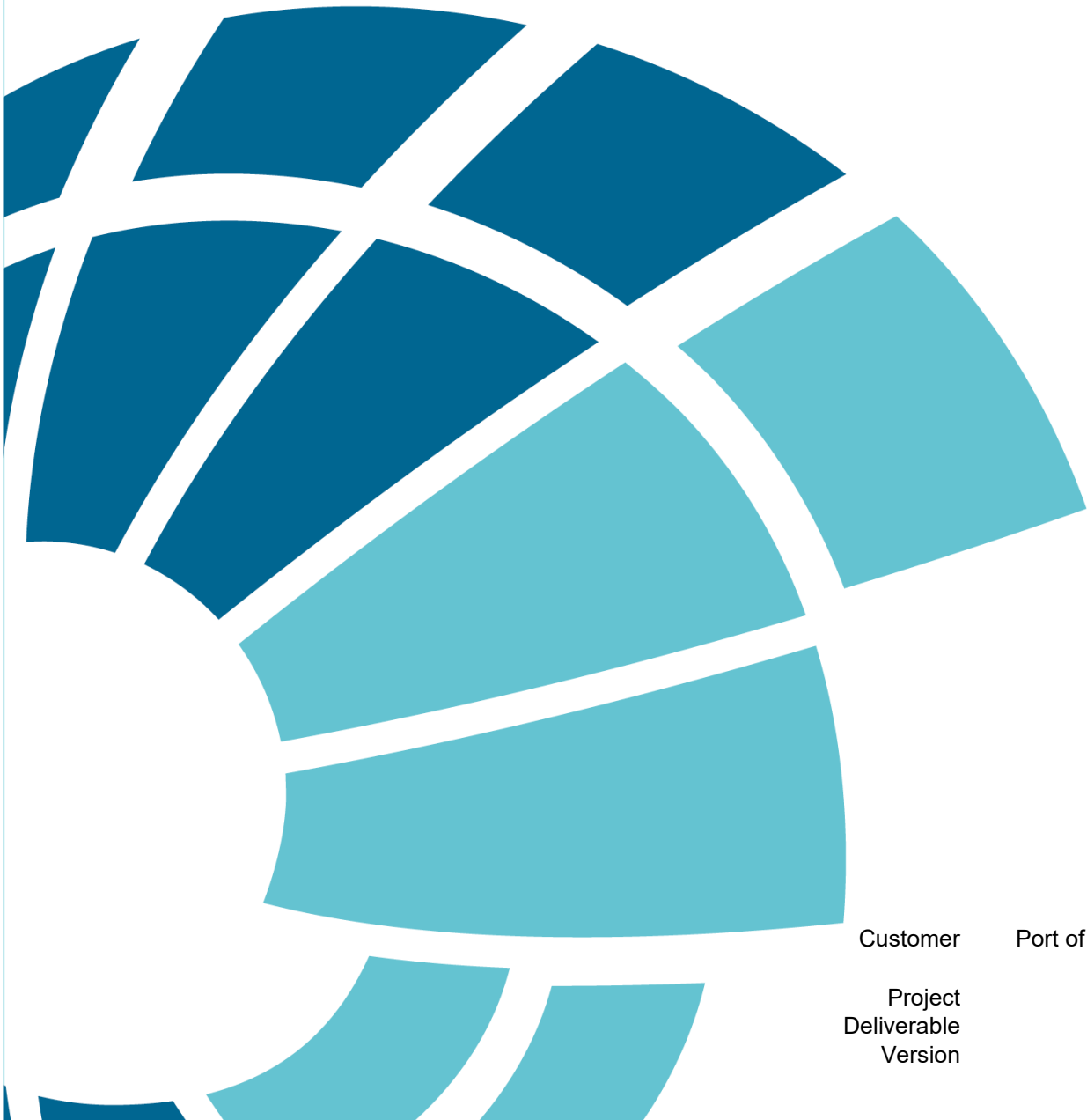


# Whyte Island Rehabilitation Program - Year 2 Assessment

July 2025



Customer	Port of Brisbane Pty Ltd
Project	000885.002
Deliverable	007
Version	00
	30 July 2025

## Document Control

### Document Identification

Title	Whyte Island Rehabilitation Program - Year 2 Assessment
Project No	000885.002
Deliverable No	007
Version No	00
Version Date	29 <sup>rd</sup> July 2025
Customer	Port of Brisbane Pty Ltd
Classification	OFFICIAL
Author	Elyssa McLeod, Julian Manning, Suanne Richards
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Approved By	Darren Richardson
Project Manager	Suanne Richards

### Amendment Record

The Amendment Record below records the history and issue status of this document.

Version	Version Date	Distribution	Record
00	23 July 2025	Port of Brisbane Pty Ltd	Draft Report
01	30 July 2025	Port of Brisbane Pty Ltd	Final Report

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## Executive Summary

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Port of Brisbane Proprietary Limited (PBPL) has entered into an agreement that has a condition to rehabilitate 10 ha of degraded land at Whyte Island by 2026. The project area for the rehabilitation works comprises part of Lot 730 SP142207 south of Boat Passage and east of Port Drive, Brisbane. As part of this agreement PBPL is required to assess habitat condition in the project area annually following implementation of rehabilitation works.

This report provides the second habitat condition assessment of the project area following Year 2 of the rehabilitation programme (FY24-25) and provides the following:

- Documents rehabilitation works undertaken within the project area in Year 2
- Assesses outcomes of the rehabilitation works for Year 2
- Provides a summary of cumulative outcomes of progressive rehabilitation works to date.

### Habitat Outcomes Following Year 1 Works

The FY23-24 programme (Year 1) rehabilitated 5.7 ha of habitat which included:

- 0.5ha of saltmarsh rehabilitation
- 4.2ha of estuarine wetland/claypan rehabilitation
- 0.24ha of saltmarsh restoration
- 0.06ha of *Phragmites australis* wetland restoration
- 0.7ha of woody weed removal.

### Rehabilitation Actions Implemented in Year 2

In Year 2 of the rehabilitation program the following works were implemented by PBPL:

- selective weed control conducted mid-2025
- environmental plantings conducted mid-2025
- initiation of a saltmarsh translocation program mid-2025
- installation of microbat boxes, habitat logs and fauna rocks for wildlife habitat enhancement
- fire ant control conducted in early to mid-2025
- cane toad trapping conducted in early to mid-2025.

### Habitat Outcomes Following Year 2 Works

Year 2 of the programme has resulted in the gain of an additional 1.65ha of high conservation value coastal and wetland habitat as follows:

- 0.32ha of previously cleared habitat has been weeded and planted to restore RE 12.3.20. This RE is Endangered under the Vegetation Management Act; a Threatened Ecological Community under the EPBC Act and supports marine plant habitat

- 0.28ha of previously cleared habitat has been weeded and planted to restore RE12.3.11. This RE is Of Concern under the Vegetation Management Act
- 0.08ha of infill plantings has been undertaken to enhance and support regenerating RE12.3.11 open forest
- 0.01ha of infill plantings has been undertaken within disturbed saltmarsh to increase species richness and assess effectiveness of saltmarsh plantings compared with natural regeneration
- 0.22 ha of dense exotic shrubland has been removed from the wetland
- 0.21 ha of weeds surrounding the wetland has been treated
- 0.05 ha of *Casuarina glauca* has regenerated in previously slashed habitat dominated by weeds. Mature stands of this vegetation type (RE12.1.1) are listed as Of Concern under the VM Act and conform to Threatened Ecological Communities under the EPBC Act. These communities also support marine plant habitat.
- 0.48 ha of *Phragmites australis* wetland +/- Saltcouch has regenerated in previously slashed habitat dominated by weeds.

In addition to these annual gains in habitat extent, the following condition improvements were recorded within habitats of the project area as a result of the FY24-25 rehabilitation programme:

- Ongoing improvement in saltmarsh condition at Site 4 (from 62% of the benchmark to 80%) due to regeneration following the removal of regular slashing. Saltmarsh (RE12.1.2) is listed as Least Concern under the Vegetation Management Act, conforms to a Threatened Ecological Community under the EPBC Act and supports marine plant habitat.
- Ongoing reduction in exotic species cover within previously slashed saltmarsh (30-50% reduction in weed cover)
- Wader and shorebird records for the claypan between 2021 and 2025 indicate 2024 recorded a 20-40% increase in bird counts from previous years. The exclusion of vehicles due to installation of the perimeter fencing has provided more favourable habitat conditions for waders and shorebirds.
- Microbat boxes have been installed on suitably large trees and habitat logs and rocks have been installed to enhance fauna habitat across the project area.
- Feral animal records within the project area continue to be low.
- Regular monitoring and spot control measures are being undertaken to manage fire ant infestations.

### Cumulative Outcomes of Progressive Rehabilitation Works

To date the programme has resulted in the rehabilitation of high conservation value coastal and wetland habitat as follows:

- Year 1: 5.7ha
- Year 2: 1.65ha
- Year 2 cumulative: 7.35ha.



## Contents

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1 Introduction .....	6
1.1 Background .....	6
1.2 Scope and Aims .....	7
2 Methodology .....	8
2.1 Data Review .....	8
2.2 Remote Sensing.....	8
2.3 Surface Hydrology.....	10
2.4 Site Surveys .....	11
3 Results.....	17
3.1 Rehabilitation Works Undertaken in FY24-25.....	17
3.2 Habitat Condition and Extent – Year 2 Results .....	22
4 Discussion .....	43
4.1 Project Area – Baseline and Year 1 Overview.....	43
4.2 Year 2 (FY24-25) Outcomes .....	44
5 Conclusion .....	49
6 References .....	55
Annex A     BioCondition Photos 2025 .....	A-1
Annex B     BioCondition Data .....	B-1
Annex C     Vegetation Transect Photos 2025 .....	C-1

# 1 Introduction

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## 1.1 Background

BMT assessed lands under Port of Brisbane Pty Ltd (PBPL) management for their suitability to support carbon reduction project/s in accordance with statutory vegetation methods under the Emissions Reduction Fund (ERF), specifically 'Reforestation by environmental plantings' and 'Tidal restoration of blue carbon ecosystems'. The capacity for potential projects to deliver co-benefits, particularly local biodiversity and water quality improvements, was also investigated.

Potential projects were prioritised by; viability of carbon sequestration method/s; potential carbon gain that could be produced; and co-benefit outcomes. Following consultation, degraded lands at Whyte Island (the project area) were identified to have the greatest restoration potential from an environmental and land use perspective and could deliver a range of biodiversity and social benefits.

The project area at Whyte Island comprises part of Lot 730 SP142207 south of Boat Passage and east of Port Drive. Although it is not intended to register this project under the Australian Carbon Credit Unit (ACCU) Scheme, PBPL has entered an external financial agreement to rehabilitate 10 ha of degraded land at Whyte Island by 2026.

The rehabilitation works are being undertaken by PBPL and the Bulimba Creek Catchment Coordinating Committee (B4C). Works completed to date include:

- Financial Year (FY) 23-24:
  - fence installation to restrict vehicle access undertaken early 2024
  - cessation of slashing in saltmarsh and adjacent habitat undertaken late 2023
  - selective weed control undertaken mid-2024
  - initial feral pest control
- FY24-25:
  - selective weed control conducted mid-2025
  - environmental plantings conducted mid-2025
  - initiation of a saltmarsh translocation program mid-2025
  - installation of microbat boxes, habitat logs and fauna rocks for wildlife habitat enhancement
  - fire ant control conducted in early to mid-2025
  - cane toad trapping conducted in early to mid-2025.

Proposed future works to be undertaken within the project area in FY25-26 will include:

- weed and feral animal control
- environmental plantings
- construction of a dedicated walking access track for educational purposes
- bird hide installation.

## **1.2 Scope and Aims**

This report provides a habitat condition assessment of the project area following implementation of the FY24-25 rehabilitation works. The aims of this report are to:

- document rehabilitation works undertaken within the project area in FY24-25
- assess the outcomes of these rehabilitation works in terms of habitat condition and extent compared with the baseline and outcomes of the first year (FY23-24) rehabilitation works.

A further annual monitoring assessment will be undertaken to document rehabilitation works implemented in FY25-26 and to measure the habitat condition and extent outcomes of these works. The combined long-term monitoring results collected from 2023 to 2026 will be used to determine whether PBPL has satisfied its sustainability and financial commitments to rehabilitate 10 ha of degraded land at Whyte Island by 2026.

## 2 Methodology

The FY24-25 habitat condition assessment of the project area was based on data review, remote sensing and site survey methods as follows.

### 2.1 Data Review

The following information was reviewed:

- Online current and historical aerial photography (Queensland Globe, Google and NearMap)
- Port of Brisbane Shorebird Monitoring 2022/23 and 2023/24 reports by QLD Wader Study Group
- Site Report and Herbicide Record, B4C Ecological Services Unit, 2024. Report prepared for PBPL.

### 2.2 Remote Sensing

To monitor landscape-scale changes in vegetation condition and extent, two cloud-free GeoEye-1 (GE1) satellite images were used to capture both temporal and seasonal habitat changes across the project area and its surrounds. The baseline image (2 August 2024) reflects conditions following an average dry season, while the second image captured on 22 April 2025 represents the landscape after a characteristic wet season. GE1 provides very high spatial resolution (VHSR) imagery, with a spatial resolution of 1.6 metres across four multispectral bands in the visible to near-infrared (VNIR) spectrum as described in Table 2.1. This combination of spatial detail and spectral richness makes GE1 imagery particularly well-suited for vegetation studies, enabling detailed analysis of vegetation health, species differentiation, and land cover classification.

It should be noted that the imagery used in the remote sensing analysis was taken prior to the environmental planting programme was undertaken in FY24-25. The remote sensing monitoring dates were selected at the start of the program based on months that would show an average 'good' growing season (April) and an average 'low' growing season (August) for estuarine wetland communities. These dates will be used consistently over the duration of the monitoring programme. Whilst timing of imagery will remain consistent over the monitoring programme, more advanced remote sensing techniques may be adopted within each year to enhance remote sensing classifications and outcomes.

Table 2.1 GeoEye-1 (GE1) Imaging System Parameters

Imaging Mode	Panchromatic (Pan)	Multispectral (MS)
Spectral Range	450-900 nm	450-510 nm (blue)
		520-580 nm (green)
		655-690 nm (red)
		780-920 nm (near infrared)
Spatial Resolution at Nadir	0.41 m GSD	1.64 m GSD

#### 2.2.1 Land Cover Classification

The April 2025 satellite image was used to classify land cover classes as defined in Table 2.2 and map their spatial distribution across the project area.

Table 2.2 Land Cover Classes

Land Cover Class	Description
Grassland	Terrestrial grasslands predominantly composed of exotic (non-native) grass species.
Shrubland	Dominated by dense thickets of exotic <i>Schinus terebinthifolius</i> (broad-leaf pepper tree).
Tree Habitat	Native tree cover, including <i>Eucalyptus tereticornis</i> (forest red gum), <i>Corymbia tessellaris</i> (Moreton Bay ash), and regrowth or plantings of <i>Casuarina glauca</i> (swamp oak).
Saltcouch Saltmarsh	Occupies the most landward zone of the estuarine mosaic dominated by <i>Sporobolus virginicus</i> in seaward zone and <i>Phragmites australis</i> on landward zone
Succulent Saltmarsh	Located at the seaward edge of the saltmarsh mosaic supporting low-growing succulent forbs.
Mangroves	Characterized by dense stands of <i>Avicennia marina</i> (grey mangrove).

To classify the image, an advanced technique known as Geographic Object-Based Image Analysis (GEOBIA) also referred to as Object-Based Image Analysis (OBIA) was used. Unlike conventional pixel-based classification methods that analyse individual pixels in isolation, GEOBIA groups pixels into meaningful units called image-objects or segments. These segments are formed based on a combination of spectral, spatial, and contextual characteristics, allowing for a more nuanced understanding of the image content. In this study the following band indices were also used to aid the classification process:

- Normalised Difference Vegetation Index (NDVI): Uses the red and near-infrared bands to highlight areas with high photosynthetic activity, making it an excellent tool for assessing vegetation density.

$$NDVI = \frac{NIR - Red}{NIR + Red}$$

where Red is the red band and NIR is the near-infrared band.

- Soil Adjusted Vegetation Index (SAVI): Introduces a correction factor to minimise soil brightness influence, especially in areas with sparse vegetation.

$$SAVI = \frac{NIR - Red}{NIR + Red + L} * (1 + L)$$

where L is a soil adjustment factor (commonly 0.5).

- Normalised Difference Water Index (NDWI): Uses the green and NIR bands to enhance the detection of water bodies, thus allowing them to be distinguished from other land-cover types.

$$NDWI = \frac{Green - NIR}{Green + NIR}$$

where Green is the green band.

- Green-Red Vegetation Index (GRVI): Uses the green and red bands to highlight vegetation presence and vigour.

$$GRVI = \frac{Green - Red}{Green + Red}$$

- Normalised Difference Soil Index (NDSI): Uses the red and blue bands to highlight bare soil areas, making it useful for soil mapping.

$$NDSI = \frac{Red - Blue}{Red + Blue}$$

where Blue is the blue band.

Once segmented, these image-objects served as input features for training a supervised machine learning model, specifically the Random Forest (RF) algorithm. Random Forest is an ensemble learning method that builds multiple decision trees during the training phase and aggregates their outputs typically by majority voting to determine the final classification. This approach enhances robustness and reduces overfitting, making it well-suited for complex image classification tasks. This object-oriented methodology enables a more accurate and realistic representation of geographic features and phenomena, as it considers the shape, texture, and spatial relationships of objects rather than relying solely on pixel values.

