PENINSULA PORTS

JACOBS

Port Spencer Grain Export Facility

Amendment to Public Environmental Report

VOLUME 5 OF 5

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JACOBS

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Appendix C. Beach Monitoring and Management Plan

eCoast Marine Consulting and Research
PO Box 151
Raglan 3265
New Zealand.
Ph. +64 21 423 224
www.ecoast.co.nz
info@ecoast.co.nz

30 October 2019

Mark Rodda
Chief Executive Officer
FREE Eyre Limited
Managing Director
Peninsula Ports Pty Ltd

Dear Mark,

Re: Beach Monitoring and Management for Port Spencer

The following provides a description of the proposed beach monitoring and management for Port Spencer. The proposed docking facility will have a ~220 m long solid section/causeway from the land/beach out to where the pile wharf begins in 10-11 m of water (Figure 1).

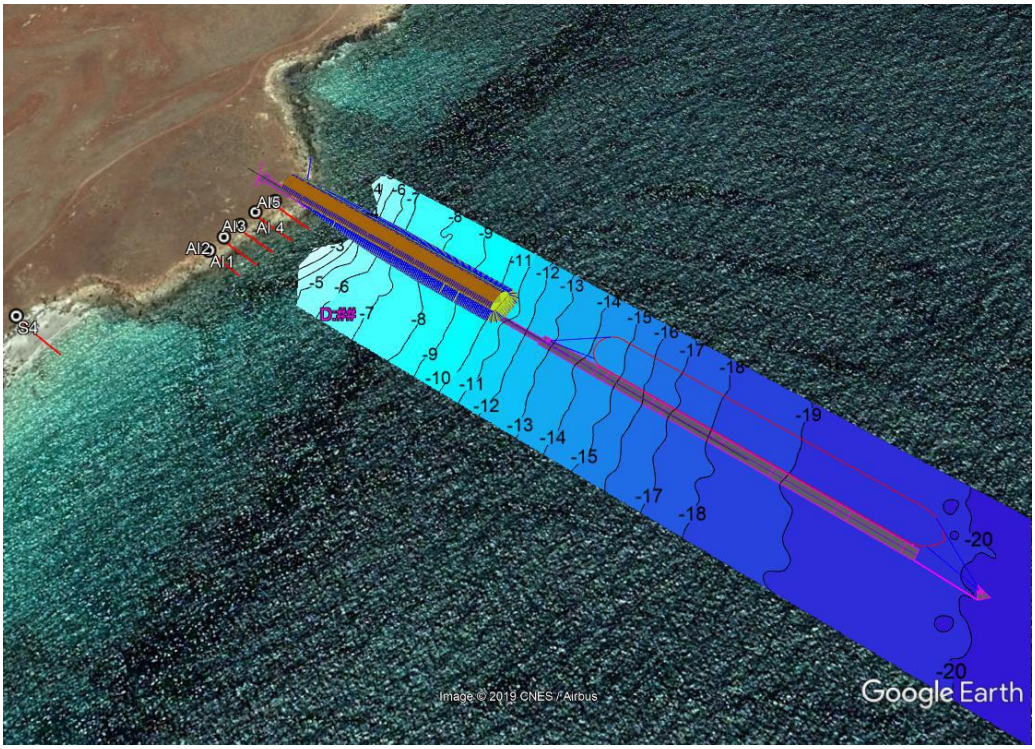


Figure 1. The inner section of the proposed Port Spencer is an approximately 220 m long causeway/reclamation out to 10-11 m depth.

In situ data and numerical modelling confirm that the sediment transport regime along this section of the coast in Spencer Gulf is predominantly to the north. This means that a solid structure across shore out to beyond the depth of closure (likely <7-8 m in this benign environment) will capture sand on its' southern side and prevent it moving northward up coast. This is a coastal system with a dominant

unidirectional sediment transport regime the structure will act like a groyne, with the known impacts of accretion on the southern side and erosion on the northern side (the 'groyne-effect').

In the present case, erosion of the coast immediately north of the wharf causeway is alleviated because the rock substrate that forms the foreshore and nearshore subtidal zone (Figure 1). However, there is potential to have chronic erosion impacts on Rogers Beach approximately 500 m to the north because the sediment that would have previously moved northward along the toe of the nearshore reef will be blocked by the wharf causeway leading to a deficit of sand into the southern end of Rogers Beach. While it is expected that accumulation of sediment on the southern side of the wharf causeway will be relatively slow at this reasonably benign site, with consequently slow loss of sand at Rogers Beach, this can effectively be managed and mitigated through the application of beach monitoring and management in the form of sand transfer; similar strategies are these days applied worldwide, with a local example being part of the Adelaide 'Living Beach' strategy in the form of back-passing.

The basic components of a beach monitoring and management strategy for the site include:

- Design of a BACI (Before/After Control/Impact) monitoring scheme – this is to ensure that natural variation is accounted for;
- Establishment of monitoring benchmarks (BM's) – these can be steel rods inside conduit with concrete or other available permanent features on the foreshore.
- 6-monthly surveys to begin with, with the potential reduce to yearly following a 2-year review, which will also provide information on setting of trigger levels.
- Trigger levels for the removal of sand from the southern side of the wharf causeway to the southern end of Rogers Beach – 2x triggers, for example a) beach erosion/retreat detected at Rogers Beach, and b) the sand on the southern side of the wharf causeway is accumulating to 100 m south of the structure (whether there is any indication of erosion or not).

In order to provide 'before' impact data, beach monitoring should be initiated as soon as practical before works begin. This can also be supported by analysis of available aerial/satellite images of Rogers Beach and the other small embayments to determine the extent of natural variations; brief analysis of the available satellite images (back to November 2005) indicate that the area is relatively stable.

The approximate locations of 14 BM's for the beach profiles are presented in Table 1 and Figure 2. These locations can be modified in order to establish them in locations where they are unlikely to move. The 4 southern profiles are 'control' sites, which are considered outside of the proposed Port's influence; by monitoring these sites, natural variation not attributable to the project can be identified (e.g. significant loss of sand may be due an intense local storm that would impact all beaches along the coast similarly). The 5 profiles on the southern side of the wharf causeway are to monitor/measure the volume of sand accreting against the structure. The 5 profiles on Rogers Beach are to monitor any changes in the beach width to determine the impact of the structure and the need to transport sand from the southern side of the wharf causeway to mitigate this effect.

