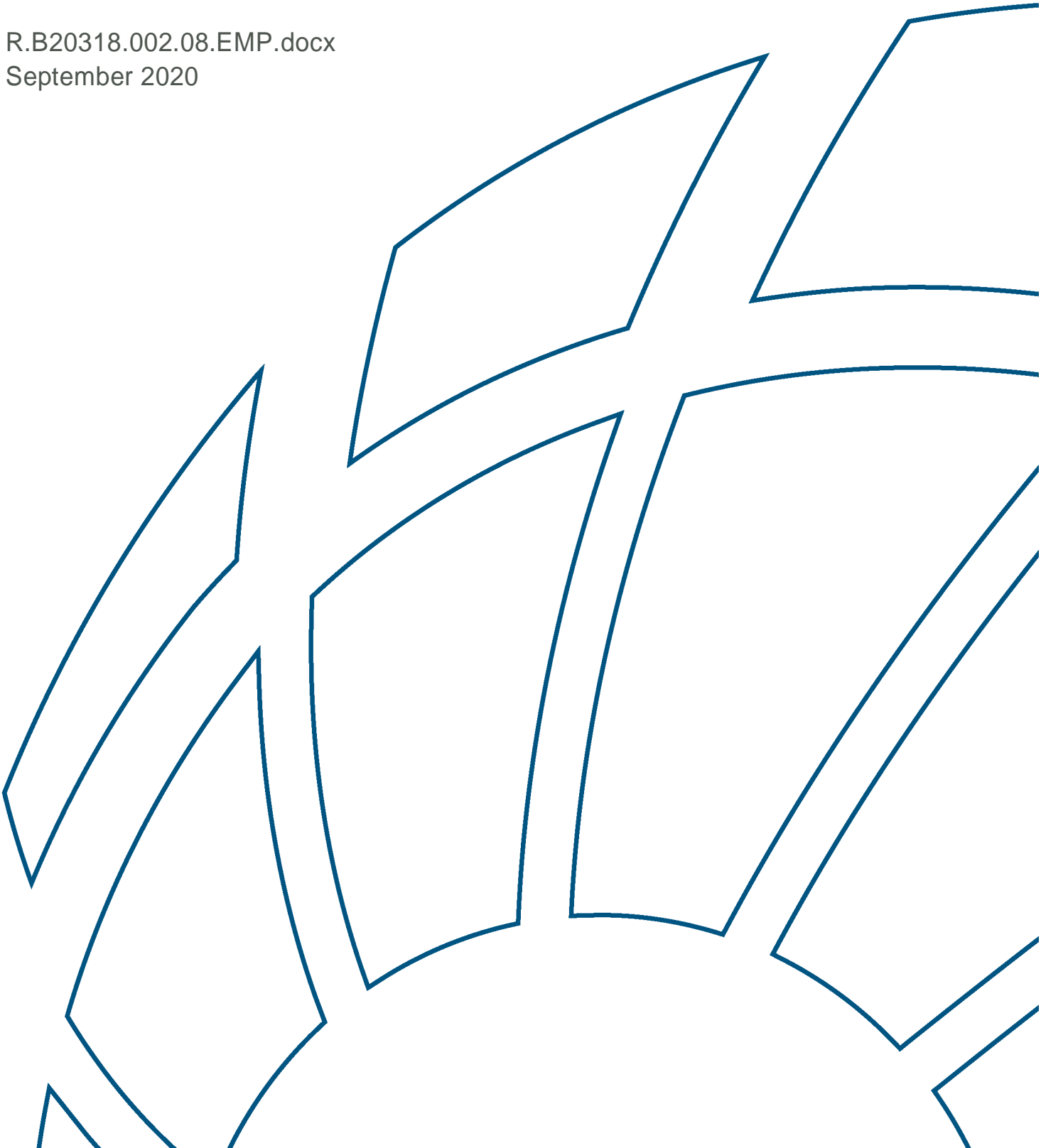


Environmental Management Plan

R.B20318.002.08.EMP.docx
September 2020



Environmental Management Plan

Prepared For: Stockland

Prepared By: BMT WBM Pty Ltd (Member of the BMT group of companies)

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Title :	Environmental Management Plan
Author :	Greg Fisk
Synopsis :	An Environmental Management Plan that addresses Condition 1 of the approval under the EPBC Act for the Caloundra South masterplanned community.

REVISION/CHECKING HISTORY

REVISION NUMBER	DATE OF ISSUE	CHECKED BY	ISSUED BY
0	24/05/13	DLR	GWF
1	29/05/13	ABM	GWF
2	11/06/13	ABM	GWF
3	17/06/13	ABM	GWF
4	25/07/13	ABM	GWF
5	09/08/13	ABM	GWF
6	19/11/13	ABM	GWF
7	09/07/17	BMG	GWF
8	17/6/19	BMG	GWF

DISTRIBUTION

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1 PROJECT OVERVIEW

1.1 Commonwealth Approval

Caloundra South is a proposed master planned community on 2,400 ha located 2 km south-west of Caloundra on the Sunshine Coast in Queensland. The Caloundra South development includes:

- A series of connected villages with residential, retail, business and enterprise land uses catering for up to 50,000 people;
- Approximately 20,000 dwellings that provide a mix of housing choices and affordability;
- A town centre accommodating retail and commercial space, cultural and entertainment, sporting and recreational facilities;
- Delivery of two major employment precincts;
- Rehabilitation and protection of land identified as having high conservation value;
- Delivery of regionally significant infrastructure including schools and parklands;
- The provision of significant new transport infrastructure for the Sunshine Coast; and
- Public transport infrastructure.

Development on the site is expected to occur in stages over a timeframe of up to 30 years.

The Caloundra South development was referred to the Department of Sustainability, Environment, Water, Population and Communities (SEWPaC) Minister in June 2011 to determine if it would require assessment and approval under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) (EPBC Ref: 2011/5987). The Minister determined that the action required approval, with a Public Environment Report (PER) being the mechanism for assessment.

The action was approved by SEWPaC on 6 June 2013 with 19 conditions. Condition 1 of the approval states:

- '1) Prior to the **commencement of the action**, the person undertaking the action must submit to the **Minister** for approval a detailed Environmental Management Plan for the proposed action. The Environmental Management Plan must be submitted to **Minister** at least three (3) months prior to the **commencement** of the action. The Environmental Management Plan must be a standalone document that incorporates specific management actions required to protect **matters of national environmental significance**. The Environmental Management Plan must include:
- a) Potential impacts to **matters of national environmental significance**;
 - b) Management and mitigation measures to manage:
 - i) acid sulphate soils;
 - ii) sediment and erosion controls; and
 - iii) pests and weeds;

- c) Detail of the objectives, methods, parameters and monitoring strategies to be used;
- d) Performance criteria for each set of parameters at which point **corrective actions** are required to be implemented;
- e) **Corrective actions**, and/or mechanisms for developing **corrective actions**, and the parties responsible for implementing corrective actions;
- f) A vegetation management and rehabilitation plan/strategy; and
- g) An environmental engagement strategy/plan identifying communication and engagement mechanism for ensuring community engagement with management practices required to protect **matters of national environmental significance**.

The **commencement of the action** must not occur until the Environmental Management Plan has been approved by the **Minister**. The approved Environmental Management Plan must be reviewed by the person undertaking the action within six (6) months of an audit undertaken in accordance with Condition 13. If the Environmental Management Plan is amended following the review, the amended plan must be submitted to the **Minister** for approval. The approved Environmental Management Plan must be implemented.'

This EMP is prepared in accordance with Condition 1 of the approval and outlines specific management actions to protect relevant matters of national environmental significance (MNES), being:

- **Wetlands of international importance** – Moreton Bay Ramsar Wetland which was listed under the Ramsar Convention on Wetlands in 1993. The Moreton Bay Ramsar site;
- **Listed Threatened species and communities** – Wallum Sedge Frog (*Litoria olongburensis*), Water Mouse (*Xeromys myoides*), Attenuate Wattle (*Acacia attenuata*), Swamp Stringybark (*Eucalyptus conglomerata*), Lesser Swamp Orchid (*Phaius Australis*), Wallum Leek (*Prasophyllum wallum*), Emu Mountain Sheoak (*Allocasuarina emuina*), Hairy-joint Grass (*Arthraxon hispidus*) and Three-leaved Bosistoa (*Bosistoa transversa*); and
- **Listed Migratory Species** - *Actitis hypoleucos*, *Arenaria interpres*, *Calidris acuminata*, *Calidris alba*, *Calidris canutus*, *Calidris ferruginea*, *Calidris melanotos*, *Calidris ruficollis*, *Calidris tenuirostris*, *Gallinago hardwickii*, *Heteroscelus brevipes*, *Heteroscelus incanus*, *Limicola falcinellus*, *Limnodromus semipalmatus*, *Limosa lapponica*, *Limosa limosa*, *Numenius madagascariensis*, *Numenius minutus*, *Numenius phaeopus*, *Tringa glareola*, *Tringa nebularia*, *Tringa stagnatilis*, *Xenus cinereus*, *Calidris subminuta*, *Phalaropus lobatus*, *Philomachus pugnax*, *Charadrius bicinctus*, *Charadrius leschenaultia*, *Charadrius mongolus*, *Charadrius veredus*, *Pluvialis fulva*, *Pluvialis squatarola*, *Glareola maldivarum*, *Sterna albifrons*, *Sterna caspia*, *Ardea modesta*, *Ardea Ibis*, *Merops ornatus*, and *Rhipidura rufifrons*.

1.2 Purpose and Scope of this EMP

This EMP responds to the requirements of Condition 1 and informs the requirements of the other management plans listed in the conditions including the Construction Environmental Management Plans (CEMPs) required for each precinct of the development as required under Condition 3 of the Approval. Precincts 1 to 19 of the Caloundra South development are defined by Caloundra South

Urban Development Area Master Plan which is shown within Annexure A of the Approval or as amended and approved by the Minister.

In accordance with the requirements in Condition 1, the EMP is set out as follows:

- A summary of potential impacts on matters of national environmental significance (Section 2).
- The following matters are addressed within Section 3 of this document:
 - Management and mitigation measures to manage:
 - Acid sulfate soils;
 - Sediment and erosion controls; and
 - Pests and weeds;
 - The objectives, methods, parameters and monitoring strategies to be used;
 - Performance criteria for each set of parameters at which corrective actions are required to be implemented; and
 - Corrective actions and/or mechanisms for developing corrective actions, and the parties responsible for implementing corrective actions;
- A Vegetation Management and Rehabilitation Plan (Section 4);
- An Environmental Engagement Plan identifying communication and engagement mechanism for ensuring community engagement with management practices required to protect matters of national environmental significance (Section 5);
- Implementation and Review of the Plan (Section 6); and
- Definitions (Section 7).

2 POTENTIAL IMPACTS ON MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

PER Guidelines were issued by SEWPaC in October 2011. A Draft Public Environment Report (Draft PER) was prepared in November 2012 and a Public Environment Report Supplementary Report (Supplementary Report) was prepared in April 2013.

The Draft PER and Supplementary Report provide detailed technical information about the current status of the natural environmental, potential impacts from the proposed action and the management and mitigation methods to address the impacts.

The Draft PER includes assessment summary tables which set out the effects of the controlled action on the relevant MNES. The tables adopt a risk based assessment combining an assessment of the level of significance, the duration of effects, and the likelihood of impacts. A residual risk rating (ranging from 'Negligible' through to 'Extreme') determines if any additional mitigation or management of the risk is required.

The Draft PER concludes that the proposed development may proceed without posing significant impacts to matters of NES. The mitigation measures identified in the Draft PER have been used to inform this EMP.

2.1 Potential Impacts on the Moreton Bay Ramsar Site

Potential Impacts to the Moreton Bay Ramsar site were addressed in the Draft PER at Chapter C2 (Acid Sulfate Soils), Chapter C3 (Groundwater), Chapter C4 (Surface Water Quality and Hydrology), and Chapter C6 (Ramsar Wetlands).

Excerpts from the assessment summary tables from these chapters that are specifically relevant to the potential impacts on the Moreton Bay Ramsar site are as follows:

Acid Sulfate Soils (Chapter C2):

Assessment Summary Table

Element	Description of impact		
	Impacting process	Mitigation measures	Residual Risk (and likelihood)
Disturbance of Acid Sulfate Soils	Filling and excavation particularly in areas below 5m AHD or in areas above 5m AHD that have existing (in-situ) acidity.	~Targeted ASS testing and treatment to identify any local hotspots. ~Water quality monitoring (ground and surface) with reactive management measures if impacts detected. ~Ensure minimal impacts from lime treatments on retained frog habitat (suitable buffers, surface water and groundwater management).	Low (Possible)

Groundwater (Chapter C3):

Assessment Summary Table

Element	Description of impact		
	Impacting process	Mitigation measures	Residual Risk (and likelihood)
Changes to groundwater levels offsite and/or in conservation areas on site.	Bulk earthworks, filling, surface drainage and associated development activities.	~Modelling has shown little to no impacts to groundwater systems offsite or in conservation areas of the site from the proposed development plan. ~Monitoring of groundwater levels will be instigated at significant locations to inform more detailed modelling/management practices at local scales. ~Ensure proper land elevation, vegetation, and drainage practices occur during construction periods.	Low (Possible)
Changes to groundwater quality.	Chemical spills or other pollutant introduction into groundwater related to development or operational activities.	~Construction plan must include spill measures and clean-up plans.	Low (Unlikely)
Groundwater recharge.	Cut-off of infiltration pathways by surface development.	~Master Plan includes large areas set aside at each stage for conservation and open space purposes that will facilitate infiltration and recharge. ~Monitoring of groundwater levels to assess any future impact.	Low (Unlikely)

Water Quality and Hydrology (Chapter C4):

Assessment Summary Table for Water Quality Impacts – Construction Phase

Element	Description of impact		
	Impacting process	Mitigation measures	Residual Risk (and likelihood)
Construction Phase Water Quality	Water quality in Bells Creek changes due to excessive sediment export during the construction phase.	~Erosion and sediment controls ~Construction stage water quality management plan	Low (Unlikely)
	Water quality in Pumicestone Passage changes due to excessive sediment export during the construction phase.	~Erosion and sediment controls ~Construction stage water quality management plan	Low (Unlikely)

Assessment Summary Table for Water Quality Impacts – Operational Phase

Element	Description of impact		
	Impacting process	Mitigation measures	Residual Risk (and likelihood)
Operational Phase Water Quality	Water quality in Bells Creek changes due to excessive pollutant export during the operational phase.	~Implementation of measures outlined in the Water Quality Management Plan (WQMP)	Low (Unlikely)
	Water quality in Pumicestone Passage changes due to excessive pollutant export during the operational phase.	~Implementation of measures outlined in the Water Quality Management Plan (WQMP)	Negligible (Highly Unlikely)
	Additional Lyngbya blooms are triggered in Bells Creek and Pumicestone Passage.	~Implementation of measures outlined in the Water Quality Management Plan (WQMP)	Negligible (Highly Unlikely)
	Caloundra South Golf Course causes adverse water quality impacts in in Bells Creek and Pumicestone Passage.	~Separation of golf course run-off from upstream urban areas with a separate treatment strategy ~Direct run off laterally across fairways and greens to generate an effective sheet flow through riparian areas to maximise infiltration and treatment with sizing of buffer areas at a 10:1 ratio.	Negligible (Highly Unlikely)
	Caloundra South development causes consequential water quality impacts elsewhere in the region.	~Implementation of measures outlined in the Water Quality Management Plan (WQMP)	Negligible (Highly Unlikely)

Assessment Summary Table for Hydraulic Impacts – Operational Phase

Element	Description of impact		
	Impacting process	Mitigation measures	Residual Risk (and likelihood)
Hydrology	Patterns of irregular/high flows in Bells Creek change after development.	~Implementation of measures outlined in the Water Quality Management Plan (WQMP)	Low (Unlikely)
	Patterns of regular/low flows in Bells Creek change after development.	~Implementation of measures outlined in the Water Quality Management Plan (WQMP)	Low (Unlikely)

Chapter C6 - Ramsar Ecological Values

Assessment Summary Table

Element	Description of impact		
	Impacting process	Mitigation measures	Residual Risk (and likelihood)
Direct Habitat Loss in Ramsar site	Clearing, filling and drainage works.	~No clearing, filling or drainage works proposed in the Ramsar site. ~Ensure clearing and other earthworks do not occur within or near the boundaries of the Ramsar site.	Negligible (Possible)
Fish movement patterns	Direct modifications to aquatic habitat within project area waterways leading to impacts on fish movement into and out of the Ramsar site.	~No instream barriers on Bells Creek North, Bells Creek South or Lamerough Creek within the project area proposed. ~Riparian buffers on major creek systems on the project site to be retained and rehabilitated in accordance with rehabilitation plan.	Negligible (Possible Beneficial Impact)
Changes to hydrology and water quality	Potential changes to aquatic ecosystem community structure as a result of changed conditions.	~Implementation of construction and operational water quality and quantity management procedures through WQMP.	Low (Possible)
Changes to water quality (pollutants)	Potential toxicity effects to aquatic ecosystem values.	~Implementation of construction and operational water quality management procedures through WQMP. ~Pollutant spill containment and clean-up procedures during construction.	Low (Unlikely)
Weeds	Accidental introduction of new weed species or spread of existing weeds due to construction activities.	~Control infestations of listed weeds. ~Weed management considered as part of vegetation clearing, earthworks and rehabilitation management plans. ~Weed monitoring during construction phases.	Low (Possible)
Weeds	Accidental introduction of new weed species or spread to existing	~Use of non-invasive species in landscape plantings.	Low (Possible)

Element	Description of impact		
	Impacting process	Mitigation measures	Residual Risk (and likelihood)
	weeds due to catchment urbanisation (operational phase).	~Ongoing weed management in public areas and retained habitats in the EPZ.	
Pest animals	Increase in abundance of pest animals in the adjacent Ramsar site.	~ Pest and domestic animal control plan. ~Covering and storage of putrescible waste, with off-site disposal.	Low (Possible)
Increase in boat traffic	Boat strike leading to mortality to megafauna in Pumicestone Passage.	~Outside control of project. ~Go slow zones already in effect in parts of Pumicestone Passage.	Medium (Possible)
	Boat strike leading to mortality to megafauna in Bells Creek.	~Outside control of project.	Low (Unlikely)
Increase in boat traffic	Bank erosion due to boat wake leading to degradation of estuarine habitats in the Ramsar site.	~No marine launching facilities associated with project. ~Other aspects outside of control of project.	Medium (Possible)
Increase in pedestrian disturbance	General pedestrian disturbance of estuarine habitats and biota in the adjacent Ramsar site (excluding direct impacts to shorebirds and water mouse).	~Design has no frontage to Ramsar site. ~EPZ provides buffer between urban areas and downstream Bells Creek. ~Other aspects outside control of project.	Low (Possible)
Increase in recreational fishing	Reduction in fish abundance in adjacent Ramsar site.	~No marine launching facilities associated with project. ~Other aspects outside of control of project.	Medium (Possible)
Marine debris	Generation of gross pollutants within the project area resulting in megafauna mortality.	~ Implementation of waste management procedures during construction and operational phases. ~Operation of stormwater management measures.	Low (Unlikely)
	Generation of gross pollutants outside the project area resulting in megafauna mortality.	N/A – outside control of project.	Low (Possible)

2.2 Potential Impacts on Threatened Species

Potential Impacts to Threatened Species are addressed in the Draft PER: at C8 (Water Mouse); Chapter C9 (Wallum Sedgefrog) and Chapter C10 (EPBC Act Listed Flora). Excerpts from the assessment summary tables from these chapters that are specifically relevant to Threatened Species are as follows:

Chapter C8 (Water Mouse):

Assessment Summary Table

Element	Description of impact		
	Impacting process	Mitigation measures	Residual Risk (and likelihood)
Habitat Loss and Fragmentation	Reduction of available habitat; reduced habitat patch size; increased exposure to edge effects; diminution in habitat viability; and potential constraints to recolonisation.	~Establishment of EPZ. ~Retention of all REs, and remnant wetland habitats. ~Rehabilitation and enhancement of habitat in the EPZ as outlined in the Vegetation Management and Rehabilitation Plan.	Negligible (Possible)
Hydrology	Alteration of key processes which influence health and condition of riparian and estuarine wetland habitat (Bells Creek and Project Area), and freshwater wetland habitat (Project Area).	~No drainage or removal of wetland habitat within EPZ. ~Maintenance of environmental flows to wetlands retained within EPZ. ~No in-stream barriers on Bells Creek North, Bells Creek South or Lamerough Creek within the project area. ~Implementation of construction and operational water quality and quantity management procedures through WQMP.	Low (Unlikely)
Water Quality (nutrients, turbidity, and salinity)	Changes to the abundance and condition of key structural and functional components of wetland biotic assemblages, particularly vegetation community composition and abundance of prey.	~Implementation of WSUD measures (including advanced bioretention strategies). ~Implementation of landscape design strategies for public areas (e.g. low nutrient demand strategies). ~Implementation of construction and operational water quality management procedures through WQMP.	Low (Unlikely)
Water Quality (pollutants)	Changes to the composition and abundance (and quality) of food resources and potential toxicity effects.	~Implementation of water management measures through Water Quality Management Plan, including spill containment and clean-up procedures. ~Implementation of WSUD measures. ~Implementation of mosquito management strategies for avoidance/ mitigation measures (within development) and nonchemical control strategies for habitat management within EPZ.	Low (Unlikely)
Water Quality (ASS impacts)	Acid sulfate soil disturbance resulting in increased acidity and potential release toxic metals; subsequent degradation of wetlands and food resources (abundance and quality) and potential toxicity effects.	~Development design resulting in location of majority of development within negligible risk areas (above 5m AHD). ~Implementation of ASS management plans across project area (including construction/earthworks management procedures) particularly where filling is proposed below 5 m AHD.	Low (Unlikely)

Element	Impacting process	Description of impact	
		Mitigation measures	Residual Risk (and likelihood)
Environmental Weeds	Changes to wetland vegetation composition; degradation of habitat suitability; increased fuel loads; and potential constraint to re-colonisation of populations between habitats.	~Implementation of weed control measures. ~Landscape design controls (including use of native endemic flora). ~Consultation with other landholders to integrate control program within EPZ, with strategies implemented on adjoining State and Council-controlled lands.	Low (Possible)
Non-native fauna	Predation pressures (foxes, cats, dogs, and pigs); destruction of nesting sites (pigs); and degradation of habitat (cattle, horses and pigs).	~Implementation of pest animal control measures throughout EPZ and development public areas. ~Domestic animal controls (e.g. prohibition within the EPZ and prohibition during construction phases) ~Consultation with other landholders to integrate control program within EPZ with strategies implemented on adjoining State and Council-controlled lands.	Low (Possible)
Fire	Inappropriate fire events/regimes can Result in changes in wetland vegetation composition and structure, increased weed invasion, and loss/degradation of habitat used for breeding, feeding and shelter.	~Implementation of a fire management plan throughout EPZ. ~Consultation with other landholders to integrate fire management program within EPZ, with strategies implemented on adjoining State and Council controlled lands.	Low (Possible)

Chapter C9 (Wallum Sedgefrog):

Assessment Summary Table

Description of impact			
Element/ Impacting Processes	Mitigation inherent in the Master Plan	Mitigation measures	Residual Risk (and likelihood)
Direct Habitat Loss (reduced area of occurrence)	<p>~Conversion of areas of urban development in the Master Plan to Wallum Sedgefrog conservation, particularly along Bells Creek North adjacent the Bruce Highway and an area in the south of the EPZ.</p> <p>~Provision of the Environmental Protection Zone and Open space waterway buffers on Bells Creek North and South and Lamerough Creek.</p> <p>~Provision for the preparation of an Acid Frog Management Plan.</p>	<p>~Retain existing sedgefrog habitat within Frog Zone and Frog Buffers.</p> <p>~Prescribe performance criteria for habitat re-creation.</p> <p>~Additional more detailed site investigations (soils, groundwater etc.) to specifically assist in the location of breeding ponds.</p>	Low (Possible)
Mortality (during clearing)	Nil	N/A. None considered effective.	Medium (Almost Certain)
Altered hydrology (ground and surface water)	Creation of breeding ponds within Frog Conservation Zones to compensate for the direct loss of breeding and other habitat.	<p>~Seasonal groundwater monitoring (to understand seasonal fluctuations);</p> <p>~More detailed groundwater modelling of specific areas of the site;</p> <p>~Soil and ground condition surveys;</p> <p>~Fill characterisation studies for suitability for use in areas proximal to conserved frog habitat; and</p> <p>~Ongoing monitoring and evaluation of breeding habitat success, to determine corrective actions or enhancements to maintain appropriate hydroperiod in breeding habitats.</p> <p>~Implementation of construction and operational water quality and quantity management procedures through WQMP.</p>	Medium (Likely)
Altered water chemistry/ quality	<p>~Implement Water Sensitive Urban Design (WSUD) features to improve the quality of surface water runoff – for the construction and operation phases of development.</p> <p>~Construct and maintain silt traps/ fencing upslope of creeklines and areas of frog habitat - during construction and operation.</p>	<p>~ Use sandy soil (sourced from elsewhere on site rather than imported) instead of clay fill in areas adjoining or in close proximity to Wallum Sedgefrog habitat, with any loose fill stabilised;</p> <p>~Use of pre-fabricated concrete (where practicable) during construction of infrastructure in proximity to waterways;</p> <p>~Develop and implement the Water Quality Management Plan during and after</p>	Low (Possible)

Description of impact			
Element/ Impacting Processes	Mitigation inherent in the Master Plan	Mitigation measures	Residual Risk (and likelihood)
	<p>~Construct and maintain temporary drains and/or bunding diverting sediment-laden runoff away from areas of frog habitat - during construction and operation.</p> <p>~Construct and maintain detention basins for containing sediment-laden runoff- during construction and operation.</p> <p>~Prohibit the use of fertilisers in proximity to waterways or areas of known or likely Wallum Sedgefrog habitat – during construction and operation.</p> <p>~Planting of wallum-native plant species tolerant of low-nutrient soils in preference to non-wallum native species.</p> <p>~Minimal usage of pesticides in proximity to waterways and areas of known/likely Wallum Sedgefrog habitat.</p> <p>~Develop and implement a fill management plan ensuring appropriate management and placement of fill during construction.</p>	<p>construction (including regular monitoring of water quality during and after construction);</p> <p>~Prohibit liming of acid soils in areas with the potential to influence acid frog habitat.</p>	
Changes in vegetation composition and structure	<p>~Designation of frog conservation areas and buffers to urban development.</p> <p>~Preservation and/or replication of habitats considered important for maintaining population viability, particularly refugia and/or corridor habitat and maintaining corridor function.</p> <p>~Fauna fencing and fauna crossing to roadways, esplanade roads to buffer residential development.</p> <p>~Signage and community education.</p> <p>~Net gain of Wallum Sedgefrog habitat within the development site to be conserved in perpetuity.</p>	<p>~Continue chopper-rolling activities in areas heavily affected by Slash Pine wilding until commencement of development;</p> <p>~Develop and implement measures within the Wallum Sedgefrog Management Plan to address alteration of vegetation composition and structure during and after construction (including regular] monitoring of habitat species during and after construction; and</p> <p>~ Implement weed management controls</p>	Low (Possible)

Description of impact			
Element/ Impacting Processes	Mitigation inherent in the Master Plan	Mitigation measures	Residual Risk (and likelihood)
	<p>~Ongoing chopper rolling, fire and weed management as the site develops.</p> <p>~Develop a weed management plan</p>		
Fire	<p>~As above.</p> <p>~Inclusion of open space between development (ignition sources) and native vegetation.</p>	~Implement appropriate fire management regime	Low (Unlikely)
Localised disturbance of habitat by humans	<p>~Designation of frog conservation areas and buffers to urban development.</p> <p>~Preservation and/or replication of habitats considered important for maintaining population viability, particularly refugia and/or corridor habitat and maintaining corridor function.</p> <p>~Signage and community education.</p> <p>~Net gain of Wallum Sedgefrog habitat within the development site to be conserved in perpetuity.</p>	<p>~Educate local residents and visitors about the significance of adjoining wetland habitat for Wallum Sedgefrogs through interpretive signage, community workshops, pamphlet drops, school visits and the provision of educational material to local schools;</p> <p>~Erect signage and limit access through physical barriers or other measures to areas of habitat that could conceivably be accessible by motorbike or 4WD;</p> <p>~Inclusion of open-space (i.e. the Lifestyle Zone) between urban development and protection zones;</p> <p>~Planting of tall dense vegetation in proximity to areas of Wallum Sedgefrog habitat; and</p> <p>~Permanent signage prohibiting inappropriate activity (e.g., riding of mountain bikes and trailbikes) within areas of sensitive frog habitat.</p>	Low (Unlikely)
Noise pollution	Buffers provided to urban development and noise polluting uses as above.	~Evaluate the benefits of co-locating frog fence/ noise barriers along roadways adjacent to Wallum Sedgefrog habitat.	Low (Unlikely)
Light pollution	Buffers provided to urban development and light polluting uses as above.	<p>~Further research and monitor Wallum Sedgefrog populations to better understand the impact of light and noise on this species;</p> <p>~Separate wetlands from intense light-sources;</p> <p>~Eliminate or reduce lighting in proximity to areas of occupied habitat;</p> <p>~Fit lights adjacent Wallum Sedgefrog habitat with low wattage bulbs and glare guards; and</p> <p>~Plant vegetation between areas of frog habitat and adjacent development</p>	Low (Unlikely)
Road kill	Fauna fencing and fauna crossing to roadways, esplanade roads to buffer residential development, signage and community education.	~Construct of frog underpasses;	Low (Possible)