### 2.2.2 Vegetation Health and Change Vector Analysis (CVA)

To evaluate vegetation health, NDVI values were calculated for both August 2024 and April 2025 images. The results from vegetation classification and NDVI analysis were examined using a change detection approach, enabling a comprehensive statistical comparison between the two time periods and across wet and dry seasons. This method facilitated the identification and quantification of changes in vegetation cover and condition over time, offering valuable insights into ecological dynamics within the project area and its surroundings. Additionally, the data can support the assessment of habitat extent and condition, highlighting changes attributable to the rehabilitation efforts.

## 2.3 Surface Hydrology

The availability of water plays a pivotal role in shaping the distribution, density, and overall health of vegetation across landscapes. It serves as a fundamental resource that directly influences plant survival, growth, and reproductive success. In ecosystems, the presence or scarcity of water determines not only which species can thrive but also how vegetation is spatially arranged. To quantitatively evaluate the potential for water accumulation in each area, researchers often utilize the Topographic Wetness Index (TWI) also referred to as the Compound Topographic Index (CTI). This index integrates topographic features to estimate the relative wetness of terrain, providing valuable insights into hydrological conditions that affect vegetation patterns.

$$TWI = \ln(a/\tan(\beta))$$

where,  $a$  is upslope contributing area per unit contour length, and  $\beta$  is local slope in radians.

TWI was analysed for the project area. To ensure accuracy, the Digital Elevation Model (DEM) was hydrologically conditioned to correct for errors and elevation changes that might have occurred since 2019 when the LiDAR data was collected. To do this a Monte Carlo Simulation (MCS) was applied to address uncertainty, running 500 iterations with random elevation adjustments within a range of  $\pm 10$  cm. The TWI was calculated for each iteration, and the final output was derived by averaging all results, enhancing robustness against elevation variability.

## 2.4 Site Surveys

A site survey of the project area was undertaken on the 1 July 2025 by qualified ecologists to assess and document habitat community condition and extent outcomes following implementation of FY24-25 rehabilitation works. Areas subject to woody weed treatment and environmental plantings were inspected and GPS points taken to map the extent of rehabilitation works undertaken. General observations of habitat condition across the project area were also undertaken focussing on new areas of natural habitat regeneration since the FY23-24 assessment.

### 2.4.1 Biocondition Plots

The BioCondition plots established at permanent monitoring points within the project area were re-measured to capture changes in vegetation and habitat condition in FY24-25. The following BioCondition plots were not remeasured during the survey:

- Site 2 BioCondition plot is now dissected by a formal access track that will not be rehabilitated. This monitoring plot will no longer be used.
- Site 5: no rehabilitation works have occurred within this area in FY23-24 or FY24-25.
- Site 6: was inaccessible at the time of survey due to extensive ponding.

For future monitoring purposes, an additional BioCondition plot (Site 10) was also established in extensively cleared and treated woody weed riparian vegetation adjacent to the ponded area.

Figure 2.1 and Table 2.3 provides descriptions and locations of each BioCondition monitoring plot within the project area.

Table 2.3 Whyte Island BioCondition Monitoring Plots

Plot	Description	Notes
1	<i>Eucalyptus tereticornis</i> , <i>Corymbia tessellaris</i> and <i>Casuarina glauca</i> open forest on fill (modified RE 12.3.20)	
2	<i>Eucalyptus tereticornis</i> , <i>Corymbia tessellaris</i> and <i>Casuarina glauca</i> open forest on fill (modified RE 12.3.20)	Monitoring plot dissected by a formal access track that will not be rehabilitated. Plot will no longer be in use.
3	Degraded saltmarsh (RE 12.1.2)	
4	Degraded saltmarsh (RE 12.1.2)	
5	Dense exotic shrubland dominated by <i>Schinus terebinthifolius</i>	Not measured. No rehabilitation works have occurred within this plot or adjacent areas in FY23-24 or FY24-25
6	Dense exotic shrubland dominated by <i>Schinus terebinthifolius</i>	Monitoring plot was inaccessible at the time of FY24-25 survey due to extensive ponding.
7	Highly modified and managed low-lying exotic grassland	
8	Highly modified and managed exotic grassland on elevated fill	
9	Intertidal succulent saltmarsh and saltpan with vehicle disturbance (RE 12.1.2)	
10	Dense exotic riparian shrubland previously dominated by <i>Schinus terebinthifolius</i> that has been cleared and chipped.	Established in FY24-25 following woody weed control.

Plots were established and measured in accordance with the Queensland BioCondition framework (Eyre *et al.* 2015) as follows.

### **Site Condition**

Site-based attributes were assessed for each plot in accordance with the framework as follows (note plot size was modified at some sites based on site condition):

- 100 m x 50 m plot were established to assess:
  - large native trees count
  - recruitment of woody perennial species
  - native tree canopy height
  - native tree species richness.
- 50 m x 10 m plot were established along the transect to assess native plant species richness for shrubs, grasses and forbs/other
- twenty 5 m x 5 m sub-plots were established each side of the transect to determine non-native plant cover
- a 50 m x 20m sub-plot was established to measure coarse woody debris (logs or dead timber on the ground that is >10 cm diameter and >0.5 m in length and more than 80% in contact with the ground)
- five 1 m x 1 m squares were established to measure and photograph native perennial grass cover and organic litter
- native tree and shrub canopy cover was estimated, and percentage of canopy cover measured along the 100 m transect line.

### **Condition Scores**

To provide quantitative data to compare baseline and post-rehabilitation works, site vegetation attributes were scored against the published Regional Ecosystem (RE) benchmark to evaluate the condition of site vegetation against 'best on offer' communities in south-east Queensland.

Historical aerial imagery and pre-clearing RE mapping indicates the entire project area comprised intertidal lands supporting a mosaic of estuarine wetlands. The project area was highly modified for road, rail and port development with land above current highest astronomical tide comprising fill. Whilst modified lands do not correspond to a land zone under the RE framework, these lands currently support patches of native regrowth and plantings consistent with remnant RE 12.3.11 and 12.3.20 woodlands, which occur in the near vicinity. Despite the small size of the project area, both RE's have been adopted as suitable benchmarks for the site with RE 12.3.11 occurring on higher ground and 12.3.20 occurring on lower ground directly adjacent to highest astronomical tide (HAT).

Refer Table 2.4 for BioCondition benchmarks for the following vegetation communities in the project area:

- RE 12.1.2 (Vegetation Management Act Class - Least concern / Biodiversity status - No concern at present / EPBC Threatened Ecological Community): Saltpan vegetation comprising *Sporobolus virginicus* grassland and samphire herbland. Includes saline or brackish sedgeland. Usually occurs on hypersaline Quaternary estuarine deposits.

Saltmarsh within the Port of Brisbane region is comprised of two distinct vegetation communities: *Sporobolus virginicus* grassland at the interface between terrestrial and intertidal lands, and; samphire forbland with saltpan/claypan at the upper tidal range. The RE12.1.2 benchmark is more reflective of *Sporobolus virginicus* grassland and does not adequately measure local samphire



forbland attributes. For the purposes of this monitoring assessment, the RE12.1.2 benchmark was adjusted to reflect local vegetation conditions where samphire forbs are the dominant groundcover.

- RE 12.3.11 (Vegetation Management Act Class – Of concern / Biodiversity status – Of concern): *Eucalyptus tereticornis* +/- *E. siderophloia* and *Corymbia intermedia* open forest to woodland. *Corymbia tessellaris*, *Lophostemon suaveolens* and *Melaleuca quinquenervia* frequently occur and often form a low tree layer. Occurs on Quaternary alluvial plains and drainage lines along coastal lowlands.
- RE 12.3.20 (Vegetation Management Act Class – Endangered / Biodiversity status – Endangered): *Melaleuca quinquenervia*, *Casuarina glauca* +/- *Eucalyptus tereticornis*, *E. siderophloia* open forest. Occurs on lowest terraces of Quaternary alluvial plains in coastal areas. May be subject to storm surge inundation.

BioCondition scores for the monitoring plots were determined by adding the scores obtained for each vegetation attribute and dividing by the maximum possible score for the community. Vegetation attributes are weighted to standardise the relative degree they have on the potential to impact on long-term condition (e.g. non-native plants), difficulty for replacement (e.g. large trees) or habitat value (refer Table 2.5).

Note that landscape-scale attributes were not used in this assessment given the small size of each site, their close proximity to each other, and the same landscape context across the project area.

#### 2.4.2 Vegetation Transects

In June (2024), four transects were also established perpendicular to highest astronomical tide to monitor potential changes in groundcover condition and extent at the interface between terrestrial and intertidal lands over the project timeframe. Variable transect lengths were established depending on site condition. Percentage and type of vegetation cover was measured along each transect with representative photos taken at each site at the approximate mid-point. In July 2025 these transects were remeasured to assess any potential change in cover and/or condition. Figure 2.1 provides locations of each transect within the project area.

Table 2.4 Published BioCondition Benchmark (Queensland Herbarium 2021)

Attribute	RE 12.1.2	RE 12.3.11	RE 12.3.20
Max Score	25	80	80
Recruitment	na	100	100
Non-native Plants	0	0	0
Tree Species Richness	na	7	4
Shrub Species Richness	na	7	4
Grass Species Richness	1	12	2
Forb/Other Species Richness	3	25	8
Emergent Canopy Height	na	na	na
Tree Canopy Height	na	23	16
Tree Subcanopy Height	na	8	8
Emergent Canopy Cover	na	na	na
Tree Canopy Cover	na	56	70
Tree Subcanopy Cover	na	33	20
Large tree threshold (Eucalypt)	na	49	na
Large tree threshold (Non eucalypt)	na	36	30
Total Number Large Trees (Eucalypt)/ ha	na	22	na
Total Number Large Trees (non-eucalypt)/ ha	na	8	165
Shrub Canopy Cover	na	20	15
Native Perennial Grass/Samphire Forb <sup>3</sup>	35	44	20
Litter Ground Cover	na	37	30
Woody Debris Length/ha	na	555	890

<sup>3</sup> RE 12.1.2 benchmark was adjusted to reflect dominance of forbs in local samphire communities; na = not applicable

Table 2.5 Weightings for Vegetation Attributes (Eyre *et al.* 2015)

Site-based Condition Attribute	Weighting (%)
Large trees	15
Tree canopy height	5
Recruitment of canopy species	5
Tree canopy cover (%)	5
Shrub layer cover (%)	5
Coarse woody debris	5
Native plant species richness for four lifeforms	20
Non-native plant cover	10
Native perennial grass cover (%)	5
Litter cover	5

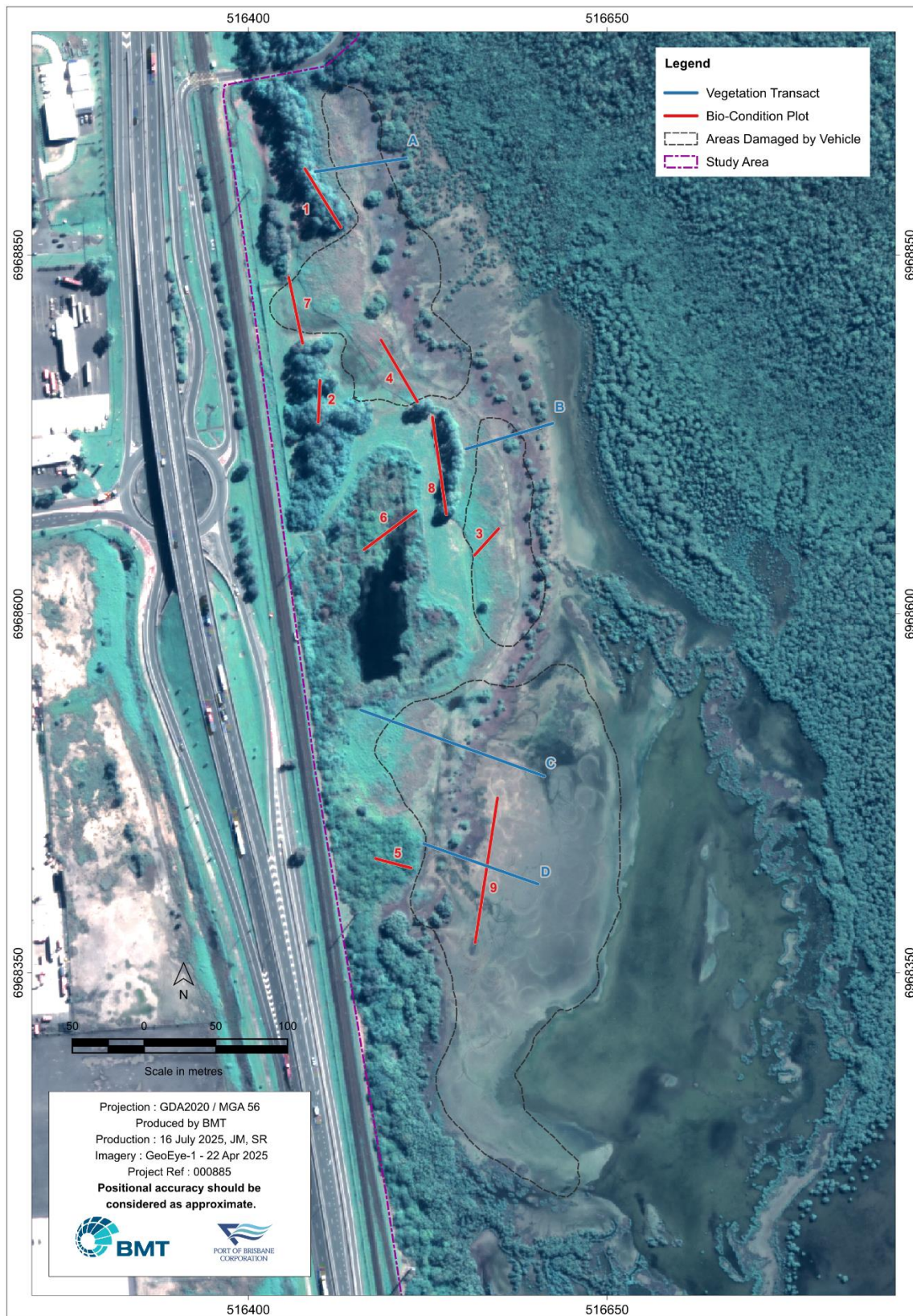


Figure 2.1 Whyte Island habitat features and monitoring locations

### 3 Results

#### 3.1 Rehabilitation Works Undertaken in FY24-25

Refer to Figure 3.1 for the location of rehabilitation works undertaken in the project area in FY24-25.

##### 3.1.1 Environmental Plantings

In FY24-25 extensive environmental planting was carried out by B4C over approximately 0.6ha of previously cleared and weed infested lands within the project area (refer Figure 3.1). Infill plantings were also carried out within approximately 0.08ha of regenerating eucalypt open forest (Site 1). Overall, a total of 6,200 tubestock were planted within the project area comprised of 58 native species which are listed in Table 3.1. All species used in the planting program are locally native and consistent with the composition of local RE's 12.3.20 or 12.3.11.