All profiles should be surveyed (RTK, total station, laser level, etc.) every 6 months from as soon as practical to 2 years after construction of the wharf causeway, at which time the monitoring data should be reviewed by a suitably qualified coastal engineer/scientist. Two main aspects should be considered in the review, a) whether to reduce monitoring surveys to annual, and b) what information has been gained to develop suitable trigger levels for bypassing sand from the wharf causeway to the north.

Table 1. Approximate locations of monitoring BM's (see Figure 2).

Benchmark	Lat	Long	Comment
South 1	34°15'47.51"S	136°15'39.06"E	Control Site
South 2	34°15'30.33"S	136°15'39.08"E	Control Site
South 3	34°15'2.83"S	136°15'54.57"E	Control Site
South 4	34°14'56.46"S	136°15'57.79"E	Control Site
AI 1	34°14'54.20"S	136°16'3.44"E	Accretion Impact Site
AI 2	34°14'53.74"S	136°16'3.85"E	Accretion Impact Site
AI 3	34°14'53.30"S	136°16'4.32"E	Accretion Impact Site
AI 4	34°14'52.82"S	136°16'4.75"E	Accretion Impact Site
AI 5	34°14'52.38"S	136°16'5.34"E	Accretion Impact Site
EI 1	34°14'38.87"S	136°16'2.84"E	Erosion Impact Site
EI 2	34°14'35.71"S	136°15'58.50"E	Erosion Impact Site
EI 3	34°14'27.32"S	136°15'54.83"E	Erosion Impact Site
EI 4	34°14'20.27"S	136°15'57.71"E	Erosion Impact Site
EI 5	34°14'13.50"S	136°16'2.11"E	Erosion Impact Site

Figure 2. Approximate locations of monitoring BM's (Table 1).

As noted above and determined through on site measurements and numerical modelling, this site is relatively benign, which means it is likely that sediment build-up on the southern side of the wharf causeway will occur slowly, as will impacts on Rogers Beach to the north. Even so, over long periods

of time up-coast erosion has the potential to occur, as has been seen on many coasts around the world and in Australia where beach management and sediment bypassing is not carried out (e.g. the northward tracking of the erosion scarp in Geraldton is now some 10 km long and continues to track northward – noting that Geraldton is a far more exposed and energetic environment than Spencer Gulf). In order to access and transport sand on the southern side of the wharf causeway to Rogers Beach to the north, access from the proposed structure for a digger and small truck to transport the same will need to be incorporated into the design. Material transported to Rogers Beach should be placed in the southern corner, which will be the first area impacted and also allow for continued sediment supply to nourish the coast to the north.

Figure 3. The recommended location for deposition of bypassed sand is shown in the green area – a small road provides access to the this part of the beach.

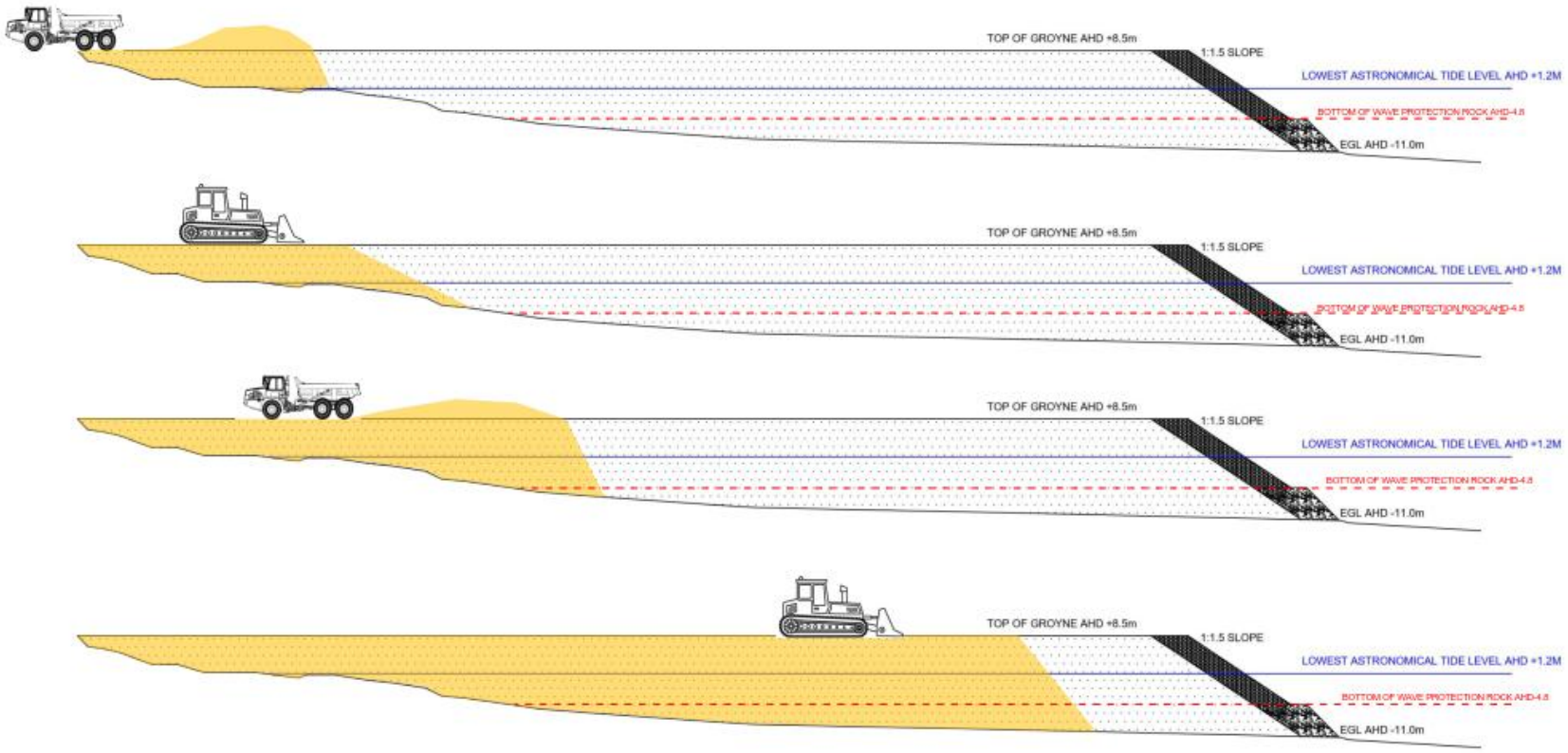
Please let me know if you require further details.

