Index
ES	Environmental Soil Sample	PI	Plasticity Index	N	SPT-N Value
P	Piston Sample	LS	Linear Shrinkage		

DRILLING/EXCAVATION METHOD

AC	Air Core	HA	Hand Auger	RC	Rotary Cored
ADH	Hollow Auger Drilling	HQ	Rotary Core 63.5mm	RO	Rotary Open Hole
AD/V	Auger with V-Bit	HQ3	Rotary Core 61.1mm	SPT	Standard Penetration Test
AD/T	Auger with TC-Bit	PQ3	Rotary Drill 83mm	TP	Test Pit
DPP	Direct Push Probe	PT	Push Tube	W	Wash Bore

BOREHOLE LOG - BH01

Client: KBR
Project: Coorong Infrastructure Feasibility Assessment
Location: Meningie, SA
Project ID: ADL2021-0001
Date: 13/08/2021

CMW Geosciences

1:30 Sheet 1 of 1

Logged by: Abu Rabbi Position: E.342336m N.6042630m Plant used: Rockmaster
Checked by: YW Elevation: Angle from horizontal: 90° Contractor: JR Soil Sampling

Well	Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Dynamic Cone Penetrometer (Blows/100mm)	Structure & other observations
		0.0-0.2	ES				TOPSOIL: SAND: fine to medium grained, dark grey, with root fibres.		VL	1 1	0.00-0.05m: FILL
							SP: SAND: medium to coarse grained; pale grey to pale brown.	M	L	3	0.05-3.10m: BRIDGEWATER FORMATION
										18	
		0.5-0.6	ES						D	25	
	▼	0.6-0.8	ES				SP-SM: CARBONATE SAND: medium to coarse grained; white to pale brown, with low plasticity silt, trace fine to medium grained gravel, angular; with seashells.				0.55-0.75m: Solid auger drilling
		1.0-1.1	ES		1		SP: CARBONATE SAND: medium to coarse grained; grey and white; with fine to medium grained gravel, angular; trace low plasticity silt; inferred calcrete layer.				1.10-3.10m: Solid auger drilling
		1.2-1.4	ES								
		1.2-1.4	QC								
		1.5-1.6	ES					W	VD		
		2.0-2.1	ES		2						
		2.0-2.1	QC								
					3		Borehole terminated at 3.10 m				
					4						
					5						
					6						

DCP/PSP Equipment Ref.: DCP02 | In Situ Vane Ref.: | Pocket Penetrometer Equipment Ref.:

Termination Reason: Equipment refusal

Remarks:

This report must be read in conjunction with accompanying notes and abbreviations.

CORE PHOTOGRAPH SHEET - BH01

Client: KBR
Project: Coorong Infrastructure Feasibility Assessment
Location: Meningie, SA
Project ID: ADL2021-0001
Date: 13/08/2021

BH01_0.0 to 3.1m

BH01_Site Photograph

BOREHOLE LOG - BH02

Client: KBR
Project: Coorong Infrastructure Feasibility Assessment
Location: Meningie, SA
Project ID: ADL2021-0001
Date: 13/08/2021

CMW Geosciences

1:30 Sheet 1 of 1

Logged by: Abu Rabbi Position: E.342703m N.6043231m Plant used: Rockmaster
Checked by: YW Elevation: Angle from horizontal: 90° Contractor: JR Soil Sampling

Well	Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Dynamic Cone Penetrometer (Blows/100mm)	Structure & other observations
		0.0-0.2	ES				FILL: CARBONATE GRAVELLY SAND: fine to coarse grained; grey and white; medium to coarse grained, subangular gravel; with low plasticity silt.	D to M	D	12	0.00-0.20m: FILL
		0.2-0.4	ES				SP: CALCAREOUS SAND: fine to medium grained; brown, trace fine to medium grained gravel, subangular.			12	0.20-6.00m: BRIDGEWATER FORMATION
		0.5-0.6	ES						MD to D	11	
										12	
										10	
										9	
										12	
										23	
										15	
		1.0-1.2	ES		1					17	
										25	
		1.2-1.3	ES				SP: CALCAREOUS SAND: fine to coarse grained; white to pale brown; with fine to medium grained gravel, angular; inferred calcrete layer recovered as sand.		D to VD		
		1.5-1.6	ES				SP: CALCAREOUS SAND: fine to medium grained; pale brown; with fine to medium grained gravel, subangular.	M			
		2.0-2.2	ES		2				MD		
					3		SP: CALCAREOUS GRAVELLY SAND: medium to coarse grained; pale grey to white; fine to medium grained, angular to subangular gravel; trace low plasticity silt.	D to M	D		
							SP: CALCAREOUS SAND: fine to medium grained; pale brown to pale yellow brown; trace fine to medium grained gravel, subrounded.				
					4			M			
									MD		
					5						
	▼	5.5-5.6	ES				SP: SAND: medium grained; brown to orange brown; trace fine grained gravel.	W			
					6		Borehole terminated at 6.00 m				

DCP/PSP Equipment Ref.: DCP02 | In Situ Vane Ref.: | Pocket Penetrometer Equipment Ref.:

Termination Reason: Target depth reached

Remarks:

This report must be read in conjunction with accompanying notes and abbreviations.

CORE PHOTOGRAPH SHEET - BH02

Client: KBR
Project: Coorong Infrastructure Feasibility Assessment
Location: Meningie, SA
Project ID: ADL2021-0001
Date: 13/08/2021

BH02_0.0 to 6.0m

BH02_Site Photograph

BOREHOLE LOG - BH03

Client: KBR
Project: Coorong Infrastructure Feasibility Assessment
Location: Meningie, SA
Project ID: ADL2021-0001
Date: 13/08/2021

CMW Geosciences

1:30 Sheet 1 of 1

Logged by: Abu Rabbi Position: E.342998m N.6043630m Plant used: Rockmaster
Checked by: YW Elevation: Angle from horizontal: 90° Contractor: JR Soil Sampling

Well	Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description (Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components)	Moisture Condition	Consistency/ Relative Density	Dynamic Cone Penetrometer (Blows/100mm)	Structure & other observations
		0.0-0.2	ES				FILL: SAND: fine to medium grained; pale brown.		VL	1	0.00-0.30m: FILL
		0.3-0.4	ES				SP: SAND: fine grained; dark grey.			2	0.30-2.25m: QUARTERNARY ALLUVIAL DEPOSITE
		0.5-0.6	ES						L to MD	3 4 3 3 3	
		0.8-0.9	ES				SP: SAND: fine grained; pale brown to brown.			2 2	
		1.0-1.2	ES		1					2	
		1.0-1.2	QC						L	2 2 2 2 2 2	
		1.5-1.6	ES								
		2.0-2.2	ES		2				L to MD		
							SP: CALCAREOUS SAND: fine to medium grained; pale brown to white; trace low plasticity silt; trace fine to medium grained gravel, subangular to subrounded.		MD to D		2.25-6.00m: BRIDGEWATER FORMATION
		3.0-3.1	ES		3			M			
							SP: SAND: fine to medium grained; pale brown to white, trace fine grained gravel.				
					4				MD		
					5						
							SP: SAND: fine to medium grained; orange brown; trace fine to medium grained gravel, subangular.				
					6		Borehole terminated at 6.00 m				

DCP/PSP Equipment Ref.: DCP02 | In Situ Vane Ref.: | Pocket Penetrometer Equipment Ref.:

Termination Reason: Target depth reached

Remarks:

This report must be read in conjunction with accompanying notes and abbreviations.

CORE PHOTOGRAPH SHEET - BH03

Client: KBR
Project: Coorong Infrastructure Feasibility Assessment
Location: Meningie, SA
Project ID: ADL2021-0001
Date: 13/08/2021

BH03_0.0 to 6.0m

BH03_Site Photograph

BOREHOLE LOG - BH04

Client: KBR
Project: Coorong Infrastructure Feasibility Assessment
Location: Meningie, SA
Project ID: ADL2021-0001
Date: 13/08/2021

CMW Geosciences

1:30 Sheet 1 of 1

Logged by: Abu Rabbi Position: E.343202m N.6043959m Plant used: Rockmaster
Checked by: YW Elevation: Angle from horizontal: 90° Contractor: JR Soil Sampling

Well	Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Dynamic Cone Penetrometer (Blows/100mm)	Structure & other observations
		0.0-0.2	ES				FILL: SAND: fine to medium grained; grey to dark grey; trace low plasticity clay.		L	2, 2	0.00-0.60m: FILL
							FILL: SAND: fine to medium grained; dark grey.			3, 3, 4, 4	
		0.5-0.6	ES								
		0.6-0.8	ES								0.60-3.90m: QUATERNARY ALLUVIAL DEPOSIT
		0.6-0.8	QC				SP: SAND: fine to medium grained; pale grey to pale brown.			3, 3, 3, 3	
		1.0-1.1	ES		1			M		3, 3, 3, 3, 3	
		1.5-1.6	ES				SP: SAND: fine to medium grained; pale brown to brown.				
	▼	1.9-2.0	ES								
		2.0-2.1	ES		2				L to MD		
		2.6-2.7	ES				SP: SAND: fine to medium grained; pale grey.				
					3						
					4		SP: CALCAREOUS SAND: fine to medium grained; pale grey and white; trace low plasticity silt; trace fine to medium grained gravel, angular to subangular.	W			3.90-6.00m: BRIDGEWATER FORMATION
					5				MD		
					6		Borehole terminated at 6.00 m				