**Table 3.1 Environmental Planting Species**

Flora Group	Scientific Name	Common Name
Fern	<i>Baloskion tetraphyllum</i>	
	<i>Blechnum indicum</i>	
	<i>Pteridium esculentum</i>	Common bracken
	<i>Lomandra hystrix</i>	
Forb	<i>Lomandra longifolia</i>	mat rush
Grass	<i>Carex appressa</i>	
	<i>Cymbopogon refractus</i>	Barbed-wire grass
	<i>Cyperus lucidus</i>	leafy flat sedge
	<i>Dianella brevipedunculata</i>	
	<i>Dianella caerulea</i>	blueberry lily or blue flax lily
	<i>Imperata cylindrica</i>	blady grass
	<i>Ottochloa gracillima</i>	pademelon grass
	<i>Themeda triandra</i>	kangaroo grass
	<i>Carex brunnea</i>	
	<i>Tetragonia tetragonoides</i>	New Zealand spinach
	<i>Chrysocephalum apiculatum</i>	yellow buttons
Herb	<i>Coleus graveolens</i>	
	<i>Scaevola ramosissima</i>	purple fan-flower
	<i>Viola hederacea</i>	native violet
	<i>Hibbertia scandens</i>	
	<i>Commelina diffusa</i>	
	<i>Smilax australis</i>	barbed-wire vine
	<i>Baloskion pallens</i>	pale cordrush
	<i>Cyperus lucidus</i>	leafy flat sedge
Sedge	<i>Gahnia aspera</i>	sword grass



Flora Group	Scientific Name	Common Name
Shrub	<i>Banksia robur</i>	broad-leaved banksia
	<i>Breynia oblongifolia</i>	coffee bush or Breynia
	<i>Dodonaea triquetra</i>	
	<i>Jacksonia scoparia</i>	
	<i>Leptospermum polygalifolium</i>	tantoon
	<i>Melastoma malabathricum</i> subsp. <i>malabathricum</i>	blue tongue
	<i>Myoporum acuminatum</i>	coastal boobialla
	<i>Trema tomentosa</i>	poison peach
	<i>Hovea Acutifolia</i>	
	<i>Austromyrtus dulcis</i>	midyim
	<i>Zieria smithii</i>	
Tree	<i>Acacia disparrima</i> subsp. <i>disparrima</i>	hickory wattle
	<i>Acacia leiocalyx</i>	black wattle
	<i>Acronychia laevis</i>	glossy Acronychia
	<i>Allocasuarina littoralis</i>	fire oak
	<i>Backhousia myrtifolia</i>	
	<i>Casuarina glauca</i>	swamp she-oak
	<i>Corymbia intermedia</i>	pink bloodwood
	<i>Corymbia tessellaris</i>	
	<i>Eucalyptus siderophloia</i>	northern grey ironbark
	<i>Eucalyptus tereticornis</i> subsp. <i>tereticornis</i>	forest red gum
	<i>Ficus coronata</i>	creek sandpaper fig
	<i>Glochidion ferdinandi</i>	cheese tree
	<i>Jagera pseudorhus</i>	foam bark tree or fern tree
	<i>Lophostemon suaveolens</i>	swamp box
	<i>Macaranga tanarius</i>	macaranga
	<i>Melaleuca linariifolia</i>	snow in summer
	<i>Melaleuca nodosa</i>	ball honey myrtle
	<i>Melaleuca quinquenervia</i>	swamp paperbark
	<i>Melaleuca salicina</i>	willow bottlebrush
	<i>Melicope elleryana</i>	pink Euodia or pink dough wood
	<i>Syzygium australe</i>	brush cherry or creek satinash
	<i>Syzygium oleosum</i>	blue lillipilli

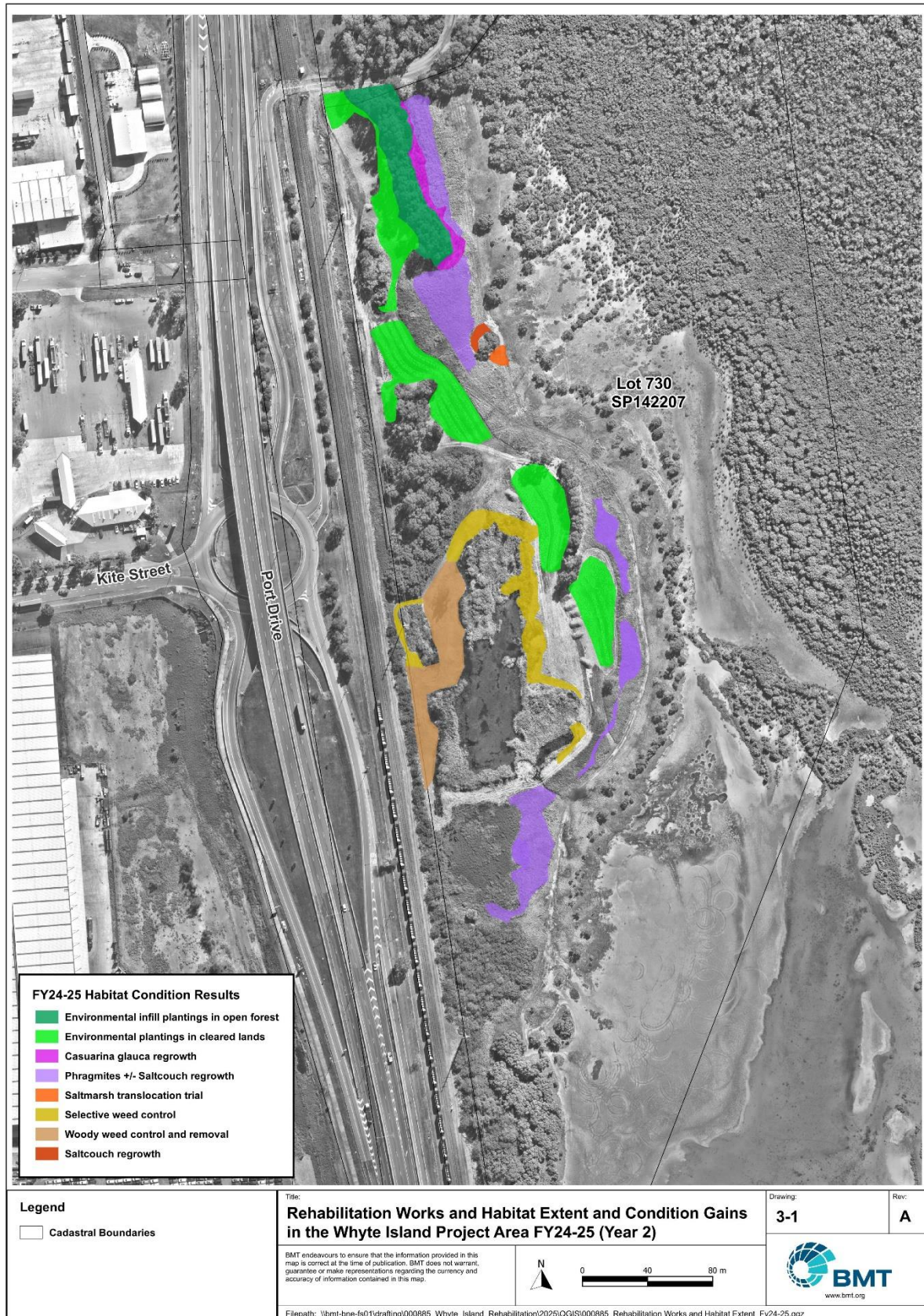


Figure 3.1 Rehabilitation Works and Habitat Extent and Condition Gains in the Whyte Island Project Area FY24-25





Figure 3.2 Environmental Plantings FY24-25

### 3.1.2 Weed Control

Weed control has also been undertaken across the project area. Intensive weed control was undertaken in FY24-25 to treat approx. 0.42 ha of dense exotic shrubland dominated by broad-leaved pepper (*Schinus terebinthifolius*) on the banks of the ponded area. Other woody species included lantana (*Lantana camara*), leucaena (*Leucaena leucocephala*), groundsel (*Baccharis halimifolia*) and castor oil plant (*Ricinus communis*) with a groundcover/vinecover of glycine (*Neonotonia wightii* var. *wightii*).





Figure 3.3 Weed Control FY24-25

### 3.1.3 Saltmarsh Translocation Trials

Translocation trials were undertaken in FY24-25 to assess the effectiveness of saltmarsh plantings compared with natural regeneration. Infill plantings were carried out within approximately 0.01ha of disturbed saltmarsh that had been highly degraded due to regular vehicle access. The results of the translocation trial will be compared with established control sites in FY25-26 by B4C.



Figure 3.4 Saltmarsh Translocation Trials FY24-25

### 3.1.4 Wildlife Habitat Enhancement

In FY24-25, ten microbat boxes were installed in the project area on suitably large trees to provide roosting places for local microbat species. Additionally, 10 m<sup>3</sup> of habitat logs and 5 m<sup>3</sup> of rocks were installed to enhance fauna habitat composition and complexity within the project area.



Figure 3.5 Habitat Enhancements FY24-25

### 3.1.5 Feral Animal and Pest Control

A fox (*Vulpes vulpes*) control program managed by Brisbane City Council did not remove any foxes from the project area in FY24-25. One European brown hare (*Lepus capensis*) was observed in the project area in June 2025.

In April 2025, seven fire ant (*Solenopsis invicta*) nests were recorded within the project area. However, no fire ant nests were observed in the project area at the end of FY24-25. Spot control for fire ants is undertaken on a regular basis by PBPL and B4C undertake regular monitoring and treat fire ant nests during rehabilitation works. Regular slashing is also undertaken outside estuarine wetland and planting areas for fire ant monitoring and control purposes. B4C also conduct cane toad control in the project area.

## 3.2 Habitat Condition and Extent – Year 2 Results

Refer to Figure 3.1 for the location of habitat extent and condition gains recorded in the project area following implementation of the FY24-25 rehabilitation works.

### 3.2.1 Removal of Slashing

In late 2023, slashing of estuarine wetlands in the project area was discontinued to promote natural regeneration. At the end of FY23-24 estuarine wetland gains were observed as a direct result of the removal of slashing. Further to these improvements, at the end of FY24-25 the following additional habitat gains as a direct result of the removal of slashing were observed (refer Figure 3.1):

- 0.05 ha gain of *Casuarina glauca* regrowth in previously slashed habitat dominated by weeds
- 0.48 ha of *Phragmites australis* wetland +/- Saltcouch regrowth in previously slashed habitat dominated by weeds.





Figure 3.6 *Casuarina glauca* regrowth and *Phragmites australis*/Saltcouch wetland regeneration in previously slashed habitat dominated by weeds (end of FY24-25 rehabilitation works)

### 3.2.2 Exclusion of Vehicles

The fence installed on the project area perimeter in early 2024 has continued to successfully exclude unauthorised vehicle access and reduce disturbance to the claypan and estuarine wetland habitats.

#### **Saltmarsh and Mangrove Habitat**

Site inspection and aerial photo analysis indicates ongoing improvements in estuarine wetland habitat condition within the project area in FY24-25 following the removal of vehicle disturbance. Approximately 0.1 ha of mangrove seedling recruitment was observed on previously unvegetated mudflats that were subject to vehicle disturbance prior to fence installation. Infilling of wheel ruts in the claypan has also been observed since exclusion of vehicles.

FY23-24



FY24-25



Figure 3.7 Example of ongoing saltmarsh recovery observed in FY24-25 in areas previously subject to vehicle disturbance



Figure 3.8 Mangrove recruitment observed at end of FY24-25 on previously unvegetated mudflats subject to vehicle disturbance

### Wader and Shorebird Habitat and Records

The project area perimeter fencing installed in early 2024 continues to exclude vehicles from high value shorebird saltpan/saltmarsh habitat.

The Queensland Wader Study Group undertakes regular wader and shorebird surveys across the claypans in the project area on behalf of PBPL. Wader and shorebird records collected from the claypan for 2021 to 2025 were analysed for this assessment. As the number of surveys undertaken within each year has varied, a single survey within each month was selected to reduce any survey effort bias. Where multiple surveys were undertaken within the same month of a year, the survey with the highest records (i.e individual bird counts) for the month was used. Note there were no survey records for June 2021 and January 2024. Highest counts by month from 2021 to 2025 are shown in Figure 3.9. The total counts recorded per year are summarised in Figure 3.10 noting that as there were no survey records for June 2021 and January 2024 these months have been excluded for all years.

Consistent with the broader region, wader counts for the project area are lowest in the winter months and highest in summer due to the presence of migratory species that return to Moreton Bay from late September. The survey data shows 2024 recorded the highest number of waders and shorebirds with approximately 22,000 individuals counted. This represents a 20-40% increase in bird counts from previous years. There has been no notable change in bird species recorded over this timeframe.

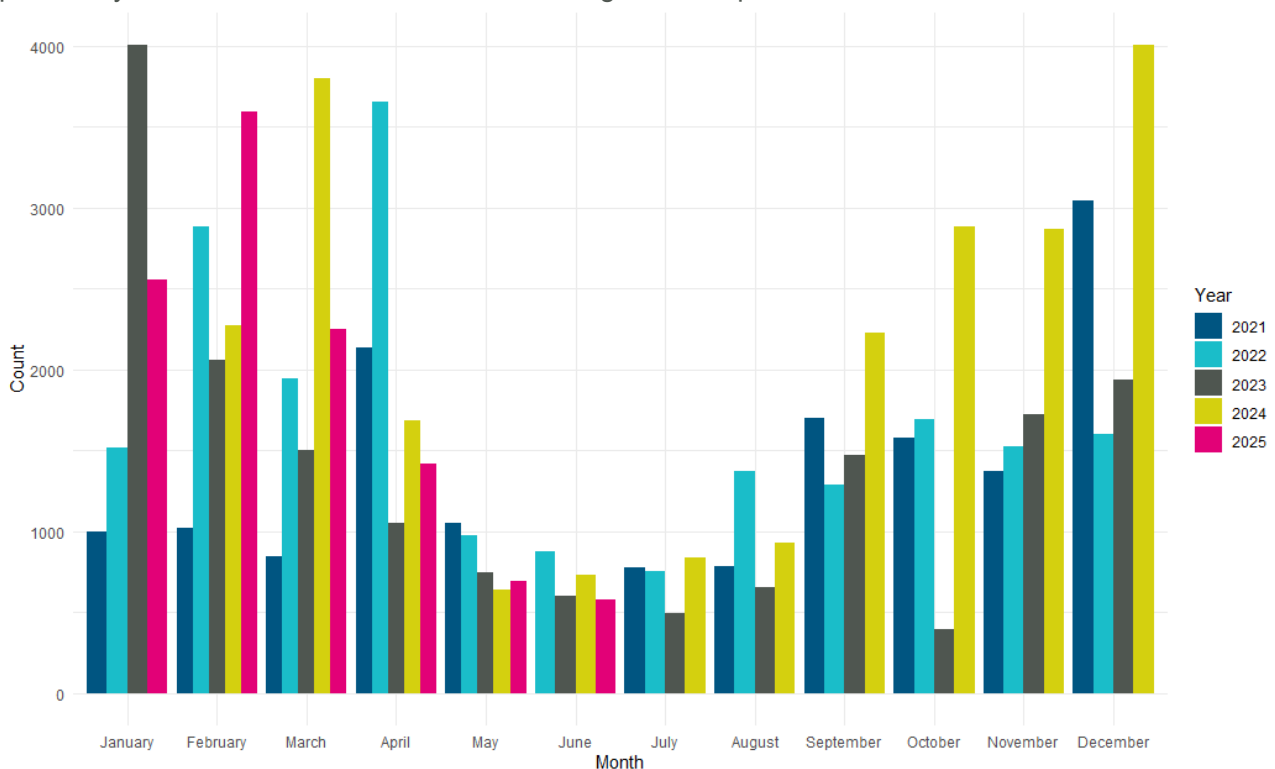


Figure 3.9 Total highest wader and shorebird count by month (one survey selected per month) from 2021 to 2025 (Source of data: QLD Wader Study Group)



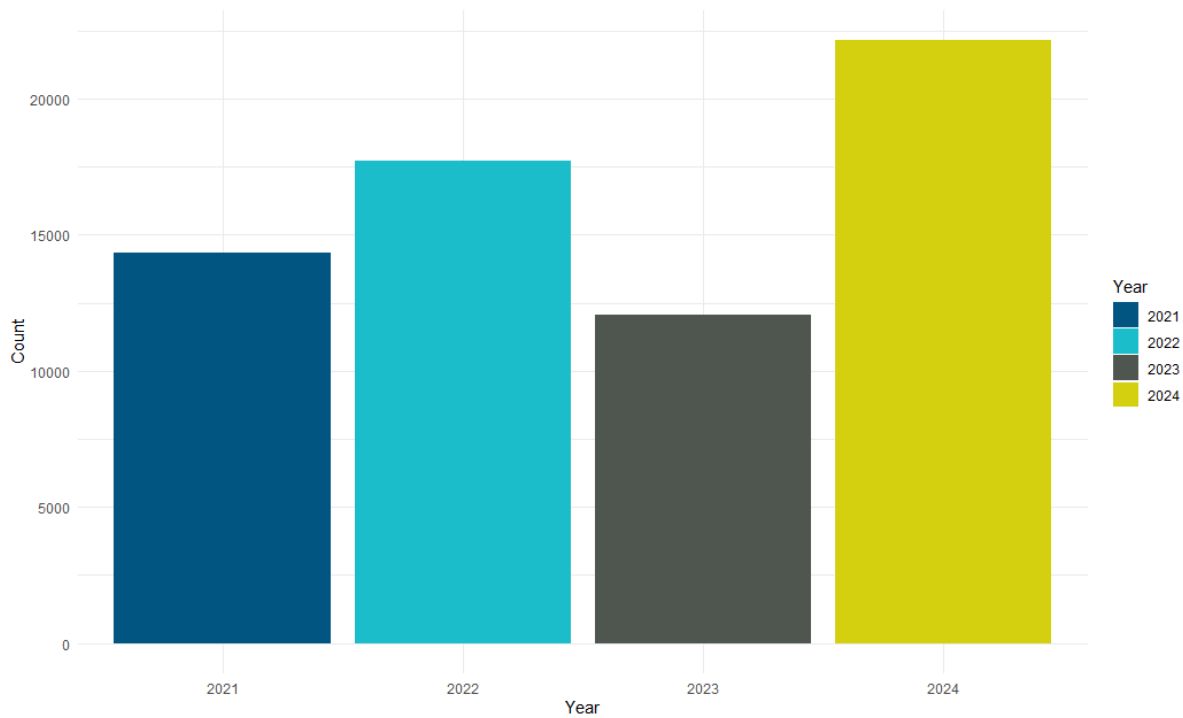


Figure 3.10 Total wader and shorebird count by year from 2021 to 2024 (excluding months January and June for all years) (Source of data: QLD Wader Study Group)

### 3.2.3 BioCondition Sites

BioCondition scores measured at each of the monitoring plots over the duration of the rehabilitation program are shown in Table 3.2, excluding plots 2, 5 and 6 . Photos of the sites taken in 2025 can be found in Annex A.

Most sites have shown an increase in overall BioCondition Score (with an increase of up to 35% compared to baseline) with the exception of Site 9 which has shown a minor reduction. BioCondition scores have increased at most sites predominantly due to the reduction in weed cover, the increase in species richness, and/or increase in native groundcover as a result of the rehabilitation programme. Based on a review of aerial imagery, the minor decrease in the BioCondition score at site 9 compared with the baseline is likely attributed to variations in the placement of the groundcover quadrats during the survey.