Yours sincerely

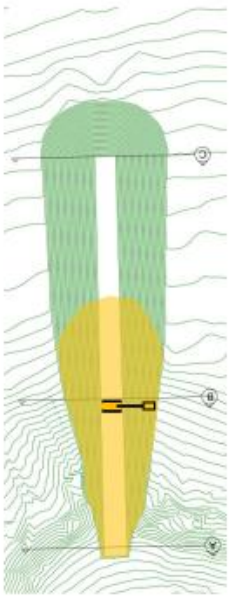
Dr Shaw Mead
Managing Director
s.mead@ecoast.co.nz

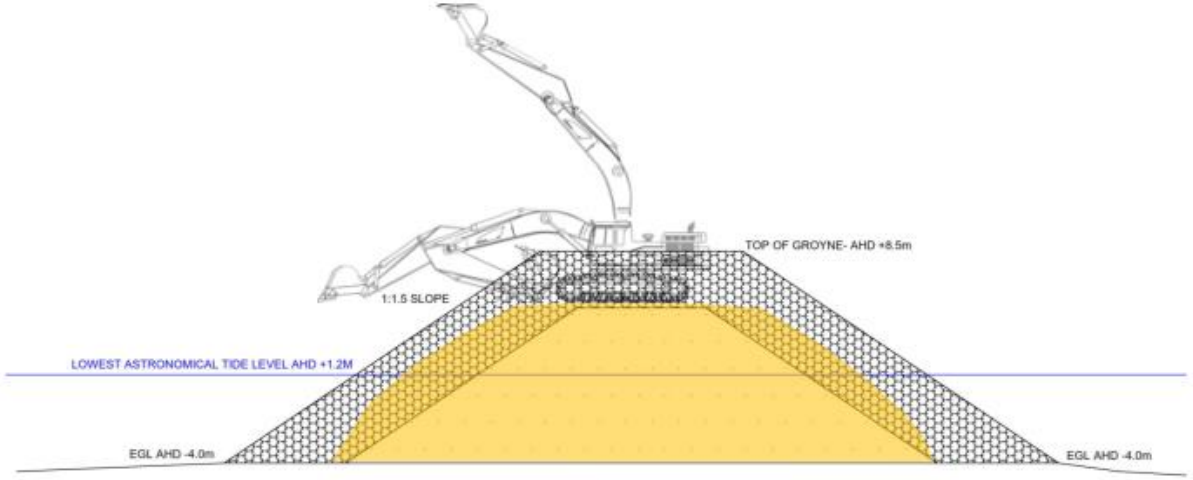
Appendix D. Causeway Construction Methodology

A combination of trucks and a dozer to create a platform out into the water over footprint of causeway.

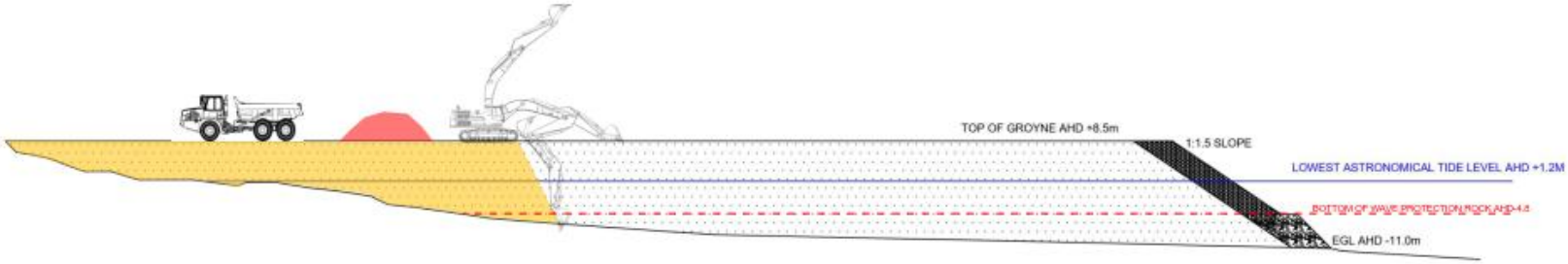


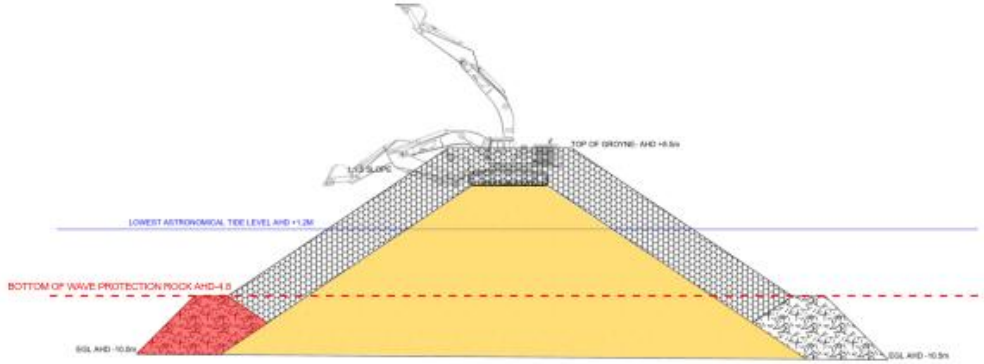
A long reach excavator is to trim the batters from the platform created by the trucks and dozer.



