Mapping Matters of Local Environmental Significance (MLES) for the Fraser Coast Region

Technical Report. June 2022

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Executive Summary

This report documents the process that has been undertaken to identify and map Matters of Local Environmental Significance (MLES) for the Fraser Coast region.

Local governments are encouraged to identify and map natural values important to a local area such as flora, fauna or ecosystems as MLES. Matters of national and state environmental significance are identified at a federal and state level.

This report provides:

- A framework for identifying MLES;
- Mapping methodology;
- Mapping outputs; and
- Recommendations.

Methods

There are no statutory requirements or guidelines for identifying MLES. A framework of Corridors, Biodiversity Areas and Ecosystems and associated sub-categories for each was established, as follows:

Corridors	Regional corridor
	Regional riparian corridor
	Established corridor
	Enhancement corridors
	Enhancement urban corridors
	Stepping stone corridor
Biodiversity Areas	Core habitat area
	Established nodes
	Enhancement nodes
	Areas of species richness and diversity
	Climate change adaptation and refugia areas
Ecosystems	Least concern regional ecosystems
	Ecosystem representation and/or uniqueness
	Coastal habitats
	Urban bushland
	Local significant species habitat
	Rehabilitation areas
	Ecosystem buffers

An Expert Panel, consisting of local ecological specialists, was engaged to nominate values for the sub-categories, undertaken over a series of workshops. This approach captured a broad and extensive ecological local knowledge base.

GIS spatial modelling was undertaken to identify potential linkages and ecological corridors within the study area using selected criteria, datasets, and mapping methods. These methods were used to map potential corridors, habitat nodes, core areas, aquatic corridors, and a rehabilitation tool.

The project utilised Expert Panel input to assist in prioritising the corridors and nodes and identifying biodiversity significant areas. Corridor mapping was undertaken utilising a set of guiding principles to run GIS spatial modelling which effectively 'linked' habitat to create corridors. For example, connecting every habitat node to at least one neighbour (another habitat area within a certain threshold distance) was a guiding principle.

Only those values supported by a scientifically robust, spatially mapped evidence base could be recommended as MLES by the Expert Panel.

Results

The process identified fifty-four (54) MLES values. From these recommended MLES values, areas of species richness and diversity was the most common sub-category (31 times), followed by riparian corridors (20), areas of ecosystem representation or uniqueness (18), core habitat areas (15), climate change refugia (14), local species habitat (13), and coastal habitats and urban bushland at 11 times.

For the biodiversity corridors and habitat node results, there were 34 core habitat areas, 137 established nodes and 220 enhancement nodes comprising a total area of 102,876 ha. The average core habitat area was 2,669 ha while the average established node was 59 ha with the enhancement nodes primarily of smaller habitat patches averaging 18 ha. There were 376 biodiversity corridors mapped across the study area. These incorporated 149 enhancement non-urban corridors, 70 enhancement urban corridors, 64 established corridors, 70 regional corridors and 23 stepping stone corridors totalling 1,291 km. Prioritised rehabilitation areas were also mapped across the council region.

Chapter 1 Introduction

1.1 Background

Redleaf Environmental was engaged by Fraser Coast Regional Council (Council) to map the Matters of Local Environmental Significance (MLES) across the council region (Figure 1). Council is undertaking a planning scheme review to facilitate alignment with the State Planning Policy 2017 (SPP). The SPP State interest of biodiversity, policy 3 and 4 relate to matters of local environmental significance (MLES).

This report presents a scientifically robust framework to identify locally significant environmental values including mapping wildlife corridors and habitat nodes within the council area. These corridors and areas were then prioritised for their biological functioning and ability for rehabilitation (where they were considered fragmented or sub-optimal).

This technical report documents the definitions, guiding principles and criteria, mapping methodology and mapping layers of the MLES across the Fraser Coast region. This body of spatial analyses and mapping products build on previous work completed by Council.

1.1.1 Policy

The following information is an excerpt from the MLES Statutory Definition:

> Queensland's Planning Act 2016 (the 'Act 2016'), 'establishes a framework of planning instruments and processes' with a purpose of establishing 'an efficient and accountable system of land use planning' and assessment that leads to ecological sustainability, including biological diversity. The Act 2016 acts as the head of power for the State Planning Policy 2017 (SPP) which outlines State Government interests. Local Government's must consider these interests when making or amending planning schemes. Matters of Environmental Significance (MES) is identified in the state interest of biodiversity (biological diversity). The SPP defines MES as matters of national, state and local environmental significance.

The Act 2016, SPP and Regional Plans that cover the Fraser Coast Region form the primary statutory foundation for MLES. Through this foundation, Local Governments are required to identify and appropriately integrate MES into their planning schemes. The Wide Bay Regional Plan commenced in 2011 and is currently being reviewed by the State Government. To the extent of any inconsistency, a State planning policy prevails instead of a regional plan and a regional plan prevails over a planning scheme.

The Queensland Government provides guidance to Local Governments regarding the identification and administration of Matters of Local Environmental Significance (MLES) in their region, with scope for further addition and refinement of local environmental values and/or areas.

For the Fraser Coast Regional Council, four fundamental foundations are proposed for identifying MLES: statutory, community values, current practice and technical data. It is proposed that the synthesis of these four foundations will facilitate, inform and guide the identification of MLES in the Fraser Coast Region. The primary statutory foundation is through the Act 2016, SPP and Regional Plans, whilst community values were identified through existing internal Council strategies/ frameworks/ plans which had a community consultation component and relevant Commonwealth and Queensland Government Strategies.

1.1.2 Matters of Local Environmental Significance

MLES refers to values and areas that are determined by a Local Government and identified in a planning scheme. MLES is not the same or substantially the same as Matters of National Environmental Significance (MNES) and or Matters of State Environmental Significance (MSES).

MLES is valuable biodiversity determined by a Local Government that cannot be the same, or substantially the same as MSES or MNES, although, they may spatially overlap in certain circumstances. For example, habitat for wildlife species that are not listed as 'vulnerable', 'endangered' or 'special least concern' under the *Nature Conservation Act 1992* (*NCA 1992*) or the *Environmental Protection Biodiversity Conservation Act 1999* (EPBC 1999) that is important locally (e.g. squirrel gliders) may overlap with an area of MSES or MNES.

1.1.3 Planning Scheme

Council have recently completed Stages 1 and 2 of the Planning Scheme Review Project of the Fraser Coast Planning Scheme 2014 (the planning scheme). This review sought stakeholder and community feedback on the planning scheme to ensure it aligns with new trends and community priorities over the next 20 years. On 28 April 2021, Council endorsed a scope of works for in response to the findings of review. The scope of works includes a MLES project. The review identified that the current biodiversity layers and planning scheme provisions relating to the protection of biodiversity are not delivering the desired outcomes on the ground.

1.1.4 Existing reports, studies and data

In 2020 Council commissioned KPMG to prepare the report *Insight into the Future of the Fraser Coast* which identified several considerations for the planning scheme review including: *Preserving and enhancing the natural assets which underpin the lifestyle experience, the main driver of migration and tourism.*

The MLES project has interdependencies with the commenced Open Space Strategy and Regional Ecosystem (RE) Vegetation Mapping project. The project was undertaken concurrently with a Corridors Master Planning project which established a methodology for multi-purpose corridors (stormwater management, open space and recreation, environmental protection, and passive transport options (i.e. footpath/cycleway connections) and linear infrastructure) within the urban footprint and urban fringe.

The project has drawn on a range of existing reports, studies and data, including but not limited to:

- Fraser Coast Planning Scheme 2014 and mapping, and other historical planning schemes;
- RE Vegetation Mapping Project outputs;
- Draft Open space strategy (once finalised);
- Individual planning studies:
    - Habitat and Biodiversity, prepared by GHD and dated February 2011
    - Landscape Character Study, prepared by AECOM and dated June 2011
- Fraser Coast Green Corridors, prepared by Tiaro Plants for Hervey Bay City Council and dated February 2008;
- Stage 2 Threatened Species Action Plan. R3 Final, prepared by Ecosure and dated July 2019;
- Stage 1 Threatened Species Action Plan 20198-2023 Rev. B, prepared by Premise Environment and dated July 2018;
- GIS mapping, including LiDAR, etc.;
- Greening Fraser Coast document; and
- All relevant State mapping

1.1.5 Aims

As part of Council's commitment to the review of the Fraser Coast Planning Scheme 2014, there is an opportunity to include MLES mapping and improve its useability. In this framework, the project aimed to develop MLES mapping for the Fraser Coast Planning Scheme through meaningful criteria and best practice methodologies. The project used progressive, forward-thinking, and innovative approaches to MLES. The project aimed to:

- Develop the project in collaboration with key council officers, industry and local subject matter experts;
    - facilitate workshops in an interactive and innovative manner to ensure effective participation, mutual understanding and shared responsibility for the outcomes
    - a panel of local subject matter experts was set up to workshop and test the deliverables
- Develop a methodology for identifying and mapping MLES for the Fraser Coast Region that is robust, practical and defendable and consistent with the SPP and guidance material;
- Produce mapping outputs of MLES for the region suitable for the inclusion in the Planning Scheme.

The project work was not constrained by Council's Planning Scheme but its outputs could potentially inform the current review.

1.2 Project study area

The project study area is the Fraser Coast region, or local government area (Figure 1). Some areas are experiencing considerable landscape change or are planned for considerable change soon. A 2 km buffer was applied to the study area to allow for trans-boundary connectivity to neighbouring local government areas and limiting any bias in the estimate of resistance values from boundary effects and (Koen et al. 2010; WHCWG 2010; 2013).