Table 3.2 Monitoring Plot BioCondition Scores 2023-2025

Year	2023	2025	2023	2025	2023	2025	2024	2025	2024	2025	2024	2025	2025
Site	1		3		4		7		8		9		10
Regional Ecosystem	12.3.11		12.3.20		12.1.2		12.3.20		12.3.11		12.1.2		12.3.20
Recruitment	5	5					0	0	0	0			0
Non-native Plant Cover	3	10	3	5	3	5	0	5	0	5	10	10	10
Tree Species Richness	5	5	0	5			0	5	2.5	5			2.5
Shrub Species Richness	0	2.5	2.5	2.5			0	5	0	5			0
Grass Species Richness	2.5	2.5	5	5	5	5	2.5	5	0	0	5	5	2.5
Forb/Other Species Richness	0	2.5	2.5	5	2.5	5	2.5	2.5	0	0	5	5	0
Emergent Canopy Height													
Tree Canopy Height	3	3	0	0			0	0	3	3			0
Tree Subcanopy Height	5	5	0	0			0	0	0	0			0
Emergent Canopy Cover													
Tree Canopy Cover	5	5	0	0			0	0	0	0			0
Tree Subcanopy Cover	2	2	0	0			0	0	0	0			0
Total Number Large Trees (Eucalypt)/ ha	5	5							0	0			
Total Number Large Trees (non-eucalypt)/ ha	0	0	0	0			0	0	0	0			5
Shrub Canopy Cover	0	0	0	0			0	0	0	0			0
Native Perennial Grass Cover	5	0	5	5	5	5	0	5	0	3	3	1	1
Litter Ground Cover	5	3	5	5			0	0	0	5			3
Woody Debris Length/ha	0	0	0	0			0	0	0	0			0

## OFFICIAL

Year	2023	2025	2023	2025	2023	2025	2024	2025	2024	2025	2024	2025	2025
Site	1		3		4		7		8		9		10
Regional Ecosystem	12.3.11		12.3.20		12.1.2		12.3.20		12.3.11		12.1.2		12.3.20
Plot Score	45.5	50.5	23	33	15.5	20	5	27.5	5.5	26	23	21	24
Max Score for RE	80	80	80	80	25	25	80	80	80	80	25	25	80
% Benchmark Condition	0.57	0.63	0.29	0.41	0.62	0.8	0.06	0.34	0.07	0.33	0.92	0.84	0.3

\*Blank cells denote N/A for RE



### 3.2.4 Vegetation Transects

Table 3.3 summarises the groundcover composition changes measured at transects across the terrestrial and intertidal interface in 2024 and 2025. There has been an overall reduction in vegetation cover within all transects however this has also been associated with a 30-50% reduction in exotic species cover at all sites, excluding site D which lies completely within the intertidal zone and does not support weed species. Notably, there was an approximate 50% increase in native grass cover at transect C. This preliminary data indicates a general improvement in wetland habitat condition due to a reduction in weed cover which was previously promoted by regular slashing and disturbance.

**Table 3.3 Groundcover composition at terrestrial and intertidal interface in meters**

Site	A		B		C		D	
Cover	2024	2025	2024	2025	2024	2025	2024	2025
Exotic Grass	22.6	14.64	14.8	7.73	37.5	10.34	0	0
Native Grass	39.5	38.08	35	36.78	12.2	26.46	5.4	6.5
Exotic Forb	1.5	1.63	1.6	0.54	2.4	1.86	0	0
Native Forb	33.6	41.71	39.1	36.12	11.9	12.04	14	8.4
Bare	2.9	3.94	9.5	18.83	36	49.30	80.6	85.1

### 3.2.5 Remote Sensing Analysis

A remote sensing analysis was conducted to monitor both seasonal variations and potential anthropogenic impacts on habitat condition and spatial extent within the project area and the broader landscape.

#### Vegetation Extent Assessment

The vegetation within the study area was classified into distinct ecological categories, as illustrated in Figure 3.11. These classes are as follows:

- Grassland: terrestrial grasslands predominantly composed of exotic (non-native) grass species. They typically occur in disturbed or previously cleared areas and may provide limited ecological value compared to native vegetation types.
- Shrubland: dominated by dense thickets of exotic *Schinus terebinthifolius* (broad-leaf pepper tree).
- Tree Habitat: native tree cover, including *Eucalyptus tereticornis* (forest red gum), *Corymbia tessellaris* (Moreton Bay ash), and regrowth or plantings of *Casuarina glauca* (swamp oak). These habitats support a range of terrestrial fauna and contribute to landscape connectivity.
- Saltcouch Saltmarsh: occupies the most landward zone of the estuarine mosaic dominated by *Sporobolus virginicus* at the seaward zone and grades into *Phragmites australis* at the most landward edge of brackish/freshwater influence. Important habitats for nutrient cycling and support a range of invertebrate and bird species.
- Succulent Saltmarsh: located at the seaward edge of the saltmarsh mosaic supporting low-growing succulent forbs. These plants are highly salt-tolerant and contribute to shoreline stability and habitat complexity in tidal environments.

- Mangroves: characterized by dense stands of *Avicennia marina* (grey mangrove) that play a crucial role in coastal protection, sediment stabilization, and providing nursery habitat for marine fauna.

The spatial extent of the classified vegetation communities from April 2025 was compared against results from the previously generated dataset from April 2024, as illustrated in Figure 3.12. Further quantitative details, including area measurements and percentage cover for each class, are provided in Table 3.4.

The most notable landscape-scale change observed between April 2024 and April 2025 was the expansion of mangrove habitat, which increased by 8.76 hectares, representing a 3.38% rise in coverage. This suggests either positive ecological growth or improved detection through enhanced remote sensing techniques. Note this expansion was recorded outside the project area.

Exotic grassland extent experienced the most significant decline, declining by 2.71 hectares and 2.67%. This is correlated with an increase in phragmites/saltmarsh communities within the project area. Tree habitats showed a modest increase of 0.48 hectares, likely reflecting regrowth or less shadow effect in this instance. Shrubland (exotic) saw minor reductions. Succulent saltmarsh communities saw minor reductions indicating subtle shifts in seasonal variations.

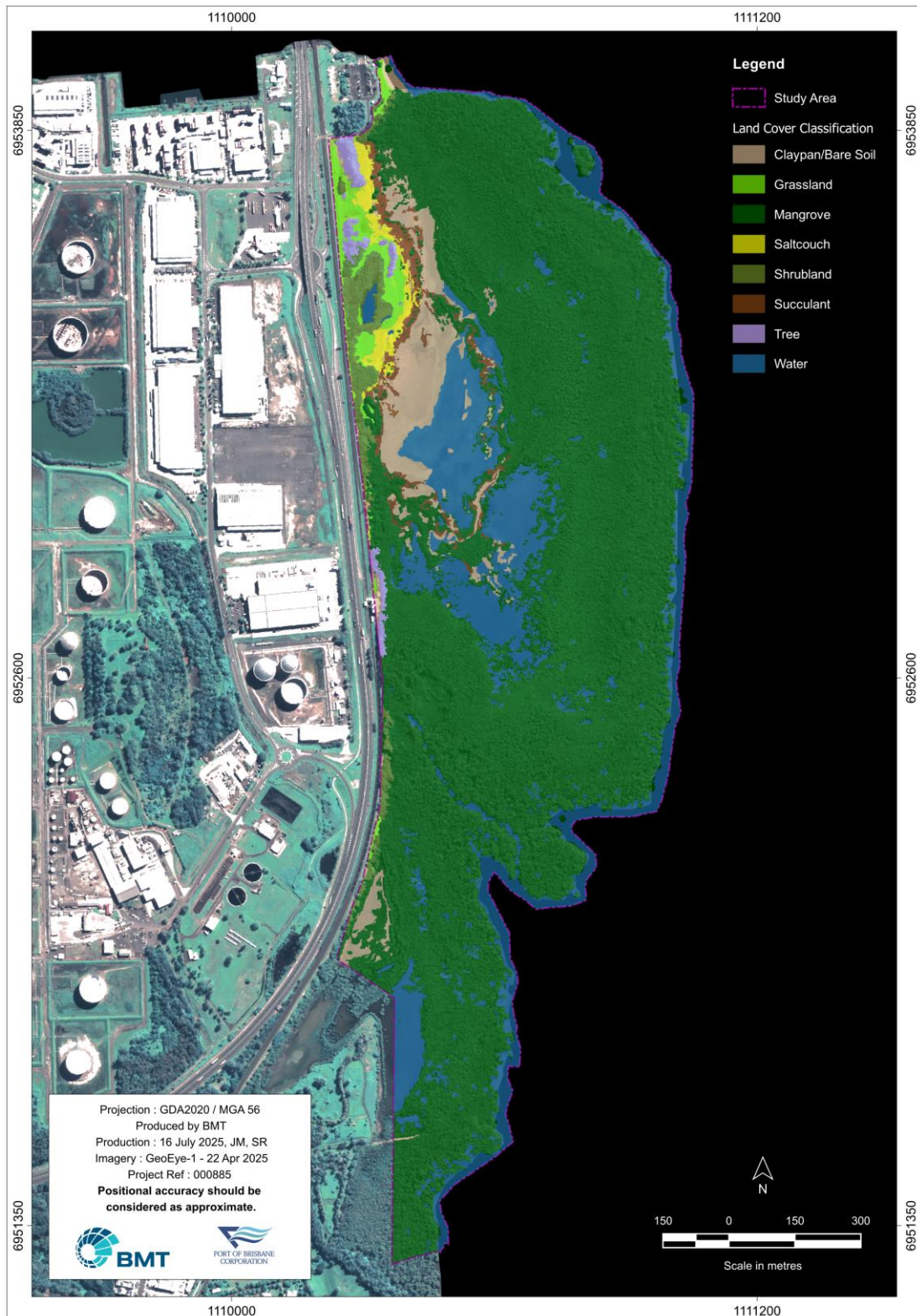


Figure 3.11 Spatial Distribution of Vegetation Communities at Whyte Island Based on GeoEye-1 Multispectral Satellite Imagery (April 2025)

Table 3.4 Comparison of Vegetation Community Area (ha) Between April 2024 and April 2025

Class	Area (ha)			Percentage Cover (%)		
	Apr-24	Apr-25	Change	Apr-24	Apr-25	Change
Grassland	5.069	2.364	-2.705	2.12	4.79	-2.67
Mangrove	92.364	101.128	+8.764	90.58	87.20	+3.38
Saltcouch	1.212	1.473	+0.261	1.32	1.14	+0.18
Shrubland	3.402	3.144	-0.258	2.82	3.21	-0.39
Succulent	3.14	2.324	-0.816	2.08	2.96	-0.88
Tree	0.739	1.215	+0.476	1.09	0.70	+0.39

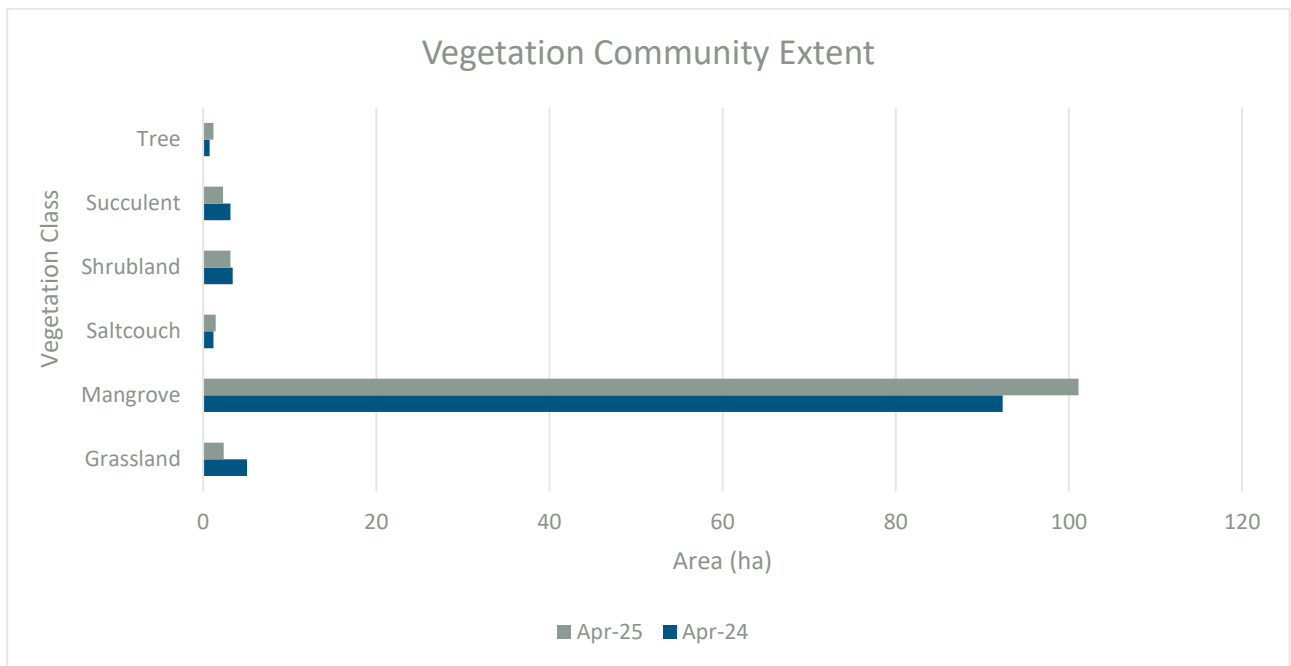


Figure 3.12 Comparison of Vegetation Community Area (ha) Between April 2024 and April 2025

### Vegetation Condition Assessment (NDVI)

Vegetation condition was evaluated using a combination of advanced image classification techniques and the Normalised Difference Vegetation Index (NDVI), a widely recognised metric for assessing plant health and photosynthetic activity. Image classification enabled the accurate identification and spatial mapping of distinct vegetation communities, while NDVI provided a quantitative measure of vegetation vigour across the landscape. This integrated approach offered a robust framework for detecting ecological changes, including areas of stress, degradation, or recovery.

To assess temporal trends in vegetation health, geo-median NDVI values were compared across four key time points: August 2023, April 2024, August 2024, and April 2025. These values are summarised in Table 3.5, providing detailed insights into seasonal and annual variations in vegetation condition for each classified community. For a more visual interpretation, Figure 3.13 presents a comparative chart of NDVI values between August 2023 and August 2024, while Figure 3.14 illustrates changes observed between April 2024 and April 2025.

Table 3.5 Geo- median NDVI Values for Classified Vegetation Communities Across Four Time Periods – Dry Seasonal (August 2023 and 2024) and Late Wet Season (April 2024 and 2025)

Class	Geo-median NDVI					
	Aug-23	Aug-24	Change	Apr-24	Apr-25	Change
Grassland	0.513	0.591	0.078	0.852	0.788	-0.064
Mangrove	0.803	0.704	-0.099	0.877	0.714	-0.163
Saltcouch	0.396	0.494	0.097	0.624	0.625	0.001
Shrubland	0.751	0.604	-0.147	0.874	0.757	-0.118
Succulent	0.430	0.433	0.003	0.592	0.555	-0.037
Trees	0.787	0.637	-0.150	0.891	0.767	-0.125

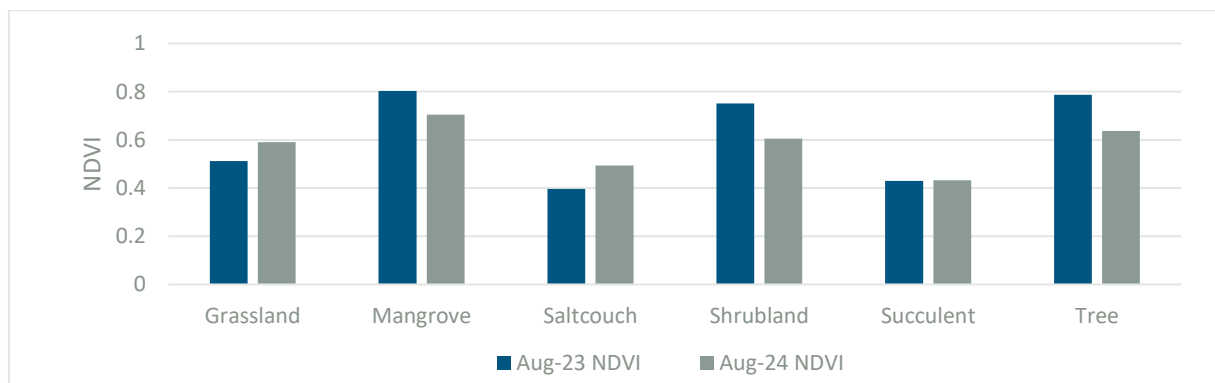


Figure 3.13 Comparative NDVI Analysis of Vegetation Communities in the Dry Season (August 2023 and August 2024)

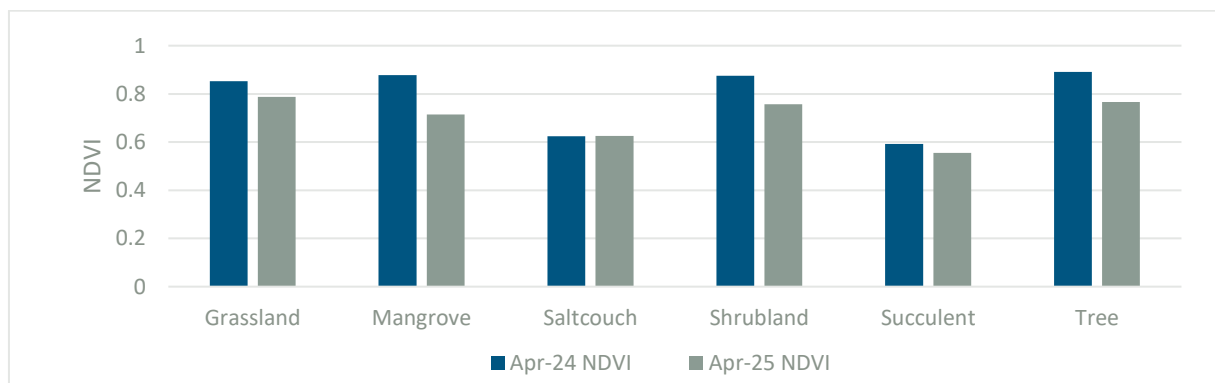


Figure 3.14 Comparative NDVI Analysis of Vegetation Communities in the Late Wet Season (April 2024 and April 2025)

Temporal patterns varied inconsistently among vegetation communities:

- Grassland - Grassland condition remained relatively stable over time (August 2023 to August 2024 = +0.078; April 2024 to April 2025 (-0.064).