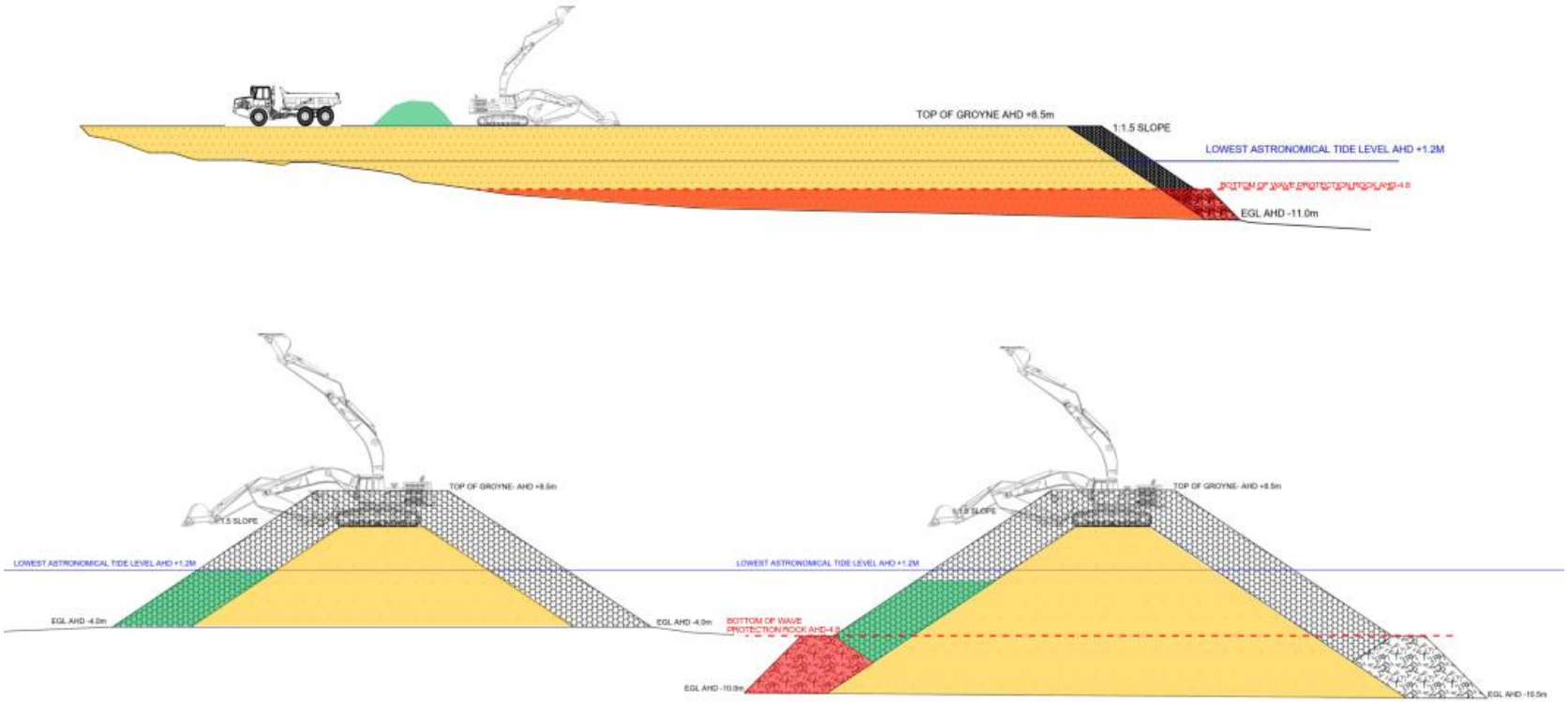


A truck is to end tip the 1-2 tonne armour rock onto the trimmed core and an excavator is to place the rock on/roll the rock down the causeway batters to create a bench for the 8 tonne rock to sit on.





A truck is to end tip the 8 tonne armour rock onto the trimmed core and an excavator is to place the rock on the causeway batters.



Appendix E. Datasheets for Proposed Seagrass Clearance

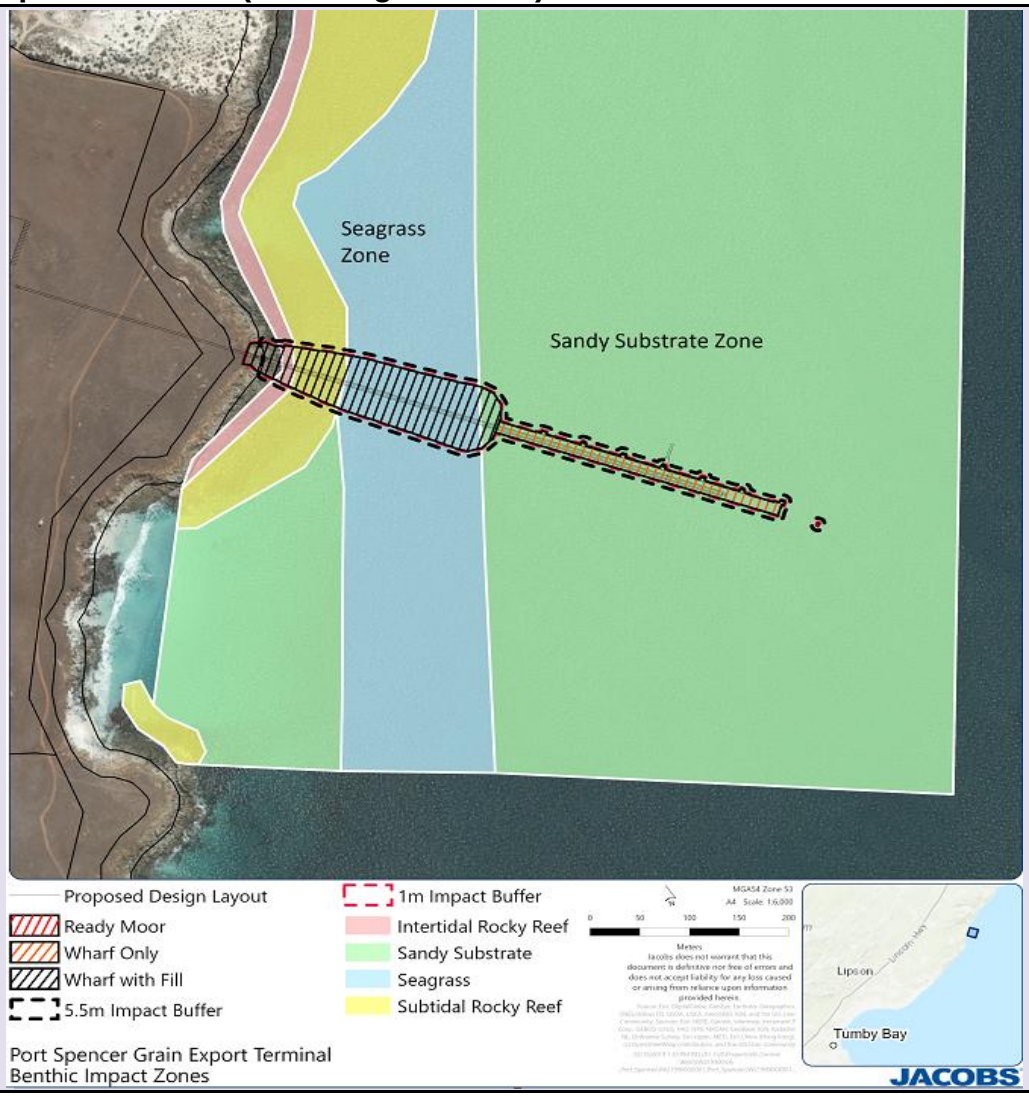
Marine Assessment Scoresheet

(Version - 4 January 2018)