Description of impact			
Element/ Impacting Processes	Mitigation inherent in the Master Plan	Mitigation measures	Residual Risk (and likelihood)
		~Install and maintain frog barriers along roadways adjacent Frog Protection Zones and the EPZ; and ~Develop and implement an adaptive management plan to monitor the success of frog underpasses, and continue to build knowledge about suitable design measures to be implemented in subsequent infrastructure.	
Disease	Buffers provided to urban development and human use.	~Adoption of standard hygiene protocols by persons working within sensitive frog habitat areas; and ~Signage in proximity to sensitive frog habitat areas prohibiting dumping of aquarium water, aquarium fish and/or aquarium plants.	Low (Unlikely)
Increased competition	~Designation of frog conservation areas and buffers to urban development. ~Preservation and/or replication of habitats considered important for maintaining population viability, particularly refugia and/or corridor habitat and maintaining corridor function. ~Net gain of Wallum Sedgefrog habitat within the development site to be conserved in perpetuity. ~Advanced WSUD across the site that achieve downstream water quality objectives.	Detailed specifications and performance criteria to be implemented as part of the Wallum Sedgefrog Management Plan including: ~Definition of proposed uses within conservation areas and buffers; ~Diversion of stormwater/surface runoff away from Wallum Sedgefrog breeding habitat; ~Locating detention basins/ settlement ponds away from sensitive frog habitat (i.e., Wallum Sedgefrog breeding habitat); ~Frog exclusion fencing around Frog Zones, subject to further design and research; and ~Ensuring detention basins and settlement ponds remain free of vegetation (in particular sedges and lily pads).	Medium (Likely)
Mortality: Adult Predation	As above.	N/A. None considered necessary.	Negligible (Highly Unlikely)
Mortality: Tadpole Predation	As above.	To be implemented through subsequent applications: ~Mitigation would focus on reducing conditions suitable for predators (i.e., maintaining semi-ephemeral hydroperiods); and ~Draining of ponds if/ when Gambusia have become established.	Low (Possible)

Chapter C10 (EPBC Act Flora Species):

Assessment Summary Table

Value/ element	Description of impact		
	Primary impacting process	Additional mitigation measures proposed	Residual risk
Reduction of suitable habitat for EPBC listed threatened flora.	Vegetation clearance reduction in the extent of areas of medium or high habitat suitability.	Investigate re-establishing the relevant EPBC threatened plant species listed in the approval within the proposed 'biohubs'- focus treatments within areas identified as suitable habitat as outlined in the Vegetation Management and Rehabilitation Plan.	Negligible (Possible)
	Illegal collection of <i>Phaius australis</i> or <i>Prasopyllum wallum</i> , subject to the location and public accessibility of rehabilitation planning.	Education and appropriate landscape design to minimise this potential occurrence.	Negligible (Possible)
	Altered fire regimes within conservation areas / areas of suitable habitat.	Develop suitable fire management regime, particularly within areas of rehabilitation planting within the EPZ	Negligible (Possible)
	Altered groundwater regime within conservation areas / areas of suitable habitat.	Maintain existing groundwater levels.	Negligible (Possible)
	Weed invasion of suitable habitats.	Weed management controls implemented for preconstruction, construction, and maintenance of conservation/rehabilitation areas.	Negligible (Possible)
	Fragmentation of re-establishing populations.	Infrastructure corridor planning and rehabilitation planting regimes to be developed collaboratively with rehabilitation planting strategy.	Negligible (Possible)

2.3 Potential Impacts on Migratory Species

Potential Impacts on Migratory Species are addressed in Chapter C7 (Migratory Birds) of the Draft PER. Excerpts from the assessment summary tables from these chapters that are specifically relevant to Migratory Species are as follows:

Chapter C7 (Migratory Birds):

Assessment Summary Table – Project Area and Adjacent Habitats

Element	Impacting process	Description of impact	
		Mitigation measures	Residual Risk (and likelihood)
Wetland Habitat Loss	Reduction of available habitat; habitat fragmentation; reduced habitat patch size; increased exposure to edge effects; and diminution in habitat viability.	~Establishment of EPZ. ~Retention of REs, and remnant wetland habitats in the EPZ and along open space waterway buffers ~Rehabilitation, enhancement and expansion of the current extent of wetland remnant vegetation.	Negligible (Possible)
Introduced Flora	Changes to wetland vegetation composition; and degradation of habitat suitability.	~Implementation of a weed management plan applicable to construction and operational phases. ~Landscape design controls (including use of native endemic flora). ~Consultation with other landholders to integrate control program within EPZ, with strategies implemented on adjoining State and Council-controlled lands.	Low (Possible)
Introduced Fauna	Predation pressures and disturbance (foxes, cats, and dogs); and degradation of habitat (cattle, horses and pigs).	~Implementation of a pest animal control plan throughout EPZ and development public areas. ~Domestic animal controls (e.g. prohibition within the EPZ and prohibition during construction phases). ~Consultation with other landholders to integrate control program within EPZ with strategies implemented on adjoining State and Council-controlled lands.	Low (Possible)
Fire	Inappropriate fire events/regimes can result in changes in wetland vegetation composition and structure, increased weed invasion, and loss/ degradation of habitat used for feeding and shelter.	~Implementation of a fire management plan throughout EPZ. ~Consultation with other landholders to integrate fire management program within EPZ, with strategies implemented on adjoining State and Council-controlled lands.	Low (Possible)
Anthropogenic Disturbances	Disturbance to birds arising from water-based recreational activities (boating) within Bells Creek; and disturbance to birds arising from land-based recreational activities within the EPZ	~No boat launch facilities to Bells Creek will be developed. ~Design and location of pathways within the EPZ to be located to avoid disturbance within	Low (Possible)

Element	Description of impact		
	Impacting process	Mitigation measures	Residual Risk (and likelihood)
	(pedestrians with or without companion animals).	sensitive areas of EPZ wetland habitats. Track design and layout to be informed by consultation with an experienced biologist. ~Companion animals to be prohibited from the EPZ.	

Assessment Summary Table – Project Area and Study Area

Element	Description of impact		
	Impacting process	Mitigation measures	Residual Risk (and likelihood)
Hydrology	Alteration of key processes which influence health and condition of riparian and estuarine wetland habitat (Bells Creek and Project Area), and freshwater wetland habitat (Project Area).	~No drainage or removal of wetland habitat within EPZ. ~Maintenance of environmental flows to wetlands retained within EPZ. ~No in-stream barriers on Lamerough Creek, Bells Creek North and Bells Creek South within the project area. ~ Implementation of construction and operational water quality and quantity management procedures through WQMP.	Low (Unlikely)
Water Quality (key water quality parameters)	Changes to the abundance and condition of key structural and functional components of wetland biotic assemblages, particularly vegetation community composition and abundance of prey.	~Implementation of WSUD measures (including advanced bioretention strategies). ~Implementation of landscape design strategies for public areas (e.g. low nutrient demand strategies). ~Implementation of construction and operational water quality management procedures through WQMP.	Low (Unlikely)
Water Quality (ASS influences)	Acid sulfate soil disturbance resulting in increased acidity and potential release toxic metals; subsequent degradation of wetlands and food resources (abundance and quality) and potential toxicity effects.	~Development design resulting in location of majority of development within negligible risk areas (above 5m AHD). ~ Implementation of ASS management plans across project area (including construction/earthworks management procedures) particularly where filling is proposed below 5 m AHD.	Low (Unlikely)
Water Quality (chemical contamination)	Changes to the composition and abundance (and quality) of food resources and potential toxicity effects.	~Implementation of water management through Water Quality Management Plan, including spill containment and clean-up procedures. ~Implementation of WSUD measures. ~Implementation of mosquito management strategies for avoidance/mitigation measures (within development) and non-chemical	Low (Unlikely)

Element	Description of impact		
	Impacting process	Mitigation measures	Residual Risk (and likelihood)
		control strategies for habitat management within EPZ.	
Additional recreation pressures	Additional contributions to cumulative disturbance impacts to feeding and roosting migratory birds arising from increased levels of water-based recreational activities.	~No boat launch facilities to Bells Creek will be developed. ~Provide education programs and ongoing communication with Caloundra South residents regarding responsible recreation behaviours within the Marine Park. ~Work collaboratively with local and state government departments on general recreational management of the Pumicestone Passage responding to general population growth.	Medium (possible)

3 MANAGEMENT AND MITIGATION MEASURES

This section of the EMP outlines the management and mitigation measures to manage the following as required by Condition 1 of the approval:

- acid sulfate soils;
- erosion and sediment controls; and
- pests and weeds species.

3.1 Preliminary

3.1.1 Structure of EMP Elements

The detailed EMP elements for acid sulfate soils, erosion and sediment controls, and pests and weed each contain a plan with standard EMP headings as follows:

- Objective: the performance goals against which the policy will be measured.
- Management and mitigation actions: the procedures to be undertaken to meet the objectives.
- Timing: when the actions are to be undertaken (e.g. prior to construction, during or post-construction).
- Responsibility: nominated responsible person or organisation for undertaking each specific task/action. Precinct CEMPs will include further detail on specific responsibilities of individuals for various management actions.
- Performance criteria: the required level of performance, where environmental/legislative standards apply, or in their absence, project specific performance outcomes.
- Monitoring: procedures to monitor, measure and record performance.
- Reporting: reporting requirements of the task/action and the responsible parties.
- Corrective action : the procedures to be undertaken if performance requirements are not met, including the parties responsible for implementing corrective actions.

These tables address the requirements of Condition 1 with respect to items 1(c), 1(d) and 1(e).

3.1.2 Project Stages and Activities

As outlined above, the management plans within the EMP relate to site construction and rehabilitation phases of the development which includes maintenance of conservation areas prior to handover to the governing authority. As such, the types of activities to which the EMPs relate include:

- Site construction activities such as vegetation clearing, site establishment, bulk earthworks, civil works, drainage, stormwater controls and devices, services, roads, other associated infrastructure construction and landscaping. These activities would be carried out by the person undertaking the action (and its civil construction contractors) as master developer for the site;
- Management and/or specialist rehabilitation activities for conservation areas such as the Environmental Protection Zone and waterway and open space buffer zones prior to hand over to

the relevant governing authority. These activities would be generally undertaken by landscape or related environmental contractors (under the direction of the person taking the action) in parallel with construction activities for a particular Precinct or stage of the development.

The EMPs do not relate to building works, plumbing and drainage works, and landscaping associated with house construction. These activities would generally be undertaken by building contractors (under the direction of the person undertaking the action) once site construction works has been completed for a particular Precinct or stage of the development.

3.1.3 Roles and Responsibilities

As outlined above, the person taking the action will engage construction (civil) contractors (for site construction works) and landscaping/environmental contractors and specialist consultants for vegetation management, pest management and rehabilitation activities in conservation areas in accordance with relevant approvals, conditions and commitments.

To oversee construction phases, the person undertaking the action will appoint either an internal or external Superintendent who will oversee and monitor implementation of the civil construction contract and associated rehabilitation activities for the project.

The requirements within this EMP, along with other management plans prepared under the approval conditions for Wallum Sedgefrogs (Condition 8) and Water Quality Management (Condition 4), will inform and guide the Construction Environmental Management Plan (CEMPs) for each Precinct that are required under Condition 3 of the Approval.

The detailed precinct-specific CEMPs will be submitted to the Minister at least 3 months prior to the commencement of the action within each precinct. It is understood that the condition does not preclude submitting amalgamated precinct CEMPs as long as the requirements of Condition 3 are addressed for each Precinct covered by the CEMP.

A diagram showing this process is contained in Figure 3-1.

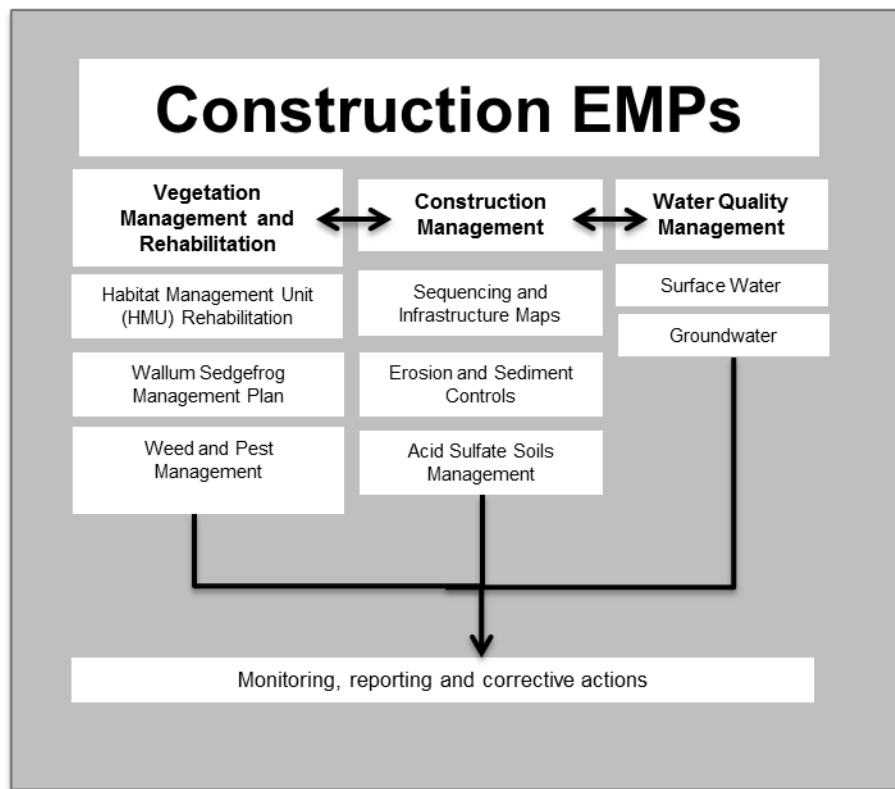


Figure 3-1 Flow Chart Showing Inputs into Construction Environmental Management Plans Undeveloped Portions of the Site

In general, existing management regimes currently employed by the person undertaking the action (or its lessee) for the site will continue for the undeveloped portions of the site. These are outside the scope of the action and this EMP.

These management activities mainly relate to maintenance of the site and include:

- Leasing of the undeveloped portion of the property which may include agricultural production, silviculture and grazing;
- Temporary uses of the undeveloped land for recreational or other group activities;
- Fencing of the site (primarily the responsibility of the lessee) – the boundary is fully fenced, and there is internal fencing throughout the property that is electrified. Cattle are not permitted in the EPZ area, waterway corridors or other future conservation areas;
- Chopper rolling - is an activity where a small dozer pulls a steel roller with blades along the rills of the previous pine plantation. The activity manages regrowth of the pine wildings re-establishing on the site and assists breaking down remaining pine stumps. Chopper rolling also contributes to reducing the risk of fire. Chopper rolling is the responsibility of the person undertaking the action and is carried out by a licensed contractor across a patchwork of areas across the site;
- Bushfire management - is undertaken periodically in accordance with the sites bushfire management plan to reduce fuel loads and protect adjacent properties;

- Pest animal control programs - implemented in accordance with relevant governing authority guidance. These programs and approaches may need to be reviewed following commencement of the use of the site by residents which will be evaluated before the release of each stage;
- Weed management activities - including monitoring of weed invasions on site and routine or opportunistic weed management, particularly where weed invasion could impact on retained conservation areas such as the EPZ;
- Track maintenance to maintain site accessibility and emergency response; and
- Minor drainage works (outside of areas of conservation significance) are routinely done 'as of right' by the Lessee with permission of the person undertaking the action.

Conservation Areas

The ULDA Development Scheme and the approved Master Plan form the principal planning framework for the on-going management of the Caloundra South site, including those areas set aside for conservation purposes such as the Environmental Protection Zone (EPZ), major creek riparian corridors, frog conservation zones and surrounding frog and lifestyle buffers.

Where relevant, this EMP outlines management methods and mitigation strategies for weeds and pest animal controls that relate to the management of these conservation areas prior to handover to the relevant governing authority.

3.1.4 Communication Protocols

The person undertaking the action will establish communication protocols with other parties involved in the implementation of the development. In the event of a non-compliance the person undertaking the action will be notified immediately and will contact Department of Agriculture, Water and Environment (DAWE) within 2 business days of being made aware of the non-compliance, consistent with condition 14 of the EPBC Approval.

3.1.5 Staff Training

The person undertaking the action or its Superintendent will ensure that all staff involved in the construction of the development (including rehabilitation and maintenance of rehabilitated land) have the requisite skills and experience to successfully undertake their roles, consistent with the relevant environmental laws and development consents.

Contractors will be required to demonstrate to the person undertaking the action that all their employees engaged in the project have the requisite skills and experience to successfully undertake their roles, consistent with the relevant environmental laws and development consents.

3.2 Acid Sulfate Soils

3.2.1 Introduction

Acid Sulfate Soils (ASS) investigations of the Caloundra South site, set out in Chapter C2 of the draft PER indicate the presence of soils with generally low concentrations of natural acidity across the site,

and a very low potential for additional acidity to be generated from oxidation of the *in-situ* soils as a result of excavation or filling.

While of generally low risk to downstream receiving environments, hot spots of natural acidity detected by existing investigations will need to be managed through a basic acid sulfate soil management plan which will be prepared and implemented as part of Construction Environmental Management Planning for each Precinct. However, typical management measures (i.e. bulk application of agricultural lime) are complicated by the presence of the Wallum Sedgefrog and other acid frogs which have a habitat preference for acidic conditions.

As such, additional testing is proposed to be undertaken prior to bulk earthworks (particularly in any earthworks proposed in areas below 5m AHD), and the application of lime as a treatment measure will be minimised as far as practicable. This approach is outlined below.

3.2.2 Management Methods and Mitigation Strategies

Table 3-1 sets out the management methods and mitigation strategies for ASS that will be addressed in greater detail as part of subsequent CEMPs prepared for each Precinct (as required by Approval Condition 3) and during the site establishment works.

More detailed information about the staging of works and activities and timelines for completion will be outlined in the relevant CEMP for a Precinct.

Table 3-1 Acid Sulfate Soils

Objectives:		
<ul style="list-style-type: none"> Impacts from the disturbance of acid sulfate soils on the site are avoided, minimised or managed to protect downstream water quality. Where ASS treatment measures such as liming are required, impacts on pH-sensitive fauna habitats and species that are being retained on the site are avoided, minimised and managed. 		
Management methods and mitigation strategies	Responsibility	Timing
As part of the detailed design within each Precinct, minimise the extent of earthworks (filling or excavation) below the 5m AHD contour where practicable noting greater concentrations of acidity in soils could be present in these locations.	The person undertaking the action	Prior to commencement of the Development within a Precinct
Given the low risk nature of the site from an ASS perspective and the occurrence of acid tolerant frog species, an appropriate sampling and management regime is to be discussed and agreed with the Superintendent prior to commencement of earthworks.	The person undertaking the action	Prior to commencement of the Development within a Precinct
Based on the above sampling and management regime, prepare acid sulfate soil testing and management plans for each subsequent stage of bulk earthworks and include this within the relevant Precinct CEMP. The ASS testing and management plan is to be developed consistent with the management and mitigation actions outlined in this plan.	The person undertaking the action	Prior to commencement of the Development within a Precinct
Where liming is proposed as part of an ASS management plan to control localised hot spots of actual acidity detected, liming rates are to be minimised and a suitable buffer is to be maintained between treated areas and known Wallum Sedgefrog habitat, with no surface water exchange to occur between areas.	Civil Contractor, reporting to the Superintendent	During construction of the Development within a Precinct

<p>Any lime treatment will be carried out on prepared pads (not <i>in situ</i>) to avoid changes to the quality of groundwater and surface waters.</p>	<p>Civil Contractor, reporting to the Superintendent</p>	<p>During construction of the Development</p>
<p>Where environmental rehabilitation and restoration works are proposed in areas below the 5m AHD contour, ensure any liming or other treatment measures for acidity in soils is avoided or minimised or otherwise managed to ensure the natural acidity of retained habitats. Consideration of groundwater levels should be made such that any areas of existing acid sulfate soils remain below the existing groundwater table wherever possible.</p>	<p>Contractors for the person undertaking the action</p>	<p>During construction of the Development</p>
<p>Performance criteria:</p> <p>~ Significant adverse effects to the natural or built environment on or off the site as a result of ASS disturbance are avoided. Triggers for corrective action include reduced pH levels observed in downstream groundwater bores and/or the presence of soluble Iron (Fe) and Aluminium (Al) that are outside the bounds of natural variability for the site (see monitoring section below).</p> <p>~ pH sensitive fauna habitats and species retained on the site in the EPZ and frog zones are not adversely affected by ASS treatment methods and implementation (e.g. liming). Triggers for corrective action include elevated pH observed in habitat areas or observable changes to surface drainage pathways (these will be measured in accordance with the Wallum Sedgefrog Management Plan as required by Condition 7 of the approval).</p> <p>Implement corrective actions if performance criteria are not achieved as a result of the development</p>		
<p>Monitoring:</p> <p>~ Additional ASS testing is to be undertaken in accordance with the management and mitigation actions outlined above. Sampling, location, frequency and intensity to be outlined within ASS testing and management plans which will be a component of each Precinct-based CEMP.</p> <p>~ Bunded stockpiles and treated soils will be periodically monitored during active construction stages to ensure the appropriate treatment and containment. The frequency of monitoring will be outlined in the ASS testing and management elements of the CEMPs.</p> <p>~ Testing of water pH within construction sediment ponds will be undertaken in accordance with water quality monitoring outlined in the erosion and sediment control element of this EMP</p> <p>~ Additional groundwater monitoring bores to be installed at the downstream reaches of Lamerough Creek, Bells Creek North and Bells Creek South (see section 3.2.3 below)</p> <p>~ Reduced pH and other potential impacts attributable to ASS leachate (principally dissolved Fe and Al) will be monitored as part of the surface water and groundwater monitoring regime as outlined in the Water Quality Management Plan.</p>		
<p>Reporting:</p> <p>~ Reporting on ASS testing and management is to be prescribed within ASS testing and management elements of the CEMPs.</p>		
<p>Corrective actions:</p> <p>~ Where groundwater data at downstream groundwater bores indicates pH or dissolved metal recordings that are outside the bounds of natural variability, the following will be undertaken:</p> <ul style="list-style-type: none"> • review groundwater data being collected from other groundwater bores on the site (control sites and sites within the works area) to determine the likely cause of the downstream elevated or reduced readings; and • If the readings persist or are attributable to site management, review acid sulfate management procedures on the site and increase local monitoring around worksites to determine and treat the exceedance. 	<p>Responsibility:</p> <p>Person undertaking the Action or its Superintendent</p>	
<p>~ In terms of potential impacts on pH sensitive habitats:</p> <ul style="list-style-type: none"> • Isolate and provide suitable bunding to any localised hot spot of acidity or lime release (where it may impact on known frog habitat). • Treat and correct fill and any associated run-off prior to release from bunded area. 	<p>Civil Contractor, reporting to the Superintendent</p>	

3.2.3 Monitoring

Given the low levels of ASS and the general absence of soft compressible sediments in areas to be developed, their management will primarily be a construction-based activity.

As shown in Figure 3-2, new groundwater monitoring bores will be installed by the person undertaking the action to specifically detect/measure any net transport of acidity (pH) or dissolved metals (Fe, Al) commonly associated with acid sulfate soils through groundwater. While such impacts are not expected, this monitoring will assist to confirm this, with the data results feeding back into site management practices if any impact or abnormality is observed.

Further details of this monitoring will be outlined in the Water Quality Management Plan in accordance with Condition 4 of the Approval.



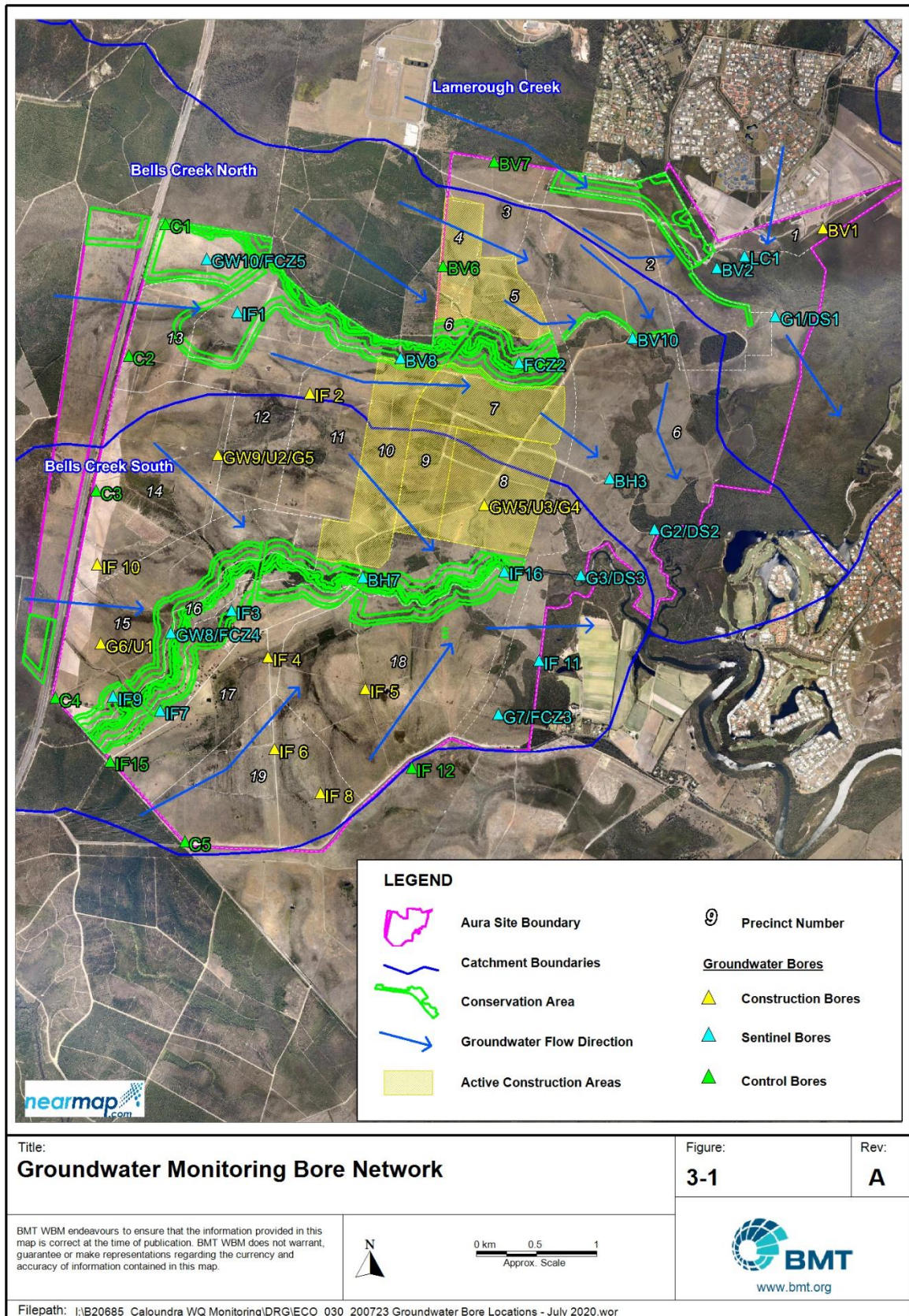


Figure 3-2 Existing and Proposed Additional Groundwater Monitoring Locations

3.3 Erosion and Sediment Controls

3.3.1 Introduction

This EMP element relates to local drainage and associated erosion and sediment control measures that are to be adhered to during the development. In accordance with the earthworks strategy and conceptual plans submitted and approved as part of the State approval process, earthworks operations across the site are expected to comprise conventional operations including:

- Ground preparatory works such as draining areas in advance of earthworks operations through constructed open channels;
- Clearing and grubbing;
- Stripping of topsoil; and
- Earthworks on leads (cutting, loading, carting, place and compact).

Specific measures have been devised to protect matters of NES including downstream water quality values.

3.3.2 Management Methods and Mitigation Strategies

Table 3-2 sets out the management methods and mitigation strategies for erosion and sediment control that will be addressed in greater detail as part of subsequent CEMPs prepared for each Precinct (as required by Approval Condition 3) and during the site establishment works.

More detailed information about the staging of works and activities and timelines for completion will be outlined in the relevant CEMP for a Precinct.