- Mangrove – Mangrove condition showed slight declines in both periods: August 2023 and August 2024 = -0.099, April 2024 and April 2025 = -0.163). This indicates a trend of slight canopy loss over the monitoring period.
- Saltcouch – NDVI increased by 0.097 in the first interval and remained unchanged in the second, indicating stable and healthy conditions.
- Succulent Saltmarsh – NDVI remained relatively stable over time (August 2023 and August 2024 = +0.003; April 2024 and April 2025 = -0.037).
- Shrubland and Tree habitats - NDVI declined across both periods—Shrubland decreased by 0.147 and 0.118, while Tree habitats declined by 0.150 and 0.125.

The result from the change vector analysis is presented in Figure 3.15 to Figure 3.20. In these figures the dry season results (August 2024, image on the left) indicated that the majority of these areas exhibited good to excellent health status ( $\text{NDVI} > 0.7$ ). However, there was poor to no vegetation activity ( $\text{NDVI} \leq 0.4$ ) in the north and east of the seasonal wetland, as well as near the left side of the infrastructure in the south. During the wet season (April 2024, image in the middle), these areas showed increased activity and achieved excellent health indicators ( $\text{NDVI} > 0.8$ ). However, the poor area near the east side of the infrastructure did not show any signs of improvement. The CVA results (right image) for this class were mostly positive, indicating overall resilience.

### 3.2.6 Hydrology

The processing of LiDAR point cloud data can yield valuable insights into surface runoff hydrology. As shown in Figure 3.22, the bare-earth elevation model derived from the 2019 LiDAR data provides a high-resolution representation of the terrain, excluding vegetation and built structures, and serves as a critical foundation for hydrological interpretation. Figure 3.22 illustrates the results of a Monte Carlo simulation of the Topographic Wetness Index (TWI), performed over 500 iterations while incorporating a  $\pm 10$  cm uncertainty in the digital elevation model (DEM). This probabilistic approach enhances the understanding of spatial variability in moisture accumulation and potential runoff zones under varying terrain conditions.



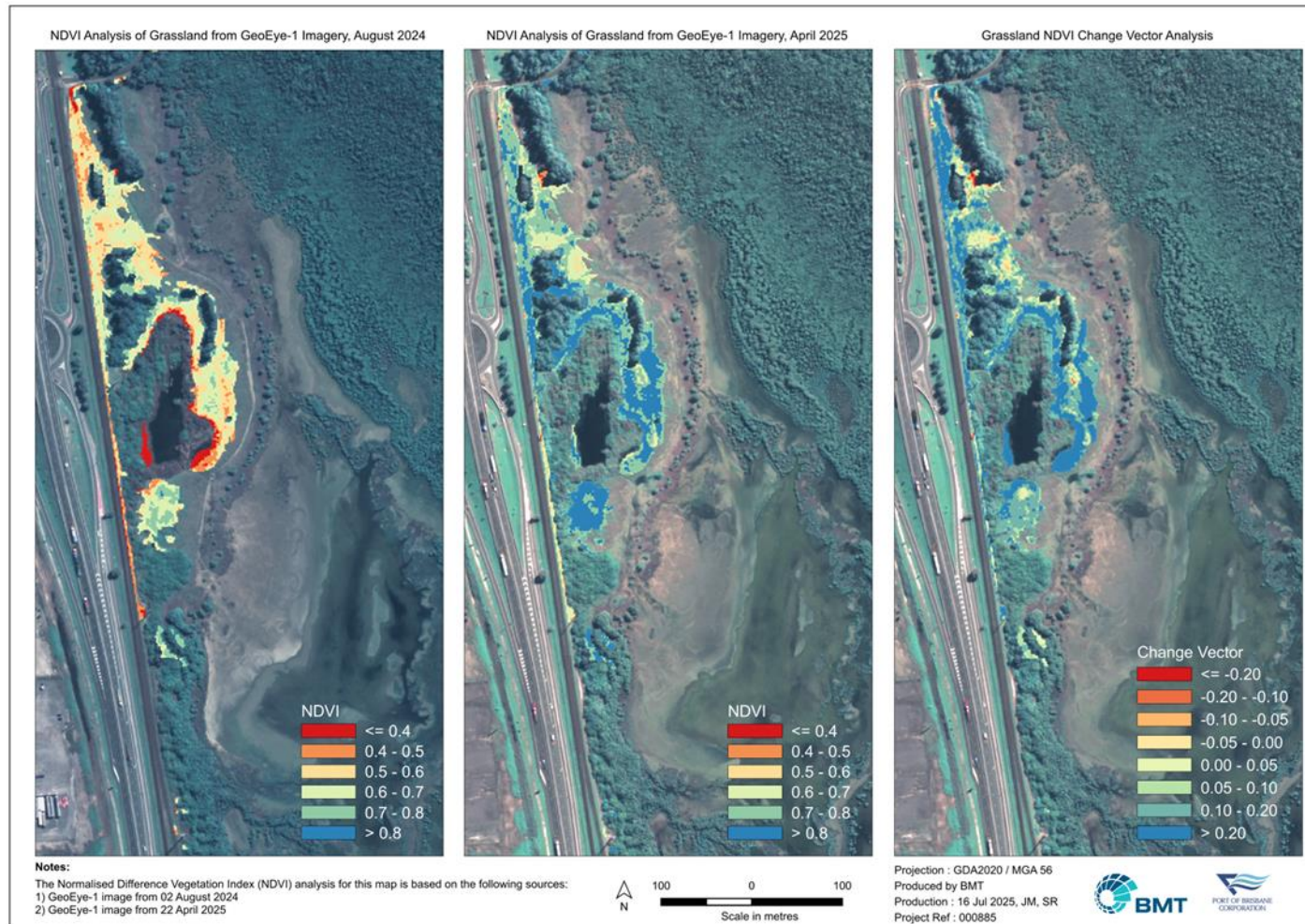


Figure 3.15 Normalised Difference Vegetation Index (NDVI) and Change Vector Analysis for Grassland

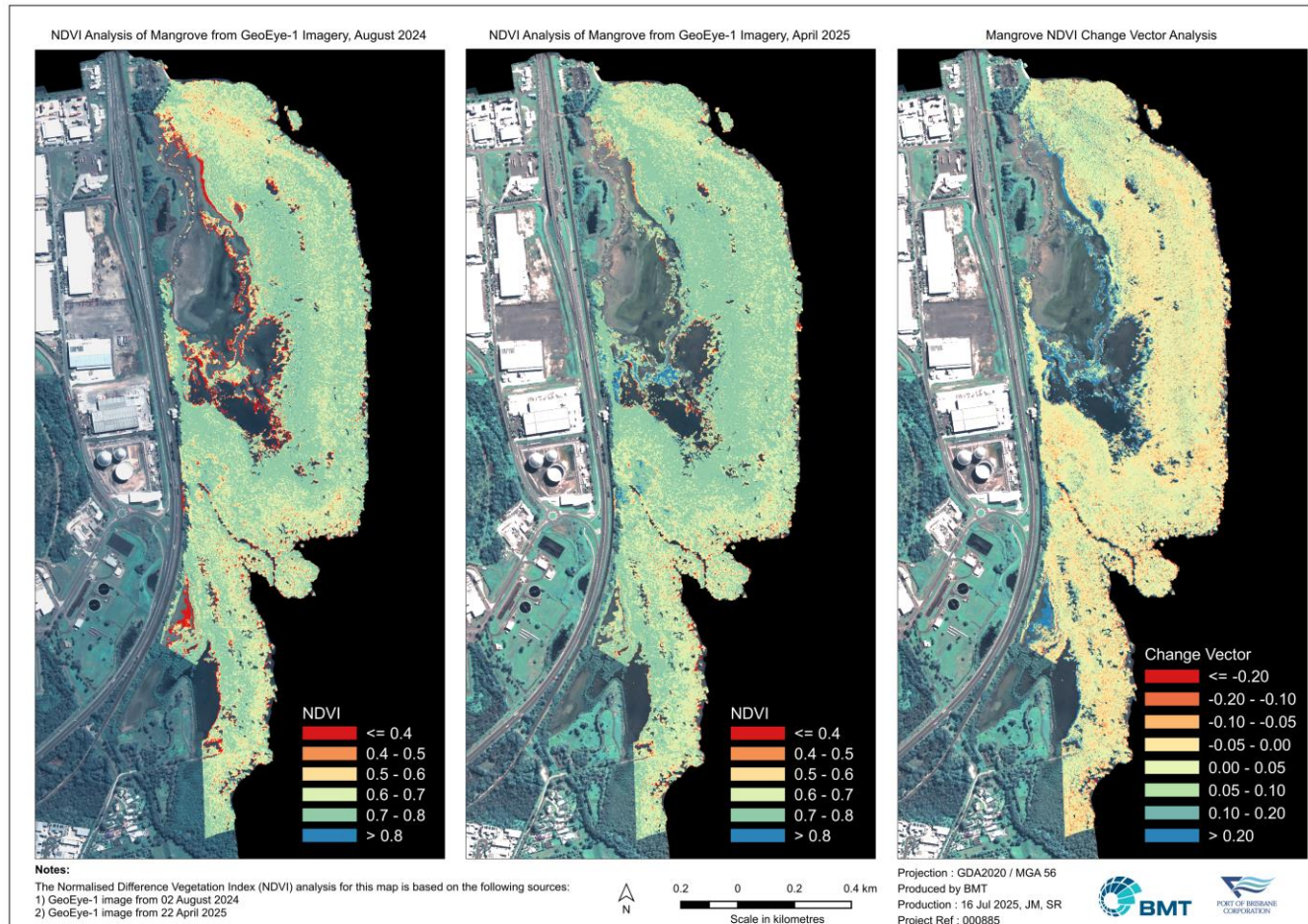


Figure 3.16 Normalised Difference Vegetation Index (NDVI) and Change Vector Analysis for Mangrove



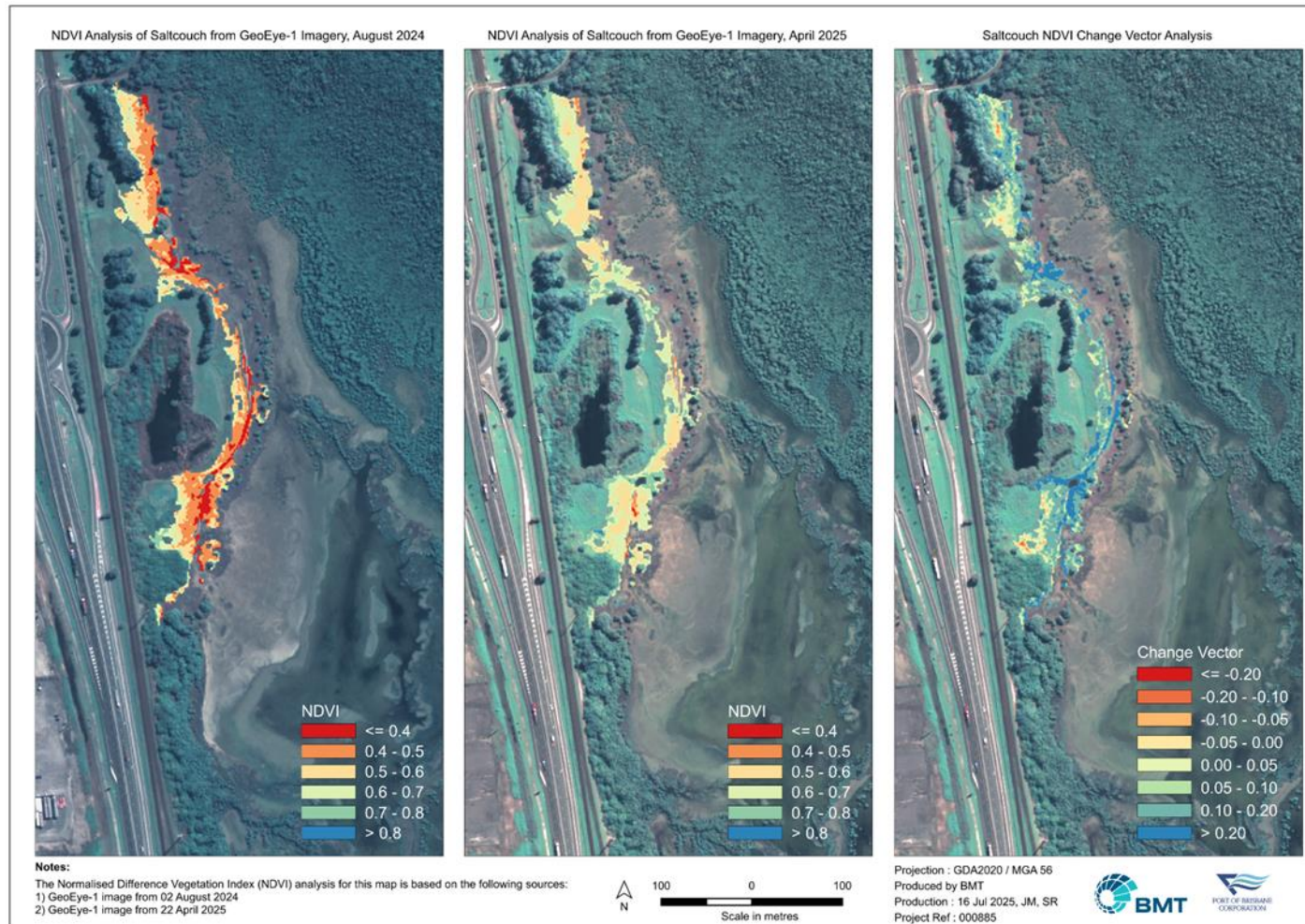


Figure 3.17 Normalised Difference Vegetation Index (NDVI) and Change Vector Analysis for Saltcouch / Phragmites



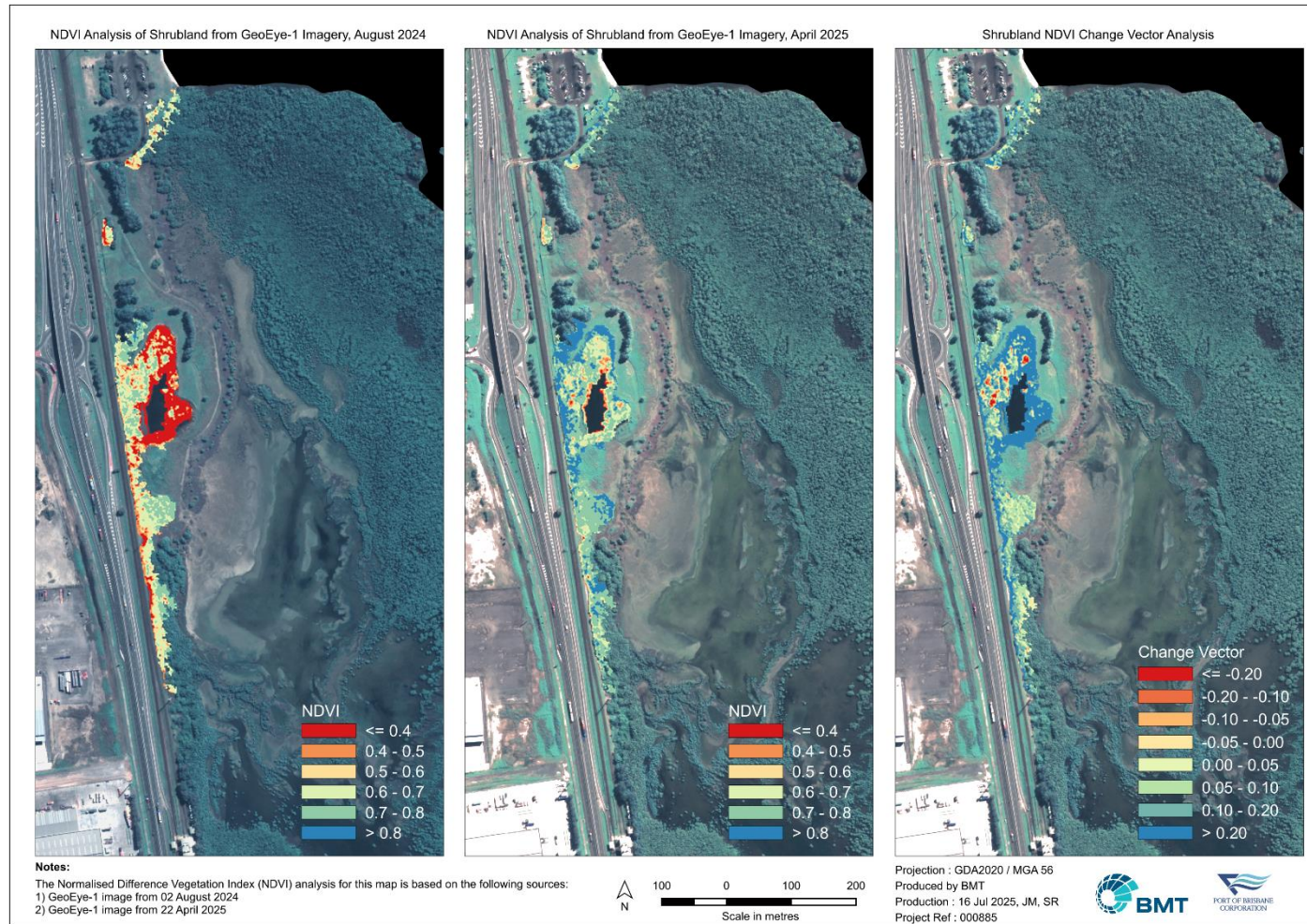


Figure 3.18 Normalised Difference Vegetation Index (NDVI) and Change Vector Analysis for Shrubland