DCP/PSP Equipment Ref.: DCP02 | In Situ Vane Ref.: | Pocket Penetrometer Equipment Ref.:

Termination Reason: Target depth reached

Remarks:

CORE PHOTOGRAPH SHEET - BH04

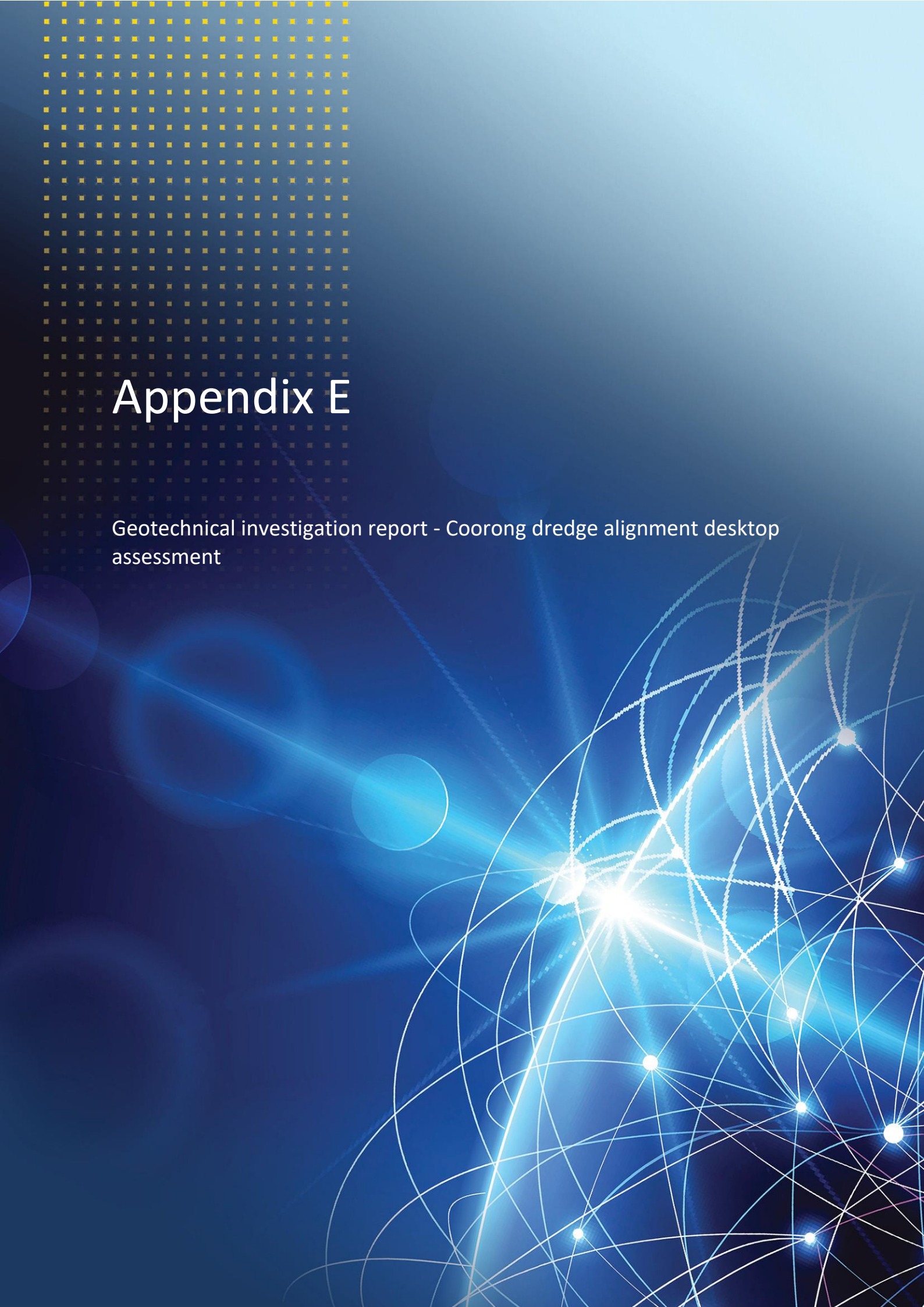
Client: KBR
Project: Coorong Infrastructure Feasibility Assessment
Location: Meningie, SA
Project ID: ADL2021-0001
Date: 13/08/2021

BH04_0.0 to 6.0m

BH04_Site Photograph

Appendix E

Geotechnical investigation report - Coorong dredge alignment desktop assessment



14 July 2021

COORONG INFRASTRUCTURE FEASIBILITY ASSESSMENT: INFRASTRUCTURE OPTION 2 – COORONG LAGOON DREDGING

GEOTECHNICAL DESKTOP STUDY

ADL2021-0001AC Rev0

Kellogg Brown and Root

Date	Revision	Comments
14 July 2021	0	Final Report

Table of Contents

Appendices

1 INTRODUCTION

CMW Geosciences (CMW) was authorised by KBR to carry out a geotechnical desktop review for the works associated with Infrastructure Option 2 – Coorong Lagoon Dredging.

The scope of work undertaken was generally consistent with our proposal letter referenced ADL2020-0001AA, Rev0 dated 18 January 2021.

Herein is a desktop study of existing information related to the Coorong Lagoon Dredging.

2 PROJECT APPRECIATION

The Coorong is the only estuary within the Murray-Darling Basin, forming the end-of-system connection for the River Murray to the Southern Ocean. The main sources of flows to the Coorong come from the River Murray (via the barrages), from the South East drainage network and tidal exchange through the Murray Mouth. These flow sources are key in controlling water quality and water levels in the Coorong's North and South Lagoons, which ultimately influence the ecological character of the site. Over-allocation of Murray–Darling Basin flows and the Millennium Drought further reduced freshwater flows at the northern extent of the Coorong, which has impacted water quality and led to an ongoing ecological decline throughout the Coorong and Lower Lakes. Furthermore, freshwater that historically flowed into the Coorong South Lagoon via wetlands and watercourses of the South East, has been substantially reduced through the construction of an extensive drainage network over the past 150 years.

Whilst the majority of the site is considered to be slowly recovering, the ecology of the Coorong South Lagoon in particular has remained in a degraded state. The effects of reduced freshwater flows are most evident in this area with high salinity, reducing water levels and increasing eutrophic conditions creating water quality conditions that have impacted a number of key aquatic species. For as long as the South Lagoon remains under stress, it is not considered sufficiently resilient to absorb the impacts of a changing climate.

Previous investigations for options to improve North / South Lagoon connectivity have examined the possibility of increasing flowrates between the North and South Lagoon of the Coorong through channel excavation or dredging. Additionally, an option has been proposed to undertake dredging at Pelican Point, although very limited information has been provided regarding the scope of works to be completed at this location.

The general zone considered for dredging is shown in Figure 1. At present, no geotechnical investigation has been completed for the area proposed to be dredged.

Figure 1: Possible Dredging Locations

3 SCOPE OF WORKS

This will include a review of published geological and environmental information to gain an understanding of potential construction issues as well as aiding in the scoping of an intrusive geotechnical investigation.

4 REFERENCE DOCUMENTS

Several previous reports have been provided to CMW to assist in the desktop study. These reports include environmental reports detailing the environmental modelling completed to date. No known geotechnical investigation has occurred at the time of writing this report.

Other sources have also been used in the desktop study, such as geology maps, groundwater well data, topographical information, Acid Sulphate Soil risk maps and aerial images. CMW have not undertaken a site visit as part of this preliminary scope of works.

1. Aurecon, December 2009, “Data Collation, Review and Preliminary Ecological Assessment – Coorong Temporary Saline Water Discharge – SA Murray Darling Basin – NRM Board”, Report No. 41180-001 Revision E;
2. BMT WBM Pty Ltd, August 2009, “Coorong Salinity Modelling”, Report No. RMH: L.N1347.022.CoorongSalinityModelling_3yearFinalToNRM_PPT.doc”;
3. Tonkin, April 2020, “Coorong Infrastructure Investigations – Technical Review”, Report No. 20200306R001 Rev1;
4. Government of South Australia, February 2010, “Managing Salinity in the Coorong – pumping hypersaline water out of the Southern Lagoon”;
5. Hobbs TJ, O’Connor J, Gibbs M (2019). Improved elevation and bathymetry models for the

Coorong. A Healthy Coorong, Healthy Basin project, DEW Technical report 2019/23, Government of South Australia, Department for Environment and Water, Adelaide.

5 COORONG LAGOON DREDGING – OPTION 1 (PARNKA NARROWS)

5.1 Description

The purpose of this construction option is, in essence, to increase hydraulic connectivity between the North and South Coorong Lagoon. This would be achieved by excavation or dredging of select locations along the proposed alignment where flows are most limited. The image below delineates the potential dredging area at this location.

Figure 2: Overview of Proposed Possible Dredge Sites (Tonkin, 2020)

5.2 Regional geology

The Geological Survey of South Australia 1:250,000 geological map Sheet 1 54-13 “Barker” Sheet suggests that the expected subsurface conditions of the islands within the channel, and along the northern shore of the Coorong comprise Quaternary kunkarised dunes, sand spreads and kunkar related to calcareous rock. The Younghusband Peninsula is expected to be underlain by quaternary alluvial deposits.