1.3 Report format

The report is presented in chapters for clarity. The chapters of the report reflect the process undertaken to review and develop the urban corridors and nodes.

Chapter 1. Introduction
Identifies the priority areas and aims of the project.

Chapter 2. Develop MLES methodology
This chapter outlines the MLES definitions, criteria, datasets and GIS mapping methods used in each step. This chapter documents the implementation of the criteria, data analyses and mapping methods for urban corridors, urban nodes, core areas, aquatic corridors, and rehabilitation tool.

Chapter 3. Chapter 3 Expert review and input
The project utilised expert review and field validation of the draft outputs. An expert panel workshop of internal/external persons with knowledge and experience of the study area assisted in identifying biodiversity significant areas.

Chapter 4. Results
The results of the selected core habitat areas, urban nodes, and corridor networks are presented.

Chapter 5. Recommendations
A summary of findings and recommendations from the project for Council's consideration.

Matters of Local Environmental Significance Mapping Project

Legend

Fraser coast boundary

Miara
Moore Park Beach
Yandaran
Waterloo
Avondale
Monduran State Forest 1
Abbotsford
Bargara
Bundaberg Central
Monduran
Takilberan
Elliott Heads
South Bingera
Fraser Island (K'gari)
Moolboolaman
Gin Gin
Bungadoo
Elliott River State Forest
Bingera National Park
Horse Camp
Wallaville
Cordalba State Forest
Woodgate
Farnsfield
Doughboy
Dulingal
Goodwood
North Isis
Burrum Heads
Morgarville
Booyal
Childers
Fraser Island
Good Night
Good Night Scrub National Park
Burrum River
Hervey Bay
Urangan
Howard
Eureka
Torbanlea
Coringa
Mungo
Wateranga
Dallarnil
Wongi State Forest
Didcot
Degilbo
Doongul
Turkey Island
Great Sandy Strait
Eurong
Byrnestown
Biggenden
Maryborough
Lakeside
Boompa
Coalstoun Lakes
Araamara
Yerra
Maaroom
Teebar
Woocoo
Campbell Creek
Ban Ban Springs
Stockhaven
St Mary State Forest 1
Dwarrylla
Glenbar
Tiaro
Tuan State Forest
Poona
Blairmore
Glenbar State Forest 1
Talegalla Weir
Malarga
Gigoomgan
Mount Urah
Bauple
Inskip
Gootchie
Bauple Forest
Marodian
Tin Can Bay
Rainbow Beach
Boolboyan
Theebine
Glenwood
Miva
Wallu
Mudlo
Woocooga
Gunalda
Great Sandy National Park
Neerdie
Kinora
Toolara State Forest
Tansey

Version	19/04/2022
Author	K.Cavanagh
Projectiion	GDA2020 MGA56

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Figure 1: Study Area - Fraser Coast Regional Council

Chapter 2 Develop MLES methodology

2.1 MLES definitions

After a review of the statutory framework, community values, identified current practice of other Queensland Local Councils and expertise from Redleaf, the following broad category framework was the preferred approach for Fraser Coast Region MLES. These were developed by Redleaf Environmental and Council staff which were then reviewed through internal council processes and presented to councillors. Three MLES categories were decided on to incorporate several sub-categories:

1. **Corridors**
    - Regional corridor
    - Regional riparian corridor
    - Established corridor
    - Enhancement rural corridors
    - Enhancement urban corridors
    - Stepping stone corridor
2. **Biodiversity Areas**
    - Core habitat area
    - Established nodes
    - Enhancement nodes
    - Areas of species richness and diversity
    - Climate change adaptation and refugia areas
3. **Ecosystems**
    - Least concern regional ecosystems
    - Ecosystem representation and/or uniqueness
    - Coastal habitats
    - Urban bushland
    - Local significant species habitat
    - Rehabilitation areas
    - Ecosystem buffers

As per the definition for MLES, the categories outlined above do not include any matters that are the same or substantially the same as identified Matters of National Environmental Significance (MNES) and Matters of State Environmental Significance (MSES). They may spatially overlap in certain circumstances. Regional plans may further 'identify natural areas or values for investigation and refinement by Local Government for protection as MLES.' (SPP p70). The definitions, mapping criteria thresholds, priorities and other descriptions are provided for each category and sub-category in Table 1.

Table 1 Fraser Coast Regional Council's MLES Definitions and Mapping Criteria

#	Category	Sub-category	Definitions and criteria thresholds
1.	**Corridors**		
1.1		**Regional Corridors**	**Definition:** Regional corridors supporting landscape scale connectivity and ecosystem functioning essential for the movement and long-term survival of regional populations of flora and fauna by connecting core habitat areas. **Criteria thresholds:** Ecological corridors connecting the largest tracts of contiguous vegetation were modelled to support regional connectivity. Corridors contribute to the ecosystem health and functioning and the movement of fauna and flora species across the landscape. They provide opportunities for connecting populations for gene flow, migration and supporting resilience by allowing for the re-population following events such as bushfire, drought, or floods. These corridors may contain cleared areas,

# Category	Sub-category	Definitions and criteria thresholds
		disturbed areas, mapped regrowth vegetation and mapped remnant vegetation suitable for rehabilitation or environmental offsets management. For the rehabilitation areas (non-remnant + regrowth) the vegetation structure and species composition are to reflect the regional ecosystem of that area. A minimum width of 800 m was applied considering the movement ecology and habitat requirements of MLES in the region. **Priority:** Highest priority for protection and rehabilitation efforts. Rehabilitation of corridor gaps and pinch points. Regional corridors are at the top of the hierarchy of MLES for the Fraser Coast region. Minimise any clearing in these corridors to achieve no net loss. **Width:** Minimum 800 m
1.2	**Regional Riparian Corridors**	**Definition:** A network of aquatic ecosystems and their riparian buffers important in providing ecological services such as maintaining healthy waterways and supporting wetland dependent flora and fauna. **Criteria thresholds:** Major and significant riparian corridors for biodiversity. Rivers and their associated riparian vegetation are recognised for their important links both through the region and to neighbouring councils. Areas within the regional riparian corridor network that enhance the healthy functioning of waterways and wetlands including protecting instream water quality and aquatic habitats. Waterways and wetlands were included where they were not otherwise protected under state law (excluding streams mapped by the *Vegetation Management Act 1999*). A minimum buffer (from centre line or edge of wetted width) was applied to the wetted extent by stream order (SO) - SO1 & SO2 = 10 m, SO3 & SO4 = 25 m and >SO4 = 50 m. Mary River and Burrum River were buffered by 400 m from the waters edge (i.e., approximately 800 m wide). Similarly, wetlands (excluding those mapped as MSES - HES) will have a minimum buffer applied to their wetted soil extent of 50 m (<5 ha wetlands) and 100 m (>5 ha wetlands). For the rehabilitation areas (non-remnant + regrowth) the vegetation structure and species composition is to reflect the native riparian vegetation of that area. Aquatic corridors contribute to the ecosystem health and functioning and the movement of fauna and flora species across the landscape. **Priority:** Highest priority for protection and rehabilitation efforts. Rehabilitation of corridor gaps and pinch points. Regional riparian corridors are at the top of the hierarchy of MLES for the Fraser Coast region. Minimise any clearing in these corridors to achieve no net loss. **Width:** Minimum width varies according to wetland size and stream order: 25 – 400 m
1.3	**Established Corridors**	**Definition:** Established corridors supporting the local movement and dispersal of flora and fauna populations by connecting habitat patches. They are relatively intact and continue to have good pre-existing biodiversity values and movement for wildlife in general. Comparatively high ecological value in fragmented landscape context. **Criteria thresholds:** Established corridors facilitate the movement of local wildlife populations by connecting areas of identified habitat. These corridors contribute to the genetic transfer and resilience of biodiversity and provide important local habitat. Established corridors will have a minimum of 400 m, and take into account the localised potential movement of species in the region. These corridors may contain cleared areas, disturbed areas, mapped regrowth vegetation and mapped remnant vegetation suitable for rehabilitation or environmental offsets management. The vegetation structure and species composition are to reflect the regional ecosystem of that area. Habitat features including animal breeding places, groundcover, large woody debris, and places of safety for wildlife are to be restored in these corridors. **Priority:** Highest priority for protection and rehabilitation efforts. Rehabilitation of corridor gaps and pinch points. Minimise any clearing in these corridors to achieve no net loss. **Width:** Minimum 400 m.