Table 3-2 Erosion and Sediment Control

Objective: ~ Erosion and sedimentation is adequately controlled during the construction phase to protect on site and downstream environmental values.		
Management methods and mitigation strategies	Responsibility	Timing
Erosion and sediment control plans will be developed in accordance with the process set out in Figure 3-3. Construction phase ESCPs will be approved by the Construction Superintendent prior to commencement of works on site. . Construction phase ESCPs are to include the following minimum requirements: <ul style="list-style-type: none"> • The location, design, sizing, construction and intended water quality performance of engineered sediment basins according to site specific factors and Best Practice Erosion and Sediment Control Guidelines (IECA, 2008) with guidance from the Manual for Erosion and Sediment Control, Version 1.2” (Sunshine Coast Council, 2008). High efficiency sediment basins will be incorporated into the ESCP at each precinct where appropriate and the plans will outline how the basins are situated to capture and treat runoff from disturbed areas up to and including the design rainfall event as specified below: <ul style="list-style-type: none"> ○ Where traditional sediment basins are used, requirements are to be in accordance with the manual for Erosion and Sediment control (Sunshine Coast Council,2008). The design 	The person undertaking the action	Prior to commencement of the Development within a Precinct

<p>rainfall depth of 77mm over a five (5) day period is to be adopted. It is noted that this is somewhat higher than the 5-day 85th percentile rainfall depth for Caloundra which is the recommended design rainfall for sensitive receiving environments.</p> <ul style="list-style-type: none"> ○ For High Efficiency sediment basins, rainfall intensity and inflow duration govern the time available for suspended sediment to settle in the basin. Design storm events for these basins are to be 0.5 times the peak 1 year ARI discharge. • Demonstrating that these basins are situated outside of retained habitat areas (EPZ, riparian areas and frog zones) and with discharges from the basins flowing directly into existing drainage lines and waterways wherever possible. • Demonstrate how provision for suitable erosion controls to direct upstream flows around disturbed areas is to be made; • Provide details to outline the construction of contour banks and lined cutoff drains in earthworks areas; • Stage works to minimise exposed areas and ensure that such areas are remediated as soon as practicable after construction to provide suitable erosion protection until lot scale works begin; • Identify areas to be designated for machinery and construction material storage (as required) that are situated away from drainage paths; • Incorporation of energy dissipaters and batter stabilisation at stormwater drains and batters respectively; • Describe the location of sediment fences and rock check dams; • Identify and describe plans for progressive stabilisation with short term (hydromulch) and long term applications (sterile and native grasses); • Describe how contractor personnel will be educated and trained with respect to erosion and sediment control measures; • Provide plans to ensure that all erosion and sediment control measures will have suitable inspection and maintenance regimes in place and responsible persons identified for reporting; • Include measures to ensure that all erosion and sediment control devices (sediment fence, diversion drains, etc.) are installed prior to large scale soil disturbance or vegetation clearing. 		
<p>During the construction of the development, erosion and sediment control management and mitigation actions in accordance with the process set out in Figure 3-4 will be implemented as follows:</p> <ul style="list-style-type: none"> • Temporary erosion and sediment control measures, e.g. sediment fences, diversion drains, sediment basins etc., will not be removed until greater than 70% ground cover has been achieved within an active work site. • All sediment, litter and gross pollutants collected by silt fencing, other control devices, or deposited on adjacent roads shall be removed and disposed of in an appropriate manner. This may include re-use for topsoil or fill, or disposal at an off-site approved facility. 	<p>Civil Contractor, reporting to the Superintendent</p>	<p>During construction of the Development within a Precinct</p>

<ul style="list-style-type: none"> • All cleared areas that are not being actively worked are to be stabilised within a (5) five-day period of inactivity where possible. • Sediment basins, once treated, are to be discharged into stabilised drainage channels in a manner that does not create additional erosion • Any stockpiles will be located within the area of disturbance, and away from any waterways or drainage channels. Appropriate erosion and sediment control measures will be installed and maintained to prevent any stockpile run-off. • Stockpile batter will be maintained at a slope of no greater than 1:1 and stabilized • If stockpiles are not to be worked within 10 days, they shall be stabilised with mulch, geofabric, temporary grassing or equivalent. 		
<p>Performance criteria: The following performance criteria will be integrated into each Precinct-based CEMP:</p> <p>~Erosion and sediment control measures (as outlined in the above management and mitigation actions) are properly incorporated into CEMPs and implemented on-site during the construction of the development in accordance with the requirements outlined above.</p> <p>~Impacts to downstream water quality are avoided or otherwise minimised in accordance with the achievement of the following water quality performance criteria for site sedimentation basins:</p> <ul style="list-style-type: none"> • pH 6.5 to 8.5, if groundwater is passed through the sediment basins, then the pH of the discharged water can be less than 6.5 • Dissolved Oxygen (DO) > 80% saturation; • Total Suspended Solids (TSS) less than 50 mg/L, or the equivalent turbidity; • Nutrients (nitrogen and phosphorous) to be managed through normal erosion and sediment control practices; and • During periods of flow in Bells Creek North or South and for any such flow events up to and including the design rainfall event as specified below, discharge turbidity offsite (as measured by the downstream automated turbidity monitor) to be no greater than 10 % above background (with background being the quality of water entering the site via the culverts where Bells Creek North and South pass under the Bruce Highway). <p>If during a rain event, the above discharge criteria have not been achieved, and downstream water quality is within the required criteria, then no further corrective action is required.</p> <p>~</p> <p>All captured runoff is to be treated (flocculated) and discharged within 5 days of cessation of the rain event where practicable, or as soon as practical noting cumulative / successive rainfall impacts the ability to de-water in some circumstances. Captured runoff is to be treated to achieve the performance criteria outlined above.</p>		
<p>Monitoring: The following monitoring regime will be integrated into each Precinct-based CEMP:</p> <ul style="list-style-type: none"> • Regular (daily and after major rain events) site inspections of all erosion and sediment control measures. • Regular (daily and after major rain events) inspections of areas surrounding construction site to detect and manage any occurrence of sediment deposition off-site. • Rainfall will be recorded at 9am each working day from an installed rain gauge. • All construction activities will be monitored daily for compliance with erosion and sediment control measures. • Within each sediment pond, turbidity and pH will be measured daily. Note that monitoring measures related to receiving water quality (e.g. outside of the sedimentation basins) are outlined in the Water Quality Management Plan (as required by Approval Condition 4). 		
<p>Reporting: To be developed further as part of Precinct-based CEMPs but must include at a minimum:</p> <ul style="list-style-type: none"> • A daily log of the effectiveness of the erosion and sediment control measures will be maintained by the construction (civil) contractor in accordance with the above monitoring regime • Reports on water quality compliance and achievement of sediment basin performance criteria to be forwarded to the site superintendent on a weekly basis and immediately following major rainfall events; • Monthly environmental compliance reports (ECR) are to be prepared to address broader erosion and sediment control measures and reported to the site superintendent 		

<p>Corrective action: Specific corrective actions will be developed as part of the Precinct-based CEMPs. Generally, where performance criteria are not being met, the following measures will be implemented:</p> <ul style="list-style-type: none"> • Contractor to amend erosion and sediment control measures as required in consultation with the Superintendent to address deficiencies through regular monitoring and inspections and in consultation with relevant regulatory agencies. • Erosion and sediment control devices will be cleaned, repaired or replaced whenever inspections show signs of noncompliance or ineffective capability/capacity. • Works will cease and/or other corrective actions taken (e.g. not allowing release of water from sedimentation basins) where erosion and sediment control devices are found not to be in accordance with the management and mitigation actions outlined in this plan or otherwise the performance requirements outlined above. • Areas of extensive scour or erosion will be rehabilitated as soon as practicable after detection. 	<p>Responsibility: Civil Contractor, reporting to the Superintendent</p>
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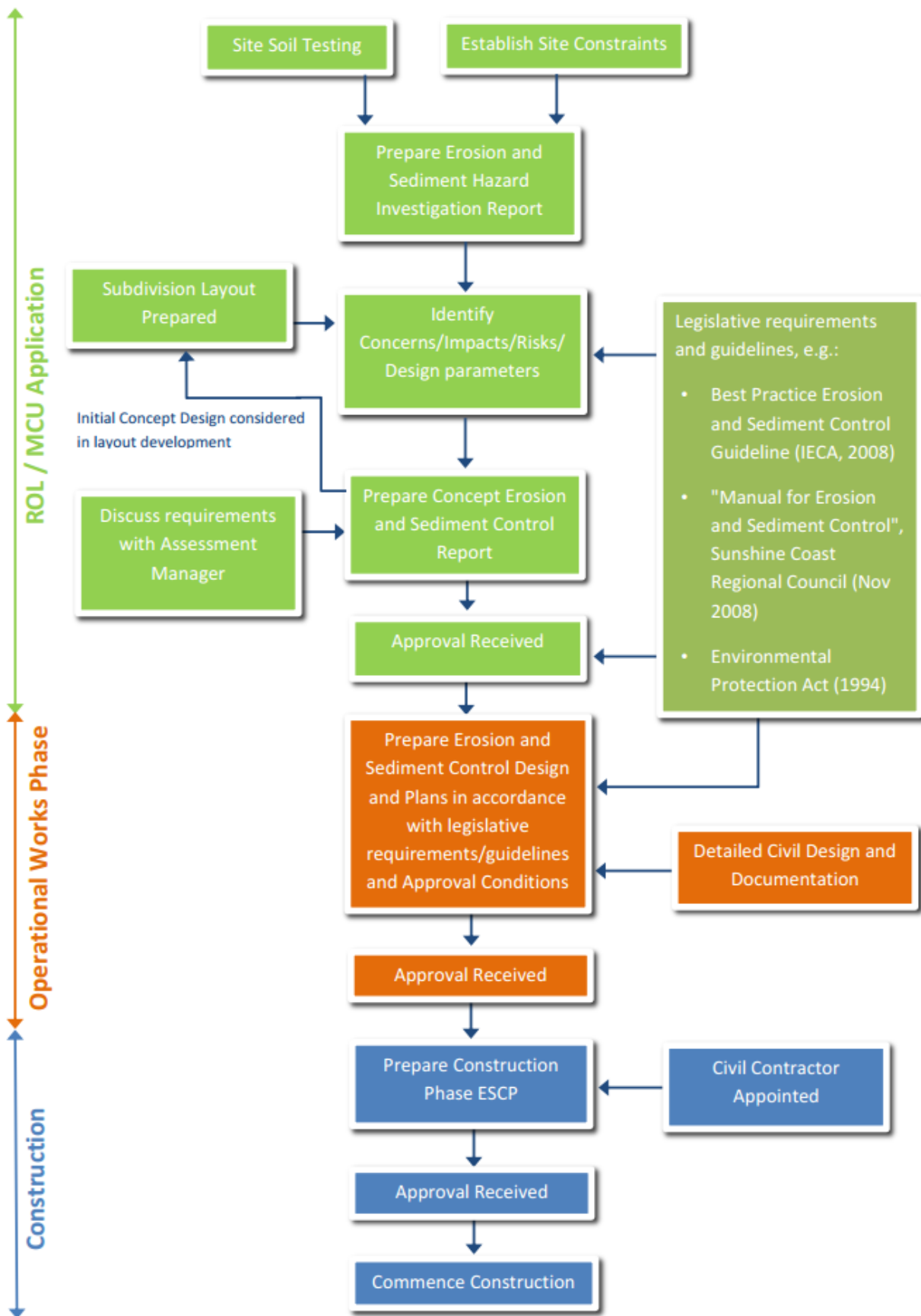


Figure 3-3 Erosion and Sediment Control Process- Pre Construction

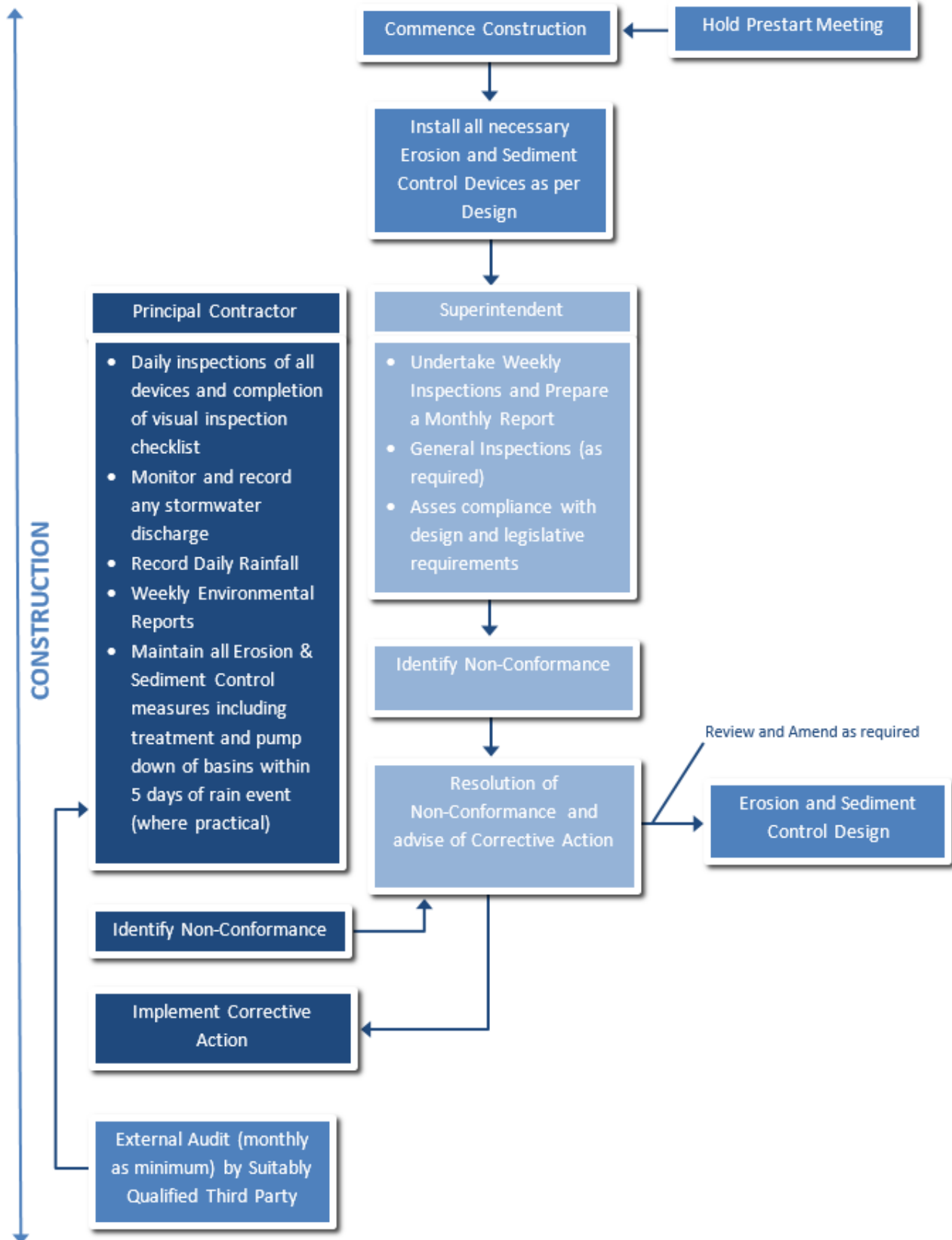


Figure 3-4 Erosion and Sediment Control Process - During Construction

3.4 Pests and Weed Species

3.4.1 Introduction

Pest Animal Species

The development site currently supports the listed Wallum Sedgefrog *Litoria olongburensis* and other acid tolerant frog species. Areas downstream from the site (e.g. along Bells Creek) support feeding habitat for migratory water birds and contains areas of potential habitat for the threatened Water Mouse *Xeromys myoides* near the confluence of Bells Creek.

Feral animals previously recorded on the development site include: dingo, cat, fox, pig, black rat, brown hare, spotted turtle-dove, cane toad and eastern gambusia. These pest animals pose direct threats to native fauna, and if uncontrolled, could travel between the development site, unimproved areas and the EPZ and other conservation areas.

This management plan element outlines broad management measures that will be enacted to support resident native fauna and control pests and weed species.

Weeds

During construction, bulk earthworks operations will clear vegetation as required on the site and has the potential to introduce and spread weeds, fungi and other pathogens to and from the work area.

Other areas of the site will be retained in their natural state or undergo rehabilitation to improve their habitat value (refer the Vegetation Management and Rehabilitation Plan contained in Appendix A of this EMP). These areas generally include the EPZ, riparian areas along waterways, frog conservation zones and adjacent buffer areas.

The introduction of weeds can pose a significant threat to biodiversity, and is recognised as one of the biggest issues affecting regeneration of native vegetation in Caloundra South. Management measures have been developed to guide any necessary vegetation clearing during construction, as well as rehabilitation and weed control during construction and operation. As weed and pest control strategies are contingent on the protection and rehabilitation of retained native vegetation, management actions relating to native vegetation management are also provided.

3.4.2 Management Methods and Mitigation Strategies - Pests

Table 3-3 sets out the management methods and mitigation strategies for pest animal species that will be addressed in the subsequent CEMPs prepared for each Precinct as required by Approval Condition 3 or apply generally to such activities undertaken within Precinct 6 (which encompasses the Environmental Protection Zone and Buffer Zones). Where relevant, more detailed information about the staging of works and activities and timelines for completion will be outlined in the relevant CEMP for a Precinct.

Table 3-3 Pest Species

<p>Objective: ~ To reduce or control impacts from pest animal species during construction stage</p>		
Management methods and mitigation strategies	Responsibility	Timing
Permanent and semi-permanent structures established during construction should be designed to minimise harborage and roosting opportunities for pest species.	Contractors for the person undertaking the action	During the construction of the Development within a Precinct
Construction crew will not be permitted to bring domestic animals to the construction works site or in conservation areas of the project site.	Contractors for the person undertaking the action	During the construction of the Development within a Precinct
Putrescible waste generated during construction will be stored in covered containers on site to limit access by scavenger animals, and will be transported off site for disposal.	Contractors for the person undertaking the action	During the construction of the Development within a Precinct
Implementation of pest animal controls to protect retained or rehabilitated wallum sedgefrog habitat in accordance with Wallum Sedgefrog Management Plan for the site (as required by Condition 8).	The person undertaking the action/ landscape and environmental contractors	In accordance with timing set out in the Wallum Sedgefrog Management Plan.
Implementation of pest animal controls to protect retained or rehabilitated habitats within the EPZ, riparian zones or other conservation areas: <ul style="list-style-type: none"> • Design and management actions for the management of mosquitoes and biting midge; • Design and management actions to limit the values of retained wetlands and bushland from cane toads; and • Identification of measures using a combination of fencing, natural vegetative barriers and signage to deter the bringing in or movement of domestic animals into the EPZ and other conservation areas. 	The person undertaking the action/ landscape and environmental contractors	During and up to the handover of the area to the relevant governing authority.
<p>Performance criteria: ~ Consideration of pest species in the design and siting of permanent and semi-permanent structures established for construction occurs <i>via</i> consultation between the contractor and a qualified ecologist ~ No domestic animals are brought on the site by construction crews and workers ~ Signage to be installed to identify conservation areas ~ Putrescible waste are managed and transported off the site for disposal. ~ Design and implementation of pest animal control measures to protect retained or rehabilitated habitat including habitat for wallum sedgefrog Implement corrective actions if performance criteria are not achieved as a result of the development</p>		
<p>Monitoring: ~ Regular checking of the performance criteria by the contractor and the Superintendent</p>		
<p>Reporting: ~ Any vegetation clearance compliance issues and/or weed control measures implemented must be incorporated into the regular weekly/monthly environmental report required by the contractor to the Superintendent.</p>		
Corrective action:	<p>Responsibility: ~ Civil and building contractors, reporting to the Superintendent</p>	

<p>~ Corrective action undertaken where non-compliance of the performance criteria are observed.</p> <p>~ For retained or rehabilitated habitat, undertake corrective actions as outlined in the Wallum Sedgefrog Management Plan and other site environmental strategies related to pest species.</p>	<p>~ For retained or rehabilitated habitat, landscape and/or environmental contractors, reporting to the Superintendent.</p>
--	--

3.4.3 Management Methods and Mitigation Strategies - Weeds

Table 3-4 sets out management methods and mitigation strategies for vegetation management and weed control that will be addressed in the subsequent CEMPs prepared for each Precinct as required by Approval Condition 3 or apply generally to the implementation of the Vegetation Management and Rehabilitation Plan within Precinct 6 (which encompasses the Environmental Protection Zone and Buffer Zones). Where relevant, more detailed information about the staging of works and activities and timelines for completion will be outlined in the relevant CEMP for a precinct.

Table 3-4 Vegetation and Weed Management

Objective:		
~ Promote the rehabilitation and revegetation of native vegetation on site and implement effective weed management measures to minimise infestation on and off site during construction.		
Management methods and mitigation strategies	Responsibility	Timing
Vegetation Management		
Areas of vegetation to be conserved must not be adversely affected by the works are to be identified on construction plans, marked and protected through the use of barrier fencing protection (i.e. areas such as the EPZ, buffers to EPZ and frog habitat).	The person undertaking the action/contractor	Prior to construction of Development within a Precinct
Vegetation communities or habitat areas that are retained, but are located within the works area and are at risk from machinery knocks, will be identified on construction plans, flagged and protected during construction with barrier fencing.	The person undertaking the action/contractor	Prior to construction of Development within a Precinct
Activities such as storage of materials, parking, liquid disposal, refuelling activities, construction site office or shed, combustion, stockpiling of soil, any filling or excavation activity (unless approved by the project manager) and use of unauthorised chemicals will be prohibited within the protected vegetation areas.	Contractors for the person undertaking the action	During the construction of the Development within a Precinct
Retained trees shall not have their crown removed. The contractor is to take all reasonable care to ensure that no branches and trunks are damaged during the construction.	Contractors for the person undertaking the action	During the construction of the Development within a Precinct
Staff are made aware of the defined significant and protected vegetation areas, including all personnel engaged in preconstruction works.	The person undertaking the action/contractor	Prior to construction of Development within a Precinct
All tree roots that are damaged during excavations and related activities are to be saw cut to a clean surface and are to be treated with a fungicidal solution prior to backfilling or within 24 hours of the damage to the root occurring.	Contractors for the person undertaking the action	During the construction of the Development within a Precinct
All construction traffic will be confined to designated access roadways to prevent soil compaction. No heavy machinery to drive under canopies of significant vegetation nominated for retention.	Contractors for the person undertaking the action	During the construction of the Development within a Precinct
Weed and Pathogen Controls		
Implementation of the following weed management measures: ~ Treatment of existing weeds within the construction site.	The person undertaking the action/contractor	During the construction of the Development within a Precinct

<ul style="list-style-type: none"> ~ Limiting machinery access near retained vegetation. ~ Wash-down facilities. ~ Certification of the origin of construction material. 		
Edge planting is undertaken to prevent weed species from penetrating high conservation areas. Recommended that they be at least 5 metres in width.	The person undertaking the action/contractor	Prior to construction of Development within a Precinct
Plant material will be removed from site in a manner which reduces disturbance and is to be disposed of at an approved green waste disposal facility or mulched on-site for landscaping purposes.	The person undertaking the action/contractor	During the construction of the Development within a Precinct
Green waste handling, stockpiling and disposal procedures will be developed and implemented on the site	The person undertaking the action/contractor	Prior to construction of Development within a Precinct
Machinery used for earth-moving and vegetation-clearing will be cleaned and inspected prior to the commencement of work to identify any attached material that needs to be removed for quarantine reasons.	The person undertaking the action/contractor	During the construction of the Development within a Precinct
Implementation of weed management controls to protect retained or rehabilitated wallum sedgefrog habitat in accordance with Wallum Sedgefrog Management Plan for the site (as required by Condition 8).	The person undertaking the action/landscape and environmental contractors	In accordance with timing set out in the Wallum Sedgefrog Management Plan.
Implementation of weed management controls to protect retained or rehabilitated habitats within the EPZ, riparian zones or other conservation areas in accordance with the Vegetation Management and Rehabilitation Plan (Appendix A)	The person undertaking the action/landscape and environmental contractors	During and up to the handover of the area to the relevant governing authority.
<p>Performance criteria:</p> <ul style="list-style-type: none"> ~ Identification and implementation of weed management measures, consistent with the guidance in the Vegetation Management and Rehabilitation Plan (Appendix A). ~ Avoid or otherwise minimise the introduction of any new weed species, and control of existing weeds. ~ Avoid or otherwise minimise dieback from the introduction of pathogens. <p>Implement corrective actions if performance criteria are not achieved as a result of the development</p>		
<p>Monitoring:</p> <ul style="list-style-type: none"> ~ Regular checking of delineated protected vegetation by the contractor, reporting to the Superintendent ~ Regular monitoring of weeds at all disturbed areas, and adjacent vehicle access points by the contractor, reporting to the Superintendent 		
<p>Reporting:</p> <ul style="list-style-type: none"> ~ Any vegetation clearance compliance issues and/or weed control measures implemented must be incorporated into the regular environmental reporting required by the contractor to the Superintendent. 		
<p>Corrective action:</p> <ul style="list-style-type: none"> ~ If clearing occurs outside the delineated, approved areas, cease all work in the area affected and advise Superintendent (and relevant regulatory agencies including the Department if unauthorised clearing occurs in the Riparian Corridor or Frog Zone or associated buffers). ~ Instigate rehabilitation efforts immediately at any area accidentally cleared in accordance with directions from the Superintendent. ~ For retained or rehabilitated habitat, undertake corrective actions as outlined in the Vegetation Management and Rehabilitation Plan. 	<p>Responsibility:</p> <ul style="list-style-type: none"> ~ For clearing works, civil and building contractors, reporting to the Superintendent. ~ For retained or rehabilitated habitat, landscape and/or environmental contractors, reporting to the Superintendent. 	

4 VEGETATION MANAGEMENT AND REHABILITATION PLAN

4.1 Introduction

Condition 1 of the approval requires a Vegetation Management and Rehabilitation Plan (VMRP).

The VMRP informs vegetation management and ecological rehabilitation actions within the Environmental Protection Zone (EPZ) and waterway buffers of the Caloundra South site by providing an overarching rehabilitation and enhancement plan, outlining associated actions required to support its implementation.

The VMRP also supports the protection of Ramsar wetland values, with rehabilitation enhancing the water quality protection measures planned throughout the site.

The VMRP will also be used to inform subsequent Environmental Rehabilitation Plans which are a requirement under the Caloundra South Infrastructure Agreement between the proponent, Sunshine Coast Regional Council and Minister for Economic Development Queensland.

The VMRP is attached to this EMP at Appendix A.

5 ENVIRONMENTAL ENGAGEMENT PLAN

5.1 Introduction

Condition 1 of the approval requires an Environmental Engagement Plan (EEP) be prepared for the site and included as part of the EMP.

The EEP is attached to this EMP at Appendix B.



6 IMPLEMENTATION AND REVIEW

The Commencement of the Action must not occur until the Environmental Management Plan has been approved by the Minister. However, Preliminary Works or Interim Uses on the site are permitted to occur prior the approval of the Environmental Management Plan.

The approved Environmental Management Plan must be implemented until Cessation of the Action. Two years after Development within a Precinct is complete and the Minister has been notified, the Environmental Management Plan no longer applies to that Precinct.

In accordance with Condition 12, if the person undertaking the action wishes to carry out the action, other than in accordance with the Environmental Management Plan, the person undertaking the action must submit to the Minister for approval, a revised Environmental Management Plan. The varied activity must not commence until the Minister has approved the varied Environmental Management Plan. If the Minister approves the varied Environmental Management Plan, the varied Environmental Management Plan must be implemented in place of this Environmental Management Plan.

In accordance with Condition 13, the person undertaking the action must ensure that an independent audit of compliance with the conditions of approval and all management plans, reports, strategies and methods is conducted. The person undertaking the action must submit an audit report to the Minister for approval within three (3) months of the date of completion of the audit, identifying any remedial actions that have taken in response to recommendations identified by the independent auditor, with any proposed changes to this EMP or other management plans, reports, strategies or methods included. The approved Environmental Management Plan must be reviewed by the person undertaking the action within six (6) months of an audit undertaken in accordance with Condition 13.

In accordance with Condition 14, the person undertaking the action must publish a report on their website, for the duration of the project, addressing compliance with the conditions of this approval over the previous twelve (12) months, including implementation of this EMP and other management plans, reports, strategies and methods as specified in the conditions.

In accordance with Condition 17, unless otherwise agreed to in writing with the Minister, the person undertaking the action must publish this EMP and other management plans, reports, strategies, and methods referred to in the conditions of approval on their website. Each management plan, report, strategy, and method must be published on the website within one (1) month of being approved.

7 DEFINITIONS

Action - the Action is the construction of a master planned community on Lot 505 RP 884348, Lot 3 RP 910849 and part of Lot 22 SP 190373 being the **Development** of Caloundra South.

Buffer Zones – buffer areas from the **Development** that consist of the Riparian Corridor, Frog Zone, Frog Buffer and Lifestyle Buffer.

Cessation of the action – 2 years following the completion of construction of the **Development** for all precincts.

Commence/d/ment of the action - The clearing of vegetation, excavation, earth works, provision of drainage or stormwater controls or devices, provisions of access or construction of any dwelling, building or infrastructure. It does not include **Preliminary Works** or **Interim Uses**.

Corrective actions – actions taken in response to performance criteria/objectives failing outside of set objectives.

Department – the Australian Government department administering the Environment Protection and Biodiversity Conservation Act.

Development - means the development of Caloundra South in stages, being the construction activities for the subdivision of a stage including vegetation clearing, site establishment, bulk earthworks, civil works, drainage, stormwater controls and devices, services, roads and other infrastructure, rehabilitation and landscape construction works. **Development** does not include the subsequent construction of structures or buildings, including housing or commercial or industrial buildings and associated infrastructure and hardstand.

Environmental Protection Zone – the area marked as ‘Environmental Protection’ in Annexure A of the conditions of Approval.

Frog Zone – a minimum of 50m from the boundary of each **Riparian Corridor** encompassing known and potentially suitable Wallum Sedge Frog habitat and also created frog habitat. No WSUD detention basins or ponds are to be located in this zone.

Interim Uses - include existing rural uses, including grazing and property management associated with existing rural uses.

Matters of National Environmental Significance – that make up the controlling provisions for the action are listed in Section 1.1 of this EMP.

Minister – the Minister administering Environment Protection and Biodiversity Conservation Act and includes a delegate of the Minister.

Person undertaking the action – Stockland Development Pty Ltd.

Precinct/s – Precincts 1 to 19 as defined by the Caloundra South Urban **Development** Area Master Plan within Annexure A or as amended and approved by the Minister.

Preliminary Works - include:

- a) minor physical disturbance necessary to undertake pre-clearance surveys, to establish monitoring programs, for geotechnical investigations or associated with mobilisation of plant, equipment, materials, machinery or personnel;
- b) surveying or the construction of boreholes;
- c) works associated with maintenance of the **subject site** including chopper rolling and weed management;

- d) works necessary for rehabilitation including construction of frog ponds, installation of monitoring devices and necessary access tracks; and
- e) other activities that are necessary for commencement that are associated with mobilisation of plant and equipment materials machinery and personnel prior to start of **Development** only if such activities will have no adverse impact on **Matters of National Environmental Significance** and only if the proponent has notified the Department in writing before an activity is undertaken.