A review of geological information published on the South Australian Resource Information Gateway (SARIG, 2021) indicates the subsurface conditions of the islands and Coorong north shore are described as the Bridgewater Formation (Qpcb) comprising Coastal barrier and shallow sub-tidal sediments: bioclastic and aeolian cross-bedded calcarenite, palaeosol horizons, often capped by calcrete. The Younghusband Peninsula subsurface is expected to be underlain by the Semaphore Sand Member (Qhcks) described therein as unconsolidated white bioclastic quartz-carbonate sand of modern beaches and transgressive dune fields.

An excerpt of the regional geology map taken from SARIG is shown in Figure 3.

Based on these reviews, we would expect the dredging/excavation activities to encounter sands, clays and gravels with the potential for high strength calcrete layers to be intercepted at all locations. The investigation of the presence and extent of these calcrete layers would be the key consideration of any intrusive geotechnical investigation.

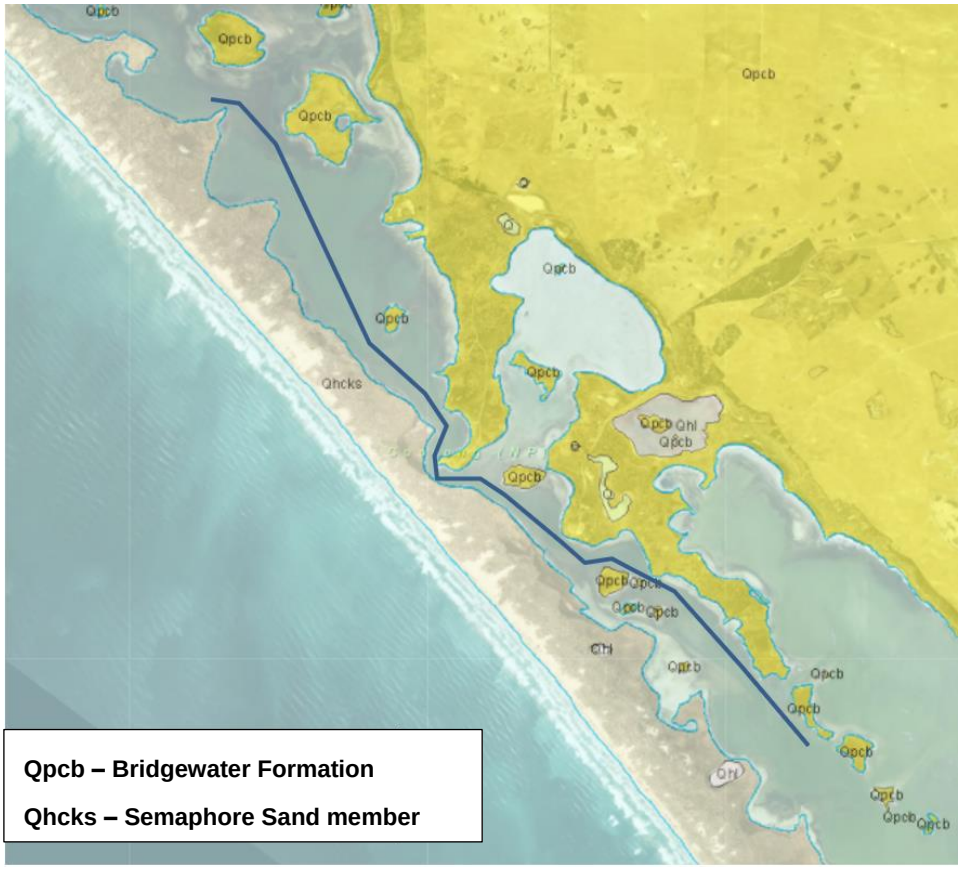


Figure 3: 1:100k Regional Geology, dredging alignment shown in blue (SARIG,2021)

5.3 Topography and Bathymetry

Based on a review of DEW Technical report 2019/23 “Improved elevation and bathymetry models for the Coorong”, the banks of the Coorong appear to be at an elevation of approximately 1-2mAHD with the sub-aquatic ground level along the dredging alignment at approximately 0mAHD.

The bathymetry model used in the BMT WBM model and simulation are broadly in accordance with the DEW bathymetry model, however in the area between The Needles and Hell’s Gate, deeper water is expected (ground elevation approximately 0 to -0.75m AHD).

Relevant figures from the Digital Elevation Model (DEM) and the BMT WBM model are included in Appendix A for reference. It is noted that the Hell’s Gate area undergoes significant morphological change due to current and wave action and that these depths are only estimates based on the supplied data.

The BMT WBM model bathymetry before and after dredging are depicted in Figures 4 and 5 respectively.

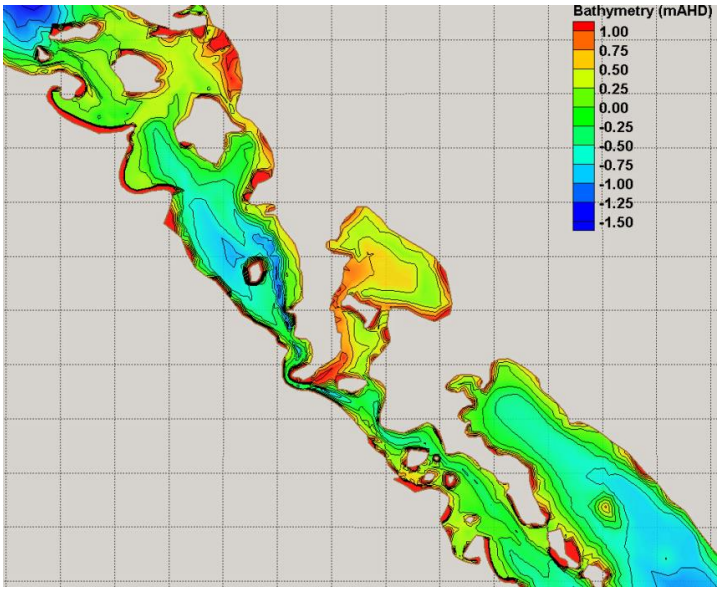


Figure 4: Modelling Bathymetry (BMT WBM, 2009)

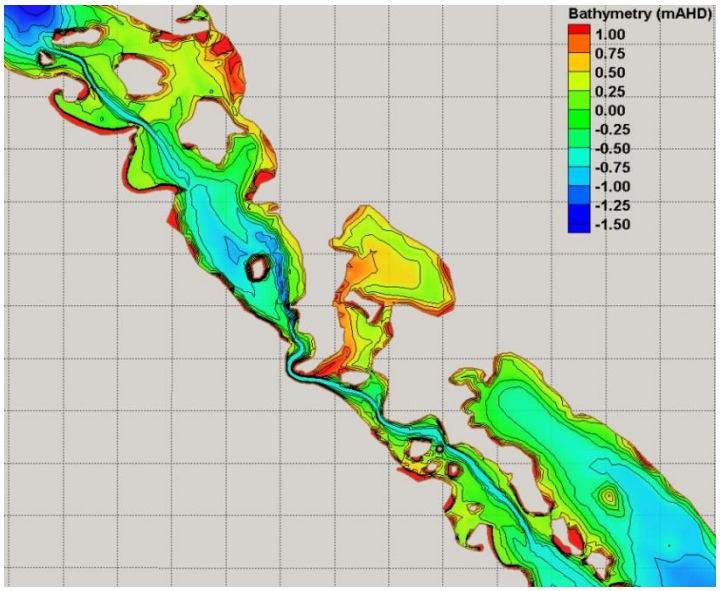


Figure 5: Modelled Bathymetry following Dredging (BMT WBM, 2009)

5.4 Risk of ASS/PASS

Based on a review of the Australian Soil Resource Information System ASS/PASS risk map, the soils underlying the proposed dredging alignment are considered as high risk of being ASS. An excerpt from ASRIS is presented in Figure 6, overlain with the proposed dredging alignment.

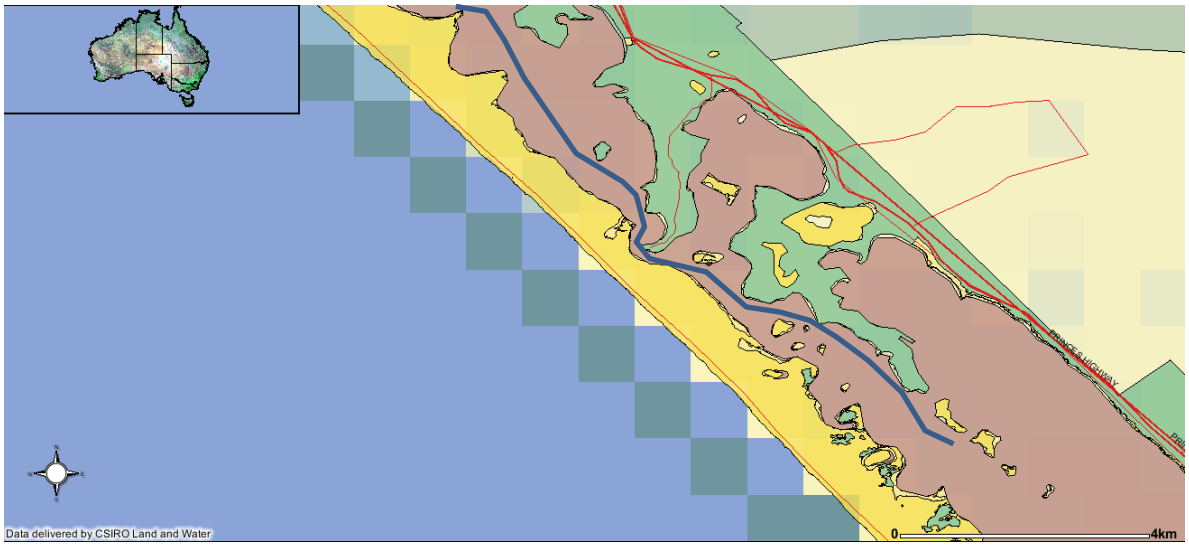


Figure 6: ASRIS probability map for occurrence of ASS with dredging alignment in blue

6 COORONG LAGOON DREDGING – OPTION 2 (PELICAN POINT)

6.1 Description

At the time of writing this report, CMW are aware that dredging at Pelican Point is being considered as a remediation option. The dredge area is proposed to be approximately 2,500m long and 200m wide to a minimum level of -1.5mAHD. Very limited data is currently available and our desktop review has considered only publicly available regional geology and environmental data. No drawings or actual alignment options have been presented.