# Category	Sub-category	Definitions and criteria thresholds
1.4	**Enhancement Rural Corridors**	**Definition:** Enhancement rural corridors have sufficient but limited biodiversity values, moderately intact and some connectivity gaps exist. They occur in the more fragmented rural landscapes. Potential to improve considerably through investment in improvement activities. **Criteria thresholds:** These corridors may contain cleared areas, disturbed areas, mapped regrowth vegetation and mapped remnant vegetation suitable for rehabilitation or environmental offsets management. The vegetation structure and species composition are to reflect the regional ecosystem of that area. Habitat features including animal breeding places, groundcover, large woody debris, and places of safety for wildlife are to be restored in these corridors. **Priority:** Medium priority for protection and rehabilitation. **Width:** Minimum width of 200 m
1.5	**Enhancement Urban Corridors**	**Definition:** Enhancement urban corridors have limited biodiversity values, low to moderately intact and many connectivity gaps exist. They also have the most landscape barriers to wildlife movement from roads, infrastructure, lighting, and fences etc. Potential to improve considerably through investment in improvement activities. **Criteria thresholds:** These corridors may contain cleared areas, disturbed areas, limited mapped regrowth vegetation and mapped remnant vegetation suitable for rehabilitation or environmental offsets management. The vegetation structure and species composition are to reflect the regional ecosystem of that area. Habitat features including animal breeding places, groundcover, large woody debris, and places of safety for wildlife are to be restored in these corridors. Urban corridors were selected if their length was mostly located in more developed or urbanised landscapes. This was chosen through expert opinion and not through any mathematical analysis or planning scheme zones. **Priority:** Medium priority for protection and rehabilitation. **Width:** Minimum width of 80 m
1.6	**Stepping stone corridors**	**Definition:** Generally isolated patches of habitat that while are not physically connected, are functionally connected to allow movement. They are mostly 'patchy' supporting transitional or resident populations of flora and fauna. Stepping stones are isolated (non-contiguous) from other habitat features or large tracts of vegetation. **Criteria thresholds:** Identified habitat that supports the movement of native fauna between core habitat areas and facilitates climate or seasonal adaptation and movement. These stepping stone corridors consist of isolated regrowth and remnant vegetation mapped by the Queensland Herbarium and native woody vegetation across the region. These areas may retain structural vegetation characters, micro habitats including fallen timber, groundcover vegetation of grasses and forbs, shrubs and mature vegetation for animal breeding places. **Priority:** The lowest priority for protection and rehabilitation. **Width:** Minimum width of rural 200 m
2. Biodiversity areas		
2.1	**Core habitat areas**	**Definition:** Large, vegetated areas which provide habitat for a variety of the region's biodiversity. These areas contain high pre-existing ecological values representing the largest intact landscape features in the region. They are the largest contiguous tracts of vegetation containing significant biodiversity areas and sustain local populations of flora and fauna. **Criteria thresholds:** Large tracts of vegetation identified as important for maintaining and sustaining landscape functioning and resilient populations of flora and fauna. The largest areas of contiguous endangered and of concern regional ecosystems were identified and included as Core Habitat. These areas are largest contiguous ecologically intact areas of remnant and regrowth vegetation as mapped by the Queensland

# Category	Sub-category	Definitions and criteria thresholds
		Herbarium. These tracks are considered contiguous even where there are fire breaks, fence lines or regional roads of <15 m width. A 1 % change in total area of tracts from any one action would be considered significant potentially requiring additional mitigation measures and / or environmental offsets. **Priority:** Highest priority for protection and rehabilitation efforts. Rehabilitation of corridor gaps and pinch points. Core habitat areas are at the top of the hierarchy of MLES for the Fraser Coast region. Limited, or no, clearing permitted in these areas. Goal of no net loss.
2.2	**Established nodes**	**Definition:** Established nodes are mostly complete remnant vegetation patches containing sufficient biodiversity values and are important refuge for local species of wildlife. There can be areas of disturbance through historical clearing, loss of habitat features and invasive species etc. **Criteria thresholds:** Includes Council bushland reserves, National Parks, Conservation Parks and State Forests (excluding pine plantations). The size is to be as large as practical with area to perimeter ratios favouring circular areas rather than long linear features. **Priority:** Highest priority for protection and rehabilitation efforts. Rehabilitation of corridor gaps and pinch points on Council land. Limited, or no, clearing permitted in these areas. Goal of no net loss.
2.3	**Enhancement nodes**	**Definition:** Enhancement nodes contain some remnant vegetation but is mostly lacking. Limited biodiversity values exist however given the location and links potential exists to enhance. Potential for vegetation to provide refuge for wildlife but needs substantial revegetation and improvement. **Criteria thresholds:** Includes Council reserves with size to be as large as practical with area to perimeter ratios favouring circular areas rather than long linear features. **Priority:** Medium priority for protection and rehabilitation.
2.4	**Areas of species richness and diversity**	**Definition:** Important biodiversity areas known to support existing flora and fauna richness and diversity that is considered high when compared to other areas within the Fraser Coast region. **Criteria thresholds:** Areas of high fauna and flora richness and diversity were mapped using known records and expert opinion. The maps identify spatial areas of relatively high species richness and diversity. The delineated areas contain non-mapped habitat features and mapped regrowth or remnant vegetation which sustains a relatively high diversity (i.e., total number) of species within the region. These areas are to be managed or enhanced for the improvement of wildlife diversity. **Priority:** Highest priority for protection and rehabilitation efforts. Rehabilitation of corridor gaps and pinch points. Regional corridors are at the top of the hierarchy of MLES for the Fraser Coast region.
2.5	**Climate change adaptation and refugia areas**	**Definition:** Areas of refugia which are considered important habitat, whether temporary or permanent, for mitigating the effects of climate change on the local flora and fauna of the Fraser Coast Region. **Criteria thresholds:** Climate change refugia includes areas identified through expert opinion based on topographic features, altitude (mountain tops), slope, aspect, permanent water, leaf litter, shading from landforms or southern slopes. These refugia also incorporate areas where species take refuge during extreme weather events and destinations from species adapting to changed climatic conditions (whether temporary or permanent). These areas contain rainforest, semi-evergreen vine thickets, wet sclerophyll forests and moist eucalypt woodlands ecosystem types. Areas with a high degree of variability in landscape topography and geology/soils have associated variability in climatic conditions (especially temperature and moisture). These areas are expected to support a diversity of species that have different thermal and moisture requirements for survival.

# Category	Sub-category	Definitions and criteria thresholds
		Priority: Highest priority for protection and rehabilitation efforts. Rehabilitation of corridor gaps and pinch points. Regional corridors are at the top of the hierarchy of MLES for the Fraser Coast region.
3. Ecosystems		
3.1	**Least concern regional ecosystems**	**Definition:** Ecosystems not otherwise protected under state or federal law that are locally important, including both regrowth and remnant patches defined as 'least concern'. **Criteria thresholds:** Areas of least concern regional ecosystems mapped by the Queensland Herbarium as remnant or regrowth are included as MLES for the region. Two comparisons were included; the area of each of least concern regional ecosystem left in the Fraser Coast region; and a percentage of area left of each least concern regional ecosystem within the SEQ Bioregion. These calculations give a percentage and are ranked Very high, High, Medium, and low and will be useful in determining protections for each regional ecosystem.
3.2	**Ecosystem representation and/or uniqueness**	**Definition:** Areas of high ecosystem diversity containing a range of habitat features and unique assemblages of flora and fauna. **Criteria thresholds:** Areas containing diverse and unique ecosystems were mapped along with those ecosystems considered to be representative of the region. The diversity of ecosystems present within an area provides an indication of habitat complexity. Unique ecosystems were identified from expert opinion as those being unusual or disjunct regional ecosystems present within the region.
3.3	**Coastal habitats**	**Definition:** Areas containing intact ecological diversity and composition of natural coastal communities. **Criteria thresholds:** Natural coastal communities which incorporate areas of foreshore dunes, beach ecosystems, rock pools, estuaries or areas identified through mapping or expert opinion. This MLES incorporates areas containing the diversity and species composition of natural coastal ecosystems.
3.4	**Urban bushland**	**Definition:** Retained, restored, or enhanced urban bushland areas important in maintaining resilient populations of local native flora and fauna. These areas may contribute to, or be a part of, urban green space. **Criteria thresholds:** Expert opinion and local knowledge was utilised to identify and map areas of local bushland within the urban areas of the region. These were selected by the panel because they were considered to sustain local populations of regional flora and fauna. Urban bushland include areas of non-mapped vegetation and / or remnant or regrowth vegetation.
3.5	**Local significant species habitat**	**Definition:** Areas within the region that are a known habitat for locally significant species. **Criteria thresholds:** Mapped areas of habitat that supports populations of locally significant species including, for example, species that are at the edge of their known range, genetically significant populations, disjunct populations, or species vulnerable to impacts of climate change. The species habitat consists of regrowth and remnant vegetation mapped by the Queensland Herbarium and native woody vegetation across the region. The locally significant flora and fauna areas were determined through an expert panel review.
3.6	**Rehabilitation areas**	**Definition:** Prioritised rehabilitation areas across the Fraser Coast region representing opportunities for potential restoration, revegetation, targeted environmental offsets management or landscape improvements. **Criteria thresholds:** Rehabilitation areas within the ecological, wildlife and aquatic regional corridors are to be improved and protected to ensure the corridor purpose and functioning is met. The rehabilitation areas include buffered regrowth and remnant vegetation, protected areas, and riverine and non-riverine wetlands. Any works within these prioritised rehabilitation areas will contribute to landscape restoration, habitat enhancements and supporting resilient regional wildlife populations.

# Category	Sub-category	Definitions and criteria thresholds
3.7	**Ecosystem Buffers**	**Definition:** A landscape buffer of variable width applied to ecosystem communities across the Fraser Coast region to protect areas of high local conservation significance. **Criteria thresholds:** The recommended minimum buffer zone is variable depending on the ecosystem being buffered. The buffer is from the outer edge of the patch (as defined by the edge of the tree canopy or mapping layer) as this distance accounts for likely influences upon the ecosystem values present. Larger buffer zones are applied, where practical, to protect patches that are of very high conservation value. Buffer zones should be large enough to ensure that biodiversity, structural integrity and ecosystem functioning are not adversely affected or if patches are located below drainage lines or a source of nutrient enrichment or groundwater drawdown. Thresholds have generally been applied from Queensland State guidelines and Commonwealth Threatened Ecological Community advice statements. Expert opinion was applied where no other guidelines could be referred to.