Public Environment Report (PER) – includes the Draft PER and Supplementary PER assessed under the EPBC Act 1999 Ref:2011/5987.

Publish/ed – documentation available on the person undertaking the action's website for the life of the approval.

Qualified Ecologist – an ecologist with formal qualifications in ecology and with more than 5 years' experience in carrying out ecological assessment and monitoring activities.

Riparian Corridor – minimum 25m wide corridor either side of any creek (from high bank) for retention and rehabilitation of riparian vegetation, providing bank stabilisation and protecting remnant vegetation along creeks.



APPENDIX A: VEGETATION MANAGEMENT AND REHABILITATION PLAN (VMRP)



APPENDIX B: ENVIRONMENTAL ENGAGEMENT PLAN





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Caloundra South

Appendix A

Vegetation Management and Rehabilitation Plan

(EMP Issue) September 2020

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APPENDIX A: VEGETATION MANAGEMENT AND REHABILITATION PLAN

1

INTRODUCTION

As part of the Caloundra South Master Plan, Stockland Development Pty Ltd (Stockland) has secured the protection of approximately 700ha of land for the purpose of protecting, rehabilitating and enhancing ecological features and processes within the Environmental Protection Zone (EPZ) Open Space Waterway Buffers and conservation lands. This equates to approximately 30% of the total site area.

This Vegetation Management and Rehabilitation Plan (VMRP) has been prepared to inform vegetation rehabilitation enhancement actions within the conservation lands by providing an overarching site rehabilitation and enhancement plan, and by outlining the associated actions required to support its implementation. The VMRP applies to the EPZ and all conservation areas required to be rehabilitated and is complemented by a Wallum Sedge Frog Management Plan (federal approval requirement) and a Acid Frog Management Plan (state approval requirement) which addresses specific rehabilitation efforts relevant to acid frogs. The VMRP covers all enhancement and rehabilitation activities within the conservation lands, including monitoring and adaptive management.

This VMRP is to be used as an overarching guide to rehabilitation planning noting that detailed area specific Environmental Rehabilitation Plans (ERP's) are required to be prepared and endorsed by the Minister for Economic Development Queensland (MEDQ) as required by the Caloundra South Infrastructure Agreement (Nov, 2015).

Matters of National Environmental Significance

This VMRP has been prepared in response to Condition 1(f) of the EPBC Act approval, and

outlines specific vegetation management and rehabilitation actions to protect relevant matters of national environmental significance (MNES), being:

- **Wetlands of international importance** – the Moreton Bay Ramsar Wetland which was listed under the Convention on Wetlands of International Importance in 1993;
- **Listed Threatened species and communities** - Wallum Sedge Frog (*Litoria olongburensis*), Water Mouse (*Xeromys myoides*), Attenuate Wattle (*Acacia attenuata*), Swamp Stringybark (*Eucalyptus conglomerata*), Lesser Swamp Orchid (*Phaius Australis*), Wallum Leek (*Prasophyllum wallum*), Emu Mountain She-oak (*Allocasuarina emuina*), Hairy-joint Grass (*Arthraxon hispidus*) and Three-leaved Bosistoa (*Bosistoa transversa*); and
- **Listed Migratory Species** - *Actitis hypoleucos*, *Arenaria interpres*, *Calidris acuminata*, *Calidris alba*, *Calidris canutus*, *Calidris ferruginea*, *Calidris melanotos*, *Calidris ruficollis*, *Calidris tenuirostris*, *Gallinago hardwickii*, *Heteroscelus brevipes*, *Heteroscelus incanus*, *Limicola falcinellus*, *Limnodromus semipalmatus*, *Limosa lapponica*, *Limosa limosa*, *Numenius madagascariensis*, *Numenius minutus*, *Numenius phaeopus*, *Tringa glareola*, *Tringa nebularia*, *Tringa stagnatilis*, *Xenus cinereus*, *Calidris subminuta*, *Phalaropus lobatus*, *Philomachus pugnax*, *Charadrius bicinctus*, *Charadrius leschenaultia*, *Charadrius mongolus*, *Charadrius veredus*, *Pluvialis fulva*, *Pluvialis squatarola*, *Glareola maldivarum*, *Sterna albifrons*, *Sterna caspia*, *Ardea modesta*, *Ardea Ibis*, *Merops ornatus*, *Rhipidura rufifrons*.

1.1 Structure of the VMRP

The VMRP provides the following:

- Definition of what is meant by 'Ecological Enhancement';
- An overview of methodology;

- A review of previous relevant surveys and studies, relevant documents;
- Identification of performance objectives;
- Definition of Habitat Management Units;
- An Integrated Weed Management Strategy;
- An overview of the approach to ecological enhancement (planting and seeding, biohub planting, site hygiene and access, ground management and fire management);
- Implementation actions and staging; and
- Monitoring, reporting and adaptive management framework.

Key elements related to matters of national environmental significance include:

- Biohub planting areas (opportunities for re-introducing/ encouraging EPBC Act listed flora on site);
- Ecological Enhancement of riparian corridors (assist in the protection of water quality in Bells Creek North and South and Lamerough Creek); and
- Ecological enhancement of areas identified for acid frog habitat (habitat for the Wallum Sedgefrog and other acid frogs).

Definition of Ecological Enhancement

In ecological restoration, there are several words that are commonly used, including: restoration, rehabilitation, remediation, regeneration, reconstruction fabrication, and reclamation (Bradshaw 1997; Chenoweth EPLA and Bushland Restoration Services 2012). Each of the terms have their own meaning and are sometimes used in differing contexts. As a number of these concepts are applied within this VMRP, the term 'ecological enhancement' is used generally to describe the effort to restore, rehabilitate, regenerate or fabricate ecological communities across the Conservation Areas in order to assist in the conservation of the target species identified within this Strategy. Conservation Areas within the site are defined as the EPZ, frog buffers and riparian buffers. The actual treatment type (whether it be regeneration or fabrication etc.) will be specific to different zones across the study area. For this reason, Habitat management units (HMUs) have been

delineated across the study area. This is further described in Section 3.

1.2 Site History

The Caloundra South site was previously operated as a pine plantation, however, it is now largely cleared and used for cattle grazing. The pre-existing pine plantation has been cleared from the site and as a consequence the site hydrology has been significantly altered, remnant vegetation is fragmented and fire regimes have been changed.

Remnant vegetation remains along the waterway corridors and is in a moderate to poor condition, being fragmented and subject to edge effects. A Blackbutt forest and other small remnant patches are located in the eastern portion of the site. A Property Map of Assessable Vegetation (PMAV) has been prepared for the site under the Queensland *Vegetation Management Act 1999*, and endorsed by the former Queensland Department of Environment and Resource Management (DERM) now known as the Department of Environment and Heritage Protection (DEHP), confirming the extent of State significant vegetation on the site.

The site is traversed by three waterways, Lamerough Creek to the north of the site and south of Caloundra Aerodrome; Bells Creek North and Bells Creek South. Both of these latter waterways are tributaries of Bells Creek. The confluence of Bells Creek North and South occurs to the south east of the site, Bells Creek then flows into Pumicestone Passage which is part of the Moreton Bay Ramsar site.

The Caloundra South landholding is predominantly located to the east of the Bruce Highway (with a 119ha portion located to the west of the Bruce Highway). Further west of this portion of land is State Forest (pine plantation). To the north of the site are various other developments including Little Mountain and Stockland owned Bells Reach. Bells Reach is currently under construction. Caloundra Aerodrome and the Caloundra State Industrial Park are also located to the north of the site. Directly east of Caloundra South is a parcel of unallocated State land

containing remnant wetlands of State significance. Further east of this wetland is the residential area of Pelican Waters. Directly south of Caloundra South is a land parcel owned by Stockland. Between this site and the Pumicestone Passage are various land parcels.

2

METHODOLOGY

2.1 Desktop Review

The Caloundra South site has been studied in detail for more than a decade, and there are several documents of use to this VMRP. A review of previous studies and reports was undertaken to gain an understanding of the current ecological features and conditions, as well as the historical land-use practices that have influenced the site. The review included identification of what pre-existing plans, objectives, ecological information and GIS data could aid the preparation of this document.

Publicly available GIS mapping as well as literature relevant to the ecology of the study area was also reviewed. This included the following sources:

- Relevant scientific literature and guidelines, which are cited throughout this report;
- Pre-clearing and current Remnant Regional Ecosystem mapping version 6.1 (DERM 2011);
- High value regrowth vegetation mapping version 2.1 (DNRM 2011);
- Wetland Management Area mapping and classification (DNRM 2011);
- Directory of Important Wetlands mapping (Australian Department of Environment and Heritage 2005); and
- Protected Areas of Queensland mapping (DNRM 2012).

2.2 Fieldwork

To inform this VMRP a site survey was undertaken on 13th and 14th February 2013 in order to understand current vegetation communities at that time and determine the most suitable treatment. The survey also verified previous habitat and vegetation community mapping undertaken by BAAM

(2011) as well re-assessed the suitability of the management units prescribed in the Greening Australia Rehabilitation Strategy (2011).

A team of three ecologists traversed the areas of planned enhancement by foot and by vehicle. At representative points within the study area, general notes were collected based on observations of seral stage, soil, topography, and flora. The landscape context (i.e. proximity to a source of flora dispersal) was also noted.

2.3 Assumptions and limitations

The following assumptions and limitations are relevant to this VMRP:

- The VMRP has been developed based on the best available information at the time of preparation.
- The VMRP has been developed based on existing information and studies. Detailed hydrology and soil surveys will inform and refine understanding of localised conditions, which in turn will guide the development of specific planting regimes to be documented in rehabilitation area plans (on a stage by stage basis), to be endorsed by MEDQ as required by the Caloundra South Infrastructure Agreement. Recommendations for further survey are discussed in Section 8.

2.4 Relationship to the Caloundra South Infrastructure Agreement

This VMRP is to be used as a guide to inform Environmental Rehabilitation Plans (ERP's) as required by the Caloundra South Infrastructure Agreement (**The IA**). **The IA** was signed in November 2015 by Stockland, Sunshine Coast Council and the Minister for Economic Development Queensland (MEDQ).

The IA requires all EPBC approved documents to be complied with, including this VMRP.

Section 3 of **The IA** relates to the Conservation Infrastructure Network. Prior to the commencement of subdivision works within a relevant Precinct, an Environmental Rehabilitation Plan (ERP) is required to be submitted to MEDQ for compliance assessment. Due to the time difference between the endorsement of the original VMRP (this document), and vegetation re-

growth that has subsequently occurred, updated surveys are required to inform each ERP, confirming required rehabilitation measures for each Habitat Management Unit (HMU). Updated survey Information that forms part of each ERP, supersedes the areas and specifications outlined in Section 5, table 3, as they will represent site based conditions at the time of preparing each ERP

3

HABITAT MANAGEMENT UNIT METHODOLOGY

As ecological characteristics and conditions vary across the site, individual HMUs have been delineated to prescribe efficient and tailored treatments for different areas. They have been created with review and assessment of objectives, constraints and opportunities identified during the desktop and field studies. They also recognise the

resource constraints required to undertake such works.

HMUs treatments and biohub specifications within this VMRP have been based on known information about each target species, as are further discussed in Chapter 5.

4

PERFORMANCE OBJECTIVES

Performance objectives have been designed as measurable steps that are required to achieve the main aim, which is to efficiently rehabilitate and enhance habitat areas to a suitable quality, quantity and configuration to allow for the conservation of the target species with minimal ongoing maintenance. Different species targeted in this VMRP require different objectives. For this reason, Table 1 outlines the objectives for enhancement, including overall community and species objectives.

Table 1 Objectives and Performance Indicators for Conservation Areas

Target	Objective	Performance indicators
Overall	Net gain in biodiversity across conservation areas upon completion of enhancement activities and the transfer of site for conservation status (i.e. National Park, Council reserve, nature refuge).	This will be measured by proxy by calculating the increase in quantity (ha) and quality (low, medium, high quality classes) of functioning native vegetation across site.
	Create a net biodiversity gain representing a 20% improvement over the site's biodiversity values from the time of site purchase.	This will be measured by assessing the percentage of functioning native vegetation across site.
	Conserve, enhance and extend existing ecological corridors to enhance fauna and flora movement/dispersal within and across the site.	This will be measured by assessing the percentage of functioning native vegetation across site, with a subjective assessment of the degree of fragmentation and quality of wildlife movement corridors.
	Continued targeted feral fauna control across the site through partnerships with council and the State to reduce impacts associated with feral animals.	Measured by the presence/absence of a feral fauna control program.
	Manage the ecological enhancement as per this VMRP.	The state at which handover may occur will need to be agreed with the receiving party.
Community	Encourage community to adopt responsible domestic pet ownership and understand the implications of feeding native fauna or pest animals through environmental educational programs and domestic animal control.	Measured by the presence/absence of education programs about domestic animal control and the feeding of native fauna.
	Encourage residents participation in ecological enhancement through community, programs, education and native garden schemes. The latter will prevent weed colonisation into	Establishment and participation of community in enhancement efforts Measured by the presence/absence of: <ul style="list-style-type: none"> ● A community participation program for enhancement efforts;

Target	Objective	Performance indicators
	enhancement areas and assist with domestic animal control. Community education materials are to be prepared and implemented during the development of each Precinct.	<ul style="list-style-type: none"> ● Education programs (e.g. interpretive displays) about the enhancement program; ● Education programs regarding native garden schemes; and ● An Environmental Education Strategy has been prepared assist in achieving these outcomes.
	Restrict community access to areas undergoing enhancement. Walkways to minimise extent and significance of human intrusion impacts and edge effects.	<p>No community walkways or public access will be provided into sensitive areas, being Biohub areas, frog habitat areas, and areas in the initial stages of enhancement.</p> <p>This will be measured by the presence/absence of appropriate fencing and / or signage along walkways and EPZ boundaries.</p> <p>Restrict domestic animals from entering enhancement areas through implementation of the EMP.</p>
Wallum sedgefrogs	Refer to the Wallum Sedgefrog Management Plan.	Refer to the Wallum Sedgefrog Management Plan.
Water Mouse	Maintain habitat quality of potential Water Mouse habitat areas within the site during development activities and maintenance period.	<p>Habitat suitable for the water mouse persists within Conservation Areas within the site boundaries and directly adjacent to the site boundaries.</p> <p>Restrict domestic animals from entering enhancement areas through implementation of the EMP.</p>
	As per the Draft PER (Chapter C8, p. 685), rehabilitation within the EPZ in the vicinity of the confluence of Bells Creek North and South with a view to enhancing Water Mouse habitat values.	Implementation of this VMRP, HMU Management Plans and Fire Management Plans.
EPBC Act Migratory species	<p>To protect downstream habitat quality through the restoration of riparian zones during the development and maintenance stages.</p> <p>To provide an increase in habitat for migratory bird species on the site, in the form of roosting, foraging and nesting.</p>	Increased wetland and sedgeland habitat across the site to support migratory wetland species.
EPBC Act Flora: Acacia attenuata	Increase the area of suitable quality habitat for EPBC Act listed flora species prior to the handover of the EPZ and riparian zones.	Creation of intact areas of suitable habitat to support EPBC Act listed flora, with a weed cover of less than 5%.
Allocasuarina emuina Eucalyptus conglomerata Phaius australis Prasophyllum wallum	Where practical and feasible, reintroduce and maintain populations of EPBC Act listed flora species on the site and configure areas of habitat strategically to allow dispersal into suitable adjacent areas.	<p>Preparation and implementation of Biohubs throughout the life of the enhancement strategy. This will be measured by the presence/absence of a plan.</p> <p>Incorporation and management of propagules of each species within planted Biohub zones within areas of suitable habitat. This will be measured by the presence/absence of established management zones.</p> <p>Continued persistence of viable local populations of each EPBC Act listed flora species, measured in accordance with monitoring requirements for handover.</p> <p>Strategic placement of flora Biohubs throughout the landscape to maximise dispersal across other suitable habitat areas (on and off site). This will be measured by assessing the level of successful</p>

Target	Objective	Performance indicators
		colonisation of EPBC Act flora outside of Biohub areas through natural dispersal.

5

MANAGEMENT UNITS AND ASSOCIATED TREATMENTS

Management units have been proposed to provide for improvement in habitat availability and quality for EPBC Act listed threatened flora species and threatened and migratory fauna species (Table 2).

A total of 59 management units have been delineated across the study area, to plan the staged restoration of the EPZ and waterway corridors. These are shown in Figure 1, with details of their associated treatments provided in Figure 2 and Table 3. Further detail of the treatment types will be further provided in precinct level Environment Rehabilitation Plans, which will be prepared prior to the commencement of subdivision works in each precinct. For the purpose of this VMRP, treatment types are described within a strategic and site-wide context, providing overarching direction to the future HMU-specific plans.

The approved Caloundra South Master Plan identifies the Environmental Protection Zone as an 'Environmental Protection Land Use Area'. The intent of this land use area is outlined in Box 1. As the definition of HMU treatments has been conducted at a strategic and site wide level, these do not preclude the development of the environmental education centre (Eco Sanctuary) or other community oriented infrastructure or infrastructure to service the development. Identified HMU treatments also do not preclude the establishment of the CAMCOS rail corridor.

Enhancement treatments for each of the HMUs range from natural regeneration to assisted rehabilitation and habitat reconstruction and generally follow the common restoration approaches outlined in Table 4, as adapted from the SEQ Restoration Framework (Chenoweth EPLA and Bushland Restoration Services 2012).

There are several management aspects associated with each of the treatments. This includes the requirements for:

- Integrated weed management;
- Seeding and planting;
- Biohub planting;
- Site hygiene and access;
- Ground management; and
- Fire management.

Table 4 details the management units and associated treatments. Green highlighted rows represent Biohub areas.

Box 1 (from the approved Caloundra South Master Plan)

It is intended that this Zone be protected for conservation and rehabilitation purposes with opportunities for passive recreation, road infrastructure and water quality and quantity management, where appropriate. Other uses may also be considered as noted as permissible development within the Development Scheme.

This area includes the Blackbutt Forest and adjacent potential Eco Sanctuary, which is envisaged to accommodate passive recreation with an educational and interpretive centre that will be designed to showcase the natural environment and maximise environmental integrity and stewardship.

The Environmental Protection Zone includes areas that are of environmental significance and have associated conservation, biodiversity, habitat or scenic amenity values. The Zone may also provide for buffers between incompatible land uses and includes land constrained by features such as saline and dispersive soils, bushfire risk, erosion and flooding. The Zone may accommodate elements for an integrated open space network providing for multipurpose functions that respond to community needs provided they do not compromise environmental values.

The Zone allows only a limited range of low impact, low-intensity land uses to protect areas identified as having significant values for biological diversity, water catchment, ecological functioning or cultural values.

Table 2: Target Species Information and Potential Rehabilitation Habitat Onsite

MNES	Suitable Habitat Characteristics	Species/ Habitat Threatening Processes	Potential Rehabilitation Habitat on Site
<p>Wallum Sedgefrog</p>	<p>Hydrology: Seasonal hydrological conditions which allow for:</p> <ul style="list-style-type: none"> ● Persistence of surface water for a minimum of eight weeks during the summer wet season; and ● Complete drying at some time during the year to reduce likelihood of predatory fish persisting. <p>Breeding habitat located outside of post –development Q5 level (movement corridors can be located within Q5 level). Most recorded habitats have water depths <50cm. Eggs generally laid in still water (0.5-20cm deep).</p> <p>Water Quality: Surface water qualities include:</p> <ul style="list-style-type: none"> ● pH levels similar to or lower than pH levels recorded during surveys (i.e., <4.9 [mean = 4.41, std dev = 0.34]); ● positioned entirely within sandy soil which does not buffer water acidity to the extent more clayey soils do; ● Tannin-staining at levels comparable to, or higher than, the median level recorded during surveys (i.e., around 9.5 tannic acid equivalents [mg/L] or higher); ● Low levels of monomeric Aluminium consistent with (non-toxic) levels in siliceous sand and Wallum waters generally; ● Heavy metals at no more than trace levels, commensurate with very low levels typical of Wallum waters; ● Low levels of dissolved Calcium consistent with levels typical of wallum waters (i.e., [Ca2+] 80 µM or less); ● Salinity levels broadly consistent with levels recorded on site during surveys (i.e., salinity < 50 ppm); ● <p>Vegetation:</p> <ul style="list-style-type: none"> ● WSF has strong affiliation with cylindrical, erect sedges and is sensitive to changes in vegetation composition and structure. ● Breeding and feeding occurs on erect, cylindrical, semi-aquatic, emergent vegetation consistent with species common in existing habitats (i.e. <i>Baumea articulata</i>, <i>Baumea juncea</i>, <i>Baumea rubiginosa</i>, <i>Juncus usitatus</i>, <i>Lepironia articulata</i>). ● Flat, broad sedges including <i>Cyperus haspan</i>, <i>Cyperus exaltatus</i> and <i>Cyperus polystachyos</i> not suitable for the species. <p>Location: Connectivity between habitats is important to maintain genetic diversity in the WSF Caloundra Unit. Movements less than or equal to 500m are likely; movements over 500m-1km are possible but less frequent; and movements over 1km are infrequent or unlikely.</p>	<p>pH, increased salinity, elevated Al, high heavy metals (Ca and Pb) and increased nitrates can effect breeding success of WSF.</p> <p>Weeds:</p> <ul style="list-style-type: none"> ● Pine regrowth may outcompete grasses and sedges in WSF habitat and lower groundwater tables reducing pooling of surface waters for WSF habitat. ● Dense <i>Setaria sphacelata</i> groundcover competes with sedges and reduces WSF breeding habitat values. ● <i>Desmodium uncinatum</i> vine, which is tolerant of low pH, has the potential to entrap frogs. <p>Common Sedgefrog: WSF can be outcompeted by common sedge frog which prefers less acidic waters. Water chemistry will be important in limiting competition with this species. In particular, increased pH and/or reduced organic acid levels may facilitate breeding of Common Sedgefrog.</p> <p>Predatory Introduced Fish: Low potential for <i>Gambusia</i> threats to WSF habitat outside of Q5 inundation zone.</p>	<ul style="list-style-type: none"> ● High: Wet heath/ wet heath and eucalypt-melaleuca ecotones/ sedgeland/reedy drainage lines. ● Medium: eucalypt-melaleuca woodland to forest ● Low: eucalypt open forest / rainforest / mangroves and saltmarsh / cleared pasture and plantation (excluding reedy drainage lines) .
<p>Water Mouse</p>	<ul style="list-style-type: none"> ● Occurs in a variety of estuarine, brackish and freshwater wetlands. ● Essential Habitat for Water Mouse (DERM, (2011b) includes sedgeland (<i>Juncus</i>, <i>Baumea</i>, <i>Lepironia</i>, <i>Cyperus</i>, <i>Eleocharis</i>), salt meadow/saline grassland (<i>Sporobolus virginicus</i>), wet heathland (<i>Banksia robur</i>, <i>Gahnia</i> spp.) and saltmarsh-chenopod grassland behind mangroves; and in open-closed mangrove scrub-forest , <i>Melaleuca quinquenervia</i> swamp forest or fresh-water mangrove, and supralittoral banks with <i>Callitris</i> and <i>Casuarina</i>. ● Forages across intertidal flats for relatively common marine invertebrates. ● Consumes prey within hollow base of mangroves, under logs, and inclined hollows (<2m above ground) ● Nests include; hollow tree trunks of mangroves, <i>Casuarina glauca</i>, <i>Melaleuca quinquenervia</i> and <i>Eucalyptus tereticornis</i>; supralittoral banks; free-standing nests; island nests. ● Mangrove communities typically comprised of <i>Avicennia marina</i>, <i>Rhizophora stylosa</i>, <i>Bruguiera gymnorhiza</i>, <i>Aegiceras corniculatum</i> and <i>Ceriops tagal</i>. ● Upper tidal areas on the shoreward side of the mangrove zone often support sedgeland or salt meadows comprised of <i>Juncus kraussii</i>, <i>Baumea juncea</i>, <i>B. rubiginosa</i>, <i>Fimbristylis ferruginea</i> and <i>Sporobolus virginicus</i>. <p>Can prefer wide mangrove zone of short mangroves and a high percentage of relatively tall vegetation cover in the sedge/saltmarsh zone (Russell and Hale, 2009).</p>	<ul style="list-style-type: none"> ● Fragmented freshwater and intertidal habitats. ● Habitat degradation as a result of altered hydrology, degraded water quality, inappropriate fire regimes and recreation activities such as jet skis and motor boats. ● Predation pressure including domestic dogs and cats. 	<ul style="list-style-type: none"> ● High: mangroves and saltmarsh / sedgeland / melaleuca woodland to forest . ● Medium: eucalypt-melaleuca woodland to forest ● Low: eucalypt open forest / rainforest / cleared pasture and plantation.

Table 2 continued: Target Species Information and Potential Rehabilitation Habitat Onsite

MNES	Suitable Habitat Characteristics	Species/ Habitat Threatening Processes	Potential Rehabilitation Habitat on Site
Migratory Birds	<ul style="list-style-type: none"> ● Estuarine wetlands provide highest habitat value for greatest number of migratory bird species. ● Habitats include exposed intertidal areas, mangroves, saltmarsh, sedgeland and Casuarina glauca communities. ● Wetland habitat of Upper Bells Creek within and adjacent to the site support potentially suitable feeding habitat for a small number of species including Latham's Snipe though do not support any known high tide roosts 	<ul style="list-style-type: none"> ● Fragmented freshwater and intertidal habitats ● Habitat degradation as a result of altered hydrology, degraded water quality, inappropriate fire regimes and recreation activities such as jet skis and motor boats ● Predation pressure including domestic dogs and cats 	<ul style="list-style-type: none"> ● High: mangroves and saltmarsh ● Medium: sedgeland / melaleuca woodland to forest ● Low: eucalypt-melaleuca woodland to forest / eucalypt open forest / rainforest / cleared pasture and plantation.
<i>Acacia attenuata</i>	<ul style="list-style-type: none"> ● Seasonally waterlogged, infertile sandy soils or peat swamps typically in wet heathland and eucalypt open forest ecotones. ● Prefers higher, light environments. ● Habitat REs include 12.2.13, 12.3.13, 12.3.14, 12.3.5 and 12.9/10.4 	<ul style="list-style-type: none"> ● Habitat removal and degradation. 	<ul style="list-style-type: none"> ● High: Wet heath / wet heath and eucalypt-melaleuca ecotones and riparian corridors ● Medium: eucalypt open forest ● Low: rainforest / mangroves and saltmarsh / reedy drainage lines and cleared pasture and plantation.
<i>Prasophyllum wallum</i>	<ul style="list-style-type: none"> ● Wallum communities and coastal Melaleuca swamp wetlands. 	<ul style="list-style-type: none"> ● Habitat removal and degradation. 	<ul style="list-style-type: none"> ● High: Wet heath and transition zone with melaleuca swamp ● Medium: melaleuca elements of eucalypt/melaleuca woodland to open forest and riparian corridors. ● Low: eucalypt open forest / rainforest / mangroves and saltmarsh / reedy drainage lines and cleared pasture and plantation.
<i>Allocasuarina emuina</i>	<ul style="list-style-type: none"> ● Open and closed wallum heath 	<ul style="list-style-type: none"> ● Habitat removal and degradation. 	<ul style="list-style-type: none"> ● High: Wet heath ● Medium: melaleuca elements of eucalypt/melaleuca woodland to open forest. ● Low: eucalypt open forest / rainforest / mangroves and saltmarsh / reedy drainage lines and cleared pasture and plantation.
<i>Phaius australis</i>	<ul style="list-style-type: none"> ● Wet heath / sedgeland wetlands, swampy grassland or swampy forest including rainforest, eucalypt or paperbark forest in coastal areas. ● Associated REs include 12.2.7, 12.3.5 and 12.9/10.14. ● High light can be tolerated but less preferred. 	<ul style="list-style-type: none"> ● Habitat removal and degradation. 	<ul style="list-style-type: none"> ● High: Transition zone between wet heath and melaleuca swamp / melaleuca –eucalypt communities; ● Medium: eucalypt open forest / rainforest. ● Low: mangroves and saltmarsh; reedy drainage lines and cleared pasture and plantation.
<i>Eucalyptus conglomerata</i>	<ul style="list-style-type: none"> ● Margins between open forest and heathland on deep sandy acidic often poorly drained soils. ● Associated RE's include 12.34, 12.3.13 and 12.3.14. 	<ul style="list-style-type: none"> ● Habitat removal and degradation. 	<ul style="list-style-type: none"> ● High: Wet heath and ecotone between wallum and eucalypt/melaleuca woodland to open forest. ● Medium: eucalypt/melaleuca woodland to open forest ● Low: eucalypt open forest; rainforest; mangroves and saltmarsh; reedy drainage lines and cleared pasture and plantation.