This proposed dredging option has not been covered in the currently discussed scope of field investigation, and any additional investigation for this area would need to be discussed whilst planning the field investigation.

6.2 Regional Geology

A review of geological information published on the South Australian Resource Information gateway (SARIG, 2021) indicates the subsurface conditions of Pelican Point as quaternary rocks and soils, with some localised occurrence of Holocene Lacustrine Deposits. The Younghusband Peninsula subsurface is expected to be underlain by the Semaphore Sand Member (Qhcks) described therein as unconsolidated white bioclastic quartz-carbonate sand of modern beaches and transgressive dune fields.

An extract of the regional geology taken from SARIG is presented in Figure 7.

Based on these reviews, we would expect the dredging/excavation activities to encounter sands, clays and gravels with the potential for high strength calcrete layers to be intercepted at all locations. The investigation of the presence and extent of these calcrete layers would be the key outcome of any intrusive geotechnical investigation.

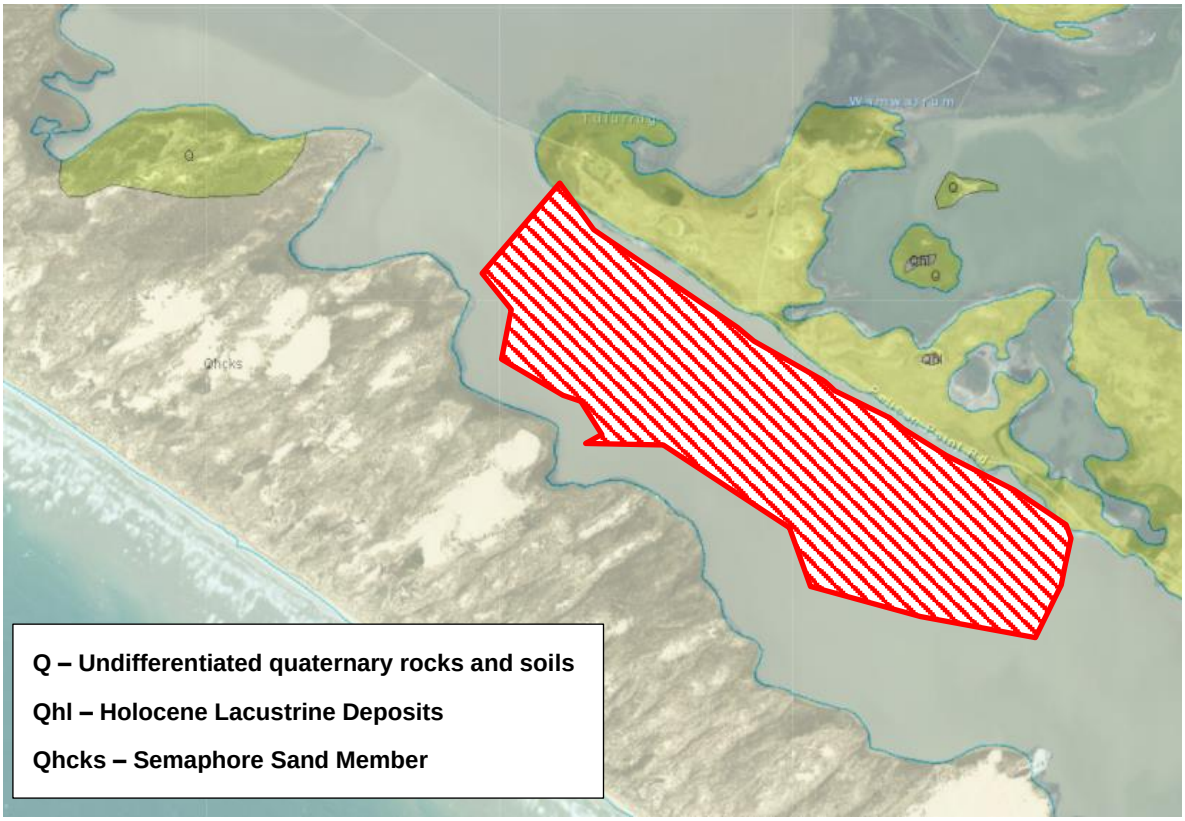


Figure 7: 1:100k Geology at Pelican Point (SARIG, 2021)

Based on a review of the Australian Soil Resource Information System ASS/PASS risk map, the soils underlying the proposed dredging alignment are considered as high risk of being ASS. An excerpt from ASRIS is displayed in Figure 8, overlain with the assumed dredging area.

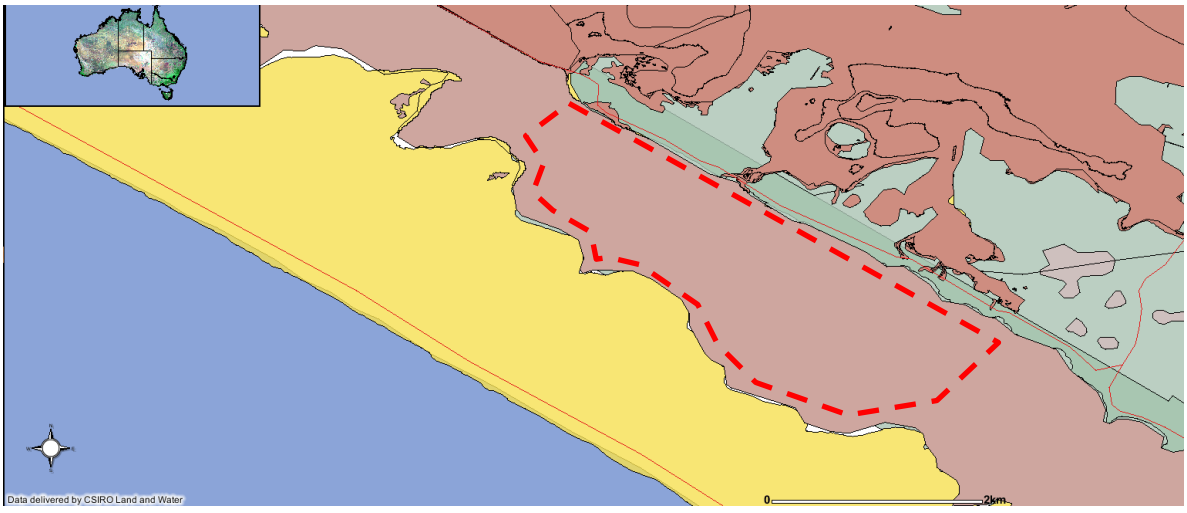


Figure 8: ASRIS probability map for occurrence of ASS with assumed dredging area in red

7 POTENTIAL CONSTRUCTION ISSUES

Based on a review of the supplied information as well as publicly available information, the following issues may potentially be encountered during construction and should be considered during planning of works:

- Presence of calcrete causing difficult excavation conditions. During previous drilling investigations near Lake Albert (SKM,2013), cemented layers were able to be penetrated with hollow auger drilling techniques, however based on previous experience on sites underlain by calcrete in other regions of South Australia this material can provide significant resistance to excavations necessitating the use of hydraulic breakers and ripping attachments;
- There is a high probability that material excavated/dredged from the Coorong Lagoon is ASS/PASS, which may pose issues during construction activities and disposal.

8 FURTHER INVESTIGATION

At present, no information is available regarding the ground conditions where excavation/dredging activities are proposed.

Our initial proposal (ADL2021-0001AA Rev0) proposed 1 x DCP per 1000m of dredge alignment however based on supply of additional information and subsequent review, we would consider it prudent to reduce the spacing of test locations to 1 x DCP per 500m of dredging alignment, with several number of boreholes drilled over water (nominally 1 per 1000m of alignment) to facilitate creation of a suitable ground model and to allow for environmental sampling and testing.

9 LIMITATIONS

The findings contained within this report are the result of a desktop review of the supplied limited discrete investigations, and publicly available information online. To the best of our knowledge, they represent a reasonable interpretation of the general condition of the site. Under no circumstances, can it be considered that these findings represent the actual state of the ground conditions away from the provided investigation locations.

This report has been prepared for use by KBR in relation to the proposed Coorong Dredging option which forms part of a larger investigation into remediation and management of Salinity and water levels in the Coorong region, in accordance with generally accepted consulting practice. No other warranty, expressed or implied, is made as to the professional advice included in this report. Use of this report by parties other than KBR and their respective consultants and contractors is at their risk as it may not contain sufficient information for any other purposes.

10 CLOSURE

Should there be any questions in relation to this report, please contact the undersigned.