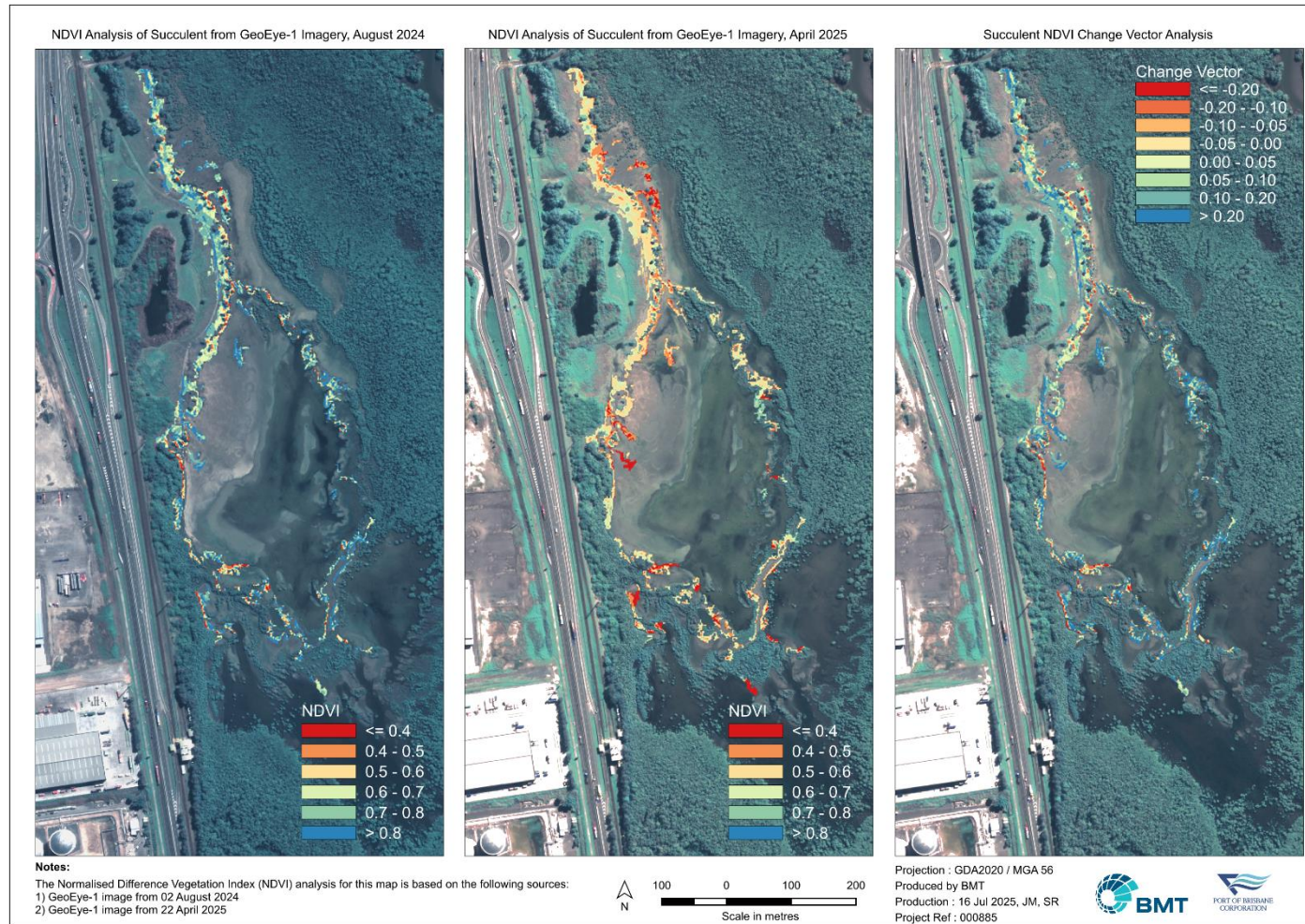


Figure 3.19 Normalised Difference Vegetation Index (NDVI) and Change Vector Analysis for Succulent



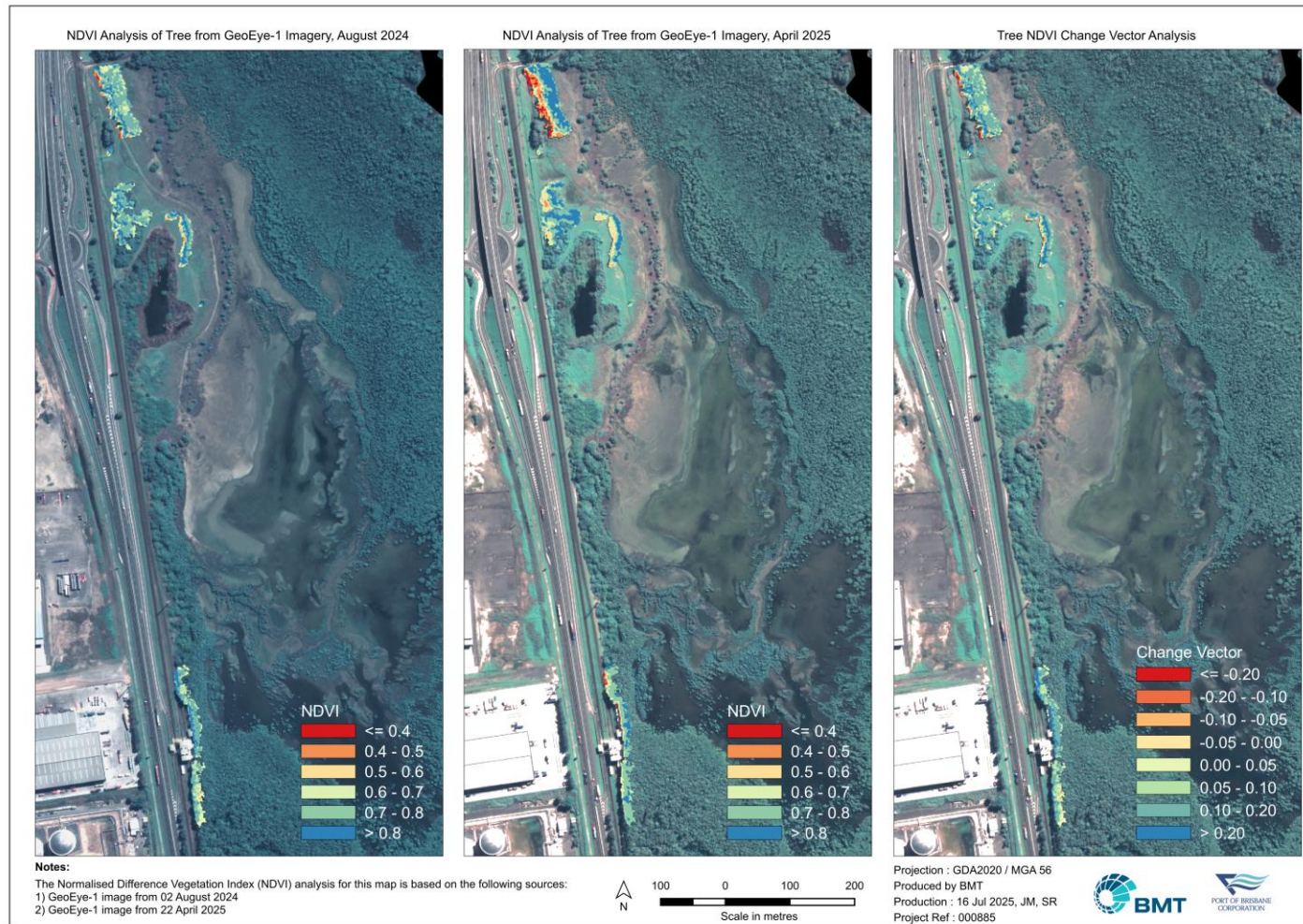


Figure 3.20 Normalised Difference Vegetation Index (NDVI) and Change Vector Analysis for Tree

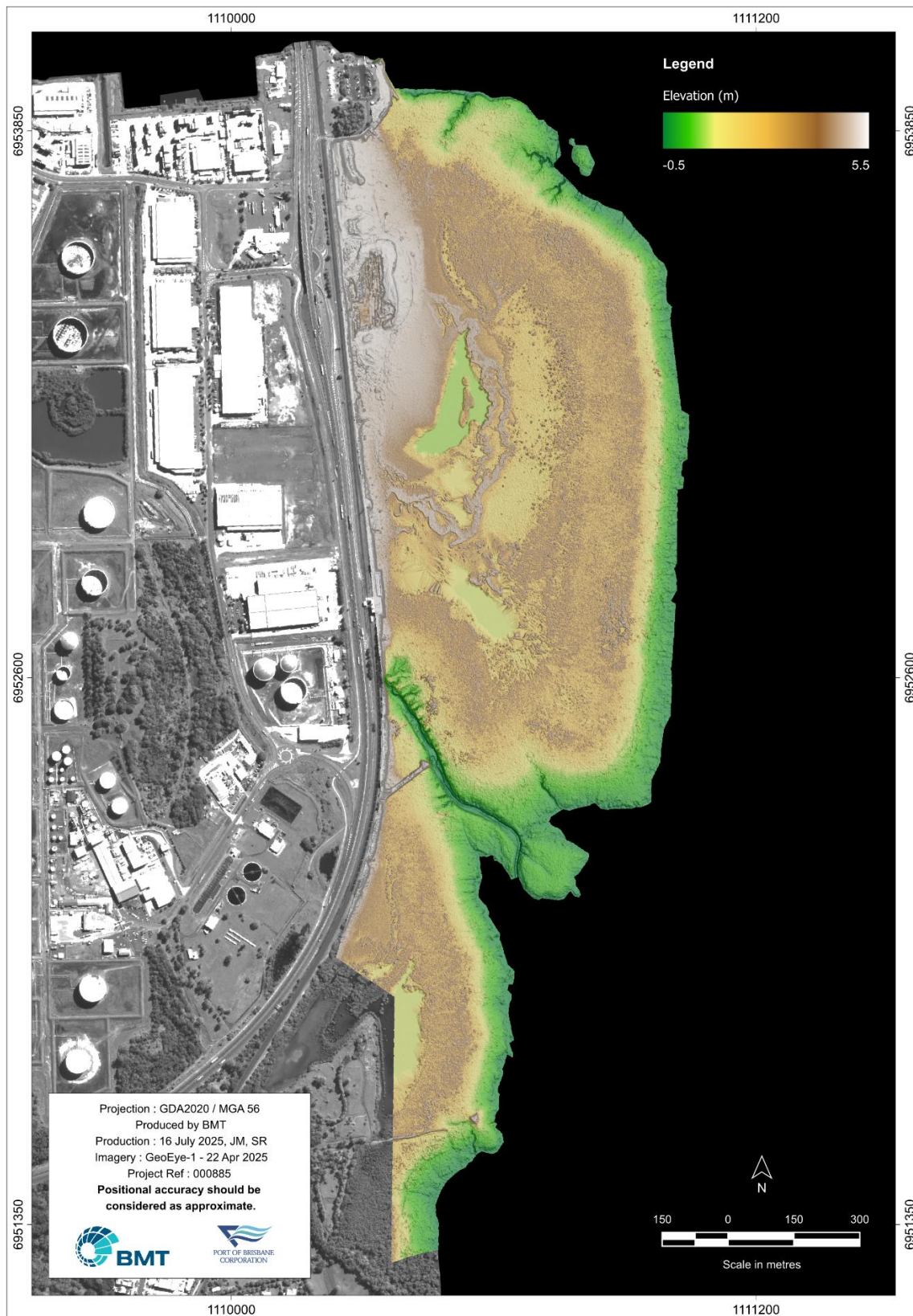


Figure 3.21 Bare-Earth Elevation Model Derived from 2019 LiDAR Data



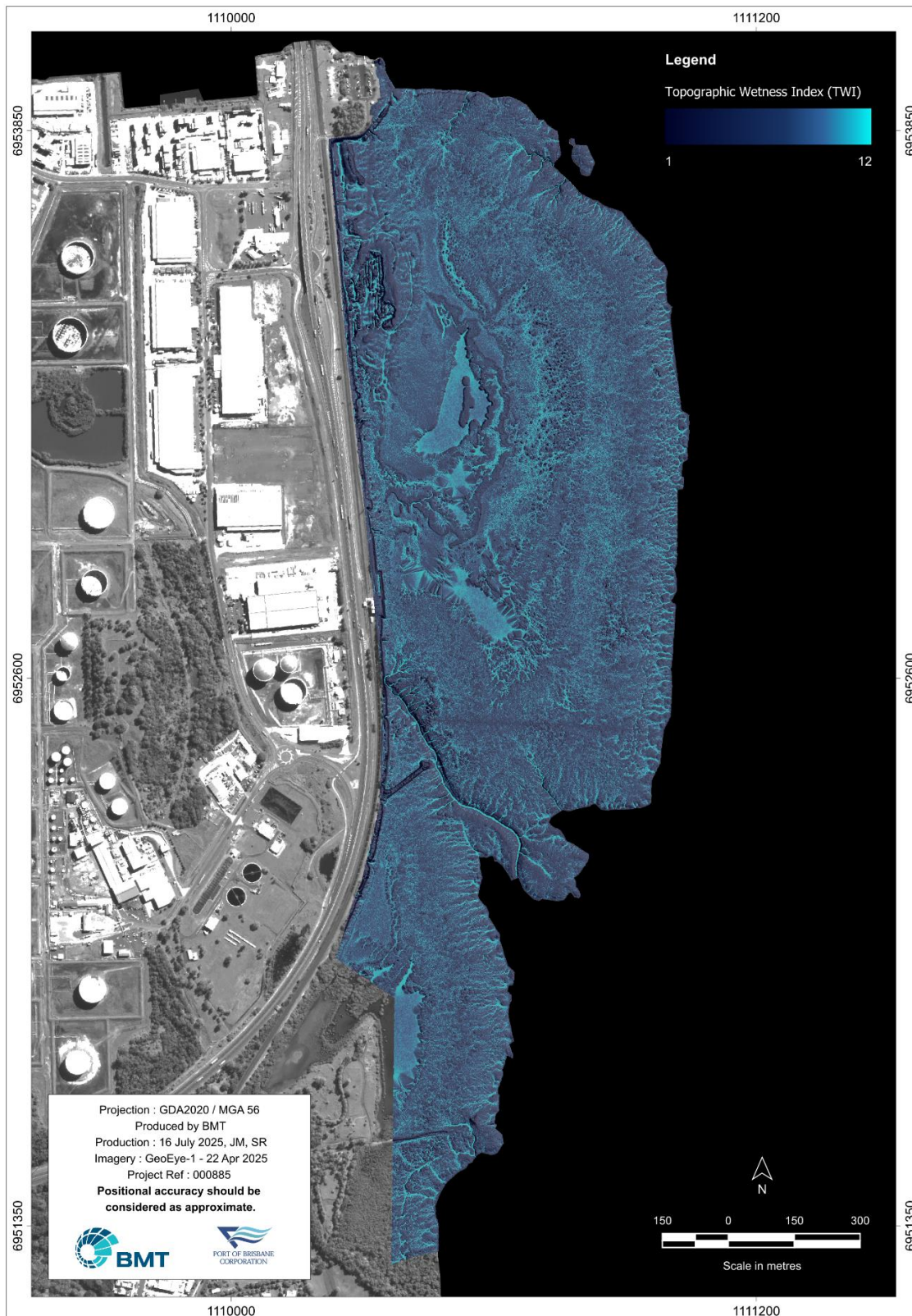


Figure 3.22 Topographic Wetness Index (TWI) from Monte Carlo Simulation (500 Iterations,  $\pm 10$  cm DEM Error)

## 4 Discussion

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### 4.1 Project Area – Baseline and Year 1 Overview

#### 4.1.1 Pre-Rehabilitation- Baseline

Prior to rehabilitation works the project area supported a range of habitats, including:

- exotic grassland dominated by Rhodes grass (*Chloris gayana*\*) with sparse exotic shrubs on lands ranging from 1.4 - 2.7 m elevation at the interface with intertidal communities
- exotic grassland dominated by green panic (*Megathyrsus maximus var. maximus*\*) and red natal grass (*Melinis repens*\*) on slightly higher ground at 1.6 - 3 m elevation
- a brackish, ephemeral wetland with open water habitat and dense common reed (*Phragmites australis*) grassland (RE 12.3.8)
- exotic shrubland dominated by *Schinus terebinthifolius*\* (broad-leaved pepper) buffering the ephemeral wetland and on unmanaged, disturbed lands ranging from 1.0-4.9 m elevation
- native regrowth and plantings on unmanaged, higher ground ranging from 1.8-3.5 m elevation dominated by *Melaleuca quinquenervia* and *Casuarina glauca* on lower ground (RE 12.3.20 - Endangered under the Vegetation Management Act and federally threatened coastal swamp oak forest of south-east Queensland listed under the EPBC Act) and *Eucalyptus tereticornis* and *Corymbia tessellaris* (RE 12.3.11) on higher ground
- intertidal habitats of high ecological and fisheries value including:
  - mangroves (RE 12.1.3) generally in good condition with some vehicle disturbance at the margins of the claypans
  - mudflats, saltpan and upper tidal saltmarsh (collectively RE 12.1.2; federally threatened subtropical coastal saltmarsh ecological community listed under the EPBC Act), generally in good condition but highly disturbed at the terrestrial interface due to regular slashing and disturbed at the margins of claypans due to vehicle disturbance.