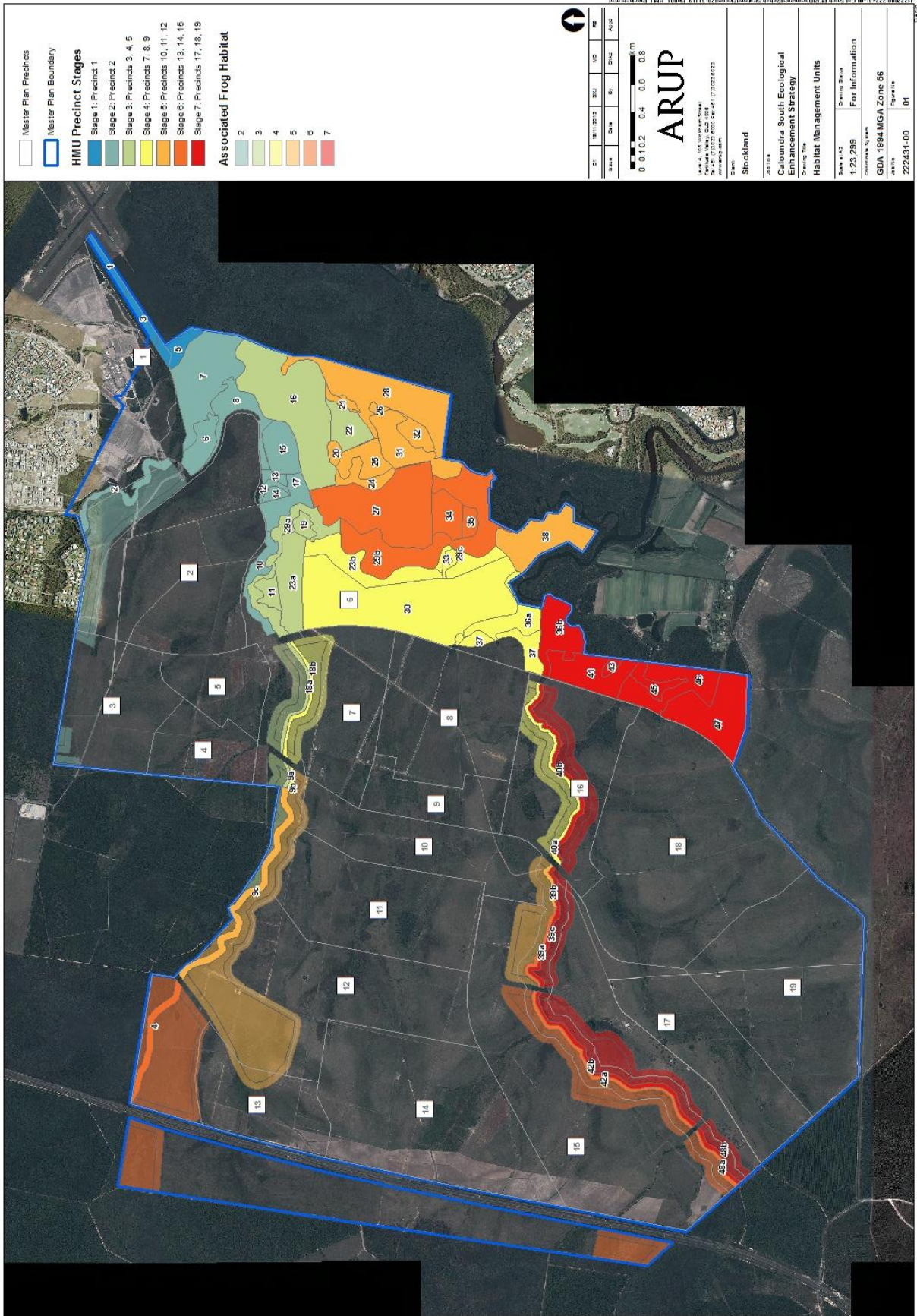


Figure 1 Habitat Management Units and Associated Staging

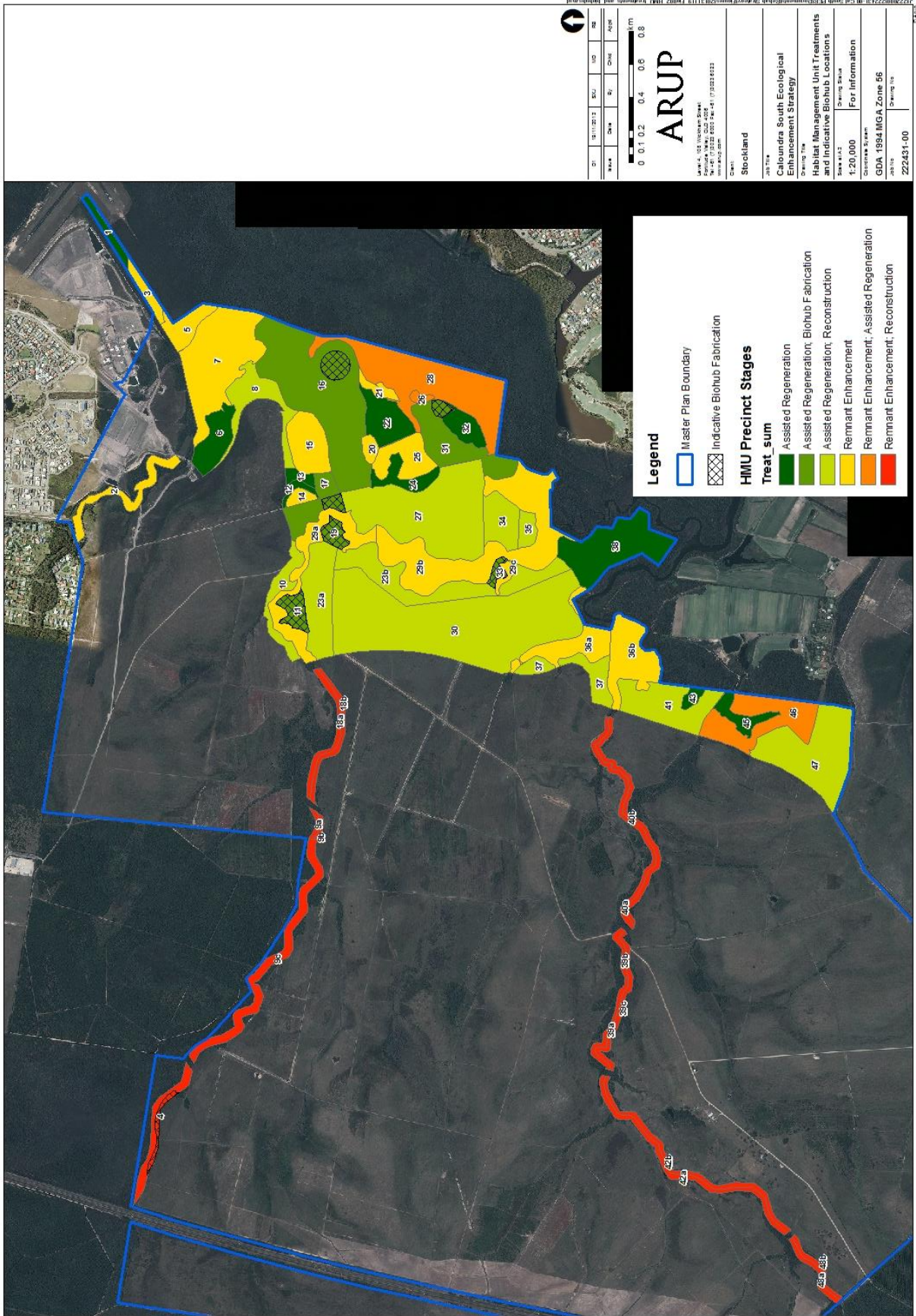


Figure 2 HMU treatments

Table 3: Habitat Management Units and Associated Treatments

HMU	Approx. Area (ha)	Target Species ²	Current Ecological Condition	Current Flora	Target Community	Treatment	Further information (e.g. Weed Management ³ , Planting/Seeding, Grazing or Soil management, timing)
STAGE 1 - Associated with Development of Precinct 1							
1	2.288	Aa, WSF, Pa Pw	Low to Moderate	Melaleuca regrowth +/- Pine. High quality WSF habitat present	Melaleuca Forest, Sedgeland	Assisted Regeneration	Integrated weed management required – predominantly mechanical removal, herbicide and access exclusion. Maintenance of WSF habitat. Further assessment into the use of frog-sensitive herbicide use required due to proximity to planned Wallum sedgefrog habitat.
3	2.222	Aa, Ae, WSF, Ec, Pa, Pw	Moderate	Remnant RE 12.3.4 and wet low heath regrowth	Melaleuca Forest, Wet Heath.	Remnant enhancement	Weed management determined by ongoing monitoring and maintenance. Fire management to incorporate recommended fire interval of every 12-20 years
5	4.246	Aa, Ae, WSF, Ec, Pa, Pw	Moderate to high	Remnant RE 12.3.13/14. Wet heath regrowth	12.3.13, 12.3.14	Remnant Enhancement	Weed management as determined by ongoing monitoring. Fire management to incorporate recommended fire interval of every 12-20 years.
STAGE 2 - Associated with Development of Precinct 2							
2	4.719	Aa, Ec, Pa, Pw	Moderate	Lamerough Creek Riparian Buffer. Predominantly remnant 12.3.5 and 12.3.6.	Melaleuca Forest	Remnant Enhancement	Integrated weed management required – predominantly mechanical removal, herbicide and access exclusion. Further assessment into the use of frog-sensitive herbicide use required due to proximity to planned Wallum sedgefrog habitat.
6	6.793	Aa, WSF, Ec, Pa, Pw	Moderate	<i>Melaleuca quinquenervia</i> regrowth with sedge ground layer (very high WSF habitat). Heath shrubs (e.g. <i>Hakea actites</i> and <i>Acacias</i>) towards centre on higher ground.	Melaleuca Forest, Sedgeland	Assisted Regeneration	Low level of integrated weed management required – predominantly Mechanical removal, herbicide and access exclusion. Maintenance of WSF habitat. Further assessment into the use of frog-sensitive herbicide use required due to Wallum sedgefrog habitat.
7	23.100	Aa, WSF, Ec, Pa, Pw	Moderate to High	Remnant RE 12.3.5. Some sedgeland areas to the south that contain very high quality WSF habitat.	12.3.5	Remnant Enhancement	Weed management to be determined by ongoing monitoring and maintenance. Particular focus on southern edge, adjacent to regrowth heath areas. Fire management to incorporate recommended fire intervals of: <ul style="list-style-type: none"> ● Heath understory 8-12 years ● Sedge understory 12-20 years Mixed grass/shrub understory 6-20 years.
8	8.298	Aa, Ae, WSF, Ec, Pa, Pw	Low	Pasture with native sedges concentrated in drainage. Heath elements, low forbs. Regularly slashed. Very high quality WSF habitat present in northern portion.	Heath, Sedgeland, Melaleuca Forest	Assisted Regeneration and Reconstruction	The Environment Education Centre is planned to exist in this HMU. Treatments with this HMU will need to account for the associated development footprint and landscape design. Integrated weed management required. Maintenance of Wallum sedgefrog habitat. Further assessment into the use of frog-sensitive herbicide use required due to proximity to planned Wallum sedgefrog habitat. Due to staging on the Master plan, a 30m wide area of reconstructed Melaleuca forest should be established along the edges that border the Sports and Recreation areas to provide a buffer against edge effects (i.e. enhanced competition from weeds during regeneration). The first five metres of this buffer should be densely planted.
10	8.096	Aa, Ae, WSF, Ec, Pa, Pw	Low	Melaleuca regrowth with pasture grasses. Many heath forbs and sedges.	Heath, Melaleuca Forest.	Assisted Regeneration and Reconstruction	High level of integrated weed management required. Due to staging on the Master plan, a 30m wide area of reconstructed Melaleuca forest should be established at the northern and western edges to provide a buffer against edge effects (i.e. enhanced competition from weeds during regeneration). The first five metres of this buffer should be densely planted. With continued weed management the need for a reconstruction treatment (planting) across the whole HMU can be assessed at future stages.
12	1.301	Aa, Ec, Pa, Pw	Moderate	Melaleuca regrowth +/- Pine	Melaleuca Forest, Sedgeland	Assisted Regeneration	The Environment Education Centre is planned to exist in this HMU. Treatments with this HMU will need to account for the associated development footprint and landscape design. Low level of integrated weed management required to control pasture grass and pine regrowth. Further assessment into the use of frog-sensitive herbicide use required due to proximity to high quality Wallum sedgefrog habitat to the west.
13	1.497	Aa Ec, Pa, Pw	Low	Pasture grass with occasional <i>Gahnia siberiana</i> . Juvenile <i>M. quinquenervia</i> also present.	Melaleuca Forest	Assisted Regeneration and Reconstruction	The Environment Education Centre is planned to exist in this HMU. Treatments with this HMU will need to account for the associated development footprint and landscape design. High level of integrated weed management required to control pasture grass and pine regrowth. Due to staging on the master plan, a 30m wide area of reconstructed Melaleuca forest / sedgeland (i.e. RE 12.3.5) should be established at the northern edge to provide a buffer against edge effects (i.e. enhanced competition from weeds during regeneration). The first five metres of this buffer should be densely planted. With continued weed management the need for a reconstruction treatment (planting) across the whole HMU can be assessed at future stages.

HMU	Approx. Area (ha)	Target Species ²	Current Ecological Condition	Current Flora	Target Community	Treatment	Further information (e.g. Weed Management ³ , Planting/Seeding, Grazing or Soil management, timing)
14	1.354	Aa, Ae, WSF, Pa, Pw	Moderate	Remnant RE 12.3.13	12.3.13	Remnant Enhancement	Weed management to be determined by ongoing monitoring and maintenance. Particular focus on edges of patch to avoid pasture grass and pine incursion. Fire management to incorporate recommended fire intervals of 7-20 years with emphasis on the 8-12 year range.
15	7.913	None	Moderate to High	Remnant RE 12.9-10.14 Blackbutt forest.	12.9-10.14	Remnant enhancement	The Environment Education Centre is planned to exist in this HMU. Treatments with this HMU will need to account for the associated development footprint and landscape design. Weed management to be determined by ongoing monitoring and maintenance. Particular focus on edges of patch to avoid pasture grass and pine incursion. Fire management to incorporate recommended fire intervals of 4-8 years maintains a healthy grassy system. 8-20 years for shrubby elements of understorey.
17	6.384	Aa WSF, Ec, Pa, Pw	Low	Pasture grass with occasional <i>Gahnia siberiana</i> . Juvenile <i>M. quinquenervia</i> also present. High value WSF habitat present.	Melaleuca Forest, Sedgeland Biohub for Aa, Ec, Pa, Pw	Assisted Regeneration with an area of Biohub Fabrication	The Environment Centre is planned to exist in this HMU. Treatments with this HMU will need to account for the associated development footprint and landscape design. High level of integrated weed management required to control pasture grasses and pine regrowth. Due to differing conditions across site, HMU-specific assessment is required at the implementation stage to determine locations of plantings for each biohub species. Biohub plantings should be towards the southern portion of the HMU. Due to staging on the Master plan, a 30m wide area of reconstructed Melaleuca forest should be established at the northern edge to provide a buffer against edge effects (i.e. enhanced competition from weeds during regeneration). The first five metres of this buffer should be densely planted. With continued weed management the need for a reconstruction treatment (planting) across the whole HMU can be assessed at future stages.
STAGE 3 - Associated with Development of Precincts 3, 4 and 5							
9a	0.487	Aa, Ec, Pa, Pw	Low to Moderate	Bells Creek North Riparian Buffer. Remnant RE 12.3.4 and 12.3.5 and cleared areas that contain pasture grasses, some regrowth <i>M. quinquenervia</i> and native sedge.	Melaleuca Forest	Remnant enhancement and Reconstruction	Integrated weed management required, with high efforts required for non-remnant areas. Further assessment into the use of frog-sensitive herbicide use required due to proximity to planned Wallum sedgefrog habitat. Plantings of flora associated with RE12.3.4 and 12.3.5 to be established for riparian enhancement and bank stability.
11	2.861	Aa, Ec, Pa, Pw	Low	Melaleuca regrowth with pasture grasses	Melaleuca Forest Biohub for Aa, Ec, Pa.	Assisted Regeneration with areas of Biohub Fabrication	Medium level of integrated weed management required to control pasture grasses and pine regrowth. Fabrication of biohub to be undertaken in sheltered, suitable areas
16	37.529	Aa, Ae, WSF, Pa, Pw	Moderate	Low regrowth heath. Pasture grasses co-dominating with heath elements. Very high quality WSF habitat present throughout area.	Heath, Sedgeland Biohub areas for Ae	Assisted Regeneration and Biohub Fabrication	The Environment Education Centre is planned to exist in this HMU. Treatments with this HMU will need to account for the associated development footprint and landscape design. Low level of integrated weed management required to control pasture grasses. Maintenance of existing WSF habitat. Potential for several Biohub areas of Aa, Ae, Ec, Pa, Pw to be determined in detailed rehabilitation stage. Biohubs species may be dispersed in several locations throughout the HMU depending on suitability of habitat. Some areas of RE 12.3.1 (HMU 20) may regrow and extend into this HMU..
18a	2.356	Aa, Ec, Pa, Pw	Low to Moderate	Bells Creek North Riparian Buffer. Remnant RE 12.3.5 and large areas of cleared pasture.	Melaleuca Forest	Remnant Enhancement and Reconstruction	Integrated weed management required, with high efforts required for non-remnant areas. Further assessment into the use of frog-sensitive herbicide use required due to proximity to planned Wallum sedgefrog habitat.
19	2.014	Aa, Ec, Pa, Pw	Low	Melaleuca regrowth with pasture grasses	Melaleuca Forest, Sedgeland Biohub for Aa, Ec, Pa, Pw	Assisted Regeneration with an area of Biohub Fabrication	High level of integrated weed management required to control pasture grasses and pine regrowth. HMU-specific assessment is required to determine locations of plantings for each biohub species.
23a	11.708	Aa, WSF, Ec, Pa, Pw	Low	Predominantly pasture with some juvenile pine and <i>M. quinquenervia</i> (due to proximity to remnant RE area). High and low quality WSF habitat present.	Melaleuca Forest, Sedgeland	Assisted Regeneration and Reconstruction	This HMU has been designed to provide a buffer to the waterway and biohub, and act as a source area for dispersal. As an initial step, a high level of integrated weed management required to steer the community back to Melaleuca and Sedgeland. Integrated weed management measures such as planting of <i>M. quinquenervia</i> (to help exclude weeds), herbicide, grazing and/or fire are to be considered. With continued weed management the need for a reconstruction treatment (planting) across the whole HMU can be assessed at future stages. Maintenance of WSF habitat is required. There is potential to rehabilitate the low quality WSF habitat to high quality through earthworks and weed management.

HMU	Approx. Area (ha)	Target Species ²	Current Ecological Condition	Current Flora	Target Community	Treatment	Further information (e.g. Weed Management ³ , Planting/Seeding, Grazing or Soil management, timing)
29a	10.519	Aa, WSF, Ec, Pa, Pw	Moderate to High	Remnant RE 12.3.5	12.3.5	Remnant Enhancement	Weed management to be determined by ongoing monitoring and maintenance. Particular focus on edges of remnant riparian vegetation to treat spread of pasture grass within the understory and pine regrowth. Fire management to incorporate recommended fire intervals for heath understory 8-12 years, sedge understory 12-20 years, mixed grass/shrub understory 6-20 years.
STAGE 4 - Associated with Development of Precincts 7, 8 and 9							
9b	0.411	Aa, Ec, Pa, Pw	Low to Moderate	Bells Creek North Riparian Buffer. Remnant RE 12.3.4 and 12.3.5 and cleared areas that contain pasture grasses, some regrowth <i>M. quinquenervia</i> and native sedge.	Melaleuca Forest	Remnant enhancement and Reconstruction	Integrated weed management required, with high efforts required for non-remnant areas. Further assessment into the use of frog-sensitive herbicide use required due to proximity to planned Wallum sedgefrog habitat. Plantings of flora associated with RE12.3.4 and 12.3.5 to be established for riparian enhancement and bank stability.
18b	2.326	Aa, Ec, Pa, Pw	Low to Moderate	Bells Creek North Riparian Buffer. Remnant RE 12.3.5 and large areas of cleared pasture.	Melaleuca Forest	Remnant Enhancement and Reconstruction	Integrated weed management required, with high efforts required for non-remnant areas. Reconstruct Melaleuca forest (RE 12.3.5) sections of the Bells Creek North corridor (southern side) at the commencement of construction activities in the Town Centre precinct ensuring habitat areas displaced have been constructed. Further assessment into the use of frog-sensitive herbicide use required due to proximity to planned Wallum sedgefrog habitat.
22	6.888	Aa, WSF, Ec, Pa, Pw	Low	<i>M. quinquenervia</i> regrowth with patches of sedge. Setaria and other exotic pasture grasses common and dense. Very high WSF habitat present.	Melaleuca Forest, Sedgeland	Assisted Regeneration	High level of integrated weed management required. Maintenance of WSF habitat required. Future regrowth of RE 12.3.1 (HMU 20) extend into this HMU.
23b	15.720	Aa, WSF, Ec, Pa, Pw	Low	Predominantly pasture with some juvenile pine and <i>M. quinquenervia</i> (due to proximity to remnant RE area). High and low quality WSF habitat present.	Melaleuca Forest, Sedgeland	Assisted Regeneration and Reconstruction	This HMU has been designed to provide a buffer to the waterway and act as a source area for dispersal. As an initial step, a high level of integrated weed management required to steer the community back to Melaleuca and Sedgeland. Integrated weed management measures such as planting of <i>M. quinquenervia</i> (to help exclude weeds), herbicide, grazing and/or fire are to be considered. With continued weed management the need for a reconstruction treatment (planting) across the whole HMU can be assessed at future stages. Maintenance of WSF habitat is required. There is potential to rehabilitate the low quality WSF habitat to high quality through earthworks and weed management.
29c	0.920	Aa, WSF, Ec, Pa, Pw	Moderate to High	Remnant RE 12.3.5	12.3.5	Remnant Enhancement	Weed management to be determined by ongoing monitoring and maintenance. Particular focus on edges of remnant riparian vegetation to treat spread of pasture grass within the understory and pine regrowth. Fire management to incorporate recommended fire intervals for heath understory 8-12 years, sedge understory 12-20 years, mixed grass/shrub understory 6-20 years.
30	59.525	Aa, WSF, Pa, Pw	Low	Pasture and juvenile pine regrowth. Low quality WSF habitat present.	Melaleuca Forest, Sedgeland	Assisted Regeneration and Reconstruction	As an initial step, a high level of integrated weed management is required to steer the community back to Melaleuca and Sedgeland. Integrated weed management measures such as planting of <i>M. quinquenervia</i> (to help exclude weeds), herbicide, grazing and/or fire are to be considered. With continued weed management the need for a reconstruction treatment (planting) across the whole HMU can be assessed at future stages. Specifically, consideration to be given to a 30m wide area of reconstructed Melaleuca forest at the western edge to provide a buffer against edge effects (i.e. enhanced competition from weeds during regeneration). The first five metres of this buffer should be densely planted. Maintenance of WSF habitat is required. There is potential to rehabilitate the low quality WSF habitat to high quality through earthworks and weed management.
33	1.115	Aa, WSF, Ec, Pa, Pw	Low	Melaleuca regrowth with pasture grasses. Low quality WSF habitat present.	Melaleuca Forest, Sedgeland Biohub for Pa and potentially Ec and Pw	Assisted Regeneration with an area of Biohub Fabrication	There is potential to rehabilitate the low quality WSF habitat to high quality through earthworks and weed management. HMU-specific assessment is required to determine feasibilities and locations of plantings for each biohub species.
36a	8.256	Aa, WSF, Ec, Pa, Pw, WM	Moderate to High	Remnant RE 12.3.5	12.3.5	Remnant Enhancement	Low level of weed management required, which will provide enhancement to portions that could provide Water Mouse habitat.
37	11.811	Aa, WSF, Pa, Pw	Low	Grazed pasture. Occasional juvenile <i>M. quinquenervia</i> and pine.	Melaleuca Forest, Sedgeland	Assisted Regeneration and Reconstruction.	As an initial step, a high level of integrated weed management is required to steer the community back to Melaleuca and Sedgeland. Integrated weed management measures such as planting of <i>M. quinquenervia</i> (to help exclude weeds), herbicide, grazing and/or fire are to be considered. With continued weed management the need for a reconstruction treatment (planting) across the whole HMU can be assessed at future stages. Specifically, consideration to be given to a 30m wide area of reconstructed Melaleuca forest and Sedgeland at the western

HMU	Approx. Area (ha)	Target Species ²	Current Ecological Condition	Current Flora	Target Community	Treatment	Further information (e.g. Weed Management ³ , Planting/Seeding, Grazing or Soil management, timing)
							edge to provide a buffer against edge effects (i.e. enhanced competition from weeds during regeneration). The first five metres of this buffer should be densely planted. Maintenance of WSF habitat is required. There is potential to rehabilitate the low quality WSF habitat to high quality through earthworks and weed management.
40a	3.826	Aa, Ec, Pa, Pw	Low to Moderate	Bells Creek South Riparian Buffer. Remnant RE 12.3.5 and large areas of cleared pasture.	Melaleuca Forest	Remnant Enhancement and Reconstruction	Integrated weed management required in areas of RE, with high efforts required for non-pasture areas. Plantings of flora associated with RE12.3.5 are also to be established for riparian enhancement and bank stability in non-remnant areas.
STAGE 5 - Associated with Development of Precincts 10,11,12							
9c	8.946	Aa, Ec, Pa, Pw	Low to Moderate	Bells Creek North Riparian Buffer. Remnant RE 12.3.4 and 12.3.5 and cleared areas that contain pasture grasses, some regrowth <i>M. quinquenervia</i> and native sedge.	Melaleuca Forest	Remnant enhancement and Reconstruction	Integrated weed management required, with high efforts required for non-remnant areas. Further assessment into the use of frog-sensitive herbicide use required due to proximity to planned Wallum sedgefrog habitat. Plantings of flora associated with RE12.3.4 and 12.3.5 to be established for riparian enhancement and bank stability.
20	1.360	Ai	Moderate to High	Remnant RE 12.3.1	12.3.1	Remnant Enhancement	Weed management to be determined by ongoing monitoring and maintenance. Particular focus on edges of patch to avoid pasture grass and pine incursion. Fire management to exclude deliberate burns and attempt to exclude natural burns. Consider implementation of a 5-10m fire break of suitable low vegetation around the outside edges.
21	1.618	Ae, Ae, WSF, Pa, Pw	Moderate to High	Remnant RE 12.3.8/13. Very high WSF habitat present.	12.3.8, 12.3.13	Remnant Enhancement	Integrated weed management required, primarily along western edge to control pasture grasses and pine regrowth. Fire management to preserve WSF habitat and maintain wet heath with sedgeland elements.
24	3.831	Aa, WSF, Ec, Pa, Pw	Low to moderate	Melaleuca regrowth +/- Pine. Very high WSF habitat present.	Melaleuca Forest, Sedgeland	Assisted Regeneration	Low level of integrated weed management required. Maintenance of WSF habitat required.
25	6.502	Aa, Ec, Pa, Pw	Moderate to High	Remnant RE 12.3.5	12.3.5	Remnant Enhancement	Weed management to be determined by ongoing monitoring and maintenance. Particular focus on edges of patch to avoid pasture grass and pine incursion. Fire management to incorporate recommended fire intervals for heath understory 8-12 years, sedge understory 12-20 years, mixed grass/shrub understory 6-20 years.
26	0.714	Aa, WSF, Ec, Pa, Pw	Moderate to High	Remnant RE 12.3.8 with areas of regrowth <i>M. quinquenervia</i> +/- pine regrowth.	12.3.8 and Melaleuca Forest	Assisted Regeneration and Remnant enhancement	Low level of integrated weed management required at edge.
28	25.918	Aa, WSF, Ec, Pa, Pw	Moderate to High	Remnant RE 12.3.5 with areas of regrowth <i>M. quinquenervia</i> +/- pine regrowth. Some areas of very high quality WSF habitat present.	12.3.5	Assisted Regeneration and Remnant Enhancement	Low level of integrated weed management required at edges. Maintenance of WSF habitat required.
31	11.715	Aa, WSF, Ec, Pa, Pw	Low	Melaleuca regrowth with pasture grasses. Many heathy forbs and sedges. High and low quality WSF habitat present.	Melaleuca Forest, Sedgeland	Assisted Regeneration with an area of Biohub Fabrication	High level of integrated weed management required. There is potential to rehabilitate the low quality WSF habitat to high quality through earthworks and weed management. HMU specific detailed assessment is required to determine suitable location for biohub plantings to support
32	3.756	Aa, Ec, Pa, Pw	Moderate	Melaleuca regrowth +/- Pine	Melaleuca Forest, Sedgeland	Assisted Regeneration	Low level of integrated weed management required. Further assessment into the use of frog-sensitive herbicide use required due to proximity to high quality Wallum sedgefrog habitat.
38	16.223	Aa, WSF, Ec, Pa, Pw	Moderate	Dense Melaleuca forest regrowth, with an average high of 1.5m. Patches of Sedgeland (low quality WSF habitat) also present.	Melaleuca Forest, Sedgeland	Assisted Regeneration	Moderate level of integrated weed management required. Further assessment into the use of frog-sensitive herbicide use required due to proximity to high quality Wallum sedgefrog habitat.
39b	0.9691	Aa, Ec, Pa, Pw	Low to Moderate	Bells Creek South Riparian Buffer. Remnant RE 12.3.5 and areas of cleared pasture.	Melaleuca Forest	Remnant Enhancement and Reconstruction	Integrated weed management required in areas of RE, with high efforts required for non-pasture areas. Plantings of flora associated with RE12.3.5 are also to be established for riparian enhancement and bank stability in non-remnant areas.
STAGE 6 - Associated with Development of Precinct 13,14,15							
4	4.496	Aa, Ec, Pa, Pw	Low to Moderate	Bells Creek North Riparian Buffer. Remnant RE 12.3.4 and large areas of cleared pasture.	Melaleuca Forest, Biohub for Aa, Ae, Ec, Pa, Pw	Remnant Enhancement, Reconstruction, Biohub Fabrication	Integrated weed management required, with high efforts required for non-remnant areas. of remnant areas and removal of weeds within remnant vegetation. Further assessment into the use of frog-sensitive herbicide use required due to proximity to planned Wallum sedgefrog habitat. Plantings of flora associated with RE12.3.4 to be established for riparian enhancement and bank stability. This area has also been nominated as a biohub due to its proximity to large tracts