For and on behalf of
CMW Geosciences

Prepared by:

Paolo Mercorella
Geotechnical Engineer

Reviewed/Authorised by:

John Slade
Principal Geotechnical Engineer, CPEng

Distribution: 1 copy to KBR (electronic)
Original held by CMW Geosciences

Appendix A
Supplied Bathymetry and Modelling Data

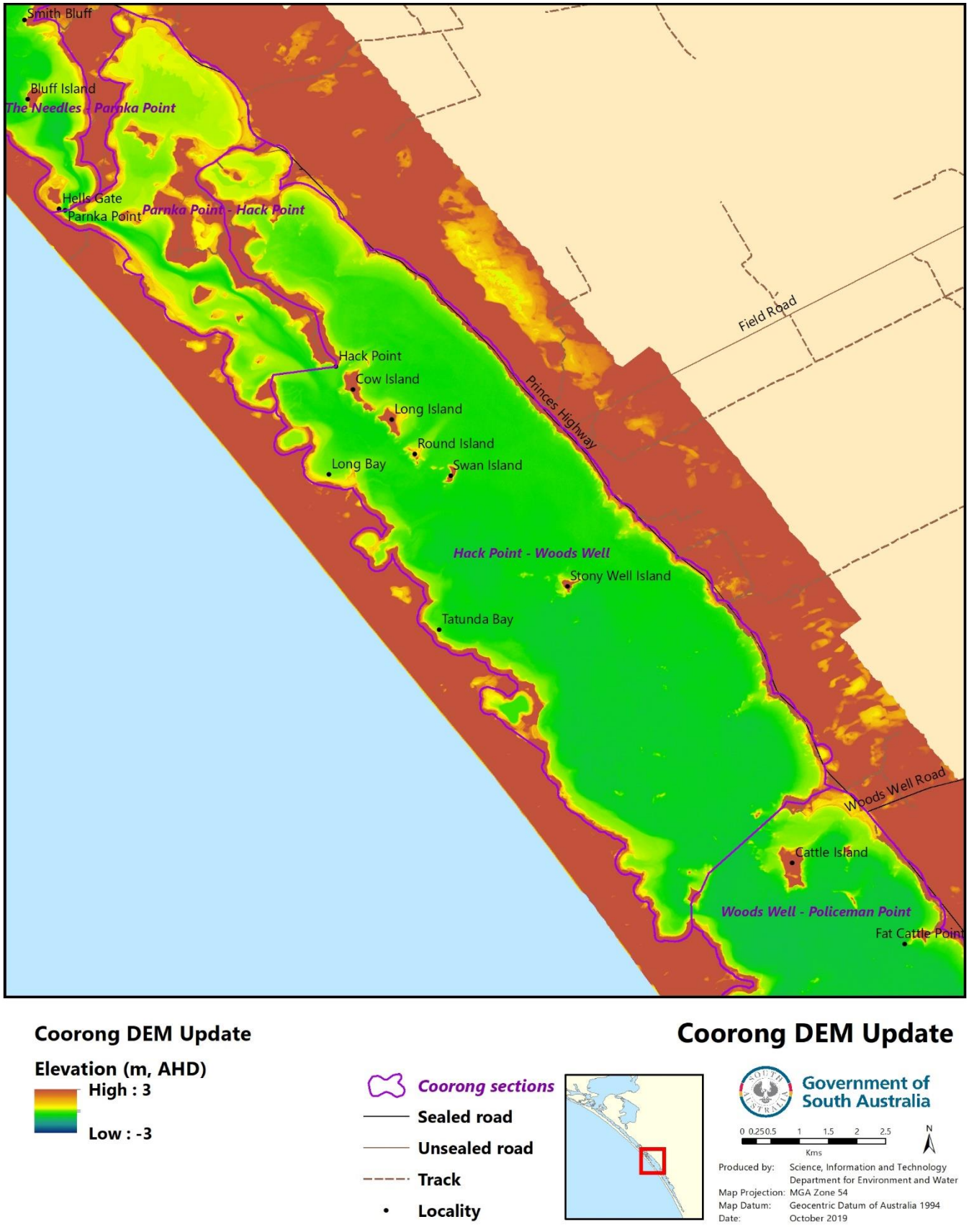


Figure 3.3. Elevation and bathymetry between Parnka Point and Woods Well in the southern Coorong

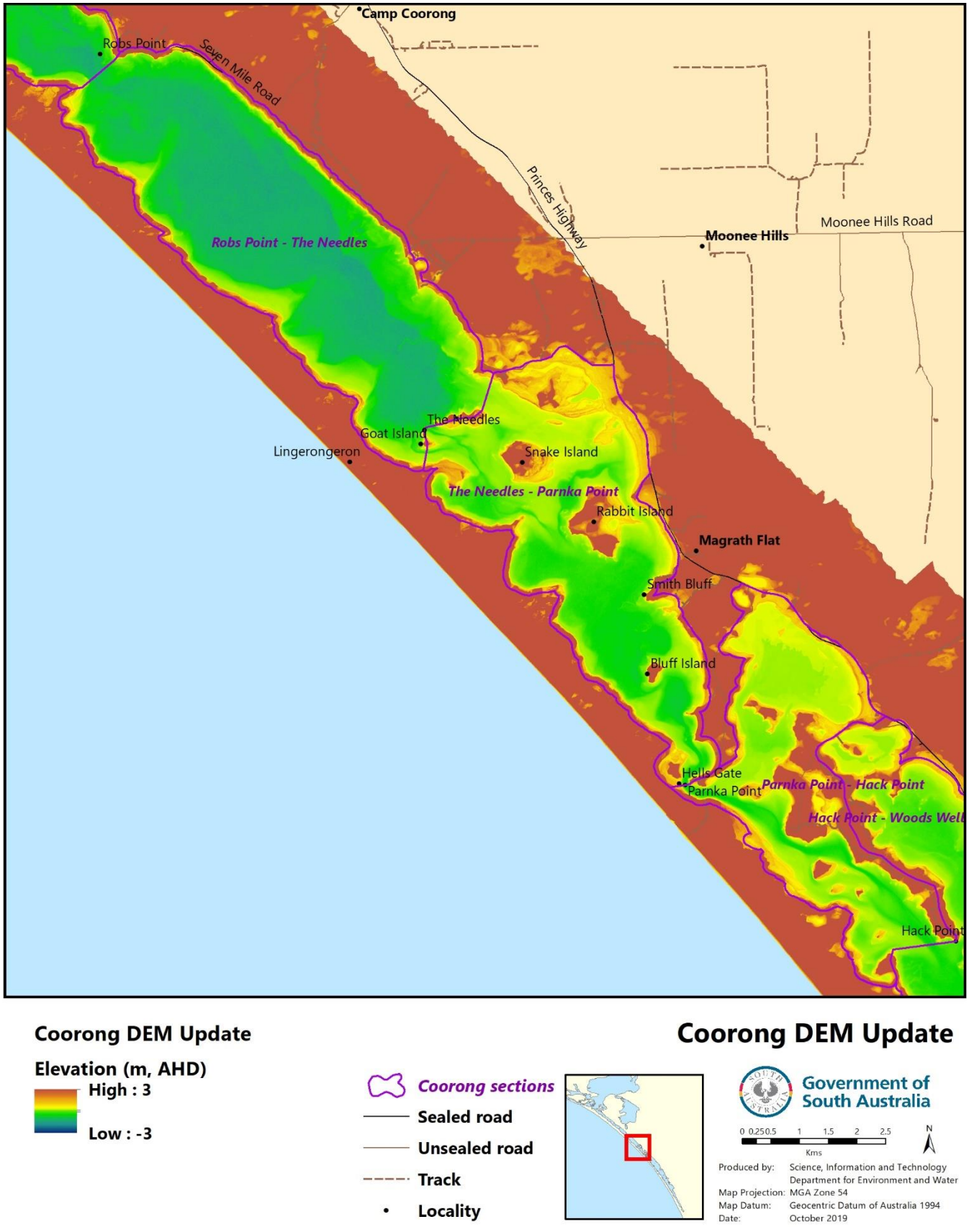


Figure 3.8. Elevation and bathymetry between Robs Point and Parnka Point in the northern Coorong

Appendix A: Dredged Channel Profile Through Hells Gate

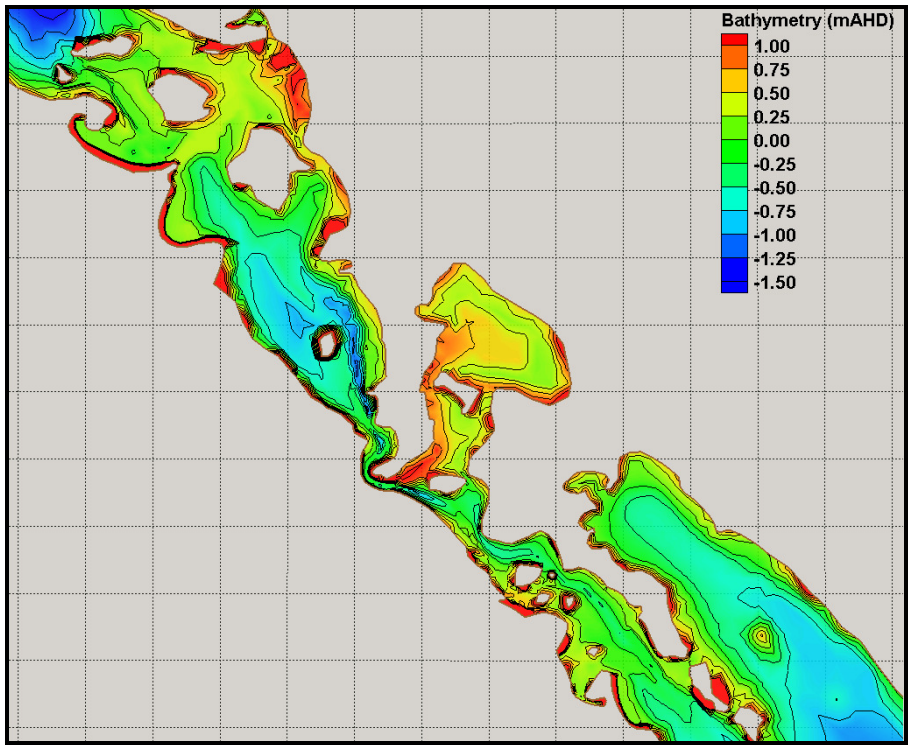


Figure A.1: Existing Bathymetry through Hells Gate Area (Base Case), Grid Size = 1000m