2.2 Guiding principles and mapping criteria

The methods outlined in this report provide a robust output that can be quickly understood, evidence based and backed by a process that is repeatable and transparent to all the relevant stakeholders and potential users. Given the guiding principles below, the MLES categories and sub-categories allow for easily queried layers and fields for decision making and policy development. This requires that mapping outputs and supporting layers can be interrogated. The mapping outputs also need to be robust and flexible so that subsequent revision is possible should the Council priorities change, or new information become available in the future.

2.2.1 Corridor design

Guiding principles established for determining which corridors were included in the final corridor mapping include:

- Connecting every node to at least one neighbour
- Excluding connections across areas with land cover so dissimilar to the natural landscape blocks that connectivity is implausible
- Excluded, or reduced the number of, corridors which do not connect to another corridor or node
- Minimising unnecessary redundancy (or density) of linkages through the landscape
- Enhancement corridors have sufficient but limited biodiversity values and moderately intact
- Stepping stone corridors incorporate isolated patches of intact habitat which are functionally connected to allow movement. They are mostly 'patchy'.

2.2.2 Node design

Guiding principles established for determining which nodes were included in the final outputs include:

- Core habitat area size is to be as large as practical
- Established node includes remnant vegetation patches that are mostly complete and contain sufficient biodiversity values
- Enhancement nodes contain some remnant vegetation but is mostly lacking. Smaller in area than for core or established nodes. The primary aim is to maintain links in a fragmented landscape.

2.2.3 Spatial unit

The chosen spatial unit for the GIS analyses is a 30 m grid across the entire study area. This spatial unit size was also chosen due to the scale of available satellite imagery and because it adequately represents the scale at which best represents the intention of the corridor modelling to provide local government scale outputs. This will allow for fine scale property planning (refer to Appendix B – Mapping assumptions and limitations). The information can inform finer individual property scale decisions, however, there would be other necessary data inputs (e.g., property scale vegetation mapping) to inform decisions.

2.2.4 Collation of datasets and coverages

All available datasets relating to the chosen mapping criteria were supplied by Council or sourced from the appropriate custodians under licence agreement. The data were sourced in a range of formats (e.g., differing projections, raster, vector layers including point, line and polygon layers) which required pre-analysis prior to use. A list of the available datasets that were included in the analyses is provided in Appendix A – List of datasets used. The major dataset themes were:

- Aquatic biodiversity layers of Aquatic Conservation Assessment (ACA) for non-riverine and riverine wetlands, Queensland Wetlands Mapping, ordered drainage layer, sentinel satellite imagery for open water and buffering.
- Vegetation layers of the Queensland Herbarium including the Regional Ecosystem mapping, wooded extent, foliage projective cover, satellite imagery and Queensland groundcover disturbance index.
- Redleaf Environmental regional ecosystem mapping for Fraser Coast region (2021)

- Terrestrial biodiversity layers incorporating SEQ Biodiversity Planning Assessment outputs and past studies within the Fraser Coast region (e.g., Ecosure layers).
- Infrastructure layers such as baseline roads and tracks, rail corridors, sewer and water pipelines, underground services, contaminated land and planning scheme zones.
- Conservation layers incorporating environmental management areas, conservation zones, urban nodes, core habitat, parks and reserves, natural area estate.

2.2.5 Corridor scale

Biodiversity corridors can function at several scales to facilitate wildlife movement across a range of landscape types. These can be at the national (e.g., National Wildlife Corridors Plan – The Great Eastern Ranges scale extending the length of eastern Australia), at the state level of Biodiversity Planning Assessment corridors (BPAs with widths of 5 – 10 kms), regional scale (500 – 2000 m) and local scale corridors (50 - 500 m).

The broader bioregional or regional scale corridors (national and state) can limit their value for Council planning scheme instruments and policy applications. Without a local corridor network mapped, it can be difficult to plan for, manage and protect local natural values even though an area may fall within an extensive bioregional corridor.

The results of the corridor outputs at the local or regional scale (i.e., smaller biodiversity corridors) will assist Council to develop appropriate policy and conservation and management responses to the above issues. Corridors included in the linkage design across the Fraser Coast area were chosen on the principle that the enhancement of these paths will have greater positive impacts on landscape connectivity. It is important to recognise that a key message for consultation with stakeholder groups or landholders is to emphasise that areas outside of the identified corridors can still support important ecological values across the Fraser Coast region.

2.2.6 Corridor buffer widths

Corridor buffers can vary according to the overall aims and potential use of the corridor design, hierarchy of corridor functionality and according to their location in the landscape.

Example 1: Coffs Harbour Landscape Corridors (Scotts and Cotsell 2014)

Regional Corridors: 650 m wide

Subregional Corridors: 350 m wide

The Orara River Corridor: 100 m wide (50 metres from the river midpoint)

Local Corridors: 80 m wide

Riparian Corridors: 80 m wide (on 3rd & 4th order streams)

Urban Links: variable width but typically less than 80 m (Scotts and Cotsell 2014).

Example 2: Brisbane City Council

Major waterway (i.e., Brisbane River): 100 m from the edge of the waterbody clipped to land use

Local waterway: 30 m from centreline (not clipped to land use)

Wetlands: mapped but no buffer applied

Example 3: Ipswich City Council

Riparian Regional Corridors: Brisbane and Bremer Rivers buffered by minimum width of 800 m wide

Established Corridors: 800 m wide

Enhancement Corridors: 400 m wide

Stepping Stone Corridors: 200 m wide

Example 4: Redland City Council

Established Corridors: 800 m wide

Enhancement Corridors: 400 m wide

Stepping Stone Corridors: 200 m wide

There can be a range of optimal riparian buffers depending on the landscape context for the waterway (e.g. urban vs rural), the management objective (e.g. surface water filtering vs terrestrial habitat) and the size of the waterway (e.g. lower order stream vs high order stream).

Other examples include the Queensland BPA outputs which have delineated corridors up to 10 km wide at the bioregional level (Brigalow Belt South and SEQ BPA outputs, EPA 2002). The wider corridors are thought to be more likely to include areas that would be identified for conservation intervention through subsequent fine scale linkage design. The relative width or length requirements for linkages is recognised by other studies as being difficult to determine through empirical data and often left to expert opinion (Sawyer et al. 2011).

The buffer widths applied to the Fraser Coast Regional corridors (this study) match those presented in the Redland City Council and Ipswich City Council. These were 800 m for regional riparian corridors, 400 m for established corridors, 200 m for enhancement corridors and stepping stone corridors. In addition, within urban areas and immediate surrounds, the enhancement corridors or stepping stone corridors will be a maximum of 80 m width to account for urban settings. The corridor widths are therefore variable across the study area. For development approval processes, corridor maps under the planning scheme may require narrow corridor widths to give certainty for developers. The centre line of the highest quality habitat through the identified corridors may be buffered by a desired width.

2.2.7 Corridor network

Several technical reports prepared by Redland City Council provide guidance on a range urban nodes and biodiversity corridors. These reports are:

- Wildlife Connections Plan 2018 - 2028
- Wildlife Connections Plan 2018 - 2028 Corridor Descriptions and locations
- Wildlife Connections Action Plan 2018 – 2023

Within these reports, there are descriptions for Established Corridors, Regional Riparian Corridors, Enhancement Corridors and Stepping Stone Corridors. The information contained in the Redland reports informed the Fraser Coast MLES framework and the associated definitions (Table 1).

The mapped corridors can be used in comparison with available underlying data layers. The mapped corridors are predicted to provide a range of biodiversity benefits for the local region, and the actual nature of the benefits will vary, depending on the location of the corridor, its setting and the physical features of vegetation and other elements occurring within.

2.3 MLES mapping methods

Redleaf used several GIS analyses to map MLES across the Fraser Coast region including complex corridor models to identify and prioritise landscape linkages, habitat nodes and map rehabilitation priority areas. Each MLES value agreed to by Council was implemented using established methods of data analysis and mapping of values. Redleaf has developed several techniques to identify and map MLES values including:

- Regional corridor analysis using Linkage Pathways Tool, Centrality Mapper and Circuitscape
- Established and enhancement corridor models focussed on linking habitat patches
- Regional riparian corridors using buffered stream ordered drainage layer, estuarine, palustrine and lacustrine wetlands
- Priority rehabilitation tool uses a range of spatial models and processes to identify the most important areas for targeted restoration efforts and/or environmental offsets. The input layers are subjected to an ArcGIS weighted function overlay analysis
- Ecosystem diversity measured using the Simpson's diversity index
- Expert panel decisions on special features
- Least concern regional ecosystems mapped by the Queensland Herbarium as remnant or regrowth
- Supervised image classification of satellite imagery for urban bushland mapping
- GIS habitat layers incorporating locally significant species

Each sub-category was mapped through a combination of spatial modelling, GIS analysis and/or expert opinion. Diagnostic refers to the calculation processes within an ArcGIS platform (Appendix A – List of datasets used). Expert panel refers to datasets predominantly identified through expert opinion.