Block	Port Spencer Benthic Impact
Size of Block (Ha)	2.057616
NRM Region	Eyre Peninsula

ASSESSOR(S)	Sonia Croft
DATE OF ASSESSMENT	23/10/2019

Map of the Block (Including the Sites)



Landscape Context Scores

Block Shape Cleared perimeter:Area (km/km2)

Cleared Perimeter (m) =	0
Cleared Perimeter to area ratio	0.00

<6 = 0.1 pts; 6 to <12 = 0.05 pts; 12 to <18 = 0.025 pt

Score 0.1

Area of potential impact (both direct and indirect impacts)

(Hectares)	2.057616

Patch size less than 2 ha = 0 pts; Patch size 2-5 ha = 0.01 pt;
Patch size 5-10 ha = 0.02 pts; Patch size 10-20 ha = 0.04 pts;
Patch size 20-100 ha = 0.08 pts; Patch size >100 ha = 0.15 pts;

Score 0.01

Note; Blocks will score a minimum Landscape Context Score of 1

LANDSCAPE CONTEXT SCORE (max 1.25) **1.11**

Plant Species Recorded (Native and Introduced)		Listed Species			Natives only	
Species	Common Name	EPBC	SA	Not in quadrat	Regenerating species	Introduced Species
Posidonia angustifolia	Narrow-leaf Tapeweed					
Posidonia australis	Southern Tapeweed					
Amphibolis antarctica	Sea Nymph					
Zostera muelleri var.	Dwarf Grass-wrack					
Halophila australis	Paddle Weed					

Threatened or Introduced Animal Species Recorded or Observed (Native and Introduced)		Threatened Species				Introduced Species
Species	**Common Name**	**EPBC**	**SA**	**Past Record**	**Observed**	
Eubalaena australis	Southern Right Whale	EN	V	PMST		
Carcharodon carcharias	White Shark	VU		PMST		
Dermochelys coriacea	Leathery Turtle	EN	V	PMST		

Vegetation Condition Scores

SITE:	Seagrass zone
VEGETATION ASSOCIATION DESCRIPTION	Posidonia spp - Amphibolis antartica dense seagrass
SIZE OF SITE (Ha)	1.110849

Native Plant species diversity	
Score the diversity of species present in the site as a proportion to what would be expected in a vegetation of that community in very good condition (approaching a pre-European state)	
Species diversity highly diminished with the site prodominantly (>95% of individuals) consisting of one species (7 points)	☐
Species diversity partially reduced, with clear signs of loss of species or significant decline in distribution of some of the species present (14 points)	☑
A full compliment of species present with limited signs of impacts on species diversity or distribution (30 points)	☐
Native Plant species diversity score (max score of 30)	14

Introduced Species Scores	
Does the site contain introduced plant or algae species? (This may include algae species such as *Caulerpa taxifolia* and *Caulerpa racemosa)*	
Introduced spp. <5% of organic biomass (15 points)	☑
Introduced spp. 5 - 15% of organic biomass (8 points)	☐
Introduced spp. 16 - 25% of organic biomass (4 points)	☐
Introduced spp. 26 - 50% of organic biomass (2 points)	☐
Introduced spp. >50% of organic biomass (0 points)	☐
Weed Score (max score of 15)	15

Bare Ground	
> 51% of site bare ground (0 points)	☐
26-50% bare ground (0.75 points)	☐
11-25% bare ground (1.25 points)	☑
5–10 % bare ground (2.5 points)	☐
< 5% bare ground (5 points)	☐
Bare Ground (max score of 5)	1.25

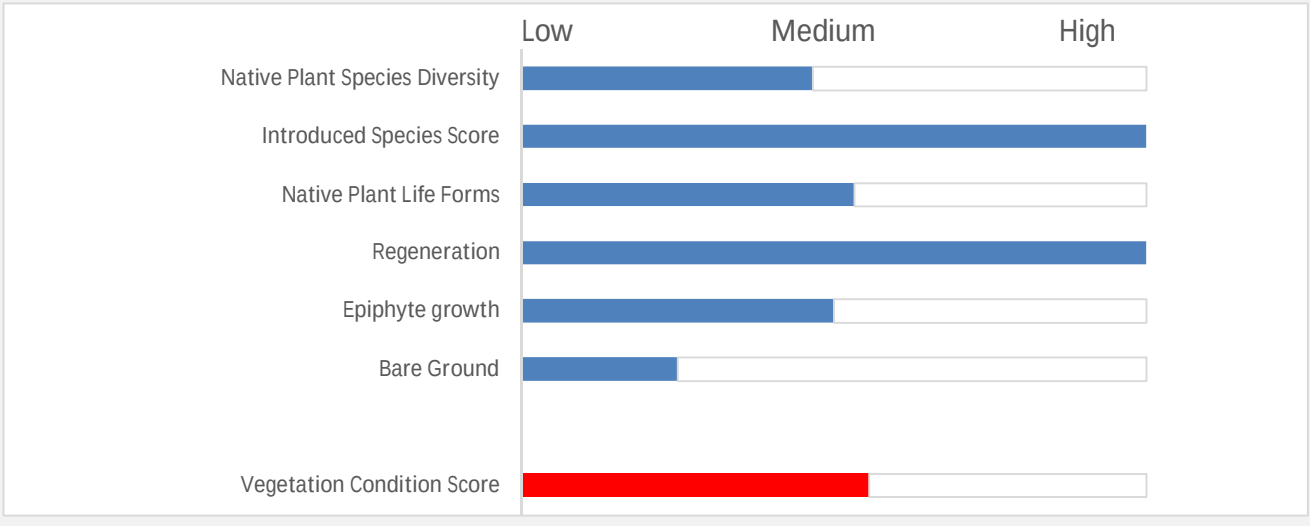
Regeneration	
No regeneration present (0 Points)	☐
Very low regeneration, consisting of highly scattered and unevenly distributed juvinile plants (5 points)	☐
Scattered regeneration over most of the site, but of limited age classes (10 points)	☐
Regeneration over most of the site with juvinilles of varying age classes (20 points)	☑
Regeneration Score (Max 20)	20