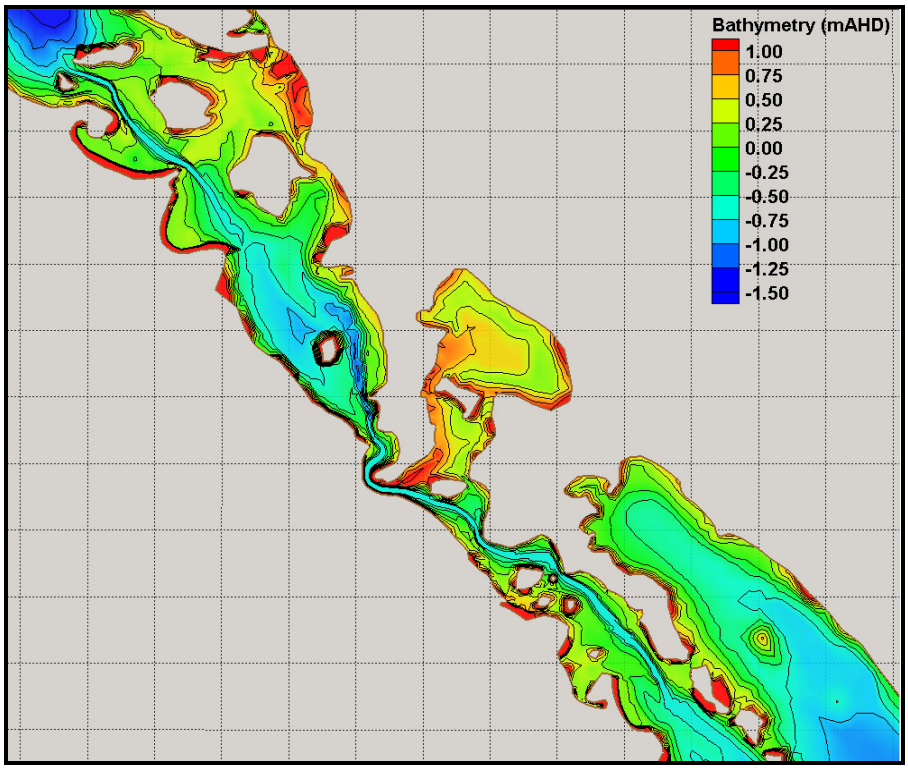


Figure A.2: Dredge Scenario Bathymetry through Hells Gate Area (Channel is typically 20m wide at -0.8 mAHD), Grid Size = 1000m

Appendix F

Geotechnical investigation report - Coorong dredge alignment investigation report

9 September 2021

COORONG INFRASTRUCTURE FEASIBILITY ASSESSMENT: COORONG LAGOON DREDGING COORONG, SA 5264

GEOTECHNICAL INVESTIGATION REPORT

Kellog Brown and Root

ADL2021-0001AE Rev0

Table of Contents

Drawings

Appendices

1 INTRODUCTION

CMW Geosciences (CMW) was authorised by KBR to carry out a geotechnical investigation for the proposed dredging option at the Coorong Lagoon at Meningie, SA 5264.

The scope of work undertaken was generally consistent with our proposal letter referenced ADL2020-0001AA, Rev1 dated 30 July 2021.

The purpose of this report is to describe the investigation completed within Coorong Lagoon, and present the field test results, advice on geotechnical parameters, and recommendations for excavatibility and excavation stability.

A separate preliminary contamination assessment report will be provided by Fyfe.

2 PROJECT APPRECIATION

The Coorong is the only estuary within the Murray-Darling Basin, forming the end-of-system connection for the River Murray to the Southern Ocean. The main sources of flows to the Coorong come from the River Murray (via the barrages), from the South East drainage network and tidal exchange through the Murray Mouth. These flow sources are key in controlling water quality and water levels in the Coorong's North and South Lagoons, which ultimately influence the ecological character of the site. Over-allocation of Murray–Darling Basin flows and the Millennium Drought further reduced freshwater flows at the northern extent of the Coorong, which has impacted water quality and led to an ongoing ecological decline throughout the Coorong and Lower Lakes. Furthermore, freshwater that historically flowed into the Coorong South Lagoon via wetlands and watercourses of the South East, has been substantially reduced through the construction of an extensive drainage network over the past 150 years.

Whilst the majority of the site is considered to be slowly recovering, the ecology of the Coorong South Lagoon in particular has remained in a degraded state. The effects of reduced freshwater flows are most evident in this area with high salinity, reducing water levels and increasing eutrophic conditions creating water quality conditions that have impacted a number of key aquatic species. For as long as the South Lagoon remains under stress, it is not considered sufficiently resilient to absorb the impacts of a changing climate.

Previous investigations for options to improve North / South Lagoon connectivity have examined the possibility of increasing flowrates between the North and South Lagoon of the Coorong through channel excavation or dredging. Additionally, an option has been proposed to undertake dredging at Pelican Point, although very limited information has been provided regarding the scope of works to be completed at this location.

The general zone considered for dredging is shown in Figure 1. At present, no geotechnical investigation has been completed for the area proposed to be dredged.

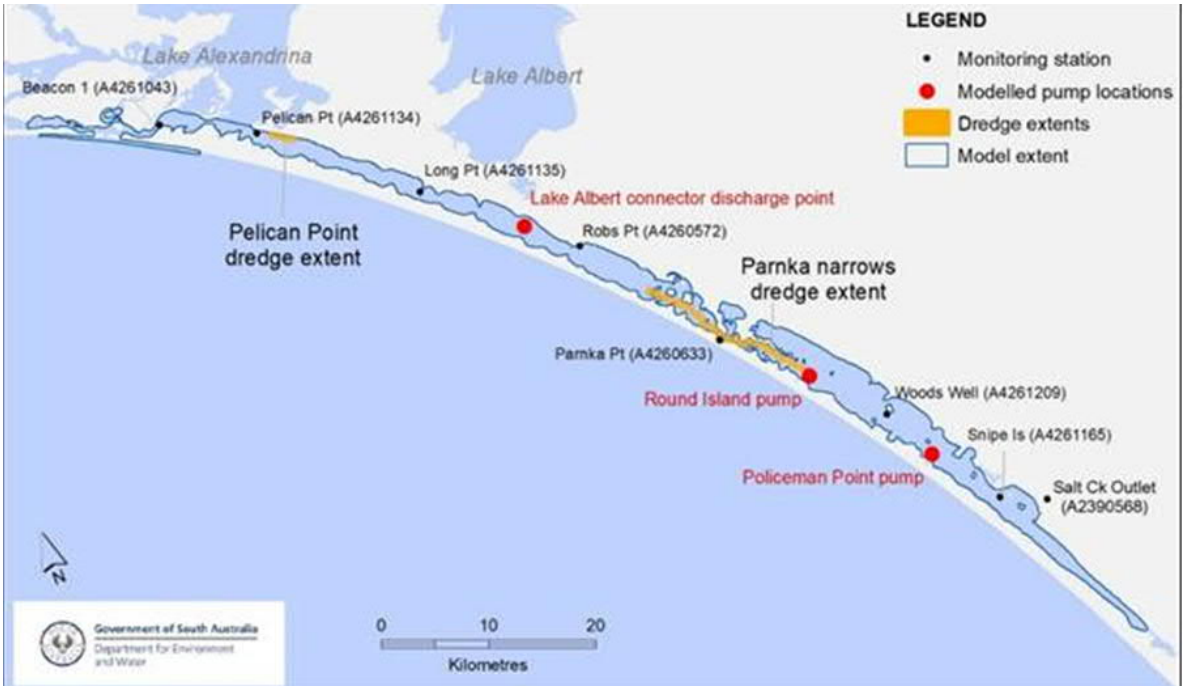


Figure 1: Possible Dredging Locations (marked in yellow)

CMW have conducted a desktop study for the aforementioned options and provided a report referenced ADL2021-0001AC, Rev0 dated 14 July 2021.

3 SITE DESCRIPTION

The proposed dredging alignment is located along 17 km length of Coorong Lagoon either side of the Parnka Point. The investigation area is located between Goat Island in the north to the Swan Island on the south side of Coorong Lagoon.

At the time of field investigation, the site was under water. It was noticed the depth of water varied along the channel between approximately 0.6m and 3.0m. Investigation locations were moved slightly from proposed locations, due to safety reason, where the depth of water was greater than 1.5m. The general condition of Coorong Lake is presented in Figure 2 and Figure 3.