Prior to rehabilitation works fauna habitat values were described as follows (after Austecology, 2023):

- habitats were not considered large enough to sustain most fauna species as residents
- improving habitat linkages within and to the project area was considered important for maintaining and enhancing its long-term biodiversity values
- installation of artificial boxes and log and rock piles were considered necessary to improve fauna habitat given the lack of hollow-bearing trees and fallen timber
- adjacent saltpan/claypan provided significant high tide roost habitat for threatened and migratory shorebirds including *Numenius madagascariensis* (Eastern curlew) – listed as critically endangered under the EPBC Act (Austecology, 2023) and restrictions to vehicle and pedestrian access to this habitat were regarded as a high priority management action

- despite the lack of abundance of feral fauna, ongoing control of European brown hare (*Lepus europaeus*) and red fox (*Vulpes vulpes*) was recommended
- several fire ant (*Solenopsis invicta*\*) nests have been recorded within the project area and will be an ongoing management priority.

#### 4.1.2 Year 1 (FY23-24)

The following on-ground rehabilitation works were implemented in the project area in Year 1 (FY23-24):

- cessation of slashing across the project area in late 2023
- installation of hard fencing around the northern and western boundaries of the project area in early 2024 to prevent unauthorised vehicular access
- treatment of 2ha of dense woody weed infestation surrounding the ephemeral wetland in mid-2024
- feral fox control conducted early 2024
- red fire ant control conducted 2024.

The FY23-24 programme (Year 1) rehabilitated 5.7 ha of habitat which included:

- 0.5ha of saltmarsh rehabilitation
- 4.2ha of estuarine wetland/claypan rehabilitation
- 0.24ha of saltmarsh restoration
- 0.06ha of *Phragmites australis* wetland restoration
- 0.7ha of woody weed removal.

## 4.2 Year 2 (FY24-25) Outcomes

### 4.2.1 Rehabilitation Actions Implemented in Year 2

In Year 2 of the rehabilitation program the following works were implemented by PBPL and/or B4C:

- selective weed control conducted mid-2025
- environmental plantings conducted mid-2025
- initiation of a saltmarsh translocation program mid-2025
- installation of microbat boxes, habitat logs and fauna rocks for wildlife habitat enhancement
- fire ant control conducted in early to mid-2025
- cane toad trapping conducted in early to mid-2025.

#### 4.2.2 Habitat Outcomes Following Year 2 Works

Table 4.1 provides a summary of rehabilitation progress within the permanent monitoring plots from the baseline to end of FY 24-25.

##### **Planting**

In FY24-25, approximately 0.62ha of previously cleared and weed infested habitat was planted to actively restore habitat representative of local regional ecosystems as follows:

- Sites 3 and 7 (approx. 0.32ha) have been planted with species analogous to RE 12.3.20 - *Melaleuca quinquenervia*, *Casuarina glauca*, *Eucalyptus tereticornis* open forest in low coastal areas that may be subject to storm surge inundation. This RE is Endangered under the *Vegetation Management Act*. Communities that satisfy condition thresholds may also conform to Coastal Swamp Sclerophyll Forest or Subtropical Eucalypt Floodplain Forest Threatened Ecological Communities under the *EPBC Act*. These habitats also support marine plants for the purposes of the *Fisheries Act 1994*.
  - At the baseline, Site 7 was a cleared, highly disturbed low-lying site with a BioCondition Score of 0.06 (6% of Benchmark Condition) which is considered to be very poor ecological condition. This was due to low scores in native recruitment, native species richness, tree and shrub cover, woody debris, litter, native groundcover and large trees and the high level of weed cover. Following FY24-25 rehabilitation works, the Site 7 BioCondition score has increased to 0.41 (or 41% of the benchmark) due to environmental plantings which have enhanced native species richness and weed control which has reduced the abundance of exotic species.
  - Site 3 lies at the ecotone between saltmarsh and terrestrial habitat. At the baseline site 3 had a BioCondition Score of 0.29 (29% of the benchmark). Following FY24-25 rehabilitation works, the Site 3 score has increased to 0.41 (41% of the benchmark). This increase can be attributed to a reduction in weed cover as a result of weed control and an increase in species richness as a result of the environmental planting programme.
- Site 8 (approx. 0.14ha) has been planted with species analogous to RE12.3.11 - *Eucalyptus tereticornis* +/- *Eucalyptus siderophloia*, *Corymbia intermedia* open forest on alluvial plains near the coast. This RE is listed Of Concern under the *Vegetation Management Act*:
  - At the baseline, Site 8 was dominated by exotic grassland with a BioCondition Score of 0.07 (7% of the benchmark) due to low scores in native recruitment, native species richness, tree and shrub cover, woody debris, litter, native groundcover and large trees and the high level of weed cover. Following FY24-25 rehabilitation works, the site 8 BioCondition score has increased to 0.33 (33% of the benchmark) due to the environmental plantings and weed control.

Approximately 0.15ha of cleared land adjacent to site 1 was also planted with species analogous to RE12.3.11.

In addition to planting within cleared habitat, approximately 0.08ha of Site 1 has been planted with native species to enhance local species richness. Site 1 comprises regenerating RE12.3.11 open forest. The baseline BioCondition score for Site 1 was 0.57 (57% of the benchmark). Following FY24-25 rehabilitation works involving infill planting, the scores for non-native cover and native species richness increased at site 1 due to weed control and planting to 0.63 (63% of the benchmark).



Translocation trials were undertaken in FY24-25 to assess the effectiveness of saltmarsh plantings compared with natural regeneration in disturbed RE12.1.2. Infill plantings were carried out within approximately 0.01ha of disturbed saltmarsh that had been highly degraded due to regular vehicle access. The results of the translocation trial will be compared with established control sites in FY25-26.

### **Weed Control**

As described above, weed control works have contributed to improved habitat condition in sites 1, 3, 7 and 8. In addition, approximately 0.22 ha of dense exotic shrubland has been actively removed from the ponded area. A further 0.21ha of riparian lands surrounding the wetland has been selectively treated for weeds. Weed control in this wetland is being staggered to allow habitat for birds and fauna to remain while the treated areas regenerate and/or are progressively planted with native species in FY25-26.

### **Removal of Slashing**

Prior to commencement of the rehabilitation programme, 3.7 ha of the project area was regularly slashed. This included regular disturbance and degradation of estuarine wetland communities, including, groundcover removal and soil disturbance via wheel ruts and compaction which facilitated weed invasion. In late 2023, slashing of estuarine wetlands in the project area was discontinued to promote natural vegetation regeneration. At the end of FY23-24 estuarine wetland gains were observed in the project area as a direct result of the removal of slashing.

Further to these improvements, at the end of FY24-25 the following habitat extent gains as a direct result of the removal of slashing were recorded:

- 0.05 ha gain of *Casuarina glauca* regrowth in previously slashed habitat dominated by weeds. This community is analogous to regenerating RE12.1.1 (Of concern under the VM Act). Communities that satisfy condition thresholds may also conform to Coastal Swamp Sclerophyll Forest Threatened Ecological Communities under the EPBC Act. These habitats also support marine plants for the purposes of the Fisheries Act 1994.
- 0.48 ha of *Phragmites australis* wetland +/- Saltcouch has regenerated in previously slashed habitat dominated by weeds.

In addition to these gains in habitat extent, the following condition improvements were recorded across previously slashed habitats:

- a 30-50% reduction in exotic species cover within vegetation transects established across previously slashed habitat at the saltmarsh/terrestrial interface.
- saltmarsh (RE12.1.2) at Site 4 had a relatively low baseline score of 0.62 (62% of the benchmark) due to high weed cover and groundcover removal due to regular slashing. In 2025, Site 4 had an improved score of 0.8 (80% of the benchmark). The improvement in condition score is attributed to a decrease in weed cover and an increase in native forb species richness due to natural regeneration following the exclusion of regular disturbance. RE12.1.2 is listed as Least Concern under the Vegetation Management Act and conforms to the Subtropical and Temperate Coastal Saltmarsh Threatened Ecological Community under the EPBC Act. These habitats also support marine plants for the purposes of the Fisheries Act 1994.

The remote sensing analysis is another line of evidence for detecting local changes in vegetation community extent and health. These assessments also provide valuable insights into hydrological patterns which directly impact habitat condition and extent. In the last year of monitoring it is recommend that refinements are made to the vegetation classification to better distinguish between

saltcouch and Phragmites habitats, which have both benefited from the rehabilitation programme through the removal of regular slashing and vehicle disturbance.

### **Vehicle Exclusion**

As initially identified in the year 1 report approximately 15.3ha of saltpan/claypan and estuarine wetland habitat continues to be protected and improved as a result of the fence installed on the project area perimeter in early 2024. The fencing has continued to successfully exclude illegal vehicle access and has reduced disturbance to local shorebird habitat.

Prior to the installation of fencing, vehicles represented a key source of visual and noise disturbance to waders and shorebirds utilising saltpan/saltmarsh habitat within the project area (AustEcology 2023; BMT 2024a). The project area perimeter fencing has continued to protect these habitats from disturbance in FY24-25. Queensland Wader Study Group shorebird records collected from the claypan in the project area between 2021 and 2025 indicate 2024 recorded the highest number of waders and shorebirds with approximately 22,000 individuals counted. This represents a 20-40% increase in bird counts from previous years. There has been no notable change in bird species recorded over this timeframe. Exclusion of vehicles from the claypan has provided more favourable habitat conditions for waders and shorebirds which has promoted higher bird visitation and use of the project area. On-going monitoring will be undertaken within this area.

### **Wildlife Habitat Enhancement**

Ten microbat boxes have been installed in the project area on suitably large trees to provide roosting places for local microbat species. Additionally, 10 m<sup>3</sup> of habitat logs and 5 m<sup>3</sup> fauna rocks have been installed throughout the rehabilitated areas to enhance fauna habitat composition and complexity.

### **Feral Animal Control**

Feral animal records within the project area continue to be low. Fire ants are an ongoing management issue within the project area with PBPL and B4C undertaking regular monitoring and spot control measures to manage local infestations and reduce the risk of exporting them from the project area.

#### **4.2.3 Cumulative Outcomes of Progressive Rehabilitation Works**

To date the programme has resulted in the rehabilitation of high conservation value coastal and wetland habitat as follows (refer Figure 4.1):

- Year 1: 5.7ha
- Year 2: 1.65ha
- Year 2 cumulative: 7.35ha.



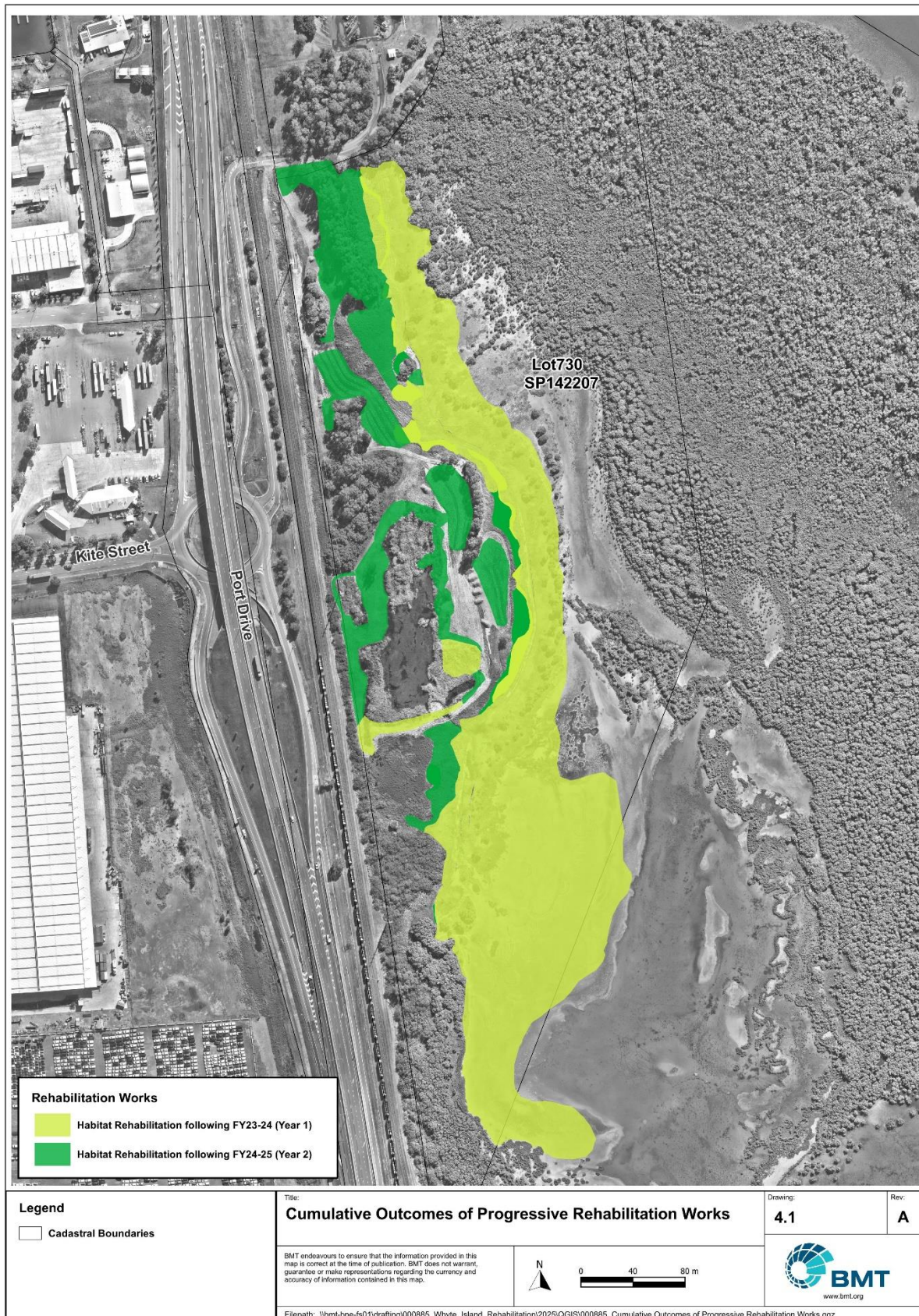


Figure 4.1 Cumulative Outcomes of Progressive Rehabilitation Works

## 5 Conclusion

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Year 2 of the programme has resulted in the gain of an additional 1.65ha of high conservation value coastal and wetland habitat as follows:

- 0.32ha of previously cleared habitat has been weeded and planted to restore RE 12.3.20. This RE is Endangered under the Vegetation Management Act; a Threatened Ecological Community under the EPBC Act and supports marine plant habitat
- 0.28ha of previously cleared habitat has been weeded and planted to restore RE12.3.11. This RE is Of Concern under the Vegetation Management Act
- 0.08ha of infill plantings has been undertaken to enhance and support regenerating RE12.3.11 open forest
- 0.01ha of infill plantings has been undertaken within disturbed saltmarsh to increase species richness and assess effectiveness of saltmarsh plantings compared with natural regeneration
- 0.22 ha of dense exotic shrubland has been removed from the wetland
- 0.21 ha of weeds surrounding the wetland has been treated
- 0.05 ha of *Casuarina glauca* has regenerated in previously slashed habitat dominated by weeds. Mature stands of this vegetation type (RE12.1.1) are listed as Of Concern under the VM Act and conform to Threatened Ecological Communities under the EPBC Act. These communities also support marine plant habitat.
- 0.48 ha of *Phragmites australis* wetland +/- Saltcouch has regenerated in previously slashed habitat dominated by weeds.

In addition to these gains in habitat extent, the following condition improvements were recorded within habitats of the project area as a result of the FY24-25 rehabilitation programme:

- Ongoing improvement in saltmarsh condition at Site 4 (from 62% of the benchmark to 80%) due to regeneration following the removal of regular slashing. Saltmarsh (RE12.1.2) is listed as Least Concern under the Vegetation Management Act, conforms to a Threatened Ecological Community under the EPBC Act and supports marine plant habitat.
- Ongoing reduction in exotic species cover within previously slashed saltmarsh (30-50% reduction in weed cover)
- Wader and shorebird records for the claypan between 2021 and 2025 indicate 2024 recorded a 20-40% increase in bird counts from previous years. The exclusion of vehicles due to installation of the perimeter fencing has provided more favourable habitat conditions for waders and shorebirds.
- Microbat boxes have been installed on suitably large trees and habitat logs and rocks have been installed to enhance fauna habitat across the project area.
- Feral animal records within the project area continue to be low.
- Regular monitoring and spot control measures are being undertaken to manage fire ant infestations.



To date the programme has resulted in the rehabilitation of high conservation value coastal and wetland habitat as follows:

- Year 1: 5.7ha
- Year 2: 1.65ha
- Year 2 cumulative: 7.35ha.