Native Plant life form	
Seagrass bed heavily impacted and represented by scattered plants only (2 points)	☐
Seagrass bed impacted with limited structural diversity, largely uniform age classes and significantly reduced vegetation cover (4 points)	☐
Seagrass bed partly impacted, with reduced structural diversity, elements may be missing and partially reduced vegetation cover (8 points)	☐
Limited impacts on seagrass bed, with a diversity of structural features and a varied age class, with only a minor loss vegetation cover or structural elements (16 points)	☑
Seagrass bed showing very little or no sign of disturbance. A variety of life forms and associated age classes present. Vegetation cover near complete (30 points)	☐
Native Plant life form score (max 30)	16

Epiphyte growth	
Epiphyte growth >15% (10 Points)	☐
Epiphyte growth between 15 and 50% (5 points)	☑
Epiphyte grown between 50-100% (0 points)	☐
Epiphyte growth (max score of 10)	5

Vegetation Condition Score calculation

Positive Vegetation Attributes Score = Native species diversity + Regeneration + Native Plant Life Forms	50.00
Negative Vegetation Attributes Score = Weeds + Bare ground + Epiphyte growth	21.25
VEGETATION CONDITION SCORE (Positive veg attributes x ((Negative vegetation attributes + 50) / 80))	**44.53**



Conservation Significance Score

Is the vegetation association considered a Threatened Ecological community or Ecosystem?	Yes/No
State (Provisional List of Threatened Ecosystems of SA) **Rare** community (0.05 pt)	☐
State (Provisional List of Threatened Ecosystems of SA) **Vulnerable** community (0.1 pts)	☐
State (Provisional List of Threatened Ecosystems of SA) **Endangered** community (0.15 pts)	☐
Nationally (EPBC Act) V**ulnerable** community (0.2 pts)	☐
Contains a Nationally (EPBC Act) **Endangered** or **Critically Endangered** community (0.3 pts)	☐
Note; all sites will score a minimum Conservation Significance Score of 1 **Score**	1

Number of Threatened Plant Species recorded for the site (within the site)	Number
**If a species has both a State (NP&W Act) and National (EPBC Act) rating, it's only recorded for its National rating.*	
State **Rare** species recorded (1 pt each)	0
State **Vulnerable** species recorded (2.5 pt each)	0
State **Endangered** recorded (5 pts each)	0
Nationally **Vulnerable** species recorded (10 pts each)	0
Nationally **Endangered** or **Critically endangered** species recorded (20 pts each)	0
0 = 0 pts; <2 = 0.02 pts; 2 - <5 = 0.04 pts; 5 - <10 = 0.06 pts; 10 - <20 = 0.08pts; 20 or > = 0.1 pts	**0**
Score	0

Potential habitat for Threatened Animal Species (number observed or previously recorded)	Number
**If a species has both a State (NP&W Act) and National (EPBC Act) rating, it's only recorded for its National rating.*	
State **Rare** species observed or locally recorded (1 pt each)	0
State **Vulnerable** species observed or locally recorded (2.5 pt each)	0
State **Endangered** species observed or locally recorded (5 pt each)	0
Nationally **Vulnerable** species observed or locally recorded (10 pts each)	1
Nationally **Endangered** or **Critically endangered** species observed or locally recorded (20 pts each)	2
0 = 0 pts; <2 = 0.02 pts; 2 - <5 = 0.04 pts; 5 - <10 = 0.06 pts; 10 - <20 = 0.08pts; 20 or > = 0.1 pts	**50**
Score	**0.1**

CONSERVATION SIGNIFICANCE SCORE	**1.1**

Total Scores for the Site

	Score
LANDSCAPE CONTEXT SCORE	**1.11**
VEGETATION CONDITION SCORE	**44.53**
CONSERVATION SIGNIFICANCE SCORE	**1.10**

Vegetation Condition x Landscape Context x Conservation Significance =	
UNIT BIODIVERSITY SCORE	54.37
Total Biodiversity Score (Biodiversity Score x hectares)	60.40

Photo Point and Vegetation Survey Location

Direction of the Photo

GPS Reference	
Datum	
Zone (52, 53 or 54)	
Easting (6 digits)	
Northing (7 digits)	

Description

Photo taken from (Golder Associate (2011) Port Spencer Marina Baseline Quantitative Surveys. Submitted to Centrex Metals Ltd. Photo taken from within project area, caption reads "Posidonia at one of the shallower sites"

Assessment for Clearance

Loss Factor	1.0
Loadings for clearance of protected areas	
Reductions for rehabilitation of impact site	
SEB Points of loss	**60.40**

SEB Points required	63.42
Hectares required	7.93
Rainfall factor	N/A
Payment into the fund (GST Exclusive)	**$79,274.75**
Administration fee (GST Inclusive)	**$4,360.11**