Table 2 Constraints and opportunities with the sub-category mapping products

#		Sub-category	Implementation
1		**Corridors**	
	1.1	Regional corridor	Diagnostic
	1.2	Regional riparian corridor	Diagnostic + Expert panel
	1.3	Established corridor	Diagnostic + Expert panel
	1.4	Enhancement rural corridor	Diagnostic + Expert panel
	1.5	Enhancement urban corridor	Diagnostic + Expert panel
	1.6	Stepping stone corridor	Diagnostic
2		**Biodiversity areas**	
	2.1	Core habitat area	Diagnostic + Expert panel
	2.2	Established nodes	Diagnostic + Expert panel
	2.3	Enhancement nodes	Diagnostic
	2.4	Areas of species richness and diversity	Expert panel
	2.5	Climate change adaptation and refugia areas	Expert panel
3		**Ecosystems**	
	3.1	Least concern regional ecosystems	Diagnostic + Expert panel
	3.2	Areas of ecosystem representation and/or uniqueness	Diagnostic + Expert panel
	3.3	Coastal habitats	Expert panel
	3.4	Urban bushland	Expert panel
	3.5	Local significant species habitat	Expert panel
	3.6	Rehabilitation areas	Diagnostic
	3.7	Ecosystem buffers	Expert panel

2.3.1 Regional, established, enhanced and stepping stone corridors

Ecological corridors support local scale connectivity and ecosystem functioning essential for the movement and long-term survival of local populations of flora and fauna by connecting tracts or nodes of vegetation. The various corridors represent how best to link patches of available habitat (or nodes) in the study area through a complex

land cover. The chosen path between suitable patches is influenced by the underlying resistance for animal movement and available cover for shelter and basic resources (food and shelter).

Implementation

The spatial analysis for developing ecological corridors was completed using the GIS methods developed by Redleaf Environmental. The corridor model focussed on linking council identified Core Habitat Areas, Established Nodes and Enhancement Nodes of vegetation across the study area determined to be a strategically important area containing ecological values. The modelled corridors were identified as the 'easiest' routes by integrating expert knowledge into resistance surfaces surrounding human modification of the landscape. This model assumed a linear relationship between modification and resistance and sensitivity analyses were incorporated at later stages of the modelling process via an expert workshop.

The corridor model was developed to incorporate constraints from existing land use (as currently available in the public information space). This includes local constraints of urban growth corridors, zoning, prime agricultural land, major roads and other barriers to wildlife movement.

Corridor buffers can vary according to the overall aims and potential use of the corridor design, hierarchy of corridor functionality and according their location in the landscape. The modelled urban corridor achieves this by identifying those linkages which are the most functional and thereby the areas of greatest priority for enhancements or management for the long-term improvement of corridors across the urban footprint.

GIS methods

Calculations were automated through AcrGIS as implemented in other studies (e.g., Beier et al. 2011; Sawyer et al. 2011; WHCWG 2010; 2013). There are four general steps taken to achieve the desired outcomes. These are presented here.

Step 1: Regional Analysis

Purpose	**To create a regionally relevant biodiversity corridor network which links the largest patches of vegetated land. Important areas of vegetation were linked across the region using a resistance layer.**
Data sources	Important areas were identified as Core Habitat Areas, Established Nodes and Enhanced Nodes of vegetated land by reviewing and combining several layers (Appendix B). A resistance layer was created: the inverse of habitat suitability using spatial information such as roads, planning scheme zones and native vegetation.
Process	Assumes regionally important species will prefer areas of native vegetation, away from roads, and in suitable zoning. These layers were combined in a cost-weighted overlay with each data source weighted to reflect its importance to native species in the region, at a localised scale - i.e., distance to roads was weighed less than the presence of suitable zoning. This created a habitat layer at a regional scale. A resistance layer was created from this analysis. Where there is less resistance (e.g., favourable zoning and available natural vegetation), the pixel receives a relative score of 'easier' movement. Using Linkage Mapper (McRae et al. 2017; Toolbox Version 2.0—Updated 2021), corridor linkages were generated across the region. These are the model links between nodes or core areas of habitat in a landscape. In those linkages it shows the relative value of each grid cell in providing connectivity. This allows users to identify which pathways encounter fewer features that facilitate or impede movement between core areas.

Step 2: Prioritised Linkages and Nodes

Purpose	**To prioritise nodes, linkages, and pathways**
Data sources	Results of Step 1

Process	Circuitscape (McRae and Shah 2009) (which uses circuit theory) was used to prioritise the important areas of vegetation and identified linkages by: • Using pinchpoint tool which identifies pinch-points (bottlenecks or choke points) in corridors produced by Linkage Mapper. • Applying Centrality Mapper (Centrality Mapper User Guide Version 2.0—Updated September 2017) to analyse core and corridor centrality in networks produced by Linkage Mapper. This can help prioritise important corridors.

Step 3: Refined Corridors

Purpose	**Refined spatial corridors dependent on vegetation and independent of constraints / barriers (i.e., unfavourable zones, buildings, roads).**
Data sources	Vegetation was identified using Sentinel 2 imagery with a 10 m resolution. This was done using a combination of red, blue, green and infrared bands.
Process	Vegetation was mapped into 6 categories using the Normalized Difference Water Index (NDWI) and the Normalized Difference Vegetation Index (NDVI) to create training polygons (or signature file). These polygons were then used in a random forest algorithm to assign pixels based on the probability of occurring to one of the classes below: • building • cleared • crop • field • house • ocean • plantation • river • road • scattered vegetation • urban water • vegetation • water The classes were then used to create a resistance layer which assigned minimal resistance to areas or high resistance depending on the class present. Prioritised linkages were then buffered before applying Circuitscape. Circuitscape was used to model connectivity between each of the important areas of vegetation (nodes) within the buffered corridors. The vegetated and non-vegetated pixels are processed across the landscape. The purpose of this is to use linkage mapper outputs based on infrastructure resistances i.e., zoning, protected land (native veg) and roads to connectivity. A review of local scale layers can be applied post analysis: • Fauna priority intersections present and future • Low pressure power lines • Aerial high-resolution imagery • Sewer, water and gas pipelines • Powerlines

Step 4: Corridor Outputs

Purpose	**Spatially defined corridors and prioritised links and nodes**

Data sources	Expert panel review of outputs from Steps 1-3
Process	Draft results were tested and reviewed by an Expert Panel, Redleaf experts and Council officers. Feedback was then incorporated in the model outputs. The outputs were: • Core Habitat Area • Established Node • Enhancement Node • Regional Corridor • Regional Riparian Corridor • Established Corridor • Enhancement Corridors • Enhancement Urban Corridors • Stepping Stone Corridor

2.3.2 Regional riparian corridor

A network of aquatic ecosystems and their riparian buffers important in providing ecological services such as maintaining healthy waterways and supporting wetland dependent flora and fauna.

Implementation

The aquatic riparian zone network was identified through a combination of data layers. These included buffering a stream ordered drainage layer and the natural palustrine, estuarine and lacustrine wetlands from the Queensland wetlands layer. These buffered layers were then combined into one layer.

Data layers used

- Wetland data - version 5 - wetland areas – Queensland
- Ordered drainage 25K – Queensland
- Matters of state environmental significance - Regulated vegetation – 100 m from wetland – Queensland
- Matters of state environmental significance - Regulated vegetation - intersecting a watercourse – Queensland
- Matters of state environmental significance - High ecological significance wetlands - Queensland

GIS methods

1. DoR ordered drainage layer (1:25,000) was buffered by stream order (SO1 = 10 m, SO2 = 10 m, SO3 & SO4 = 25 m and >SO4 = 50 m).
2. Select only natural wetlands (H1s) and only palustrine (P), estuarine and lacustrine (L) from the Queensland wetlands layer. These were buffered accordingly: <5 ha wetland buffer = 50 m; >5 ha wetland buffered by 100 m.
3. Merge buffered drainage layer and buffered wetland layer in combined vector layer.
4. Major waterways of the Mary River and Burrum River were buffered by 400 m from the waters edge (i.e., approximately 800 m wide). This buffered layer formed the 'regional riparian corridor' and is separate to Steps 1-3 above.

2.3.3 Core Habitat Areas, Established Nodes and Enhanced Nodes

Implementation

Core Habitat Areas include the largest 5% (in size) of contiguous patches of Endangered and Of Concern Regional Ecosystems. National Parks, Conservation Parks and selected tracks of vegetation (5-10% by size) were assigned to Established Nodes. Council Reserves and some areas identified by Expert Panel were included in the Enhanced Nodes.

Data layers used

- Vegetation management regulated vegetation management map – Version 5.1
- Protected Estate
- Council Reserves

GIS methods

1. Defined regrowth and remnant endangered and of concern polygons where they are contiguous (touching).
2. Rank the polygons (about 2,000) from largest to smallest in area.
3. Display the top 5% of polygons (i.e., 100)
4. Expert review finalised the list of Core Habitat Areas, Established Nodes and Enhanced Nodes.

2.3.4 Ecosystem representation and/or uniqueness

Implementation

This sub-category incorporates outputs from the Expert Panel decisions on special features and from applying the Biodiversity Planning Assessment (BPA) Criteria F – ecosystem diversity to the remnant regional ecosystems of the Fraser Coast Region. The following excerpt is taken from DEHP (2014) BAMM methodology (p.15):

The number and size of ecosystems and wetlands present in an area is an indication of habitat complexity. Ecosystem diversity reflects the degree to which regional ecosystems are 'packed' within an area, that is, an area with high ecosystem diversity will have relatively many regional ecosystems and ecotones.

Ecosystem diversity is commonly classified using concepts of 'richness' and 'evenness'. Richness refers to the number of different ecosystems, while evenness refers to their relative abundance. Simpson's Diversity Index is a commonly used measure that incorporates both richness and evenness. The index calculates a probability between 0 and 1, with high scores representing areas of high densities of regional ecosystems and ecotones.