Figure 2 - Site photograph at DCP08 near Parnka Point (Looking South)

Figure 2: Site photograph at DCP03 (Looking North-East)

4 FIELD INVESTIGATION

Following a dial before you dig search, and onsite service location, the field investigation was carried out on 11 and 13 August 2021. All fieldwork was carried out under the direction of CMW Geosciences in general accordance with AS1726 (2017), Geotechnical Site Investigations. The scope of fieldwork completed as follows:

- Completed a dial before you dig search and engaged a specialist service locator for locating the underground services before commencing the drilling work.
- Walkover assessment before commencing the work to assess the overall site condition and expected ground condition.
- Advance 17x Dynamic Cone penetration (DCP) tests denoted by DCP01 to DCP17 along the proposed dredging channel to a depth of 1.5m below ground level or shallower upon refusal. DCP08 encountered a refusal at 1.3m below ground level.
- Collected sufficient soil samples for subsequent Environmental laboratory testing, including:
    - 17 x samples for Potential Acid Sulphate Soils testing.
    - 17x Soil samples in glass jar for contamination testing at a depth 0 – 0.15m below ground level.

Collection of Duplicate soil samples after every 10 samples. Rinsate samples from the re-usable equipment is collected on a daily basis.

Environmental laboratory testing is carried out in ALS International a NATA accredited laboratory. Laboratory testing is conducted as per the instruction of our Environmental consultant Fyfe.

DCP test results are presented in Appendix A along with the depth of water at the investigation locations. The approximate locations of the respective investigation sites referred to above are shown in the attached site investigation plan (Drawing 1).

The investigation locations were recorded using a hand-held GPS to the inherent accuracy of the unit (+/- 5m) and elevations were inferred based on the survey plan provided. A summary of the investigation locations are provided in Table 1.

Table 1 : Summary of Investigation Locations

Site ID	Depth of Water (m)	Easting (m)	Northing (m)	DCP Termination Depth (mbgl)	Target Depth Reached (Y/N)
DCP01	0.8	350611	6032118	1.5	Y
DCP02	0.9	351463	6031474	1.5	Y
DCP03	0.8	352199	6030548	1.5	Y
DCP04	1.1	353198	6029427	1.5	Y
DCP05	1.0	353617	6028293	1.5	Y
DCP06	1.1	354380	6027437	1.5	Y
DCP07	1.0	355150	6026899	1.5	Y

Table 1 : Summary of Investigation Locations					
Site ID	**Depth of Water (m)**	**Easting (m)**	**Northing (m)**	**DCP Termination Depth (mbgl)**	**Target Depth Reached (Y/N)**
DCP08	0.8	355370	6025641	1.3	N
DCP09	0.9	356322	6025331	1.5	Y
DCP10	0.8	357015	6024740	1.5	Y
DCP11	0.7	357976	6024372	1.5	Y
DCP12	1.2	358867	6023774	1.5	Y
DCP13	0.7	359451	6022928	1.5	Y
DCP14	1.1	360029	6022218	1.5	Y
DCP15	1.2	360464	6021222	1.5	Y
DCP16	0.6	361070	6020450	1.5	Y
DCP17	0.7	361598	6019435	1.5	Y

5 GROUND MODEL

5.1 Regional Geology

The Geological Survey of South Australia 1:250,000 geological map Sheet 1 54-13 “Barker” Sheet suggests that the expected subsurface conditions of the islands within the channel, and along the northern shore of the Coorong comprise Quaternary kunkarised dunes, sand spreads and kunkar related to calcareous rock. The Younghusband Peninsula is expected to be underlain by quaternary alluvial deposits.

A review of geological information published on the South Australian Resource Information Gateway (SARIG, 2021) indicates the subsurface conditions of the islands and Coorong north shore are described as the Bridgewater Formation (Qpcb) comprising Coastal barrier and shallow sub-tidal sediments: bioclastic and aeolian cross-bedded calcarenite, palaeosol horizons, often capped by calcrete. The Younghusband Peninsula subsurface is expected to be underlain by the Semaphore Sand Member (Qhcks) described therein as unconsolidated white bioclastic quartz-carbonate sand of modern beaches and transgressive dune fields.

An excerpt of the regional geology map taken from SARIG is shown in Figure 4.

Based on these reviews, we would expect the dredging/excavation activities to encounter sands, clays and gravels with the potential for high strength calcrete layers to be intercepted at all locations. The investigation of the presence and extent of these calcrete layers would be the key consideration of any intrusive geotechnical investigation.

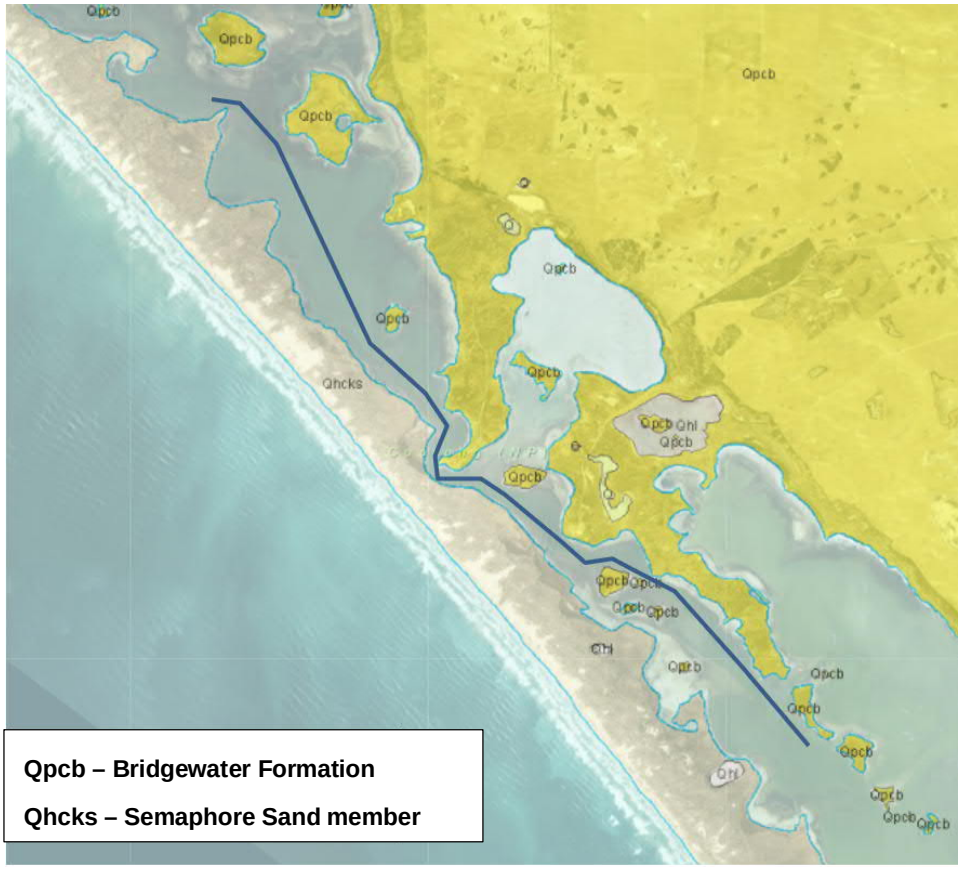


Figure 4: 1:100k Regional Geology, dredging alignment shown in blue (SARIG,2021)

6 GEOTECHNICAL ASSESSMENT AND RECOMMENDATIONS

6.1 Estimated Geotechnical Model

The DCP test results indicated that the existing ground has very little resistance within the investigation depth. A slightly increased resistance of (DCP blows between 3 and 10) is found at selected locations (DCP01, DCP06, DCP09, DCP11, DCP15, DCP16 and DCP17) at a depth 1.0m below ground level.

Based on the limited field investigation DCP test data obtained from this study (presented in Appendix A) an estimated geotechnical model has been assessed for Coorong Lagoon Dredging alignment and provided in Table 2.

Table 2: Preliminary geotechnical model

Unit	Depth range (mBGL)		Φ' (°)	c' (kPa)	C_u, (kPa)	γ (kN/m^3)	E' (MPa)
Semaphore Sand	0	1.5	25	-	-	17	5
Bridgewater Formation Sand*	0	1.5	32	-	-	18	20
Suitable pad foundation layer not identified							

Where; Φ' = angle of internal friction, c' – drained cohesion, c_u = Undrained shear strength γ = bulk unit weight, E = Youngs Modulus N/A – Not Applicable, uncontrolled fill not suitable founding layer

Note: *is expected to encounter in near DCP08 at Parnka Point.

6.2 Construction Issues

6.2.1 Excavatability

Based on the resistance to DCP testing the resistance to excavation or dredging may vary across the site. Granular natural soils and organic clay soils are assessed to be excavatable at least up to 1.5m using conventional earthmoving equipment such as backhoes and excavators. Inferred calcrete layer was encountered at DCP08 at a depth of 1.3m. The hard layer is prone to very strong resistance to the conventional earthmoving equipment such as graders, excavators and backhoes and slower production rates during trenching are anticipated.

6.2.2 Excavation Stability

All trench excavations deeper than 0.5 m will need to be supported, or continuous battered. Noting a specific assessment by geotechnical engineer is recommended.