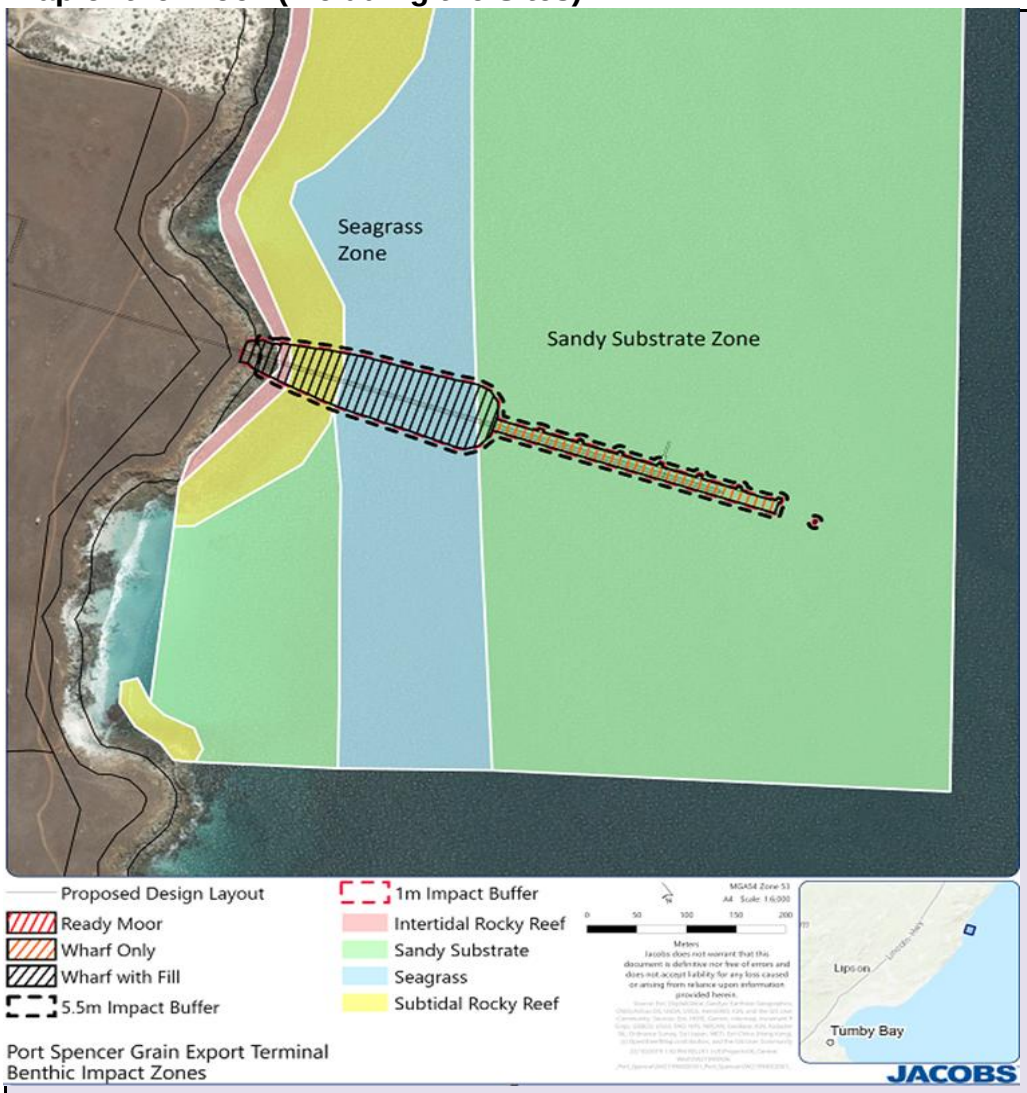
Marine Assessment Scoresheet

(Version - 4 January 2018)

Block	Port Spencer Benthic Impact
Size of Block (Ha)	2.057616
NRM Region	Eyre Peninsula

ASSESSOR(S)	Sonia Croft
DATE OF ASSESSMENT	23/10/2019

Map of the Block (Including the Sites)



Landscape Context Scores

Block Shape Cleared perimeter:Area (km/km2)

Cleared Perimeter (m) =	0
Cleared Perimeter to area ratio	0.00

<6 = 0.1 pts; 6 to <12 = 0.05 pts; 12 to <18 = 0.025 pt

Score 0.1

Area of potential impact (both direct and indirect impacts)

(Hectares)	2.057616

Patch size less than 2 ha = 0 pts; Patch size 2-5 ha = 0.01 pt;
Patch size 5-10 ha = 0.02 pts; Patch size 10-20 ha = 0.04 pts;
Patch size 20-100 ha = 0.08 pts; Patch size >100 ha = 0.15 pts;

Score 0.01

Note; Blocks will score a minimum Landscape Context Score of 1

LANDSCAPE CONTEXT SCORE (max 1.25) **1.11**

Plant Species Recorded (Native and Introduced)		Listed Species			Natives only	
Species	**Common Name**	**EPBC**	**SA**	**Not in quadrat**	**Regenerating species**	**Introduced Species**
Posidonia angustifolia	Narrow-leaf Tapeweed					
Posidonia australis	Southern Tapeweed					
Zostera muelleri var.	Dwarf Grass-wrack					
Halophila australis	Paddle Weed					

Threatened or Introduced Animal Species Recorded or Observed (Native and Introduced)		Threatened Species				Introduced Species
Species	**Common Name**	**EPBC**	**SA**	**Past Record**	**Observed**	
Eubalaena australis	Southern Right Whale	EN	V	PMST		
Carcharodon carcharias	White Shark	VU		PMST		
Dermochelys coriacea	Leathery Turtle	EN	V	PMST		

Vegetation Condition Scores

SITE:	Sandy Substrate
VEGETATION ASSOCIATION DESCRIPTION	Zostera muelleri - Posidonia spp sparse seagrass
SIZE OF SITE (Ha)	0.946767

Native Plant species diversity	
Score the diversity of species present in the site as a proportion to what would be expected in a vegetation of that community in very good condition (approaching a pre-European state)	
Species diversity highly diminished with the site prodominantly (>95% of individuals) consisting of one species (7 points)	☐
Species diversity partially reduced, with clear signs of loss of species or significant decline in distribution of some of the species present (14 points)	☑
A full compliment of species present with limited signs of impacts on species diversity or distribution (30 points)	☐
Native Plant species diversity score (max score of 30)	14

Introduced Species Scores	
Does the site contain introduced plant or algae species? (This may include algae species such as *Caulerpa taxifolia* and *Caulerpa racemosa)*	
Introduced spp. <5% of organic biomass (15 points)	☑
Introduced spp. 5 - 15% of organic biomass (8 points)	☐
Introduced spp. 16 - 25% of organic biomass (4 points)	☐
Introduced spp. 26 - 50% of organic biomass (2 points)	☐
Introduced spp. >50% of organic biomass (0 points)	☐
Weed Score (max score of 15)	15

Bare Ground	
> 51% of site bare ground (0 points)	☑
26-50% bare ground (0.75 points)	☐
11-25% bare ground (1.25 points)	☐
5–10 % bare ground (2.5 points)	☐
< 5% bare ground (5 points)	☐
Bare Ground (max score of 5)	0