HMU	Approx. Area (ha)	Target Species ²	Current Ecological Condition	Current Flora	Target Community	Treatment	Further information (e.g. Weed Management ³ , Planting/Seeding, Grazing or Soil management, timing)
							of vegetation to the west, north and north east, as well as the large conservation area that is planned for to the south.
27	32.970	Aa, WSF, Ec, Pa, Pw		Pasture grasses with juvenile pine regrowth. Small saplings (30cm) and low density of MQ. Low density of sedge. Areas of low, high and very high quality WSF habitat present	Melaleuca Forest, Sedgeland	Assisted Regeneration and Reconstruction	As an initial step, a high level of integrated weed management required to steer the community back to Melaleuca and Sedgeland. Integrated weed management measures such as planting of <i>M. quinquenervia</i> (to help exclude weeds), herbicide, grazing and/or fire are to be considered. With continued weed management the need for a reconstruction treatment (planting) across the whole HMU can be assessed at future stages Maintenance of WSF habitat is required. There is potential to rehabilitate the low quality WSF habitat to high quality through earthworks and weed management.
29b	29.075	Aa, WSF, Ec, Pa, Pw	Moderate to High	Remnant RE 12.3.5	12.3.5	Remnant Enhancement	Weed management to be determined by ongoing monitoring and maintenance. Particular focus on edges of remnant riparian vegetation to treat spread of pasture grass within the understory and pine regrowth. Fire management to incorporate recommended fire intervals for heath understory 8-12 years, sedge understory 12-20 years, mixed grass/shrub understory 6-20 years.
34	6.315	Aa, WSF, Ec, Pa, Pw	Low	Pasture Grass	Melaleuca Forest, Sedgeland	Assisted Regeneration and potential Reconstruction	Currently, a high level of integrated weed management required to steer the community back to Melaleuca and Sedgeland. Planting of <i>M. quinquenervia</i> (to help exclude weeds), herbicide, grazing and/or fire as initial weed management measures are to be considered. With continued weed management the need for a reconstruction treatment (planting) across the whole HMU can be assessed at future stages.
35	2.195	Aa, Ec, Pa, Pw	Low	Pasture grass. Occasional juvenile <i>M. quinquenervia</i> and pine.	Melaleuca Forest, Sedgeland	Assisted Regeneration and potential Reconstruction	As an initial step, a high level of integrated weed management is required to steer the community back to Melaleuca and Sedgeland. Integrated weed management measures such as planting of <i>M. quinquenervia</i> (to help exclude weeds), herbicide, grazing and/or fire are to be considered. With continued weed management the need for a reconstruction treatment (planting) across the whole HMU can be assessed at future stages. Planting allows for buffer for the WM.
39a	1.73	Aa, Ec, Pa, Pw	Low to Moderate	Bells Creek South Riparian Buffer. Remnant RE 12.3.5 and areas of cleared pasture.	Melaleuca Forest	Remnant Enhancement and Reconstruction	Integrated weed management required in areas of RE, with high efforts required for non-pasture areas. Plantings of flora associated with RE12.3.5 are also to be established for riparian enhancement and bank stability in non-remnant areas.
42a	4.422	Aa, WSF, Ec, Pa, Pw	Low to moderate	Bells Creek South Riparian Buffer. Unmapped Regrowth 12.3.4 with some small areas of high and very high WSF habitat. Some cleared pasture areas also exist.	Melaleuca Forest	Remnant Enhancement and Reconstruction	Integrated weed management required in areas of RE, with high efforts required for non-pasture areas. Plantings of flora associated with RE12.3.4 are also to be established for riparian enhancement and bank stability in non-remnant areas.
48a	1.347	Aa, WSF, Ec, Pa, Pw	Low to Moderate	Bells Creek South Riparian Buffer. Remnant 12.3.5 with cleared pasture areas.	Melaleuca Forest	Remnant Enhancement and Reconstruction	Integrated weed management required in areas of RE, with high efforts required for non-pasture areas. Plantings of flora associated with RE 12.3.4 are also to be established for riparian enhancement and bank stability in non-remnant areas.
STAGE 7 - Associated with Development of Precinct 13							
36b	10.893	Aa, WSF, Ec, Pa, Pw, WM	Moderate to High	Remnant RE 12.3.5	12.3.5	Remnant Enhancement	Low level of weed management to enhance Water Mouse habitat.
39c	2.522	Aa, Ec, Pa, Pw	Low to Moderate	Bells Creek South Riparian Buffer. Remnant RE 12.3.5 and areas of cleared pasture.	Melaleuca Forest	Remnant Enhancement and Reconstruction	Integrated weed management required in areas of RE, with high efforts required for non-pasture areas. Plantings of flora associated with RE12.3.5 are also to be established for riparian enhancement and bank stability in non-remnant areas.
40b	3.786	Aa, Ec, Pa, Pw	Low to Moderate	Bells Creek South Riparian Buffer. Remnant RE 12.3.5 and large areas of cleared pasture.	Melaleuca Forest	Remnant Enhancement and Reconstruction	Integrated weed management required in areas of RE, with high efforts required for non-pasture areas. Plantings of flora associated with RE12.3.5 are also to be established for riparian enhancement and bank stability in non-remnant areas.
41	12.349	Aa, Ec, Pa, Pw	Low	Grazed pasture. Occasional juvenile <i>M. quinquenervia</i> and pine.	Melaleuca / Eucalypt Forest	Assisted Regeneration and Reconstruction	As an initial step, a high level of integrated weed management is required to steer the community back to Melaleuca and Sedgeland. Integrated weed management measures such as planting of <i>M. quinquenervia</i> (to help exclude weeds), herbicide, grazing and/or fire are to be considered. With continued weed management the need for a reconstruction treatment (planting) across the whole HMU can be assessed at future stages. Specifically, consideration to be given to a 30m wide area of reconstructed Melaleuca forest at the western edge to provide a buffer against edge effects (i.e. enhanced competition from weeds during regeneration). The first five metres of this buffer should be densely planted.

HMU	Approx. Area (ha)	Target Species ²	Current Ecological Condition	Current Flora	Target Community	Treatment	Further information (e.g. Weed Management ³ , Planting/Seeding, Grazing or Soil management, timing)
							Maintenance of WSF habitat is required. There is potential to rehabilitate the low quality WSF habitat to high quality through earthworks and weed management.
42b	4.018	Aa, WSF, Ec, Pa, Pw	Low to moderate	Bells Creek South Riparian Buffer. Unmapped Regrowth 12.3.4 with some small areas of high and very high WSF habitat. Some cleared pasture areas also exist.	Melaleuca Forest	Remnant Enhancement and Reconstruction	Integrated weed management required in areas of RE, with high efforts required for non-pasture areas. Plantings of flora associated with RE12.3.4 are also to be established for riparian enhancement and bank stability in non-remnant areas.
43	1.120	Aa, Ec, Pa, Pw	Low to Moderate	Melaleuca regrowth +/- Pine	Melaleuca Forest, Sedgeland	Assisted Regeneration	Low level of integrated weed management required
45	3.318	Aa, WSF, Ec, Pa, Pw	Low	Melaleuca regrowth with sedge. Low quality WSF habitat present.	Melaleuca Forest, Sedgeland	Assisted Regeneration	This HMU is within a pocketed area, allowing more efficient recolonisation of native species. A moderate level of integrated weed management required.
46	13.077	Aa, Ec, Pa, Pw	Moderate	Melaleuca regrowth +/- Pine. Remnant RE 12.3.5 along waterway.	Melaleuca and Eucalypt Forest	Assisted Regeneration and Remnant Enhancement	A low level of integrated weed management required, mainly in the non-remnant areas.
47	16.080	Aa, WSF, Ec, Pa, Pw	Low	Pasture grass and weedy shrubs. High quality WSF habitat present.	Melaleuca / Eucalypt Forest, Sedgeland	Assisted Regeneration and Reconstruction	As an initial step, a high level of integrated weed management is required to steer the community back to Melaleuca and Sedgeland. Integrated weed management measures such as planting of <i>M. quinquenervia</i> (to help exclude weeds), herbicide, grazing and/or fire are to be considered. With continued weed management the need for a reconstruction treatment (planting) across the whole HMU can be assessed at future stages. Specifically, consideration to be given to a 30m wide area of reconstructed Melaleuca/Eucalypt forest and Sedgeland at the western and southern edge to provide a buffer against edge effects (i.e. enhanced competition from weeds during regeneration) and protect the areas of WSF habitat. The first five metres of this buffer should be densely planted.
48b	1.294	Aa, WSF, Ec, Pa, Pw	Low to Moderate	Bells Creek South Riparian Buffer. Remnant 12.3.5 with cleared pasture areas.	Melaleuca Forest	Remnant Enhancement and Reconstruction	Integrated weed management required in areas of RE, with high efforts required for non-pasture areas. Plantings of flora associated with RE 12.3.4 are also to be established for riparian enhancement and bank stability in non-remnant areas.

² This column represents what species shall be targeted. This does not necessarily mean that these species will be planted direct; however, the target community is aimed at providing suitable habitat. Aa = *Acacia attenuata*; WSF = Acid Frogs, Ae = *Allocasuarina emuina*, Bg = *Blandfordia grandiflora*; Ec = *Eucalyptus conglomerata*; Pa = *Phaius australis*; Pw = *Prasophyllum wallum*; WM = Water Mouse

³ Weed management methods will be assessed for suitability and implemented via the HMU-specific Management Plan.

Table 4 Application of Ecological Enhancement Treatments

Remnant Enhancement	
Applies:	<p>To intact and areas of remnant native vegetation where there may be weed impacts (such as pasture grass or pine).</p> <p>Where native plants are healthy and capable of regenerating without human intervention if weed are treated.</p> <p>When native plant seed is stored in the soil or will be able to reach the site from nearby natural areas, by birds or other animals, wind or water.</p> <p>When preventative action is all that is required to avert on-going disturbance e.g. erection of fencing to prevent intrusion by cattle.</p>
Role of Planting:	Planting will not be required as seed banks are intact.
Goal:	To enhance the current condition of remnant vegetation.
Applies:	<p>To relatively large and intact areas of non-remnant native vegetation.</p> <p>Areas are largely free of weeds and protected from other disturbance processes. Low levels of weed incursion and disturbances may be experience at edges of remnant patches.</p> <p>Where native plants are healthy and capable of regenerating without human intervention.</p> <p>Where large tracts of source plant diversity (e.g. remnant vegetation) are in close proximity and dispersal into treatment areas is likely.</p> <p>When native plant seed is stored in the soil or will be able to reach the site from nearby natural areas, by birds or other animals, wind or water.</p> <p>Where the plant community has a high potential for recovery after any short-lived disturbance, such as a fire or cyclonic winds.</p> <p>When preventative action is all that is required to avert on-going disturbance e.g. erection of fencing to prevent intrusion by cattle.</p>
Role of Planting:	The installation of new plantings is not proposed within this treatment type. Planting in such areas can work against the aims of restoration by interfering with natural regeneration and the introduction of non-local plant stock
Goal:	The maintenance of a remnant vegetation community with minimal weed incursion and other ecological disturbances.
Assisted Regeneration	
Applies:	<p>To areas where the native plant community is largely healthy and functioning.</p> <p>When native plant seed is still stored in the soil or will be able to reach the site from nearby natural areas, by birds or other animals, wind or water.</p> <p>Where the natural regeneration processes (seedling germination, root suckering, etc.) are being inhibited by external factors, such as weed invasion, soil compaction, cattle grazing, mechanical slashing, etc.</p> <p>When human intervention, such as integrated weed management, minor amelioration of soil conditions, erection of fencing, cessation of slashing, etc. will be enough to trigger the recovery processes through natural regeneration.</p> <p>When the main management issue is weed infestation and/or current land use practices.</p>
Role of Planting:	Planting in such areas can work against the aims of restoration by interfering with natural regeneration except where species cannot return to site without direct intervention.
Goal:	The re-establishing plant community will be similar in structure, composition and diversity to the original vegetation.

Table 4 Continued: Application of Ecological Enhancement Treatments

Reconstruction	
Applies:	<p>Where the site is highly degraded or altered.</p> <p>When the degree of disturbance has been so great and long-standing that the pre-existing native plant community cannot recover by natural means.</p> <p>To sites such as areas of fill, sites affected by stormwater flow, areas that have been drastically cleared, even though there may be a few remaining native trees or shrubs.</p> <p>When a greater degree of human intervention is required, such as integrated weed management, cessation of grazing and/or slashing, amelioration of soil conditions such as importation of soils, drainage works or re-shaping of the landscape.</p>
Role of Planting:	<p>Importation of native species to the area is required, either through planting or direct seeding (in some situations). Natural regeneration and recruitment is insufficient to initially re-establish the original vegetation. Depending on the prevailing circumstances, the planting of a broad diversity of species from the target ecosystem may be unnecessary and the use of pioneers may be sufficient to re-establish ecological processes.</p>
Goal:	<p>The re-establishing planted community should be similar to the original vegetation in structure, composition and diversity.</p>
Fabrication (Type Conversion)	
Applies:	<p>Where site conditions have been irreversibly changed.</p> <p>When it is not possible to restore the original native plant community.</p> <p>Where a better-adapted local plant community can be planted that will function within the changed conditions.</p> <p>In situations such as the construction of a wetland plant community to mitigate increased urban storm-water run-off.</p>
Role of Planting:	<p>Revegetation (planting) is the major component in a fabrication program.</p>
Goal:	<p>The re-establishing planted community should be similar to a naturally occurring plant community of the same type (e.g. a constructed freshwater wetland should resemble a natural system in terms of structure, composition and diversity).</p>

6

INTEGRATED WEED MANAGEMENT

Due to the history of the site, exotic pasture grasses dominate many areas requiring ecological enhancement. These include:

- *Setaria sphacelata*;
- Giant rat's tail grass (*Sporobolus pyramidalis* and *S. natalensi*), a Class 2 Declared Pest; and
- Grass species from the genera *Paspalum*, *Panicum*, and *Chloris*.
- There are also numerous other weed species on the site. Some of the more common weeds include:
- *Lantana camara*, a Class 3 Declared Pest;
- Groundsel Bush (*Baccharis halimifolia*) a Class 2 Declared Pest; and
- Slash Pine (*Pinus elliottii*).

These weeds are a significant threat to achieving the objectives of ecological enhancement across the site; therefore, this strategy focusses on integrative weed management as one of the primary tools to allow ecological enhancement of the HMUs.

The crux of integrated weed management is that broader aspects of ecosystem enhancement are considered when applying weed management practices. This allows for the most efficient weed management outcome, as all factors (direct and indirect) are considered during the planning and implementation of weed management. Weeds are less able to cope when a variety of direct and indirect methods are undertaken simultaneously (CSIRO 2011).

Five broad considerations of integrated weed management have been considered within this strategy. These are summarised in Table 5.

Table 6 describes what integrated weed management measures will be adopted to control weeds. The application of any combination of these measures in each HMU will be further assessed as part of the preparation of HMU-specific management plans as part of the Environmental Rehabilitation Plan, which will be prepared prior to the commencement of enhancement works.

Table 5 Considerations of Integrated Weed Management

Considerations	
1	Study and understanding of the biology of weeds (e.g. dispersal, germination, growth habit and habitat preferences) relevant to the study area: In doing so, individual species such as the <i>Setaria</i> grass that dominates many areas across the study area can be targeted through chemical, physical or biological (e.g. grazing) controls. A weed management plan is currently in place, which addresses the weed management issues associated with ongoing land management of the site as grazing/pasture land. Targeted weed management actions will be incorporated into each rehabilitation area plan developed on a stage by stage basis. Importantly, the indirect adverse impacts these techniques have on non-target species and ecosystem health also need to be considered (e.g. grazing impacts on native species, or use of herbicide on the Wallum Sedgefrog).
2	Consideration to threats posed by the cumulative and interactive effects of weeds, particularly in Australia where this is common (Grice 2006): For example, the exclusion of native plant growth is an interactive effect created by the dominance of pasture grasses. Pasture grasses also reduce the diversity of fauna across the site by making habitat unsuitable for foraging, breeding and dispersing.
3	The application of a landscape ecology perspective (With 2002): This is required to understand how spatial patterns across the study area (such as fragmentation and resource distributions) will affect the weed colonisation/recolonisation process over time and space.
4	An understanding of the structure and dynamics (including temporal) of the HMUs to determine what causal factors enhance or suppress invasibility (Hobbs and Humphries 1995; Radosevich, Holt et al. 2007); Sheley, Mangold et al. (2006) propose that understanding successional processes (such as infill planting) associated with an ecosystem could be used as a tool to manipulate HMUs to a desired state. Bussan and Dyer (1999), Williams and West (2000), Haig, Pratley et al. (2005) and Simmons (2005) note that this could include utilisation of intrinsic biological attributes of endemic plant species to outcompete invasive species through suppression (e.g. allelopathy) or direct competition for resources.
5	Finally, the influence of other management programmes needs to be understood and planned for. This includes the management of adjacent land use, pest animal, stock or human access (as vectors), fire management, and staff resources requirements (Hobbs and Humphries 1995; Williams and West 2000; Radosevich, Holt et al. 2007).

Table 6: The application of Integrated Weed Management

Method	Description
Mechanical Removal	Mechanical removal (by hand or machine) will be required for the removal of larger plants such as pine and lantana. In some areas of sensitive frog habitat, HMU-specific management plans may assess that chemical spot spraying will be unsuitable, and mechanical or hand removal of pasture grasses may be required.
Herbicide	<p>Due to the extent of weeds, mechanical removal may not always be practical. For this reason, chemical herbicide will be used across the site.</p> <p>Methods may include: Cut-scrape-paint, Cut-Paint, Scrape-Paint, Over spraying, Spot spraying, Splatter gun use, Roll-hang, Gouge-paint, Basal barking, Wick wiping and stem injection. See SEQ Ecological Restoration Framework Manual (Chenoweth EPLA and Bushland Restoration Services 2012) for further information.</p> <p>Frogs have been found to be very sensitive to some herbicide products, and specifically, the surfactants that are used to improve the effectiveness of the products. For this reason, and unless products (and independent research results) can demonstrate the herbicide is safe, HMU Management Plans will assess whether chemical spraying is suitable.</p>
Access exclusion	Livestock and the general public will be excluded from HMUs undergoing ecological enhancement, unless temporary crash grazing is being used to control exotic pasture grasses. This will help to control weed and disease (e.g. chytrid fungus) spread.
Temporary Grazing	Grazing can result in both positive and negative impacts to the HMUs, depending on the condition of weed infestation (Lunt et al. 2007). Grazing is preferred to slashing as stock can be selective in what they browse, and avoid juvenile tree species. Temporary Grazing, as a weed management strategy, will only be considered in areas where the dominant weed species is palatable and available to stock. A moderate level of grazing should be considered, with supportive use of other weed management strategies (like subsequent chemical spot spraying once taller grasses have been browsed down).
Fire Management	In terms of weed control, fire is most likely to control the slash pine. The pasture grasses are likely to remain, with or without fire, until they are shaded out by a shrub/tree canopy. As well as controlling the pine, fire (provided it is not too regular) may stimulate flowering in many wallum species (such as <i>Prasophyllum wallum</i>), so it could be an effective management tool to encourage wallum regeneration provided the fire timing and frequency is right. To remove pine, fire management may have benefits over chopper rolling, as the latter limits regeneration of native species and suppresses canopy cover which in turn encourages the pasture grasses. Use of fire then selected hand-spraying around shrubs/trees may be the best approach.
Timing	The timing of weed treatments has been considered for each HMU so that the chance of recolonisation of weeds from adjacent areas is minimised. Timing is discussed in Section 8.
Native Flora (planting / seeding / natural regeneration)	<p><i>Melaleuca quinquenervia</i> is known to be competitive against exotic species due to its canopy cover, dense superficial roots and production of allelochemicals that suppress surrounding vegetation (Di Stefano and Fisher 1983). For example, although no formal statistical analysis has been undertaken, it was observed that HMU 31 had a dense stand of juvenile <i>M. quinquenervia</i> with a canopy height of 1-2 metres. In this area, the foreign grass species were observed to be dying off, perhaps due to the impact of <i>M. quinquenervia</i> and other canopy species present. This is in opposition to areas where only small saplings of <i>M. quinquenervia</i>, and native grasses were observed to be dominant and healthy. Native flora will work to out-compete weed species; though this method should not be relied upon in isolation as it is unlikely to be successful (especially for recolonisation of smaller native shrubs, forbs and grasses) unless other measures are applied. It is also only likely to be effective once large dominant trees are established, and therefore should not be relied upon in early stages of rehabilitation.</p> <p>For this reason, monitoring will be required in order to assess the need for other types of weed management.</p>
Infill Planting / seeding	In fill planting of shrubs and/or seeding (e.g. of native grasses) should be considered in later stages of succession to further help outcompete weed species.
WMPs	Weed Management Plans will be integrated into the overall Plan for each HMU. These will be both tailored and adaptive.

7

APPROACH TO RESTORATION

As mentioned in Section 1, some areas may not be able to be rehabilitated unless planting or seeding is employed. This is due to the irreversibility of some impacts caused by the transition to an ecosystem dominated by exotic pasture grasses. Planting and seeding does not have to be undertaken in every location; rather, planted/seeded stands of forest can act as a source area to aid dispersal of flora across to other areas thus allowing more efficient and effective regeneration. Furthermore, the planting of dominant species only, such as *Melaleuca quinquenervia* may be sufficient to allow regeneration of other species.

Planting / seeding can also be undertaken to infill areas of native vegetation to increase diversity and help drive succession to the desired state, and to management weeds.

The SEQ Restoration Framework Manual outlines background information and considerations for plantings, including understanding species selection, sourcing, timing of planting, site preparation, plant densities, installation and maintenance. This information will be considered within each HMU-specific Management Plan.

Table 4 outlines where planting / seeding is planned; however, specific details will be included in subsequent HMU Management plans. Some HMUs have been created solely to act as source points for the future distribution of flora across the site; others are already regenerating due to established native seed banks and proximity to remnant vegetation and therefore may not need further planting.

7.1 Biohub Planting

Some of the HMUs have been specifically established to act as biohubs for threatened flora. The aim of the biohubs is to provide small, carefully managed areas where threatened flora can be planted. These areas will act as source areas where threatened flora can disperse to other areas of suitable habitat.

As there are different objectives for different species targeted by this VMRP, only the EPBC Act listed species are relevant to the Biohub areas. This includes Swamp Stringybark (*Eucalyptus conglomerata*); Attenuate wattle (*Acacia attenuata*); Emu Mountain She-oak (*Allocasuarina emuina*); Lesser swamp orchid (*Phaius australis*); and Wallum leak (*Prasophyllum wallum*).

Biohub areas for the selected threatened species have been chosen based on:

- The idea that all targeted biohub species will be represented across the study area
- The suitability of habitat for the target species
- The proximity to remnant vegetation
- The protection afforded by remnant vegetation. For instance, biohubs eventually exist within core habitat areas, to mitigate against potential edge effects. Where practical, biohubs have been placed in pockets - areas sheltered by surrounding remnant vegetation to reduce the cost of establishing core habitat areas.

Management for each biohub will be addressed in the respective HMU-specific Management Plan, as part of the Environmental Rehabilitation Plan. It is likely that these areas will require higher levels of management to prevent the loss of the planted threatened species.

7.2 Site Hygiene and Access

Within each HMU's Management Plan, measures will be put in place to prevent the spread of weed seeds and diseases such as *Phytophthora*, Myrtle Rust and Chytrid fungus. During enhancement activities, this may include shoe and tool disinfecting, exclusion areas and the use of clearly defined tracks.

In regards to community access, walking tracks will be clearly defined to limit human disturbance. Access will be excluded from sensitive areas, such as Riparian areas and Biohub areas. In accordance with Chapter D1 of the Draft PER, domestic or companion animals will not be encouraged within the EPZ.

7.3 Ground Management

The Greening Australia Ecological Rehabilitation Strategy (2011, pp. 41) provides information on the changes in topography

across the site and this information has been adapted for use here.

Micro-topography of much of the Site appears to have been altered on pine plantation areas and standard plantation management practices would reflect this. Plantation areas are typically covered with parallel furrows and ridges. The furrows are inundated for long periods and are slow to drain. Although it has been identified that the furrows have resulted in large areas of Wallum sedgefrog habitat becoming available, they are thought to provide poor habitat for terrestrial mammals and reptiles and are likely responsible for the poor representation of these species at the Site (BAAM 2010).

Furrow removal may be necessary to reduce ponding and associated mosquito habitat, although some ponding may aid in diversifying habitat and the continued provision of Wallum Sedgefrog habitat in some wallum sedgeland areas. Furrow removal may be required if human occupation is to increase on site or surrounding areas (e.g. housing, industry, recreation reserves etc.).

Greening Australia (2011, p.43) also outlined further considerations for rehabilitation in areas with furrows. The following will be further considered within the HMU-specific Management Plans:

- The extent of furrow removal necessary for successful rehabilitation and the most effective means of furrow removal;
- The effects of furrow retention on the development of native vegetation and the provision of Wallum sedgefrog habitat (where identified as an objective for the HMU). In time terrestrial species on the ridge tops may become dominant, shading out or suppressing growth of wet heath species that colonise furrows; and
- Furrows create a hindrance to maintenance activities by impeding vehicle access for planting, direct seeding and follow-up maintenance and making foot inspections of the Site more difficult and dangerous.

7.4 Fire Management

Fire plays a significant role in maintaining the diversity and abundance of native flora and fauna. Although rainforests and mangroves

can be damaged by fire, heath, wetland and eucalypt ecosystems are dependent on fire to maintain composition, structure and functionality. For this reason, ecosystem enhancement treatments will include fire management to not only manage weeds, but also maintain ecological processes for the conservation of the target species.

HMUs will require differing management objectives due to:

- Proximity to urban development;
- The target species that exist within the HMU;
- The type of ecosystem;
- Proximity to ecosystems that require different fire regimes; and
- The size of the patch, as mosaic burning may be required to allow for a variety of successional stages within a patch.

If areas immediately adjacent to urban development and other assets are managed to keep fuel loads low, other areas can then be managed more effectively to conserve biodiversity.

HMU-specific Management Plans will further detail plans for fire. Table 7 outlines the differing fire management requirements for the vegetation communities across the site. These are based on The Regional Ecosystem Fire Guidelines published by the Queensland Department of Environmental and Heritage Protection (Biodiversity and Ecosystem Sciences 2012) and Watson (2001).

Table 7 Fire Regimes for different ecosystems across the site

Target Community	Fire Guidelines
<p><i>Casuarina glauca</i> woodland habitat for Water Mouse (RE 12.1.1)</p>	SEASON/ CONDITIONS: Early winter or storm burning seasons.
	INTENSITY: Low to moderate.
	INTERVAL: Aim for a 6-7 year minimum threshold at a broad scale planning level.
	<p>STRATEGY: Management of this habitat is important for conservation of the Water Mouse. RE 12.1.1, with 12.1.2, and 12.1.3, are regarded as estuarine wetlands, and comprise the majority of the habitat regarded as potentially suitable for Water Mouse within the Bells Creek system. Essential habitat for Water Mouse.</p> <p>Aim to retain at least 25-50% unburnt in any given year. This RE needs disturbance to maintain structure. Use fire to reduce opportunistic native (<i>Allocasuarina</i> spp.) or weed species dominance. Active fire management is required to reduce the accumulation of a significant dry fuel layer. Burns planned in surrounding REs should account for the disturbance requirements of this fringing vegetation.</p>
	<p>ISSUES: The fire ecology of this regional ecosystem is poorly known. Monitoring the impact of fire and recovery of the ecosystem's component species is highly desirable. A long fire interval could increase fire intensity when fire occurs, thus detrimentally affecting the tree layer. Recovery should be relatively quick (~10 years to a woodland/open forest community). A 'grassy' ecosystem might be lost if fire is excluded or too frequent (<2 years). Signs of problems in this community might include the regeneration of 'whipstick' communities and/or the presence of weeds (such as lantana). Fire exclusion and buffering from fire is not necessary. Where obligate seeding allocasuarinas are present in the under- and mid-storeys, fires causing 100% leaf scorch will kill these trees; therefore fires of this intensity should be avoided. A seven year minimum fire interval is required for obligate seeding allocasuarinas and casuarinas.</p>
<p>Saltpan vegetation habitat for Water Mouse (RE 12.1.2)</p>	<p>STRATEGY: Management of this habitat is important for conservation of the Water Mouse. RE 12.1.2, with 12.1.1, and 12.1.3, are regarded as estuarine wetlands, and comprise the majority of the habitat regarded as potentially suitable for Water Mouse within the Bells Creek system. Essential habitat for Water Mouse.</p> <p>Burn in association with surrounding vegetation. Surrounding vegetation should be burnt when swamp is wet to avoid undesirable effects such as peat fire.</p>
	<p>ISSUES: Some elements of this RE will be flammable. Though not usually deliberately burnt, fire should not be avoided. This RE will often burn in association with surrounding ecosystems. Moist conditions are desirable for any planned burning activities in this ecosystem.</p>
<p>Mangrove shrubland habitat for Water Mouse (RE 12.1.3)</p>	Do not burn.
	<p>STRATEGY: Management of this habitat is important for conservation of the Water Mouse. RE 12.1.3, with 12.1.1, and 12.1.2, are regarded as estuarine wetlands, and comprise the majority of the habitat regarded as potentially suitable for Water Mouse within the Bells Creek system. Essential habitat for Water Mouse.</p>

¹ Based on the Regional Ecosystem Fire Guidelines published by the Queensland Department of Environmental and Heritage Protection (Biodiversity and Ecosystem Sciences 2012) and Watson (2001).