Temporary excavations exceeding 0.5m depth should be continuously battered back at a slope no greater than 1V: 3H. Use of heavy machinery adjacent to open excavations must be avoided.

It is recommended that upon confirmation of the proposed construction methodology and where required as per the above guideline, geotechnical design advice is sought to ensure mitigation of geotechnical related hazards. CMW are able to assist in such an assessment.

7 FURTHER WORK

CMW has extensive experience in the detailed design of foundations, pad, shallow footings and deep foundations. We would be pleased to undertake this work to optimise the design solutions for the project. If required, CMW can assist in the detailed design or the review of designs prepared by other parties.

It is recommended that an experienced geotechnical engineer attend site to verify the validity of the assumptions made by the designer as to the subsurface conditions encountered.

8 CLOSURE

The findings contained within this report are the result of limited discrete investigations conducted in accordance with normal practices and standards. To the best of our knowledge, they represent a reasonable interpretation of the general condition of the site. Under no circumstances, can it be considered that these findings represent the actual state of the ground conditions away from our investigation locations.

If the ground conditions encountered during construction are significantly different from those described in this report and on which the conclusions and recommendations were based, then we must be notified immediately.

This report has been prepared for use for KBR in relation to the proposed development at Coorong Infrastructure Feasibility Assessment of Coorong Lagoon Dredging Project at Coorong SA 5264 in accordance with generally accepted consulting practice.

No other warranty, expressed or implied, is made as to the professional advice included in this report. Use of this report by parties other than KBR and their respective consultants and contractors is at their risk as it may not contain sufficient information for any other purposes.

For and on behalf of CMW Geosciences

Prepared by:	Reviewed and authorised by:
Abu Rabbi	John Slade
Project Geotechnical Engineer	**Principal Geotechnical Engineer, CPEng**

Distribution: 1 electronic copy to KBR via email
Original held at CMW Geosciences

Drawing 1
Site Plan

LEGEND:

DCP01 APPROXIMATE DCP LOCATION

NOTES:

1. AERIAL FROM BING MAPS

1:60000 0 600 1200 1800 2400 3000 m

CMW Geosciences

CLIENT: KBR		DRAWN: DE	PROJECT: ADL2021-0001
PROJECT: COORONG INFRASTRUCTURE FEASIBILITY ASSESSMENT		CHECKED: AR	DRAWING: 02
		REVISION: A	SCALE: 1:60,000
TITLE: SITE INVESTIGATION PLAN - SHEET 2		DATE: 16.08.21	SHEET: A3 L

Appendix A
Results of Field Investigation

CMW Geosciences	CLIENT: KBR	DATE:	12/08/2021
	PROJECT: Coorong Infrastructure Feasibility Assessment	TESTED BY:	ANS/EEV
		Hammer Weight:	9Kg
		Hammer Drop Height:	510mm
	TITLE: DYNAMIC CONE PENETROMETER TESTING (AS1289.6.3.2 - 1997)	PROJECT No:	ADL2021-0001

Easting	350611	351463	352199	353198
Northing	6032118	6031474	6030548	6029427
Depth of Water (m)	0.8	0.9	0.8	1.1
Time of Testing	9.40 AM	10.30 AM	11.00 AM	11.35 AM

Depth Range (mm)	DCP01	DCP02	DCP03	DCP04
0-100	1	1	0	1
100 - 200	0	0	0	0
200 - 300	1	0	0	0
300 - 400	1	0	0	0
400 - 500	1	0	0	0
500 - 600	2	0	0	1
600 - 700	2	0	0	0
700 - 800	1	1	0	0
800 - 900	3	0	0	0
900 - 1000	2	0	0	1
1000 - 1100	3	0	0	1
1100 - 1200	4	0	0	1
1200 - 1300	5	0	1	0
1300 - 1400	6	1	0	1
1400 - 1500	6	1	1	1
1500 - 1600				
1600 - 1700				
1700 - 1800				
1800 - 1900				
1900 - 2000				
2000 - 2100				

Notes:

1) DCP tests were recorded as blows / 100 mm interval.

CMW Geosciences	CLIENT: KBR	DATE:	11 and 12/08/2021
	PROJECT: Coorong Infrastructure Feasibility Assessment	TESTED BY:	ANS/EEV
		Hammer Weight:	9Kg
	TITLE: DYNAMIC CONE PENETROMETER TESTING (AS1289.6.3.2 - 1997)	Hammer Drop Height:	510mm
		PROJECT No:	ADL2021-0001

Easting	353617	354380	355150	355370
Northing	6028293	6027437	6026899	6025641
Depth of Water (m)	1	1.1	1	0.8
Time of Testing	12.10 PM	4.20 PM	3.50 PM	3.15 PM

Depth Range (mm)	DCP05	DCP06	DCP07	DCP08
0-100	0	1	1	1
100 - 200	0	0	1	0
200 - 300	0	0	0	0
300 - 400	0	0	1	0
400 - 500	1	1	1	0
500 - 600	0	1	1	1
600 - 700	0	0	0	1
700 - 800	0	1	1	0
800 - 900	0	1	1	1
900 - 1000	1	2	1	0
1000 - 1100	0	2	1	1
1100 - 1200	0	3	0	1
1200 - 1300	1	3	0	25
1300 - 1400	0	3	1	
1400 - 1500	1	4	1	
1500 - 1600				
1600 - 1700				
1700 - 1800				
1800 - 1900				
1900 - 2000				
2000 - 2100				

Notes:

1) DCP tests were recorded as blows / 100 mm interval.

CMW Geosciences	CLIENT: KBR	DATE:	11/08/2021
	PROJECT: Coorong Infrastructure Feasibility Assessment	TESTED BY:	ANS/EEV
		Hammer Weight:	9Kg
	TITLE: DYNAMIC CONE PENETROMETER TESTING (AS1289.6.3.2 - 1997)	Hammer Drop Height:	510mm
		PROJECT No:	ADL2021-0001

Easting	356322	357015	357976	358867
Northing	6025331	6024740	6024372	6023774
Depth of Water (m)	0.9	0.8	0.7	1.2
Time of Testing	2.40 PM	2.15 PM	1.40 PM	1.15 PM

Depth Range (mm)	DCP09	DCP10	DCP11	DCP12
0-100	1	1	1	1
100 - 200	0	0	1	1
200 - 300	1	0	0	0
300 - 400	0	0	1	0
400 - 500	1	0	0	0
500 - 600	0	1	1	0
600 - 700	2	0	0	1
700 - 800	1	0	1	0
800 - 900	1	0	0	0
900 - 1000	2	0	1	0
1000 - 1100	3	0	1	0
1100 - 1200	2	0	2	1
1200 - 1300	3	0	3	0
1300 - 1400	3	1	3	0
1400 - 1500	2	1	2	1
1500 - 1600				
1600 - 1700				
1700 - 1800				
1800 - 1900				
1900 - 2000				

Notes:

1) DCP tests were recorded as blows / 100 mm interval.

CMW Geosciences	CLIENT: KBR	DATE:	11/08/2021
	PROJECT: Coorong Infrastructure Feasibility Assessment	TESTED BY:	ANS/EEV
		Hammer Weight:	9Kg
		Hammer Drop Height:	510mm
	TITLE: DYNAMIC CONE PENETROMETER TESTING (AS1289.6.3.2 - 1997)	PROJECT No:	ADL2021-0001

Easting	359451	360029	360464	361070
Northing	6022928	6022218	6021222	6020450
Depth of Water (m)	0.7	1.1	1.2	0.6
Time of Testing	12.50 PM	12.20 AM	11.20 AM	10.50AM

Depth Range (mm)	DCP13	DCP14	DCP15	DCP16
0-100	1	0	0	1
100 - 200	0	1	1	0
200 - 300	0	0	0	1
300 - 400	0	0	1	0
400 - 500	1	1	1	1
500 - 600	0	0	0	1
600 - 700	0	1	1	1
700 - 800	0	1	1	0
800 - 900	1	0	0	2
900 - 1000	0	0	1	4
1000 - 1100	1	0	1	6
1100 - 1200	1	1	2	8
1200 - 1300	1	1	4	10
1300 - 1400	2	2	4	8
1400 - 1500	3	2	4	10
1500 - 1600				
1600 - 1700				
1700 - 1800				
1800 - 1900				
1900 - 2000				

Notes:

1) DCP tests were recorded as blows / 100 mm interval.

CMW Geosciences	CLIENT: KBR	DATE:	11/08/2021
	PROJECT: Coorong Infrastructure Feasibility Assessment	TESTED BY:	ANS/EEV
		Hammer Weight:	9Kg
	TITLE: DYNAMIC CONE PENETROMETER TESTING (AS1289.6.3.2 - 1997)	Hammer Drop Height:	510mm
		PROJECT No:	ADL2021-0001

Easting	361598			
Northing	6019435			
Depth of Water (m)	0.7			
Time of Testing	10.00 AM			

Depth Range (mm)	**DCP 17**			
0-100	1			
100 - 200	1			
200 - 300	1			
300 - 400	0			
400 - 500	1			
500 - 600	0			
600 - 700	0			
700 - 800	1			
800 - 900	2			
900 - 1000	3			
1000 - 1100	3			
1100 - 1200	3			
1200 - 1300	4			
1300 - 1400	5			
1400 - 1500	6			
1500 - 1600				
1600 - 1700				
1700 - 1800				
1800 - 1900				
1900 - 2000				
2000 - 2100				

Notes:

1) DCP tests were recorded as blows / 100 mm interval.