To classify ecosystem diversity a buffer is placed around the focus remnant unit reflecting its shape. The width of the buffer is derived using the modal (most frequently occurring) area of all remnant units within the bioregion (rounded to the nearest 50m). An ecosystem diversity value for the focus remnant unit is calculated within the total buffered area. Refer to Appendix 3 for a worked example of how this criterion is applied. The buffer distance used for each BPA is recorded in the summary report.

Data layers used

- Vegetation management regulated vegetation management map – version 12.2

GIS methods

Ecosystem diversity was measured using the Simpson's diversity index with scores between 0-1 given. Higher scores indicate high densities of regional ecosystems and ecotones.

To classify ecosystem diversity a buffer is placed around the focus remnant unit reflecting its shape. The width of the buffer is derived using the mean area of all remnant units within the Fraser Coast Region (rounded to the nearest 150 m). An ecosystem diversity value for the focus remnant unit is calculated within the total buffered area.

As each bioregion has a different range of Simpson's Diversity Index values, the indicators are defined according to the range within the bioregion. The quarter-percentiles and respective thresholds for the range of Simpson's Diversity Index values within a bioregion are used to define the ratings for ecosystem diversity (Table 3).

Table 3 Indicators and ratings for Criterion F: Ecosystem diversity

Rating	Low	Medium	High	Very high
Indicator	The remnant unit has a Simpson's Diversity Index that is <25% of the maximum value for the bioregion	The remnant unit has a Simpson's Diversity Index that is 25% to 50% of the maximum value for the bioregion	The remnant unit has a Simpson's Diversity Index that is 50% to 75% of the maximum value for the bioregion	The remnant unit has a Simpson's Diversity Index that is >75% of the maximum value for
Expert panel decisions: Refer to Expert Panel section for implementation notes.				

2.3.5 Least concern regional ecosystems

Implementation

This sub-category incorporates areas of least concern regional ecosystems mapped by the Queensland Herbarium as remnant or regrowth and compares these by the area left within the Fraser coast council area itself or the South-East Queensland bioregion. There were two GIS outputs for this MLES, one shows the area of least concern regional ecosystems remaining within the Fraser coast region compared to the Preclear extent (ranked as a percentage from Very high to Low). The second output is a comparison of Least concern regional ecosystems within Fraser coast compared to all Least concern ecosystems within the South-east Queensland Bioregion. Both outputs are then ranked from Very high through to Low based percentage of area of each Regional ecosystem.

Data layers used

- Vegetation management regulated vegetation management map – version 4.02
- Vegetation management regulated vegetation management map – Preclear extent– version 4.02
- Redleaf Environmental updated Regional Ecosystem mapping (2021)
- Matters of state environmental significance - Regulated vegetation - category C endangered or of concern – Queensland
- Matters of state environmental significance - Protected area - estates – Queensland
- Matters of state environmental significance - Protected area - nature refuges - Queensland

GIS methods – Fraser coast ecosystems and preclear extent

1. Select the least concern regrowth and remnant regional ecosystems (select VM_Status = 'hvr_leastc' or 'rem_leastc') on the vegetation management regulated vegetation map and Redleaf updated regional ecosystem mapping. For this exercise these two layers were merged on RE1. The same was done for the Preclear extent regional ecosystem mapping.
2. In the Attribute table, a new field was created. Calculate Geometry was selected to calculate the area (in hectares) of each regional ecosystem.
3. The regrowth and remnant layer, as well as the preclear extent layer were then converted to CSV files. The Preclear extent area values were added to the regrowth and remnant regional ecosystem layer. The regrowth and remnant value was divided by the preclear extent value and converted to give a percentage.
4. Each percentage was ranked according to the rating for Local Ecosystem values from the BAMM V2.2 methodology (Table 4).
5. In the Attribute table, a new field was created. The ranking value was input and displayed in 'Symbology' as 'Categorised' using the new 'Value' field.
6. The layer was clipped to the Fraser coast council area (Excluding K'gari) and State Protected areas, Estates and Refuges layer was excluded using the 'Difference' tool.

Table 4 Indicators and ratings for Least concern ecosystems compared to Preclear extent

Rating	Low	Medium	High	Very high
Indicator	'Limited conservation value' RE (>50% of the pre-clearing extent remains)	'Moderate conservation value' RE (30-50% of the pre-clearing extend remains)	'High conservation value' RE (10-30% of the pre-clearing extent remains)	'Very high conservation value RE' (<10% of pre-clearing extent remains)

GIS methods – Fraser Coast ecosystems and bioregion comparison

1. Select the least concern regrowth and remnant regional ecosystems (select VM_Status = 'hvr_leastc' or 'rem_leastc') on the vegetation management regulated vegetation map and Redleaf updated regional ecosystem mapping. For this exercise these two layers were merged together on RE1.

2. In the Attribute table, a new field was created. Calculate Geometry (=$Area/10000) was selected to calculate the area (in hectares) of each regional ecosystem.
3. The layer is then converted to CSV file.
4. For each Least concern regional ecosystem, the estimated extent left within the bioregion was taken from the REDD database 12.0 (2021) and added to the CSV file. The area of each least concern regional ecosystem within the Fraser coast council area was divided by the estimated bioregion extent and converted to give a percentage.
5. Each percentage was ranked according to the rating for Local Ecosystem values from the BAMM V2.2 methodology (Table 5). In this instance the rating was inverted so that ecosystems with a higher percentage of area that fell within the Fraser Coast council area were given a higher rating to infer importance to ecosystems that are a 'stronghold' in the region.
6. In the Attribute table, a new field was created. The ranking value was input (Very high, High, Medium or Low) and displayed in 'Symbology' as 'Categorised' using the new 'Value' field.
7. The layer was clipped to the Fraser coast council area (Excluding K'gari) and State Protected areas, Estates and Refuges layer was excluded using the 'Difference' tool.

Table 5 Indicators and ratings for Least Concern ecosystems compared to the SEQ Bioregion extent

Rating	Very High	High	Medium	Low
Indicator	'Very High conservation value' RE (>50% of the pre-clearing extent remains)	'High conservation value' RE (30-50% of the pre-clearing extend remains)	'Medium conservation value' RE (10-30% of the pre-clearing extent remains)	'Low conservation value RE' (<10% of pre-clearing extent remains)

2.3.6 Rehabilitation areas

Implementation

A model was developed to identify priority areas within the designated corridors for future rehabilitation and ecological restoration. The priority rehabilitation tool used a range of spatial models and processes to identify the most important areas for targeted restoration efforts. The input layers were subject to an ArcGIS weighted function overlay analysis. Table 6 provides the input factors and classes included in the tool.

The spatial unit is the same as for the ecological corridor models whereby 10 m pixels (raster input layers) were analysed in ArcGIS. This spatial unit allows for consistency across the project outputs and allows for ease of calculations.

The rehabilitation tool incorporates expert determined weights and scores that provide an indication of which layers and information are more important from an ecology rehabilitation priority point of view. The scores were rated between 1 and 10, then rescaled between 1 and 100, (with 100 = highest priority and 1 = lowest priority). The weights were calculated to sum to 100% across all factors. These can be adjusted to reflect other project priorities if required. The calculations for this process are presented in Table 6.

The rehabilitation tool layer provides end users in Council with a decision support system that identifies the associated values and priorities for rehabilitation across the Fraser Coast Region including within the mapped corridors. This tool may be beneficial in development assessment, strategic biodiversity offsets and possible areas for targeted restoration and ecological monitoring.

Data layers used

- Wetland data - version 5 - wetland areas – Queensland
- Vegetation management regulated vegetation management map – version 4.02
- Aquatic Conservation Assessments (ACAs) – SEQ

- Protected estate

GIS methods

The following table documents the inputs (factors and class) along with their GIS implementation and scoring system.

Table 6 Rehabilitation Tool criteria, GIS implementation notes, weights and scores

Factor		Class	GIS Implementation	Class Score	Rescale 1-100	Factor Weight
1	Threatened Remnant Vegetation Buffer Zone	Endangered RE	Buffered by 100 m Select 'VM-Poly' = 'E_dom' + 'rem_endangered' Buffer zone only includes "non-remnant" areas (clipped by remnant)	10	100	20
		Of Concern RE	Buffered by 100 m Select 'VM-Poly' = 'OC_dom' + 'rem_ofconcern' Buffer zone only includes "non-remnant" areas (clipped by remnant)	8	78	
		Least Concern RE	Buffered by 50 m Select 'VM-Poly' = 'LeastC'	6	56	
2	Remnant	All remnant	Intersected with corridors. All remnant vegetation that intersects with a corridor gets a value (excludes non-remnant or regrowth, covered elsewhere)	6	56	10
3	Regrowth	Endangered RE	Polygon + 50 m buffer VMA Rev11	10	100	15
		Of Concern RE	Polygon + 50 m buffer VMA Rev11	8	44	
		Least Concern RE	Polygon + 25 m buffer VMA Rev11	6	44	
4	Riverine Wetlands	Riparian zones	Use buffered streams from AquaBAMM riverine layer – they have already been buffered according to stream order (SO1 = 10 m, SO2 = 10 m, SO3 & SO4 = 25m and >SO4 = 50 m	10	100	5
5	Non-riverine Wetlands	Buffered non-riverine wetlands	AquaBAMM non-riverine layer. Selected: Buffer 200 m -> AS Score = 'VH' Buffer 100 m -> AS Score = 'H' Buffer 50 m -> AS Score = 'M'	10	100	15