Target Community	Fire Guidelines
	ISSUES: Scorching within the supra-littoral margin, particularly when this ecotone merges into flammable vegetation such as woodlands and forests of melaleuca may be a problem. Surrounding HMUs may also require fire exclusion low intensity regular fires to avoid burning of this ecosystem.
Rainforest habitat for Large Leaf Chain Fruit (<i>Alyxia ilicifolia</i> ssp. <i>magnifolia</i>) (though no longer listed as EVNT under the NC Act). (RE 12.3.1)	<p>STRATEGY: Management of this ecosystem is required for the conservation of Large Leaf Chain Fruit (<i>Alyxia ilicifolia</i> ssp. <i>magnifolia</i>).</p> <p>Do not burn deliberately. Protection relies on management of surrounding HMUs. May need active protection from wildfire in extreme conditions or after prolonged drought. Planned burns should not create a running fire into vine forest. Ensuring conditions of good soil moisture and moisture of litter in surrounding communities will limit fire behaviour/intensity.</p> <p>ISSUES: Fire sensitive and not normally flammable. Some preliminary work suggests rainforest seedling germination from planned burning activities will assist the establishment of seedlings in newly burnt areas, especially due to smoke. There may be issues with lantana and other weeds from fire and other disturbance. Remnants may be limited by frequent fire at the margins; this requires further research.</p>
Open Melaleuca Forest habitat for: <ul style="list-style-type: none"> ● <i>Acacia attenuata</i>; ● Wallum sedgefrogs (in sedge understory areas) ● <i>Allocasuarina emuina</i> in ecotones ● <i>Eucalyptus conglomerata</i> ● <i>Phaius australis</i> ● <i>Prasophyllum wallum</i> Includes RE 12.3.4, 12.3.5 and 12.3.6.	<p>SEASON: Late summer to mid-winter (after rain). These communities should be burnt when substrate is wet to avoid the risk of peat fire.</p> <p>INTENSITY: Planned and occasional unplanned burns (typically of higher intensity) influence the ecology of melaleuca ecosystems.</p> <p>INTERVAL: Heath understory 8-12 years, Sedge understory 12-20 years, Mixed grass/shrub understory 6-20 years.</p> <p>STRATEGY: Aim for a 25-70% burn mosaic (in association with surrounding ecosystems, as melaleuca ecosystems often just occur in patches or along natural drainage lines). Fires may, depending on the conditions and type of vegetation, burn areas larger than just the melaleuca ecosystem. Ensure secure boundaries from non-fire regime adapted ecosystems. Consider the needs of melaleuca ecosystems based on understorey (i.e., heath dominated, sedge dominated or mixed grass/shrub) when planning burns. High soil moisture (or presence of water on the ground) is required, as avoidance of peat-type fires must be maintained.</p> <p>ISSUES: Fire regimes for melaleuca ecosystems require further fire research. Melaleuca forests are fire-adapted, but too high an intensity or frequent fire will slow or prevent regeneration and lead to lower species richness (since these communities contain numerous obligate seed regenerating species that require sufficient fire intervals to produce seed). High intensity fires may kill trees and lead to whipstick regeneration. Too frequent fire may result in a net loss of nutrients over time from an already nutrient poor system. Fire associations are significantly influenced by understorey composition. Melaleuca communities with a heath understorey should burn in a similar way to coastal heath (8-12 years). Sedge understorey communities will burn in association with the surrounding ecosystems (so will often burn with them but sometimes not, such that these communities have a slightly less fire frequency). Mixed understorey communities burn in a similar way to dry sclerophyll, in association with the surrounding dry sclerophyll, though somewhat less frequently due to the additional moisture present in melaleuca communities.</p>
Swamp habitat for: <ul style="list-style-type: none"> ● Wallum sedgefrogs ● <i>Acacia attenuata</i> ● <i>Prasophyllum wallum</i> Includes RE 12.3.8.	<p>STRATEGY: Burn in association with surrounding vegetation. Surrounding vegetation should be burnt when swamp is wet to avoid undesirable effects such as peat fire.</p> <p>ISSUES: Some elements of this RE will be flammable. Though not usually deliberately burnt, fire should not be avoided. This RE will often burn in association with surrounding ecosystems. Moist conditions are desirable for any planned burning activities in this ecosystem.</p>
Heath habitat for:	SEASON: Late summer to winter.

Target Community	Fire Guidelines
<ul style="list-style-type: none"> ○ <i>Acacia attenuata</i> ○ Wallum sedgefrogs ○ <i>Allocasuarina emuina in ecotones</i> ○ <i>Blandfordia grandiflora</i> ○ <i>Eucalyptus conglomerata</i> ○ <i>Phaius australis</i> ○ <i>Prasophyllum wallum</i> <p>Includes RE 12.3.13 and 12.3.14</p>	<p>INTENSITY: Moderate (to high; due to the inherent characteristics of highly flammable vegetation).</p> <p>INTERVAL: 7-20 years with emphasis on the 8-12 year range.</p> <p>STRATEGY: Aim for a burn mosaic of 40-80%. Ensure planned burn conditions are conducive to maintaining integrity of the landscape (i.e., use good soil moisture, recent rainfall and standing water on the ground). Wet heaths should be burnt when substrate is wet to avoid the risk of peat fire</p> <p>ISSUES: Intervals at the upper end (12-20 years) of the recommended regime may be desirable to counteract detrimental impacts of a high intensity fire over 100% of landscape. This vegetation often contains obligate seed regenerating species and as such, the application of frequent fire may reduce species richness if the intervals between fire are not sufficient for plants to produce seed.</p>
<p>Blackbutt forest habitat for <i>Phaius australis</i></p> <p>Includes RE 12.9-10.14.</p>	<p>SEASON: Summer to winter.</p> <p>INTENSITY: Plan for low to moderate. Unplanned occasional high intensity wildfire will occur.</p> <p>INTERVAL: 4-8 years maintains a healthy grassy system. 8-20 years for shrubby elements of understorey.</p> <p>STRATEGY: Aim for 40-60% mosaic burn. Needs disturbance to maintain RE structure (eucalypt overstorey with open understorey of predominantly non-rainforest species).</p> <p>ISSUES: Frequent fire is needed to maintain understorey integrity, keeping more mesic species low in the profile of the understorey so that other species can compete. It is essential that wildfires are not the sole source of fire in this ecosystem. High intensity fires occur periodically through time, however frequent low to moderate intensity fires will create the disturbance required to keep the understorey diverse. A follow-up burn soon after a high intensity wildfire can be considered to reduce germinating mesic species.</p>

8

IMPLEMENTATION ACTIONS AND STAGING

8.1 Overview

Rehabilitation activities are intended to occur in a staged manner across the site that is sequenced with development of the various stages and precincts within the Northern, Central and Southern Localities of the site.

Specific staging requirements are determined by the Caloundra South Infrastructure Agreement endorsed by the Sunshine Coast Council and MEDQ ensuring that rehabilitation occurs concurrently with development activities.

This staged approach takes into account the 30 year duration and scale of the proposed project and will also contribute to:

- Allowing development and rehabilitation works to be undertaken in parallel by a common contractor within a defined works area which will reduce cost and timing delays;
- Reducing the likelihood of the active construction works interfering with or otherwise compromising achievement of intended long term conservation outcomes; and
- Providing for the integrated consideration of developed areas and conservation areas in terms of on-maintenance and management handover (off-maintenance) processes.

As outlined in the indicative staging plan shown in Figure 1 of the VMRP, the rehabilitation of HMUs (and associated frog conservation and frog buffer areas) will occur for those HMU areas that are adjacent to or share a common boundary with land which is the subject of a reconfiguring of a lot development application.

In some cases, there are parts of a single HMU that will undergo ecological enhancement at different stages; therefore, these have been split into two or three sub-HMUs (e.g. 23a and 23b),

In terms of timing, it is proposed that:

- Rehabilitation of a HMU must be in accordance with the Environmental Rehabilitation Plan for that development stage or precinct.

- Rehabilitation of a HMU will be undertaken in accordance with relevant performance objectives (which are to be developed in accordance with the more detailed rehabilitation planning process outlined in the VMRP).
- Rehabilitation may be completed incrementally in stages within a HMU in accordance with requirements of **The IA**. These stages would not necessarily coincide with separately titled allotments.

Table 8 summarises indicative rehabilitation stages.

8.2 Implementation Actions

This section provides a summary of the required actions to be implemented (and associated HMU enhancement), as well as a summary of implementation and ongoing maintenance requirements.

Several broad actions will be required to address current pressures across the site. These pressures operate at several scales, including site-wide as well as stage and HMU specific and will require an integrated approach for management. The following actions should be commenced prior to the staged detailed restoration of the site, and will continue throughout the staged development and ecological enhancement of the site:

- Commence engagement with local environment groups, Sunshine Coast Council departments, bushcare groups, in accordance with the Environmental Education Plan.
- Review grazing practices and regime across the site, with respect to planned ecological enhancement treatments.
- Assess staging and frequency of chopper rolling and slashing. As chopper rolling and slashing has been identified as a contributing factor to the development of suitable Wallum sedgefrog habitat across the site, the staged cessation of this works must coincide with the creation of suitable habitat within identified frog habitat area.
- Seed collection and propagation for installation and biohub plantings.
- Weed management across the site – development of site wide Integrated Weed Management Plan, as well as detailed weed management plans for each

ecological enhancement stage. A weed hygiene and site access protocol is to be developed for the site to address weed spread due to construction activities and ongoing grazing practices.

- Fire management planning to promote biodiversity and for community safety.
- Identification of reference control sites (relevant to wallum sedge frog habitat) outside the site.

Table 8 Indicative Ecological Enhancement Stages

Stage	Description
Stage 1 Associated with Precinct 1	HMUs 1, 3 and 5 Includes remnant enhancement and some assisted regeneration, particularly along the thin wedge between Bells Reach and the Aerodrome lands. Refer Table 4 for detail of HMUs and associated treatments.
Stage 2 Associated with Precinct 2	HMUs 2, 6, 7, 8, 10, 12, 13, 14, 15 and 17 This includes ecological enhancement in the areas of the EPZ that border the urban living areas of Precinct 2. It also includes some areas of riparian remnant enhancement along Lamerough Creek. Rehabilitation works along the creek should also be undertaken in accordance with requirements of the WSFMP. A biohub is also proposed to be fabricated in the south-western area of HMU 17 (see Figure 2).
Stage 3 Associated with Precincts 3, 4 and 5	HMUs 9a, 11, 16, 18a, 19, 22, 23a and 29a Includes riparian remnant enhancement along the northern sections of Bells Creek North, biohub fabrication areas within HMU 11 and 16 and a large area of assisted heath regeneration in HMU 16.
Stage 4 Associated with Precincts 7, 8 and 9	HMUs 9b, 18b, 22, 23b, 29c, 30, 33, 36a, 37 and 40a. Includes HMUs along the western edge of the EPZ, bordering Precincts 7 and 8. Treatments include large pasture areas that will require assisted regeneration and reconstruction (HMUs 23, 30 and 37), with some areas of remnant enhancement.
Stage 5 Associated with Precincts 10, 11, 12	HMUs 9c, 20, 21, 24, 25, 26, 28, 31, 32, 38 and 39b Many of these HMUs exist in the eastern portion of the EPZ and will form a large area of core habitat. Assisted regeneration and remnant enhancement is proposed in more easterly HMUs, and remnant enhancement and assisted regeneration along parts of Bells Creek. A Biohub will also be fabricated within the northern portion of HMU 32.
Stage 6 Associated with Precincts 13, 14, 15	HMU 4, 27, 29b, 34, 35, 39a, 42a, 48a This stage includes an areas of remnant enhancement around Bells Creek North within the EPZ and a large area of assisted regeneration. The upper reaches of Bells Creek South will be subject to remnant enhancement and assisted regeneration. A Biohub will also be fabricated within HMU 4
Stage 7 Associated with Precincts 17, 18, 19	HMUs 36b, 39c, 40b, 41, 42b, 43, 45, 46, 47 and 48b The southern portion of the EPZ will be subject to primarily assisted regeneration works, with areas of remnant enhancement along the southern edge of Bells Creek South.

9

MONITORING, REPORTING AND ADAPTIVE MANAGEMENT

9.1 Monitoring

The objectives of this VMRP are to provide habitat for EPBC Act listed MNES and EVNT species listed under the Queensland NC Act. The progress of the site enhancement will be measured based on performance indicators that are linked to the habitat requirements of these species. Monitoring recommendations for the progress of the overall enhancement of the site, as well as the corresponding measurable indicators are outlined in Table 9. The broad tasks and methodology involved in each monitoring activity are outlined in the following sections. Specific details of the required monitoring program will be outlined in each precinct level Environment Rehabilitation Plan.

Visual Monitoring

Visual monitoring will be conducted to evaluate the effectiveness of the enhancement strategies and inform the need for adapting the strategies. A visual monitoring point will be established in each HMU.

The following characteristics will be monitored:

- The performance of the HMU against performance criteria;
- The success of weed control and treatments and the presence of any exotic or declared pest plants within the management area; and
- Quality of identified habitat for MNES and EVNT species.

Photographic monitoring points will be established within the offset site to monitor the change in the offset site over time. A brightly painted stake will be used to mark the location of the photopoint. The co-ordinates of the photopoint will also be recorded using GPS. Photos will be taken at the photopoints annually during spring, during a similar time of day (for consistence of light conditions).

A record of the photographs will be maintained which includes:

- Co-ordinate of the photopoint;
- Date and time of each photograph; and
- The direction in which the photo was taken.

After each photographic monitoring event, the photographs will be compared to the photographs from the previous monitoring periods. The following elements will be noted:

- Natural regeneration of native ground, shrub and tree species;
- Changes in habitat structure;
- Plant establishment; and
- The status of weeds.

Permanent Flora Transect

A single permanent flora transect will be established in HMUs that represent each treatment type and target community. Transects will not need to be established in all 59 HMUs, however they must be established to capture a representative sample of all treatment types and target communities. The methodology for condition survey will be in accordance with the BioCondition methodology (Eyre et al 2011), and outlined in precinct level HMU rehabilitation plans.

Table 9 Performance Indicators for Monitoring

Target	Performance Indicator	Monitoring Requirements and Timing
Overall	This will be measured by proxy by calculating the increase in quantity (ha) and quality (low, medium, high quality classes) of functioning native vegetation across site.	The overall condition and progress of the vegetation communities across the site will be monitored through photopoint and flora transect monitoring. Photopoint records to be maintained every six (6) months and permanent flora transects surveyed yearly. Monitoring and reporting to be completed until handover requirements are satisfied. Trapping program to continue and records maintained of the number of trapped feral animals until morning and reporting requirements are satisfied.
	This will be measured by assessing the percentage of functioning native vegetation across site.	
	This will be measured by assessing the percentage of functioning native vegetation across site, with a subjective assessment of the degree of fragmentation and quality of wildlife movement corridors.	
	Measured by the presence/absence of an ongoing feral fauna control program.	
Community	Measured by the presence/absence of education programs about domestic animal control and the feeding of native fauna.	Review community engagement and education strategies at the completion of each Precinct to assess success of programs as identified by performance indicators in the Environmental Engagement Plan.
	Establishment and participation of community in enhancement efforts: Measured by the presence/absence of; <ul style="list-style-type: none"> ● A community participation program for enhancement efforts; ● Education programs (e.g. interpretive displays) about the enhancement program; and ● Education programs regarding native garden schemes. 	
	No public walkways or public access into sensitive areas. This will be measured by the presence/absence of appropriate fencing and signage along walkways and EPZ boundaries as recommended within this Plan. Restrict domestic pets (i.e. contractor's companion animals) from entering enhancement areas through contract conditions.	
Wallum sedgefrogs	Refer to the Wallum Sedgefrog Management Plan	Refer to the Wallum Sedgefrog Management Plan.
Water Mouse	Habitat quality within the EPZ is maintained. Access restrictions to people, pets (i.e. during construction) and motorised activity, in accordance with the EMP.	Permanent photopoint monitoring points are to be established within areas of known Water Mouse habitat within the site and directly adjacent to the site. Monitoring is to be carried out yearly until the handover of defined rehabilitation stages within the EPZ.

Target	Performance Indicator	Monitoring Requirements and Timing
Migratory species (species as defined in PER C7)	Increased wetland and sedgeland habitat across the site to support migratory wetland and terrestrial species.	Area and quality of suitable wetland migratory bird habitat is to be recorded as part of the six (6) monthly photopoint and yearly flora transect monitoring.
EPBC Act Flora: <i>Acacia attenuata</i> <i>Allocasuarina emuina</i> <i>Eucalyptus conglomerata</i> <i>Phaius australis</i> <i>Prasophyllum wallum</i>	<p>Creation of intact areas of suitable habitat to support EPBC Act listed flora, with a weed cover of less than 5%.</p> <p>Preparation, implementation and continued adaptation of Biohub management plan throughout the life of the enhancement strategy. This will be measured by the presence/absence of a plan and whether scheduled reviews take place.</p> <p>Incorporation and management of propagules of each species within planted Biohub zones within areas of suitable habitat. This will be measured by the presence/absence of established management zones.</p> <p>Continued persistence of viable local populations of each EPBC Act listed flora species, measured in accordance with the monitoring requirements for handover.</p> <p>Strategic placement of flora Biohubs throughout the landscape to maximise dispersal across other suitable habitat areas (on and off site). This will be measured by assessing the level of successful colonisation of EPBC Act flora outside of Biohub areas through natural dispersal.</p>	<p>Area and quality of suitable EPBC Act listed flora habitat is to be recorded as part of the six (6) monthly photopoint and yearly flora transect monitoring, until handover of the rehabilitation works.</p> <p>Permanent flora transects are to be established within biohub areas and are to record the establishment and population size of installed EPBC Act listed flora.</p>
NC Act Flora: <i>Blandfordia grandiflora</i>	<p>Assessment of habitat suitability for each of the NC Act listed flora species between baseline levels of suitable habitat and areas of suitable habitat.</p> <p>Maintenance of known populations.</p>	<p>Areas of known populations of these species are to be mapped and recorded.</p> <p>Population surveys for known NC Act species should be carried out every two years during the construction staging, until handover of defined rehabilitation stages within the EPZ.</p>

9.2 Reporting

A report will be produced yearly for the duration of the ecological enhancement program relevant to the rehabilitation stages commenced but not handed over, following the assessment of the permanent flora transect. The report will summarise:

- Management measures conducted within the site over the last 12 months;
- Results of the monitoring and progress towards achieving performance criteria;
- Management measures recommended for the following year to achieve performance criteria; identification of risks, issues or opportunities to achieve the management outcome and performance criteria; and
- Recommended modifications or adjustments to the VMRP or detailed rehabilitation plan to achieve performance criteria.

Reporting obligations relevant to each area of rehabilitation as specified in subsequent ERP's will cease once the relevant performance criteria have been met and areas accepted 'off maintenance' and accepted by council.

9.3 Adaptive Management

To manage the ecological enhancement and restoration strategy, adaptive management principles will be applied. Subsequent and ongoing plans will be refined based on monitoring and the condition of the target sites prior to the commencement of treatments.

There is also a level of uncertainty regarding the success of revegetation and restoration

projects of this scale. Re-created habitats often do not resemble target (remnant) habitats, in their ecological function and species compositions (Maron et al 2012). Due to the large size of the site and the 30 year development timeframe, there is likely to be changes in the site condition, vegetation structure and habitat condition. To effectively manage the risk associated with this large ecological enhancement project the following adaptive management principles will be applied:

1. Establish a permanent monitoring point, quadrat or transect within representative HMUs across the site.
2. Survey the ecological condition, structure and habitat features of each HMU prior to the development of the detailed rehabilitation plan for each stage.
3. Assess and record the progress of enhancement works within previous development stages. This assessment should include a comparison of different treatments applied to similar HMUs and an analysis of the success of the treatment for achieving targets.
4. Provide recommendations for amending this ESS report and subsequent detailed rehabilitation plans based on the success or failure of similar treatments as well as monitoring reporting and recommendations.

Where this plan is to be updated, the amended plan is to be approved by the Minister for DAWE.

POTENTIAL RISKS TO ACHIEVING THE REHABILITATION GOALS

Table 10 outlines potential threats to achieving the goals of the VMRP, originally identified in Greening Australia's Ecological Rehabilitation Strategy (2011), and explored more recent assessments.

Table 10 Potential Risks and Associated Mitigation Measures

	Risks	Mitigation Measures
1.	Inappropriate level of weed management. Weeds management will need to be at a level that can successfully suppress weeds over the long term and allow for native species to establish. The effort required to restore native ecosystems to where weeds are no longer a threat is not linear and often involve a substantial amount of energy to 'tip' the system back into the favour of native flora. Subsequently, only a low level of continued effort will be required to maintain the native community as positive feedback loops will have been established. As an example, a land manager can apply a too low level of weed management consistently (with very large cumulative effort and cost) and never restore a native community. This is because this approach is unlikely to tip an ecosystem back to native flora dominance, as positive feedback loops still exist for weed persistence.	Implementation of Weed Management Plans.
2.	Unplanned fires/inappropriate fire regimes (Greening Australia, 2011).	Implementation of a Fire Management Plan, with appropriate monitoring and adaptive management frameworks
3.	Inappropriate grazing regimes. Cattle can aid restoration by keeping pastures down but can damage regrowth if over-stocked.	Monitoring of grazing effort and regeneration success (compared to non-grazing areas) to ensure it is not impacting ecological enhancement goals.
4.	Chopper-rolling is being undertaken on-site to both remove pine stumps, stimulate regrowth and return the area to a more appropriate drainage pattern by removal of mounding. Long-term chopper-rolling usage however could affect regrowth quality by seedbank depletion if treated areas are not adjacent to remnants and select species are unable to seed (Greening Australia 2011).	As per Greening Australia (2011), halt chopper rolling of regrowth in all HMUs indicated within this plan unless deemed necessary for frog habitat maintenance or mound / stump removal and pine regrowth management; Other methods of weed removal should be assessed to avoid impacts to ecological enhancement goals.
5.	Use of herbicide impacts threatened or near threatened flora or fauna (e.g. Wallum sedgefrogs).	The type and quantity of herbicide used should be assessed for each HMU. Further research will be required to assess whether there is a herbicide that is commercially available and can be used in close proximity areas of Wallum sedgefrog habitat.
6.	Former pasture areas are likely to have higher nutrient levels, including phosphorus and nitrogen. This may make it difficult to restore heath vegetation in such areas, as many heath species find high phosphorus levels in the soil toxic (e.g. Banksia and other <i>Proteaceae</i> species). Higher nutrient levels are also likely to lead to greater numbers of exotic understory species in the eucalypt	As 'assisted regeneration' applies to a large majority of the area, the native communities that respond to potentially high level of nutrients will be allowed to grow. Weed management will need to continue to remove those weed species that are able to persist due to high levels of nutrients. This includes the removal of acacias and melaleucas, where these species are not desired (e.g. heath).

	Risks	Mitigation Measures
	communities present on some of the drier areas of the site. Such high nutrients tend to build up in cattle resting areas due to the concentration of cattle dung in these locations. On areas that have had pine plantations, organic carbon and available phosphorus levels are moderate to high, most likely due to past fertilisation practices (Greening Australia 2011)	Biohub planning should avoid areas with high nutrient concentrations. Despite this, if high levels of nutrients are affecting biohub areas, consideration should be given to transplanting the target species to areas that are more suitable.
7.	Direct seeding and tubestock propagation are important aspects of the reconstruction and biohub fabrication treatments. For some species, it may be difficult to either find seed, propagate or establish propagules.	The following mitigation measures should be adopted: <ul style="list-style-type: none"> ● Early planning for seed sourcing and nursery propagation. ● Planting of a relatively high number of target species within Biohub areas (whilst avoiding crowding) as a contingency against death. ● Biohubs to be fabricated to provide the most suitable conditions for the target species.
8.	In terms of management of hydrology on site, development and vegetation changes across due to enhancement efforts may impact hydrology across the site. It is likely that groundwater will generally become shallower in conservation areas due to the development, though revegetation is likely to increase depth to groundwater in the longer term as communities are re-established (Draft PER, p. 31). Greening Australia (2011, pp. 42) notes that very small differences in water levels or frequency of inundation can lead to dominance by distinctly different plant species (e.g. Melaleuca, Wallum or Eucalypt). This suggests it will be difficult to accurately predict the longer-term vegetation types. There is an inherent risk that as hydrology changes, habitat provided for the target species (e.g. biohub habitat) may change. Therefore careful balancing of local hydrology will be essential to maintaining desired habitats.	Future assessment of whether vegetation change affects VMRP and Wallum sedgefrog Management Plan objectives will be required.

SUMMARY AND CONCLUSIONS

With implementation of this plan, it is expected that a range of vegetation communities will have been created, restored or enhanced. Figure 3 shows the predicted result of the Strategy, once vegetation in each HMU has matured, or reached remnant status. At this stage, it is difficult to predict the exact vegetation communities which will exist in the future; thus, Figure 3 describes only broad vegetation community types for non-remnant areas, rather than prescribing regional ecosystem codes as targets. Despite this, where remnant enhancement is occurring, the target community is the existing remnant vegetation's regional ecosystem type.

Once enhancement efforts are complete, habitat values will vary across the site according to the habitat preferences of each target species, as outlined in Table 2. It is expected that most of the habitat will be melaleuca forest and sedgeland, providing large tracts of potential habitat for *Acacia attenuata*, *Eucalyptus conglomerata*, *Phaius australis*, and *Prasophyllum wallum*. It is also expected that there will be large patches of dry and wet heath within HMU 8, 10 and 16 in the north-east, providing habitat for *Allocasuarina emuina*, *Eucalyptus conglomerata*, *Phaius australis*, and *Prasophyllum wallum*. Biohubs placed across the site will also aid in the recolonisation of threatened flora species across the site.

Habitat for *Blandfordia grandiflora* will also be protected and enhanced with opportunities for *Blandfordia grandiflora* to naturally expand into restored heath areas across the site.

In terms of threatened fauna species targeted as part of this VMRP, the range of habitats across the site will provide some habitat values to migratory terrestrial and wetland bird species, whilst patches of sedgeland within the EPZ will provide habitat for the three Wallum sedgefrogs. Remnant enhancement within Regional Ecosystems 12.1.2 and 12.1.3 will also help conserve habitat for the Water Mouse.

Dedicated weed treatments, and monitoring and reporting will be a key factor in contributing to the success of this VMRP. This Strategy will continue to evolve to suit changing circumstances to achieve the overarching objective of ecological restoration across conservation areas within the site. The first stages of enhancement will also function as crucial case studies to assess success and apply lessons learnt to future stages. With this adaptive management framework in place, it is expected that enhancement results will improve over time to the benefit of the environment and local community.

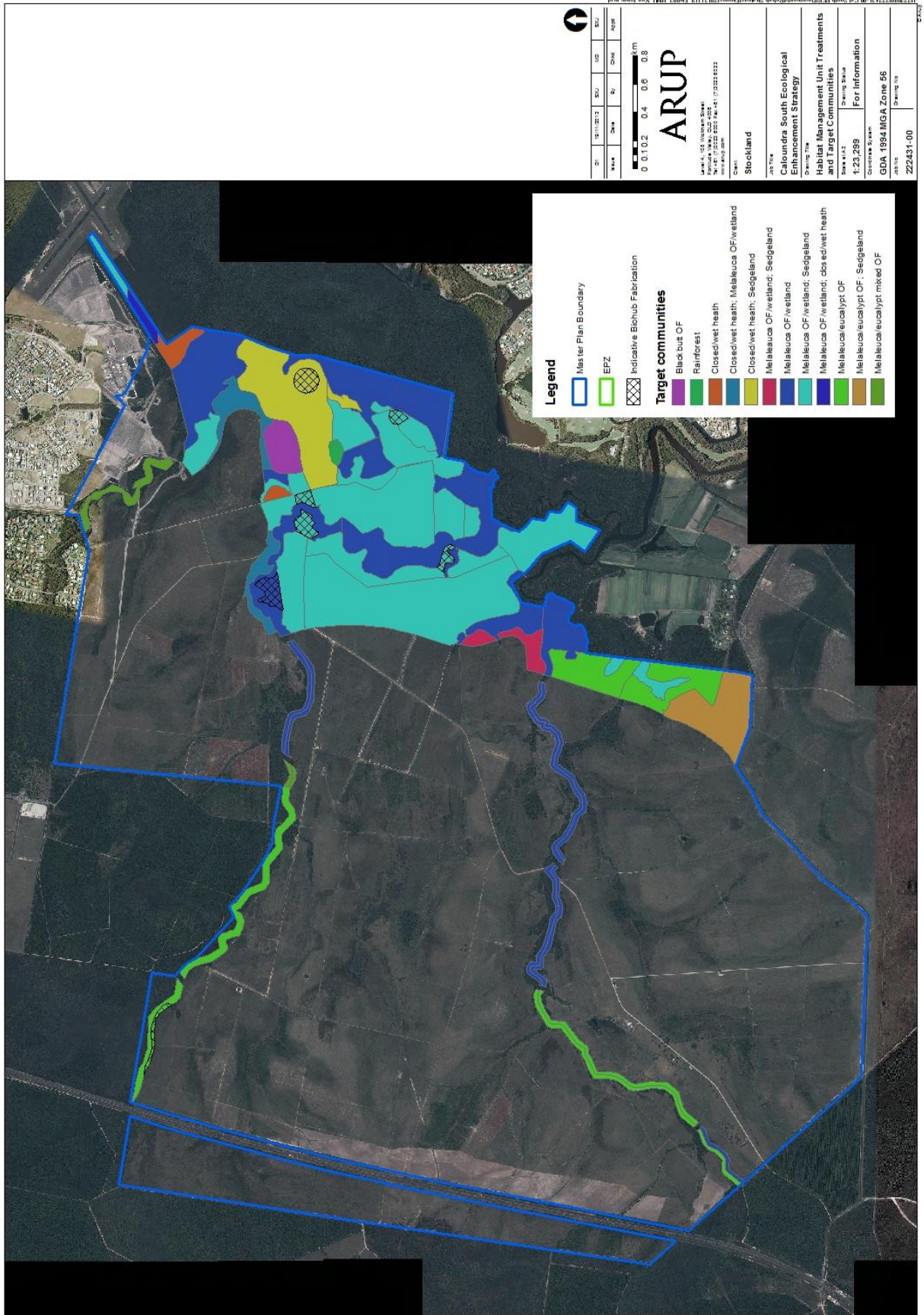


Figure 3 Target Vegetation Communities

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APPENDIX B: ENVIRONMENTAL ENGAGEMENT PLAN

B1.1 INTRODUCTION

Caloundra South is a proposed master planned community on approximately 2,310 hectares (ha) of land, located approximately 100 kilometres (km) north of Brisbane, and 16km south of Maroochydore – the principal centre on the Sunshine Coast. The development provides for approximately 20,000 dwellings, catering for 50,000 new residents, and facilities that include a town centre, two major employment precincts and associated transport infrastructure and utilities. An Environmental Protection Zone (EPZ) and waterway buffers of conserved or rehabilitated habitat protected within conservation tenure are integral parts of the development.