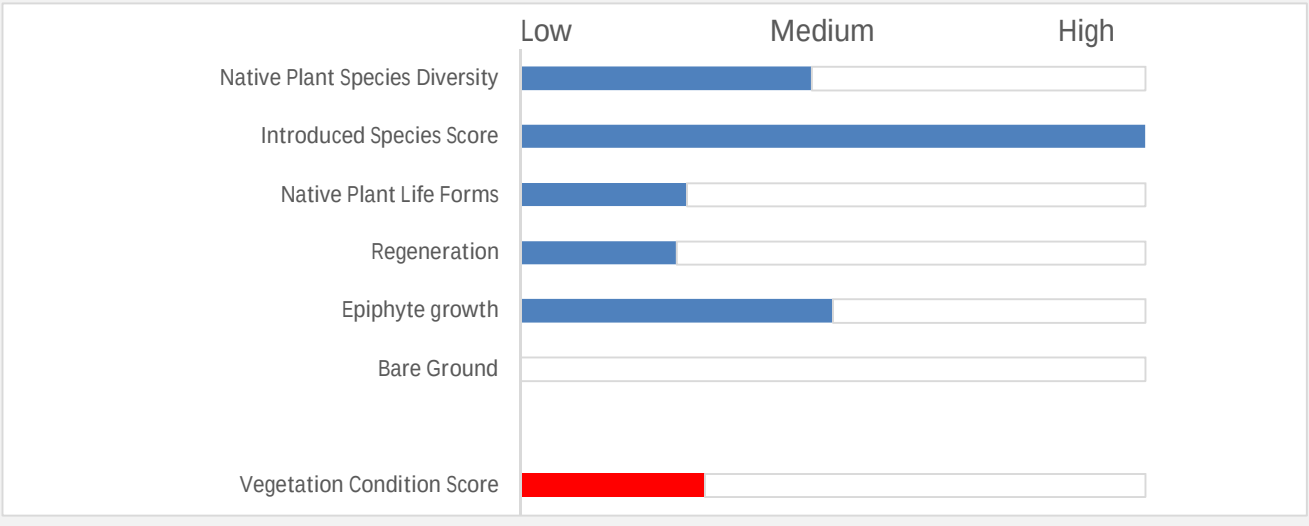
Regeneration	
No regeneration present (0 Points)	☐
Very low regeneration, consisting of highly scattered and unevenly distributed juvinile plants (5 points)	☑
Scattered regeneration over most of the site, but of limited age classes (10 points)	☐
Regeneration over most of the site with juvinilles of varying age classes (20 points)	☐
Regeneration Score (Max 20)	5

Native Plant life form	
Seagrass bed heavily impacted and represented by scattered plants only (2 points)	☐
Seagrass bed impacted with limited structural diversity, largely uniform age classes and significantly reduced vegetation cover (4 points)	☐
Seagrass bed partly impacted, with reduced structural diversity, elements may be missing and partially reduced vegetation cover (8 points)	☑
Limited impacts on seagrass bed, with a diversity of structural features and a varied age class, with only a minor loss vegetation cover or structural elements (16 points)	☐
Seagrass bed showing very little or no sign of disturbance. A variety of life forms and associated age classes present. Vegetation cover near complete (30 points)	☐
Native Plant life form score (max 30)	8

Epiphyte growth	
Epiphyte growth >15% (10 Points)	☐
Epiphyte growth between 15 and 50% (5 points)	☑
Epiphyte grown between 50-100% (0 points)	☐
Epiphyte growth (max score of 10)	5

Vegetation Condition Score calculation

Positive Vegetation Attributes Score = Native species diversity + Regeneration + Native Plant Life Forms	27.00
Negative Vegetation Attributes Score = Weeds + Bare ground + Epiphyte growth	20.00
VEGETATION CONDITION SCORE (Positive veg attributes x ((Negative vegetation attributes + 50) / 80))	**23.63**



Conservation Significance Score

Is the vegetation association considered a Threatened Ecological community or Ecosystem?	Yes/No
State (Provisional List of Threatened Ecosystems of SA) **Rare** community (0.05 pt)	☐
State (Provisional List of Threatened Ecosystems of SA) **Vulnerable** community (0.1 pts)	☐
State (Provisional List of Threatened Ecosystems of SA) **Endangered** community (0.15 pts)	☐
Nationally (EPBC Act) V**ulnerable** community (0.2 pts)	☐
Contains a Nationally (EPBC Act) **Endangered** or **Critically Endangered** community (0.3 pts)	☐
Note; all sites will score a minimum Conservation Significance Score of 1 **Score**	1

Number of Threatened Plant Species recorded for the site (within the site)	Number
**If a species has both a State (NP&W Act) and National (EPBC Act) rating, it's only recorded for its National rating.*	
State **Rare** species recorded (1 pt each)	0
State **Vulnerable** species recorded (2.5 pt each)	0
State **Endangered** recorded (5 pts each)	0
Nationally **Vulnerable** species recorded (10 pts each)	0
Nationally **Endangered** or **Critically endangered** species recorded (20 pts each)	0
0 = 0 pts; <2 = 0.02 pts; 2 - <5 = 0.04 pts; 5 - <10 = 0.06 pts; 10 - <20 = 0.08pts; 20 or > = 0.1 pts	**0**
Score	0

Potential habitat for Threatened Animal Species (number observed or previously recorded)	Number
**If a species has both a State (NP&W Act) and National (EPBC Act) rating, it's only recorded for its National rating.*	
State **Rare** species observed or locally recorded (1 pt each)	0
State **Vulnerable** species observed or locally recorded (2.5 pt each)	0
State **Endangered** species observed or locally recorded (5 pt each)	0
Nationally **Vulnerable** species observed or locally recorded (10 pts each)	1
Nationally **Endangered** or **Critically endangered** species observed or locally recorded (20 pts each)	2
0 = 0 pts; <2 = 0.02 pts; 2 - <5 = 0.04 pts; 5 - <10 = 0.06 pts; 10 - <20 = 0.08pts; 20 or > = 0.1 pts	**50**
Score	**0.1**

CONSERVATION SIGNIFICANCE SCORE	**1.1**

Total Scores for the Site

	Score
LANDSCAPE CONTEXT SCORE	**1.11**
VEGETATION CONDITION SCORE	**23.63**
CONSERVATION SIGNIFICANCE SCORE	**1.10**

Vegetation Condition x Landscape Context x Conservation Significance =	
UNIT BIODIVERSITY SCORE	28.85
Total Biodiversity Score (Biodiversity Score x hectares)	27.31

Photo Point and Vegetation Survey Location

a) A patch of *H. nigricaulis* and *H. australis* (14.9 m deep).

Direction of the Photo

GPS Reference	
Datum	
Zone (52, 53 or 54)	
Easting (6 digits)	Not known
Northing (7 digits)	Not known

Description

Photo copied from Golder Associates (2011) Port Spencer Marine Baseline Quantitative Surveys. Submitted to Centrex Metals Ltd.

Assessment for Clearance

Loss Factor	1.0
Loadings for clearance of protected areas	
Reductions for rehabilitation of impact site	
SEB Points of loss	**27.31**

SEB Points required	28.68
Hectares required	3.58
Rainfall factor	N/A
Payment into the fund (GST Exclusive)	**$35,845.11**
Administration fee (GST Inclusive)	**$1,971.48**