Factor		Class	GIS Implementation	Class Score	Rescale 1-100	Factor Weight
6	Threatened Species and MLES Species	EVNT Habitat	BPA (Brigalow Belt + SEQ) Select 'A_Rating': Very High; High; Medium.	10	100	5
7	MLES Habitat	MLES Habitat	Select MLES from habitat models	10	100	20
8	Conservation Tenures (used DCDB)	Nature refuges, Protected Estate, bushland reserves	Buffered the Protected Estate (national Parks, conservation parks, scientific reserves) by 500 m. Buffered Council bushland reserves by 250 m. Only the buffer was included in the tool.	8	78	10

Table 7 A worked example of the calculations in the priority rehabilitation tool for a single 10 m pixel

Criteria		Rescaled Score		Factor Weight	Interim Factor Score		Interim Pixel score	Pixel Score*
1.	Endangered RE buffered by 200m	100		0.30	30			
2.	Wetlands riverine	100		0.15	15			
3.	EVNT BPA Criteria A Output	100	*multiply*	0.10	10	add	74	47
4.	Conservation tenures (state and local)	78		0.10	7.8			
5.	Regrowth least concern	56		0.20	11.2			

* Pixel score was rescaled between 0-100 ([interim pixel score/max pixel score 151.2]*100)

The calculations across the study area ranged between 0 and 73. The rehabilitation layer was rescaled to represent a category of 1-4 for priority rehabilitation areas (using 'natural breaks Jenks', ArcGIS). The relative rehabilitation categories are:

1) Low (0-10)
2) Medium (10-25)
3) High (25-35)
4) Very high (35-73)

The GIS layer output includes the ability to interrogate a local area within the corridor network and determine what rehabilitation criteria generated the priority value ranging between 'Low' to 'Very High'.

Chapter 3 Expert review and input

3.1 Expert panel

Redleaf Environmental facilitated two expert panel workshops consisting of local ecological specialists from universities, private sector consultants, persons with specialist knowledge, Queensland government and Council staff. The workshop participants were invited to provide advice on the scientific evidenced based outputs of the MLES process. The workshop agenda is provided in Appendix C – Expert Panel . The primary purpose for the panel was to provide scientific advice and recommendations to inform the MLES mapping methodology and outputs. This included providing advice on:

- Identifying information sources including expert knowledge, technical reports and papers
- Providing expert opinion where quantitative data is not available uniformly across the Fraser Coast region
- Review of corridor mapping at the landscape scale, wildlife areas, riparian areas, stepping stones and rehabilitation priorities
- Identifying areas with special biodiversity values
- Special features of climate change adaptation and refugia
- Provide recommendations on spatial areas containing values under the MLES framework

The output of the panel process aims to be justifiable and transparent. Data that is captured digitally and mapped is a result of consensus within the panel.

3.2 Panel members

The panel consisted of 22 members appointed to ensure expertise from a range of specialisation including (but not limited to):

- Ecology – flora / fauna
- Coastal / Marine Biology
- Development assessment
- Matters of State Environmental Significance (MSES), BPAs, ACAs
- Landscape ecology
- Botany and vegetation mapping

The initial consultation list of potential members was developed by Council and was further added to after consultation with various technical experts providing recommendations for additional potential members. Where someone was unable to attend, another potential member was invited with similar experience and skill set. Invitations were sent out until 22 panel members had agreed to attend the workshop (Appendix C – Expert Panel Terms of Reference).

Table 8 Panel member organisation and expertise

Name	Organisation	Expertise
Tim Ryan	Queensland Herbarium	Botany, vegetation mapping and Regional ecosystems
Peter Young	Consultant	Botany and Regional ecosystems
Tony Van Kampen	Consultant	Botany, vegetation mapping and Regional ecosystems
Brad Crosbie	WYLD projects	Landscape ecology
Michael Smith	WYLD projects	Landscape ecology
Mike Moller	Wiide Bay Burnett Environment council & Mary River Catchment Coordination Committee.	Ecology – flora / fauna

Name	Organisation	Expertise
Vanessa Elwell-Gavins	Wildlife Preservation Society Queensland - Fraser Coast Branch	Ecology – flora / fauna
Tina Raveneau	Consultant	Ecology – flora / fauna
Maria Zann	Wetlands Team, Environmental Policy and Programs Department of Environment and Science	Coastal / Marine Biology, Ecology - fauna
Marilyn Connell	Tiaro and district landcare	Ecology – flora / fauna
Frank Ekin	Hervey Bay Birdwatching	Ecology – flora / fauna
Peter Mulcahy	Department of State Development, Infrastructure, Local Government and Planning	Development assessment
Sue Sargent	FINIA – the Natural Integrity Alliance for K'gari	Coastal / Marine Biology, Ecology – flora / fauna
Cecile Espignole	Queensland Wader Study Group	Coastal / Marine Biology, Ecology – flora / fauna
Will Price	Queensland Wader Study Group	Coastal / Marine Biology, Ecology – flora / fauna
Greg Boheme	Department of Environment and Science	Development assessment
David Scheltinga	QLD Water	Landscape ecology
Roger Currie	Fraser Coast Property Industry Association	Ecology – flora / fauna, Development assessment
Julian Gregson	Department of Resources	Development assessment
Natalie Richardson	Koalas Fraser Coast	Ecology – flora / fauna
Alex Stengl	Gympie regional council	Development assessment
Sharon Marshall	Department of Regional Development, Manufacturing and Water	Development assessment

3.3 Facilitators and support staff

The panel was facilitated by Dr Darren Fielder (Principal Scientist, Redleaf Environmental) who has a 26-year career in biodiversity planning and assessment from the public and private sectors. Darren was part of the team which implemented the first Biodiversity Planning Assessment (BPA) undertaken by the Queensland State Government in 2002 for the New England Tablelands Bioregion. Darren was instrumental in the development and implementation for the Southern Brigalow Belt and Mulga Lands BPAs. He also co-authored the Queensland State Government Aquatic Biodiversity Assessment and Mapping Method (AquaBAMM) and Aquatic Conservation Assessment (ACA) which was applied to all riverine and non-riverine wetlands across Queensland (Clayton et al. 2006). Darren went on to lead multi-disciplined teams in the development and implementation of several ACAs (Queensland Murray Darling Basin, LEB, Condamine River Catchment, NSW Murray Darling Basin, Brisbane City Council). He has facilitated over 25 ACA or BPA expert panel (1-2 day) workshops since their implementation in the early 2000's.

Dr Darren Fielder (Facilitator), Kaitlyn Cavanagh, Dr Christina Kindermann and Annerie Dinkelmann from Redleaf Environmental. There were four staff in attendance from Fraser Coast Regional Council.

Chapter 4 Results

4.1 Expert Panel Recommendations

The expert panel workshops resulted in 54 recommendations being spatially delineated across a range of values for the Fraser Coast region (Table 9; Appendix D – Expert Panel Recommendations). A further 11 recommendations couldn't be implemented because they required additional detail (e.g., field surveys) before they could be mapped. These were recorded for future review or action. The recommended MLES values included identifying riparian corridors, areas of richness and diversity, climate change, core habitat areas, representative ecosystems, coastal habitats, urban bushland, and ecosystem buffers. From these recommended MLES values, areas of species richness and diversity was the most common category (31 times), followed by riparian corridors (20), areas of ecosystem representation or uniqueness (18), core habitat areas (15), climate change refugia (14), local species habitat (13), and coastal habitats and urban bushland at 11 times.

Table 9 Implemented Expert Panel MLES – summary list

Code	Special Feature Description
MLES02	Ecosystem Buffers – Littoral Rainforest and coastal vine thicket – Coastal Swamp Oak – Coastal swamp sclerophyll – Lowland rainforest – Subtropical and temperate coastal saltmarsh – Protected Estate – Melaleuca drainage lines
MLES05	Rainforest Ecosystem buffers
MLES06	Rainforest Ecosystems
MLES07	Melaleuca drainage lines
MLES27	Booral township
MLES28	River Heads Township
MLES29	Burgowan/Walliebum – Important / High Biodiversity area
MLES30	Tinana urban bushland
MLES31	Fairfield Park urban bushland
MLES32	Maryborough Rifle Range - Urban bushland
MLES33	Hervey Bay Airport
MLES34	Maryborough Motor Racing Park
MLES03	Saltwater Creek
MLES04	Beelbi Creek - Riparian corridor
MLES14	Burrum River system (including Isis, Gregory and Cherwell Rivers) - Biodiversity hotspot
MLES15	Munna Creek system
MLES22	Gutchy Creek - Riparian corridor
MLES23	Riparian corridor - Tinana Creek system
MLES24	Kauri Creek
MLES25	Susan River catchment
MLES35	Riparian corridor - Beaver Rock

Code	Special Feature Description
MLES37	Riparian corridor - Little Tuan Creek, Big Tuan Creek and Thangawang Creek.
MLES38	Poona Creek
MLES40	Wondunna - Riparian corridor
MLES55	Aquatic species habitat (Platypus, freshwater turtles, Australian lungfish, Mary River cod)
MLES09	Eli Creek system
MLES36	The Dimonds system – Important / High Biodiversity Area
MLES39	Tinnanbar – Important / High Biodiversity Area
MLES10	Locally significant flora species
MLES01	Koala Habitat
MLES08	Glider Habitats
MLES18	Flying fox camps
MLES41	Critical shorebird roosts
MLES51	Mary River estuary shorebird critical feeding areas
MLES52	Low-tide seagrass feeding areas
MLES11	Mount Walsh – Important / High Biodiversity area
MLES12	Lenthalls Dam - Important / High Biodiversity area
MLES13	Teebar - Area of ecosystem uniqueness
MLES16	Grongah National Park
MLES17	Glenbar National Park Foothills of Mt Urah
MLES19	Mount Bauple - Important / High Biodiversity area
MLES20	St Mary - Important / High Biodiversity area
MLES21	Woocoo National Park - Important / High Biodiversity area
MLES26	Wallum and heath systems
MLES42	Eli Creek - Gatakers Bay - Dundowran; reef seagrass and mangrove network.
MLES45	Coral reef and rocky shore systems
MLES46	Dayman Spit Seagrass
MLES47	Finger corals
MLES48	Urangan and Maaroom Coastal Habitats
MLES49	Booral Wetlands - Important / High Biodiversity area
MLES50	Mangroves and saltmarshes
MLES67	Hervey Bay Urban bushland
MLES68	Hervey Bay Rail Trail corridor
MLES43	Point Vernon - Coral Reef Biodiversity hotspot