The approval holder is committed to engaging and communicating with stakeholders across the planning and implementation of Caloundra South. Building the capacity of local people (and agencies) to participate in decisions that affect their future and fostering collaborative approaches to the opportunities and challenges of change in their local area have been key considerations in the development of community engagement approaches for the project.

This Environmental Engagement Plan (EEP) has been developed in response to EPBC Act approval condition 1(g) that “an environmental engagement strategy/plan identifying communication and engagement mechanisms for ensuring community engagement with management practices required to protect matters of national environmental significance” is prepared.

B1.2 BACKGROUND TO ENGAGEMENT ON THE CALOUNDRA SOUTH PROJECT

Existing Stakeholders

Stockland and its consultants identified that the key stakeholders are currently as follows:

- Department of Agriculture, Water and Energy (DAWE)
- Queensland State Government agencies – Department of State Development, Manufacturing
- Infrastructure and Planning (DSDIP) and Department of Environment and Science (DES)
- Sunshine Coast Council (SCC)
- Sunshine Coast Environment Council (SCEC)
- Take Action Pumicestone Passage (TAPP)
- Nighteyes Water and Land Care
- Healthy Land and Water
- Organisation of Sunshine Coast Associations of Residents (OSCAR)
- Golden Beach Progress Association
- Kabi Kabi First Nation People
- Bellvista Community association (BeCa)
- Caloundra South residents.

B1.2.3 Proactive Involvement by Stockland with Key Agencies in the Pumicestone Passage Catchment

Through the community and stakeholder engagement process for the Master Plan and PER, Stockland developed relationships and partnerships with various agencies and organisations operating in the Pumicestone Passage catchment area.

It is intended to build on these networks in this EEP, recognising that there is a key role for a range of stakeholders and partners that will contribute to the delivery of the long term environmental goals and obligations for Caloundra South and protect environmental values in neighbouring Bells Creek and Pumicestone Passage.

B1.3 ENVIRONMENTAL ENGAGEMENT FRAMEWORK AND APPROACH

B1.3.1 Introduction

Communication and engagement imperatives will evolve both over the lifecycle of the development and between stakeholders. It is intended that the capacity of stakeholders to engage, invest and contribute to the project will be increased over time together with their participation in and engagement in the outcomes. Significance is given to the fact that in 30 years when development is complete, the appropriate agencies including the community, has the capability, tools and resources to maintain desired outcomes over time.

B1.3.2 Principles

Caloundra South is a transformative development for the Sunshine Coast region and a flagship project for Stockland. To maximise its net regional benefit to the existing and emerging community it is recognised that ongoing proactive stakeholder communications and engagement will be required.

The community engagement principles for the project have been adapted from Stockland's national principles and are important because they characterise the long term relationships the Project is seeking to establish with key stakeholders. They are as follows:

- proactive
- sincere and transparent, seeking to build relationships of trust beyond the project
- reciprocal and based on understanding and stakeholder concerns, needs and drivers
- regular with consistent resourcing
- engaging, building excitement and empowering the community to assist in delivery of the project's vision and identity.

B1.3.3 Overarching Project Objectives

The overarching objectives for community development for the entire Caloundra South project are to foster:

- a more resilient community with a clear identity
- increased social capital and earlier provisions of community networks
- a heightened sense of responsibility towards the environment and involvement in its care
- active participation in economic activity – employment and enterprise
- increased depth of cultural participation and self-expression
- increased community capacity – formal and informal
- an active and healthy community with high levels of community well-being.

B1.3.4 EEP Outcomes and Objectives

Building on the overarching Project Objectives; the specific outcomes and objectives for delivery of the EEP are outlined in Table B1.3 below:

Table B1.3a: EEP Outcomes and Objectives

EEP Outcomes	
This EEP involves seven key outcomes for engagement on the Caloundra South project as follows:	
1	Identification of key stakeholders – values, agendas, concerns and opportunities for involvement
2	Stakeholders who feel emotionally engaged with the project; excited about the opportunities that it offers them (and to their community or constituents)
3	Opportunities for stakeholders to participate in Caloundra South at every stage
4	Compliance with all regulatory driven conditions associated with the Master Plan and EPBC Act approvals
5	A transparent mechanism to raise and respond to community conflict and concern
6	A license to operate and positive development environment
7	An enhanced reputation for corporate citizenship
EEP Objectives	
In addition to the above, the following are the more specific objectives for the delivery of the Environmental Engagement Plan:	
1	Inform, educate and collaborate towards a heightened sense of responsibility towards the local environment and involvement in its care
2	A commitment to actively soliciting the community’s input throughout the planning and implementation process
3	Providing meaningful opportunities for involvement and resourcing where appropriate
4	Providing leadership and advocacy role in the Pumicestone Passage catchment while engaging the broader community
5	Making a commitment to the long term process
6	Reporting success and acknowledging community contributions

B1.3.5 Engagement Techniques

This EEP has adopted a progressively collaborative approach by building on networks and partnerships established in earlier phases of the project to move towards integrative community development models of managing environmental issues to deliver net positive change.

As the maturity of the community development strategies and outcomes increases and the capacity of local agencies and organisations to participate grows, there is greater capacity to achieve collaboration and empowerment outcomes.

The engagement techniques proposed to be adopted for subsequent phases of the project will include all of those described to date others mentioned in the EEP.

B1.3.6 EEP Delivery

The Environment Engagement Plan will be delivered in key stages which span the life of the project.. It is intended that the Plan be reviewed and renewed on a regular basis reflecting the project phasing and changing stakeholder needs and interests.

Table B1.3b: EEP Delivery

Years	EEP Delivery Phase	Details
0 to 2	Mobilisation and Launch (complete)	The mobilisation and launch phase marks the period of initial engagement with stakeholders once the project has become live. In this case, the time from lodging the Master Plan, the preparation and lodgement of the PER for approval and (assuming approval is forthcoming) the commencement of site works. This period coincides with much of the initial statutory consultation processes and is focussed

Years	EEP Delivery Phase	Details
		on maintaining a license to operate from both regulators and the community, creating relationships and introducing the project to the community.
2 to 4	Acceleration Phase (complete)	The acceleration phase moves the relationship with all stakeholders beyond statutory participation and towards elective engagement and community development. The key to success in this phase is consolidating the network of relationships with delivery agencies and partners and starting to build momentum around community capacity building outcomes.
5 to 20	Opportunity	The emphasis of this phase is involvement and inclusion, building appetite / brand loyalty, increasing participation and ultimately converting this into market opportunity. The opportunity for active place management and community engagement and development activities based around constructive problem solving and leveraging opportunity will have become 'real'. Cultural and recreational participation through programed spaces, festivals or events is likely to have become a key driver, together with education, employment and enterprise development – encouraging capacity in the community and creating social capital outcomes. Long-term engagement mechanisms will be embedded in the community and participatory design processes have become the business as usual approach.
Year 20 onwards	Ownership	As Caloundra South reaches critical mass, the ownership of key initiatives will transition to the stakeholders and become part of life in the community. The need for structured opportunities for public participation will have reduced and much of the community development activity has been divested to partner organisations.
20 to 30	Exit	Significance should be attached to the need for a managed exit that ensures the community has the capability and capacity as well as the tools and sustainable funding required to maintain desired outcomes over time. Planning for this end point should be embedded in the thinking from the outset – to avoid expectations that are unrealistic or establishing unsustainable outcomes.

B1.4 FACTORS DRIVING ONGOING ENVIRONMENTAL ENGAGEMENT

B1.4.1 Introduction

This section of the Plan seeks to group the key factors that will drive on-going environmental engagement at Caloundra South. Factors driving engagement refers to environmental aspects or values that:

- are identified from previous studies that are or are likely to become core obligations on Stockland's part and as such require on-going management and or conservation
- are important to stakeholders
- form the environmental factors underpinning community engagement activities which are the subject of this Plan.

B1.4.2 Environmental Values Important to Stakeholders

A comprehensive assessment of the environmental values and issues considered important to stakeholders have been summarised at a high level in Section B1.2.4 of this Plan.

B1.4.3 Factors Driving Environmental Engagement

Based on the above, the key factors driving environmental engagement initiatives at Caloundra South for the purposes of this Plan can be summarised into five areas given below. It should be noted that the scope of this Plan is intended to cover Federal environmental interests (i.e. matters of NES).

1. **Sensitivity of the adjacent Ramsar Wetland; the need to maintain ecological values and minimise impacts:** Contribute to the protection of the Moreton Bay Ramsar wetland values (including Bells Creek and Pumicestone Passage) during construction and operation. During construction, each stage of the project requires a Construction Environment Management Plan detailing compliance with environmental conditions and standards for contractor performance and management.
2. **Re-provision of acid frog habitat lost to the development to maintain corridor function and acid frog population viability in the long term:** Habitat retention and re-creation for acid frog habitat will be provided within water way buffers located along creek lines within the development site commensurate with that area of habitat lost to the development. Within these buffers acid frog habitat will be rehabilitated, areas of existing habitat will be retained and these areas will be conserved in an appropriate tenure for long-term benefit to acid frog species. Education of the conservation values present on site, the importance of the rehabilitation program and research into the species would underpin the proposed engagement for this environmental factor.
3. **Beneficial rehabilitation of environmentally degraded land including riparian corridors to support increased site-wide biodiversity:** Rehabilitate riparian vegetation and conservation corridors along Lamerough Creek, Bells Creek North and South and enhance degraded land within the Environmental Protection Zone whilst conserving these areas in an appropriate tenure for long-term benefit. Co-benefits associated with this activity are the provision of additional habitat and feeding opportunities for Federally listed species such as water mouse and migratory birds. Education of the conservation values present on site; the importance of the rehabilitation program in the context of protecting Ramsar values more widely; the value research can provide would underpin engagement for this environmental factor.
4. **Stakeholder requests to remain involved in the project:** Maintain and increase the levels of engagement with existing and future interested stakeholders to enhance the environmental outcomes sought.
5. **Environmental education programs as educational and awareness raising tools to support all other factors and living sustainably:** Environmental and sustainability education of Caloundra South residents, businesses and service providers and appropriate stakeholders beyond the site is essential to support the awareness of need to protect the environmental values of the site and catchment as development progresses. Environmental Education resources are intended to be available on-line, established in consultation with the Landcare Group and other relevant stakeholders.

These factors will require ongoing management and monitoring through the life of the development and the Project will continue to adapt and refine approaches in consultation with the community, agencies and partners in the catchment.

B1.5 FUTURE STAKEHOLDERS

The construction and implementation of the Caloundra South development will likely attract interest from stakeholders that are additional to the existing stakeholder group outlined in sections B1.2.2 and B1.2.3 of the Plan. This may be due to a number of factors including:

- new residents, businesses, schools and service providers now residing or operating within the Caloundra South development that are seeking to engage and be active within their developing community
- partners and collaborators participating in Caloundra South environmental initiatives and commitments such as the proposed Landcare Group and Environmental Education programs
- partners and collaborators participating in catchment wide and Ramsar-related environmental initiatives of which Caloundra South is a part
- media and other observers responding to issues and opportunities that may arise.

Table B1.5 provides an outline of the potential future stakeholders including their expected areas of interest as the Caloundra South community develops.

In general, it is considered that future stakeholders who have not previously been engaged by the stakeholder engagement process for the Caloundra South development, will likely take an interest in partnering or collaborating to achieve desired environmental outcomes for the development, and to improve catchment wide outcomes where possible. The Action Plan in Section B1.7 identifies the potential mechanisms for future stakeholder involvement.

Table B1.5: Future Stakeholders and Potential Areas of Interest

No.	Future Stakeholders	Potential Areas of Interest
Government		
1	Moreton Bay Regional Council (MBRC)	<ul style="list-style-type: none"> ○ Potential for involvement and benefit from catchment wide initiatives.
Residents and Community Groups		
2	Residents of Caloundra South	<ul style="list-style-type: none"> ○ Sustainability education, awareness and practice. ○ Participation in Landcare led activities. ○ Opportunity to utilise open space, recreational and other community infrastructure. ○ Outcomes of annual reporting of environmental indicators.
3	Businesses and service providers of Caloundra South	<ul style="list-style-type: none"> ○ Sustainability education, awareness and practice. ○ Participation in Landcare activities. ○ Opportunity to utilise open space, recreational and other community infrastructure.
4	Schools of Caloundra South	<ul style="list-style-type: none"> ○ Sustainability education, awareness and practice. ○ Participation in Landcare and other environmental activities. ○ Opportunity to utilise open space, recreational and other community infrastructure. ○ Outcomes of annual reporting of environmental indicators.
5	Project neighbours including residents of Little Mountain, Pelican Waters and Bells Creek	<ul style="list-style-type: none"> ○ Sustainability education, awareness and practice. ○ Participation in catchment wide environmental protection initiatives. ○ Opportunity to utilise open space, recreational and other community infrastructure. ○ Outcomes of annual reporting of environmental indicators.
6	Industry and agricultural businesses adjacent to Caloundra South	<ul style="list-style-type: none"> ○ Catchment wide environmental protection initiatives. ○ Outcomes of annual reporting of environmental indicators.
Academic Institutions		
7	Local Sunshine Coast and Brisbane based Universities	<ul style="list-style-type: none"> ○ Opportunity for research in specialist areas that relate to matters of NES, community engagement around environmental matters etc.
Other		
8	Media	<ul style="list-style-type: none"> ○ Issues arising as the development progresses. ○ Opportunities for promotion of community environmental activities. ○ Outcomes of annual reporting of environmental indicators.

B1.6 PRIMARY METHODS FOR ENVIRONMENTAL ENGAGEMENT

It is proposed to implement two methods for on-going environmental engagement of interested stakeholders:

1. Establishment of an independent community group such as a Landcare Group.
2. Provision of Environmental Education Programs.

B1.6.1 Establishment of a Landcare Group

The scale and location of Caloundra South as well as the project's extensive environmental commitments including the implementation of the rehabilitation and revegetation strategy provide the opportunity to form a dedicated local community group or subcommittee that focuses on the environment.

A key concern identified by many local stakeholders is the need for local education and engagement within the development to influence behavioural change to ensure the environmental values of the Pumicestone Passage and local area are protected. Proactively establishing such a community group or subcommittee is intended to contribute to raising awareness of the need to uphold the site's environmental values and commitments.

A number of options are to be explored including the formation of an independent community association, partnering with an existing local group or establishing a new Landcare group.

The current Caloundra South Landcare group is represented by the Aura (Caloundra South) Community Stewardship Group which has been active since 2014 working on community based educational land care activities. Once a critical mass of residents have been established and sufficient demand exists, key activities of the Aura (Caloundra South) Community Stewardship Group will be transferred to a new group or subcommittee involving representation of the local community.

As per the current practice by the Aura (Caloundra South) Community Stewardship group, it is intended that annual planning of activities and priorities would continue.

B1.6.2 Environmental Education Programs

Since commencement of the project, environmental education programs have focused on the following activities:

- preparation of the Aura (Caloundra South) residents welcome pack (available online)
- community events – which have included events for World Wetland Day, National Tree Day and World Habitat Day
- partnerships with institutions such as Caloundra Chamber of Commerce to provide environmental educational material in the way of training programs for community stakeholders.

Furthermore, partnerships have been formed with local schools where Stockland has made available their consulting experts to conduct lectures and field expeditions for students.

As the population of Caloundra South grows, it is expected that the online education resources will be further developed for use by the community as a 'virtual ecocentre'. This includes information about the environmentally significant coastal wetlands and adjacent to the project and , site relevant environmental and sustainability education.

Program and Outputs

It is widely recognised that we engage and learn in many different ways. In order to reach the widest possible audience base and provide the greatest opportunity for disseminating information and gaining knowledge and understanding there is a need for creative and innovative learning environments where a range of different

education opportunities are accessible and can be used to add value to more conventional learning experiences.

This section provides examples of a small number of programs that may be delivered from the Environmental Education programs in response to key audience groups.

Living sustainably at Caloundra South – Due to the proximity of Caloundra South to the Moreton Bay Ramsar wetland and the plans for rehabilitation and conservation on site to protect MNES, it will be important to equip residents with the skills and knowledge to ensure that their daily activities support and enrich these environmentally sensitive areas.

Examples of programs that could be developed to aid knowledge of sustainable are as follows:

- understanding the importance of the conservation areas being rehabilitated at Caloundra South including flora and fauna species and responsible recreational usage of the areas
- the water cycle, integrated water management strategy for the site and importance of how Caloundra South has been designed to protect downstream creek systems
- requirements and guidance for matters such as domestic pets, waste management, energy usage and travel.

Enriching School based education – practical, experience-rich programs delivered to support the national curriculum focused on sustainable development and wetlands. School groups will be welcomed and can participate in either teacher led on-line curriculum based activities.

Community development programs – An evolving program of community development activities are proposed to be developed and delivered in response to the needs, drivers and appetites of the emerging community at Caloundra South and Sunshine Coast community. A particular focus will be promoting sustainable lifestyles and community wellbeing. Programs could include formal education activities through to informal social events all themed around sustainable, healthy living and leveraging the unique natural environment at Caloundra South (e.g. breakfast with the birds; sunset supper or BBQ; treasure trails to find plants, insects or wildlife; and quiz nights focused on environment and sustainable living).

B1.6.3 Addressing Environmental Factors

The proposed educational activities would enable the Project to support the environmental factors that are driving engagement as shown in Table B1.6.3:

Table B1.6.3 How the Primary Engagement Methods Support the Five Key Environmental Factors

Five Key Environmental Factors	Landcare Group	Environmental Education Programs
<p>Sensitivity of the adjacent Ramsar Wetland; the need to maintain ecological values and minimise impacts</p>	<ul style="list-style-type: none"> ● Assistance with implementation of the on-going rehabilitation programs in the EPZ and waterway buffers that supports the integrated water management strategy for the site as part of the WSUD treatment train. Dedicated tree planting days, seed management and propagation, fire and weed management. 	<ul style="list-style-type: none"> ● Programs developed and delivered to provide education to residents and the broader community about the importance of the Ramsar wetland, its sensitivity, appropriate recreational use of the Passage, the integrated water management strategy being delivered during construction and operation and how their daily activities can support and enrich these aspects of the development.

Five Key Environmental Factors	Landcare Group	Environmental Education Programs
<p>Re-provision of acid frog habitat lost to the development to maintain corridor function and acid frog population viability in the long term</p>	<ul style="list-style-type: none"> ○ N/A 	<ul style="list-style-type: none"> ○ Programs developed and delivered to provide education to residents and the broader community about the nature and importance of acid frog habitat on site and in the context of the regional population; accessibility allowed to the waterway buffers and rationale. ○ Potential for access to re-habilitated acid frog habitat for site specific learning for the community, residents, schools and higher education facilities.
<p>Beneficial rehabilitation of environmentally degraded land including riparian corridors to support increased site-wide biodiversity</p>	<ul style="list-style-type: none"> ○ Assistance with implementation of the on-going rehabilitation programs in the EPZ and waterway buffers with dedicated tree planting days, seed management and propagation, fire and weed management. 	<ul style="list-style-type: none"> ○ Programs developed and delivered to provide education to residents and the broader community about the nature and importance of site rehabilitation activities and the potential for studies into increased biodiversity as the rehabilitation progresses on site. ○ Potential for access to rehabilitated land in the EPZ for site specific learning for the community, residents, schools and higher education facilities.
<p>Stakeholder requests to remain involved in the project</p>	<ul style="list-style-type: none"> ○ The Landcare Group for Caloundra South would be open to members of existing community and environmental groups already engaged in the Caloundra South project. 	<ul style="list-style-type: none"> ○ Environmental Education will provide on-going learning and skilling opportunities for interested stakeholders and will provide a focus for local environmental NGO activities and research.
<p>Environmental education programs as educational and awareness raising tools to support all other factors and living sustainably</p>	<ul style="list-style-type: none"> ○ Assistance with community education activities and events for residents. 	<ul style="list-style-type: none"> ○ Environmental Programs are intended to provide the greatest opportunity for disseminating information and gaining knowledge and understanding about the surrounding environment (Ramsar, etc), the site based environmental initiatives proposed and guidance on living sustainably. ○ They will provide a creative and innovative learning environment where a range of different education opportunities are accessible and can be used to add value to more conventional learning experiences.

B1 ENVIRONMENTAL ENGAGEMENT PLAN

B1.7 ENVIRONMENTAL ENGAGEMENT ACTION PLAN

The Action Plan in Table B1.7 is written for the Opportunity Phase (see Section B1.3.6) of the project (years 5-20 of the development). This Phase is intended to work collaboratively with the needs of the emerging community.

The engagement approach refers to the techniques proposed to to inform, consult, collaborate and engage with interested stakeholders in order to meet the objectives of this Environmental Engagement Plan.

Table B1.7 Action Plan

No.	Engagement Approach	Description	Engagement Technique	Environmental Factors Driving Engagement	Actions	Timing	Responsibility
1.	Caloundra South Landcare	The establishment of a Landcare group as part of the Caloundra South development will enable interested stakeholder organisations to work together under an independent community auspice to protect and enhance local and surrounding environmental values. For more information see Section B1.6.1.	Collaborate Include Empower	Sensitivity of adjacent Ramsar wetland. Beneficial rehabilitation of environmentally degraded land. Stakeholder requests for on-going involvement. Environmental Education to support all other factors	1.1 Seek establishment of Caloundra South Landcare group / subcommittee or similar community organisation.	1.1 Within 12 months of approval of the action	1.1 The approval holder
					1.2 Following establishment, the Landcare group will be an independent community operated organisation, able to access grants, develop programs, coordinate volunteers etc. Active participation identifying broader community needs and environmental performance through monitoring activity.	1.2 Landcare activities to commence on establishment of the group based on resident interest	1.2 Landcare Group
2	Environment Reporting	Environmental Reporting aims to provide information on how the environment is responding to development activities. This will be undertaken on a yearly basis presented at a forum to interested stakeholders	Inform Include	Stakeholder requests for on-going engagement. Environmental Education to support all other factors	2.1 Develop a public annual compliance report that monitors performance against all key environmental indicators required to protect MNES as conditioned in the Caloundra South EPBC approval	2.1 Annual	2.1 The approval holder
					2.2 Provide the compliance report to DAWE, published online.	2.2 Annual	2.2 The approval holder
3	Public Forums at key stages of development	At key stages of the development Stockland will hold an open forum to inform the community and interested stakeholders of proposed sequencing, construction methodologies, strategies in place to manage environmental issues and performance expectations of contractors. As the development progresses public forums for future stages will also enable Stockland to share initiatives such as their lessons learnt, identify adaptive measures and emerging new technologies and approaches.	Inform Include	Stakeholder requests for on-going engagement. Environmental Education to support all other factors	3.1 Hold public forums annually to interested stakeholders outlining intended activities and mitigation measures for protecting environmental values and community safety and amenity.	3.1 Annual	3.1 The approval holder
4	Environment Education Programs	Environmental Education Programs will be developed educating the community on sustainable principles which underpin all aspects of the planning, delivery and ongoing management of Caloundra South. Programs will aim to explore principles of sustainable design and management through the delivery of a broad range of potential initiatives.	Collaborate Include Empower	Sensitivity of adjacent Ramsar wetland. Beneficial rehabilitation of environmentally degraded land. Re-provision of acid frog habitat Stakeholder requests for on-going involvement. Environmental Education to support all other factors	4.1 Engage key collaborators, funding partners and government agencies to seek input to planning, sustainable design, governance and funding of Environment Education Programs.	4.1 Start of the planning process for Education Programs (during opportunity phase).	4.1 The approval holder
					4.2 Involvement by interested community stakeholder groups in the preparation of environmental education programs	4.2 Start of the planning process (during the opportunity phase).	4.2 The approval holder

B1 ENVIRONMENTAL ENGAGEMENT PLAN

No.	Engagement Approach	Description	Engagement Technique	Environmental Factors Driving Engagement	Actions	Timing	Responsibility
					<p>4.3 Delivery of the programs may include:</p> <ul style="list-style-type: none"> • Living sustainably at Caloundra South • Enriching School based education • Community development programs • Skilling and employment opportunities for school leavers, long term unemployed and persons returning to the workforce • Higher education learning, teaching and research opportunities 	4.3 During the planning process (during the opportunity phase).	4.3 The approval holder
5	Resident Education Program	A particular early focus for the development will be establishing a resident education and awareness raising program which can also assist in promoting sustainable lifestyles and community wellbeing.	<p>Inform</p> <p>Collaborate</p> <p>Include</p> <p>Empower</p>	<p>Sensitivity of adjacent Ramsar wetland.</p> <p>Beneficial rehabilitation of environmentally degraded land.</p> <p>Re-provision of acid frog habitat Stakeholder requests for on-going involvement.</p> <p>Environmental Education to support all other factors</p>	<p>5.1 Development of the Living Sustainability Program is a priority for both attracting and educating new residents and is planned in the Acceleration Phase. Engage with appropriate partners to develop the following:</p> <p>A Welcome Prospectus for residents seeking to invest / move to Caloundra South that outlines the environmental values of the site and the protection measures in place that must be abided by, including WSUD initiatives, responsible use of Pumicestone Passage and local RAMSAR and MNES values.</p> <p>Signage and interpretative information (subject to council approval as asset owners) to clearly outline to residents and visitors locations of areas of ecological sensitivity, the significance of the areas and areas of the development able to be /not able to be accessed.</p> <p>With the Landcare group develop a program for resident and business participation in raising environmental awareness and calling for volunteers for rehabilitation programs and environmental initiatives.</p> <p>With local schools will develop a program for school participation in raising environmental awareness and revegetation and environmental initiatives.</p> <p>Host a series of fun and engaging activities for residents to encourage enjoyment of the environmental values of the development e.g breakfast with the birds, sunset supper or BBQ, treasure trails to find plants, insects or wildlife, and quiz nights focused on environment and sustainable living.</p>	5.1 Commence during the Acceleration Phase.	5.1 The approval holder
6	Research partnerships and collaboration	Research partnerships will be undertaken with organisations such as the Sunshine Coast University and other SEQ based Universities around the protection, monitoring and management of initiatives and actions	<p>Involve</p> <p>Collaborate</p>	<p>Sensitivity of adjacent Ramsar wetland.</p> <p>Beneficial rehabilitation of environmentally degraded land.</p>	6.1 In consultation with DAWE and relevant research institutions, develop research priorities for MNES with a focus on Wallum Sedge Frog.	6.1 During the acceleration phase.	6.1 The approval holder

B1 ENVIRONMENTAL ENGAGEMENT PLAN

No.	Engagement Approach	Description	Engagement Technique	Environmental Factors Driving Engagement	Actions	Timing	Responsibility
		identified under the wallum sedge frog management plan.		Re-provision of acid frog habitat Environmental Education to support all other factors	6.2 Seek research proposals SEQ based Universities which includes provision for regular updates of research progress to the local community.	.	6.2 The approval holder
7	On-going engagement with groups and agencies operating in Pumicestone Passage	Continue engagement with other actors and agencies operating in the Pumicestone Passage.	Involve Collaborate	Sensitivity of adjacent Ramsar wetland. Beneficial rehabilitation of environmentally degraded land. Stakeholder requests for on-going involvement. Environmental Education to support all other factors	7.1 Maintain the commitment to Healthy Waterways working with Healthy Waterways including funding of two additional monitoring sites in Bells Creek for the duration of the project.	7.1 Ongoing as a key stakeholder	7.1 The approval holder
					7.2 Continue involvement in Pumicestone Passage Form Groups managed by Council assisting with strategies to improve catchment management practices internal to the site and beyond.	7.2 On-going as a key stakeholder	7.2 The approval holder
8	On-going evaluation of the success of the EEP	Evaluate the success of the actions outlined in the EEP. It is intended that the actions in this Plan will be monitored on an annual basis to establish progress and undertake an assessment of how each action has performed against the (relevant) objectives of the EEP.			8.1 Monitor actions from this plan against the objectives of the EEP to be reported annually in the Annual Compliance Report.	8.1 annually.	8.1 The approval holder