Table 5.1 Summary of Rehabilitation Program Progress in Permanent Monitoring Plots (Baseline to FY 24-25)

Plot	Baseline Description and BioCondition Score	Site Factors Limiting Habitat Condition	Proposed Rehabilitation Measures to Enhance Habitat Condition and/or Extent	Year 1 Actions	Year 1 Outcomes	Year 2 Actions	Year 2 Outcomes
1	Regenerating <i>Eucalyptus tereticornis</i> , <i>Corymbia tessellaris</i> and <i>Casuarina glauca</i> open forest on fill (RE 12.3.11)  BioCondition Score of 0.61	Weed cover Low shrub species richness Low forb species richness Lack of large tree hollows Lack of woody debris	Decrease exotic cover through weed control Increase native species richness through planting Install logs/mulch to improve ground conditions Nest box installation to substitute lack of hollow bearing trees	Nil	NA	Environmental infill plantings (approx. 0.08ha) Weed control Mulch placement Installation of microbat boxes	Decrease in weed cover Increase in shrub and forb Species richness Increase in fauna habitat Despite habitat condition improvements there was an overall decline in BioCondition score to 0.54 due to reduced litter and groundcover. This is likely due to seasonal effects and weed control and planting activities temporarily disturbing the groundlayer.
2	<i>Eucalyptus tereticornis</i> , <i>Corymbia tessellaris</i> and <i>Casuarina glauca</i> open forest on fill (RE 12.3.20)  BioCondition Score of 0.54	Weed cover Low shrub species richness Low forb species richness Lack of large trees and hollows Lack of woody debris	Decrease exotic cover through weed control Increase native species richness through planting Install logs/mulch to improve ground conditions Nest box installation to substitute lack of hollow bearing trees	Nil	NA	A permanent access track has been established within the monitoring plot. This site will no longer be used for monitoring purposes.	NA - discontinued
3	Degraded grasslands at terrestrial and saltmarsh interface  BioCondition Score of 0.29	Weed cover Low tree species richness Low forb species richness Lack of large tree hollows Lack of woody debris	Weed control by removing slashing / vehicle disturbance Decrease exotic cover through weed control Increase native species richness through planting	Cessation of slashing (late 2023)	Groundcover increase from approx. 60% to 80% cover	Environmental plantings of native species (approx. 0.12ha) (RE12.3.20) Weed control	Decrease in weed cover Increase in tree and forb species richness Increase in BioCondition Score to 0.41

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Plot	Baseline Description and BioCondition Score	Site Factors Limiting Habitat Condition	Proposed Rehabilitation Measures to Enhance Habitat Condition and/or Extent	Year 1 Actions	Year 1 Outcomes	Year 2 Actions	Year 2 Outcomes
			Install logs/mulch to improve ground conditions Nest box installation to substitute lack of hollow bearing trees				
4	Degraded <i>Sporobolus virginicus</i> saltmarsh (RE 12.1.2)  BioCondition Score of 0.62	Weed cover	Weed control by removing slashing/vehicle disturbance	Cessation of slashing (late 2023)	Groundcover increase from approx. 60% to 80% cover	No rehabilitation works undertaken. Native regeneration encouraged following removal of slashing.	Decrease in weed cover Increase in forb species richness Increase in BioCondition Score to 0.80
5	Dense exotic shrubland dominated by <i>Schinus terebinthifolius</i>  BioCondition Score of 0.13	Lack of tree species Lack of shrub species Low grass species richness Low forb species richness Low native recruitment Lack of large trees and hollows Lack of woody debris	No works proposed in current program: to be used as a control site for site 6	Nil	NA	NA	NA
6	Dense exotic shrubland dominated by <i>Schinus terebinthifolius</i>  BioCondition Score of 0.11	Lack of tree species Lack of shrub species Low grass species richness Low forb species richness Lack of large trees and hollows	Staged weed control Tree, shrub, groundcover plantings Installation logs/mulch to improve ground conditions	At least 0.7 ha of dense woody weed infestation surrounding the ephemeral wetland treated mid-2024	More than 80% successful weed kill observed following recent weed control application	Weed control and removal.	Approximately 0.56 ha of dense exotic shrubland surrounding the wetland has been removed. BioCondition plot inaccessible due to ponding.

Plot	Baseline Description and BioCondition Score	Site Factors Limiting Habitat Condition	Proposed Rehabilitation Measures to Enhance Habitat Condition and/or Extent	Year 1 Actions	Year 1 Outcomes	Year 2 Actions	Year 2 Outcomes
		Lack of woody debris	Nest box installation to substitute lack of hollow bearing trees				
7	Highly modified and managed low-lying exotic grassland  BioCondition Score of 0.06	Lack of tree species Lack of shrub species Low grass species richness Low forb species richness Low native recruitment Lack of large trees and hollows Lack of litter Lack of woody debris	Weed control Tree, shrub, groundcover plantings Installation logs/mulch to improve ground conditions	Nil	NA	Environmental plantings of native species (approx. 0.22ha) (RE12.3.20) Weed control	Decrease in weed cover Increase in tree, shrub and grass species richness Increase in groundcover Increase in BioCondition Score to 0.34
8	Highly modified and managed exotic grassland on elevated fill  BioCondition Score of 0.07	Low tree species richness/cover Lack of shrub species Low grass species richness Low forb species richness Low native recruitment Lack of large trees and hollows Lack of litter Lack of woody debris	Weed control Tree, shrub, groundcover planting Installation logs/mulch to improve ground conditions	Nil	NA	Environmental plantings of native species (approx. 0.14ha) (RE12.3.11) Weed control	Decrease in weed cover Increase in tree and shrub species richness Increase in groundcover Increase in BioCondition Score to 0.34
9	Remnant RE 12.1.2. intertidal succulent saltmarsh and saltpan with vehicle disturbance	Site in very good condition but some vehicle disturbance.	Enhance RE condition and improve wader habitat conditions by removing vehicle access	Fencing to remove vehicle access (late 2023)	Site protected from vehicle access and natural restoration occurring.	NA	BioCondition score maintained



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Plot	Baseline Description and BioCondition Score	Site Factors Limiting Habitat Condition	Proposed Rehabilitation Measures to Enhance Habitat Condition and/or Extent	Year 1 Actions	Year 1 Outcomes	Year 2 Actions	Year 2 Outcomes
	BioCondition Score of 0.92						
10	<p>Dense exotic shrubland dominated by <i>Schinus terebinthifolius</i></p> <p>Indicative BioCondition Score of 0.11 (as per Site 6)</p>	<p>Lack of tree species</p> <p>Lack of shrub species</p> <p>Low grass species richness</p> <p>Low forb species richness</p> <p>Lack of large trees and hollows</p> <p>Lack of woody debris</p>	<p>Tree, shrub, groundcover plantings</p> <p>Installation logs/mulch to improve ground conditions</p> <p>Nest box installation to substitute lack of hollow bearing trees</p> <p>Staged weed control</p>	NA	NA	Dense woody weed control	Reduction in weeds to <5% cover

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## Annex A BioCondition Photos 2025

### A.1 Site 1



North



East





South



West



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## A.2 Site 3



North



East



OFFICIAL



South



West



OFFICIAL





### A.3 Site 4



North



East





South



West



OFFICIAL





## A.4 Site 7



North



East





South



West



OFFICIAL





## A.5 Site 8



North



East





South



West



OFFICIAL





## A.6 Site 9



North



East





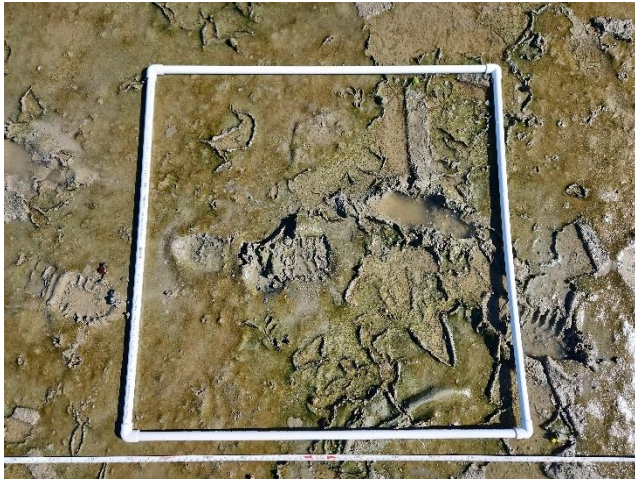
South



West



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A.7 Site 10



North



East





South



West



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## Annex B BioCondition Data

Table B.1. Survey Data for BioCondition Sites FY24-2025

	1	3	4	7	8	9	10
RE	12.3.11	12.3.20	12.1.2	12.3.20	12.3.11	12.1.2	12.3.11
Tree canopy median height:	15 m	0 m		0 m	15 m		0 m
Tree canopy cover:	82	0		0	0		0
Sub-canopy median height:	8m	0 m		0 m	0 m		0 m
Sub-canopy cover:	10	0		0	0		0
Number of large trees/ha:	6	0		0	0		0
Tree species richness:	19	9		10	9		3
Tree species:	<i>Acacia disparrima</i> subsp. <i>disparrima</i> <i>Acacia leiocalyx</i> <i>Alectryon coriaceus</i> <i>Allocasuarina littoralis</i> <i>Casuarina glauca</i> <i>Corymbia tessellaris</i> <i>Cupaniopsis anacardioides</i> <i>Eucalyptus tereticornis</i> <i>Ficus coronata</i> <i>Ficus obliqua</i> <i>Glochidion ferdinandi</i> <i>Glochidion sumatranum</i>	<i>Acacia disparrima</i> subsp. <i>disparrima</i> <i>Acacia leiocalyx</i> <i>Casuarina glauca</i> <i>Elaeocarpus reticulatus</i> <i>Eucalyptus tereticornis</i> subsp. <i>tereticornis</i> <i>Ficus coronata</i> <i>Lophostemon suaveolens</i> <i>Macaranga tanarius</i> <i>Melaleuca quinquenervia</i>		<i>Acacia disparrima</i> subsp. <i>disparrima</i> <i>Acacia leiocalyx</i> <i>Allocasuarina littoralis</i> <i>Casuarina glauca</i> <i>Corymbia tessellaris</i> <i>Eucalyptus tereticornis</i> subsp. <i>tereticornis</i> <i>Lophostemon suaveolens</i> <i>Macaranga tanarius</i> <i>Syzygium australe</i> <i>Syzygium oleosum</i>	<i>Acacia</i> sp. <i>Acacia</i> sp. <i>Casuarina glauca</i> <i>Corymbia tessellaris</i> <i>Eucalyptus siderophloia</i> <i>Eucalyptus tereticornis</i> subsp. <i>tereticornis</i> <i>Lophostemon suaveolens</i> <i>Macaranga tanarius</i> <i>Pittosporum undulatum</i>		<i>Casuarina glauca</i> <i>Macaranga tanarius</i> <i>Hibiscus tiliaceus</i>



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	1	3	4	7	8	9	10
	<i>Leptospermum polygalifolium</i> <i>Livistona australis</i> <i>Lophostemon confertus</i> <i>Lophostemon suaveolens</i> <i>Macaranga tanarius</i> <i>Melaleuca quinquenervia</i> <i>Pittosporum undulatum</i>						
Native shrub cover:	-	-		-	-		-
Shrub species richness:	4	1		7	7		0
Shrub species:	<i>Breynia oblongifolia</i> <i>Dodonaea triquetra</i> <i>Jagera pseudorhus</i> <i>Trema tomentosa</i>	<i>Myoporum acuminatum</i>		<i>Banksia robur</i> <i>Elaeocarpus reticulatus</i> <i>Jagera pseudorhus</i> <i>Leptospermum polygalifolium</i> <i>Melastoma malabathricum subsp. malabathricum</i> <i>Myoporum acuminatum</i> <i>Trema tomentosa</i>	<i>Banksia robur</i> <i>Elaeocarpus reticulatus</i> <i>Jagera pseudorhus</i> <i>Leptospermum polygalifolium</i> <i>Melastoma malabathricum</i> <i>Myoporum acuminatum</i> <i>Trema tomentosa</i>		-
Native perennial grass cover:	0.4%	43%	59%	66%	31%	17%	0%
Grass species richness:	5	6	3	4	2	1	1
Grass species:	<i>Cynodon dactylon</i> <i>Imperata cylindrica</i> <i>Phragmites australis</i> <i>Themeda triandra</i> <i>Cymbopogon refractus</i>	<i>Cynodon dactylon</i> <i>Phragmites australis</i> <i>Portulaca oleracea</i> <i>Sesuvium portulacastrum</i> <i>Sporobolus virginicus</i> <i>Suaeda australis</i>	<i>Cynodon dactylon</i> <i>Phragmites australis</i> <i>Sporobolus virginicus</i>	<i>Carex appressa</i> <i>Cynodon dactylon</i> <i>Imperata cylindrica</i> <i>Themeda triandra</i>	<i>Imperata cylindrica</i> <i>Themeda triandra</i>	<i>Sporobolus virginicus</i>	<i>Phragmites australis</i>

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	1	3	4	7	8	9	10
Organic litter cover:	96.2%	45.25%		0%	31%		68%
Forb species richness:	9	9	4	4	2	3	0
Forb/Other:	<i>Carex appressa</i> <i>Commelina ensifolia</i> <i>Cyperus polystachyos</i> <i>Dianella brevipedunculata</i> <i>Dianella caerulea</i> <i>Hibbertia scandens</i> <i>Lomandra hystrix</i> <i>Lomandra longifolia</i> <i>Pandorea jasminoides</i>	<i>Carex appressa</i> <i>Dianella brevipedunculata</i> <i>Dianella caerulea</i> <i>Eustrephus latifolius</i> <i>Imperata cylindrica</i> <i>Juncus sp.</i> <i>Lomandra hystrix</i> <i>Lomandra longifolia</i> <i>Tetragonia tetragonoides</i>	<i>Bacopa monnieri</i> <i>Cyperus polystachyos</i> <i>Fimbristylis dichotoma</i> <i>Fimbristylis ferruginea</i>	<i>Bacopa monnieri</i> <i>Cyperus polystachyos</i> <i>Lomandra longifolia</i> <i>Pandorea jasminoides</i>	<i>Carex appressa</i> <i>Lomandra longifolia</i>	<i>Salicornia quinqueflora</i> <i>Sesuvium portulacastrum</i> <i>Suaeda australis</i>	-
Coarse Woody Debris total length:	0 m	0 m	0 m	0 m	2.2 m	0 m	2.2 m
Non-native plant cover:	<5%	5%	5%	5%	5%	0%	<5%

\*Blank cells denote NA for RE



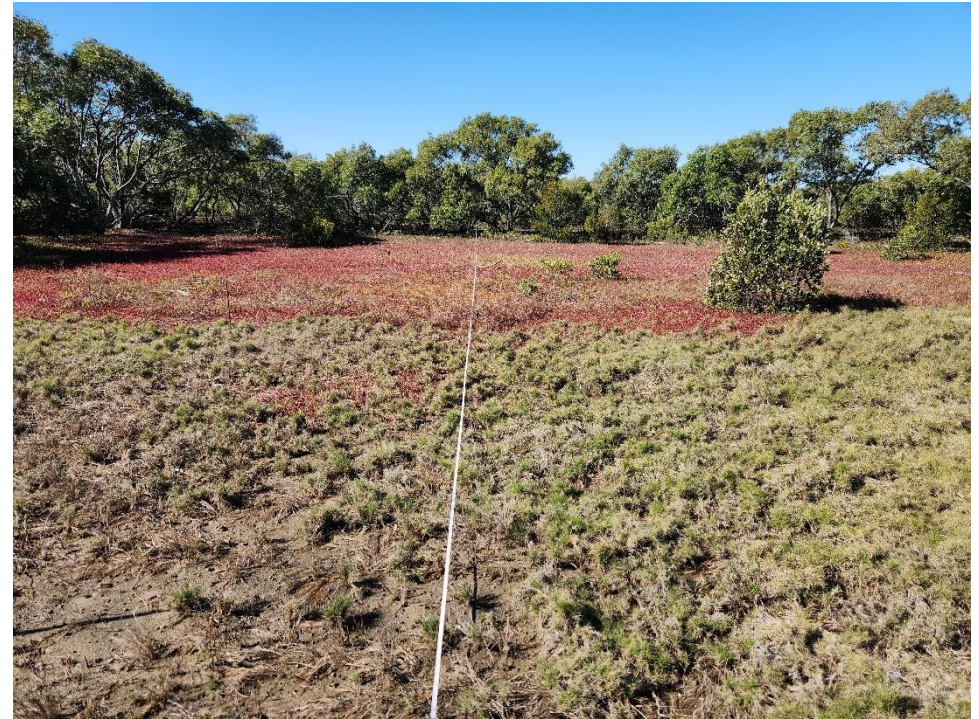
## Annex C Vegetation Transect Photos 2025

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### C.1 Transect A



North



East





South



West



## C.2 Transect B



North



East





South



West



### C.3 Transect C



North



East





South



West



## C.4 Transect D



North



East



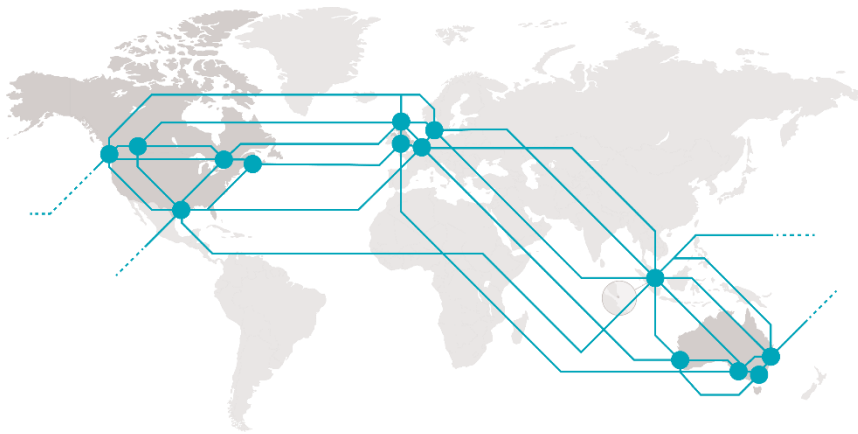


South



West





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