4.2 Corridors and Habitat Nodes

4.2.1 Biodiversity Corridors and Habitat Nodes

The corridors and habitat nodes are presented in **Map Series 1 – MLES Biodiversity Corridors and Habitat Nodes**. The implementation methods of how these corridors and nodes were developed are provided in 2.3.1 Regional, established, enhanced and stepping stone corridors and 2.3.3 Core Habitat Areas, Established Nodes and Enhanced Nodes. Map Series 1 present the FINAL results of the mapped corridors and habitat nodes following manual refinement through expert opinion of the modelled outputs to suit the underlying land use and values. That is, Map Series 1 were based on the modelled corridors shown in Map Series 3.

From the detailed GIS spatial analysis, 391 habitat nodes were spatially identified containing 102,876 ha of land. The breakdown of these nodes included 34 core habitat areas, 137 established nodes and 220 enhancement nodes across the Fraser Coast region (Table 10). The connecting corridors consisted of 1,291 kms of corridor length with regional corridors (344 km), established corridors (220 km), stepping stone corridors (131 km), enhancement corridors non-urban (532 km) and enhancement corridors urban (64 km) (Table 11).

Table 10 Summary of Habitat Node Types

Node Type	Count	Area (ha)	Average (ha)
2.1 Core Habitat Area	34	90,750	2,669
2.2 Established Nodes	137	8,117	59
2.3 Enhancement Nodes	220	4,010	18
Total	**391**	**102,876**	**263**

Table 11 Summary of Corridor Types

Corridor Type	Count	Total Km Length	Average Km length	Buffer Width (m)
1.1 Regional	70	344	4.9	800
1.3 Established	64	220	3.4	400
1.4 Enhancement - rural	149	532	3.6	200
1.5 Enhancement - urban	70	64	0.9	80
1.6 Stepping Stone	23	131	5.7	400
Total	**376**	**1,291**	**3.4**	**-**

Note: the outputs in Map Series 1 do not incorporate Areas of species richness (2.4) and diversity or Climate change adaptation and refugia areas (2.5) as these are recorded in the Expert Panel recommendations.

4.3 Other MLES Values

As part of the analyses, there were several MLES values calculated from the datasets. These included the rehabilitation tool, corridor pathway and priority analysis (used for the corridor modelling), ecosystem diversity calculations and assessment of the Least Concern regional ecosystems of the council region. The outputs of these are provided in:

4.3.1 Rehabilitation Tool

The methods of the Rehabilitation Tool are provided in **2.3.6 Rehabilitation areas**. The outputs are the combined analysis of the eight (8) factors to provide medium and highest locations for targeted restoration efforts. The scores were categorised into the following values of 0-7 = Low; 8-17 = Medium; 18-28 = High; 29-74 = Very High. The outputs of the rehabilitation tool could be used to guide future restoration efforts or environmental offsets for

targeted action under the planning scheme or other natural resource strategy. That is, the higher the rating the more priorities occur on that patch of land. The rating is therefore an accumulation of the 8 factors per pixel assessed.

4.3.2 Corridor Pathways and Priority Model

The outputs presented in **Map Series 3 – MLES Corridor Pathways and Priority Model** provides the unedited, raw modelled outputs from the various GIS spatial analyses described in section 2.3.1 Regional, established, enhanced and stepping stone corridors and 2.3.3 Core Habitat Areas, Established Nodes and Enhanced Nodes. Within this output, each potential linkage is assigned a priority ranking by the computer analysis. This ranking is determined algorithmically as to which linkage is the most important to the least important based on distance and how many other alternative options are available in the landscape to link habitat nodes together. Similarly, the nodes were also ranked by computer algorithm according to their contribution to the network of habitat patches across the landscape. The models are complex algorithms which determine relative rankings according to a series of inputs by the user.

Consequently, Map Series 3 provides a record of the GIS spatial analysis and rankings applied to the linkages and nodes throughout the Fraser Coast Region. These were then manually adjusted through expert opinion to formulate the FINAL outputs presented in Map Series 1.

4.3.3 Ecosystem Representation and Uniqueness

The results presented in **Map Series 4 – MLES Ecosystem Representation** provide an GIS spatial analysis of regional ecosystem (regrowth + remnant) across the Fraser Coast Region. This analysis is based on the same method used by the State Government in the Biodiversity Planning Assessments (BPAs). The full method is described in this report under section 2.3.4 Ecosystem representation and/or uniqueness. The relative ratings of Low, Medium, High and Very High follow the BPA recommendations. For the outputs, the following categories were used 0-0.296147 = Low; 0.296148-0.523975 = Medium; 0.523976-0.688376 = High; 0.688377-0.929852 = Very High.

A Very High rating means these ecosystems were calculated as having relatively diverse landscape settings with several ecotones and different types of ecosystems immediately adjacent to it. This creates a category structure for establishing MLES in the planning scheme or policy framework. These high and very high RE polygons hold inherent ecological significance and may warrant higher protections.

The outputs of Map Series 4 were conducted on all regrowth and remnant RE mapping by the Queensland Herbarium incorporating recent updates by Redleaf (2021) and was applied across all tenure types. The resulting map may require further refinement to exclude protected estate or other tenure depending on council priorities.

4.3.4 Least Concern Regional Ecosystems

The **Map Series 5 – MLES Least Concern Regional Ecosystems** is a sub-category (3.1) which incorporates areas of Least Concern REs mapped by the Queensland Herbarium as remnant or regrowth and compares these by the area left within the Fraser coast council area itself and the South-East Queensland bioregion. The output is a comparison of Least Concern REs within Fraser Coast region compared to all Least Concern REs within the South-east Queensland Bioregion. The output was ranked from Very high through to Low based percentage of area of each Regional Ecosystem. In this instance the rating was inverted so that ecosystems with a higher percentage of area that fell within the Fraser Coast council area were given a higher rating to infer importance to ecosystems that are a ‘stronghold’ in the region.

Endangered and Of Concern REs were not included in this assessment because they are MSES values which are administered under the VMAct by the State Government.

Chapter 5 Recommendations

5.1 Mapping output application opportunities

The mapping products provide a robust scientific assessment of the MLES categories and sub-categories incorporating corridors, biodiversity areas and ecosystems across the Council study area. These mapped areas could be used to inform the policy framework within the Planning Scheme. Actions from this could include:

- Developing guidelines on the interpretation and use of the mapping products as environmental area overlays in the planning scheme. These guidelines would be for council staff to assess development applications and for development proponents to submit the relevant reports and studies to address these overlays where they occur on the land.
- Documenting an ecological assessment and reporting guideline for internal and external stakeholders. For example, the Gold Coast City Council has documented Guidelines for Ecological Assessment which assists applicants to adequately address the performance criteria for the various biodiversity overlays.
- Documenting the requirements for various associated plans: vegetation management plan, ecological restoration plan, fauna management plan, habitat tree management plan, survey and monitoring techniques, green infrastructure designs, environmental corridor restoration plan.
- Document the environmental offsets policy and practical application of this process.
- Defining local hierarchy in the environmental area overlays, for example, nominating corridors as locally significant. Some areas will contain multiple values and guidance on what the preferred hierarchy to address these values within a development application may be beneficial.

5.1.1 Environmental area overlays

The MLES mapping products including corridors, habitat nodes, expert panel recommended MLES values, riparian corridors and rehabilitation areas can be used to evaluate land use alternatives and provide a series of outputs to compare the effects of various types, locations, and intensities of land use on the identified values. They can be used exclusively, together or in an integrated approach depending on the policy context or development scenario. The choice of how each element is interrogated is dependent on the policy outcome. Table 12 provides a list of possible policy applications. This list is not exhaustive as the end user may have unlimited ways to use the data and interpret the information as part of a decision-making process.

The mapping products can be adopted in whole or part as environmental area overlays for use in the Planning Scheme. These layers would be used by Council to determine the assessment requirements for a development application. The mapping layers would represent the Council's most environmentally important areas recognised as MLES.

5.1.2 Development application

A planning scheme policy may utilise the mapping products to:

a) outline the information Council may require for the assessment of a development application;

b) provide guidance and advice for the achievement of outcomes of the overlay assessment benchmarks;

c) provide guidance and advice for developers and decision makers on how development can achieve high quality development design outcomes;

d) provide guidance and advice for counterbalancing environmental values where permitted as a last resort, using environment offsets.

The overlays would apply to development applications (code assessable development and impact assessable development) for land containing 1 or more of the overlays on the lot plan. For example, where native vegetation clearing is proposed within an Established Node and the clearing is not accepted development, a legally secured offset would be required to ensure maintaining local wildlife habitat outcomes for stepping stones is achieved.

The mapping would support the Council framework to determine ecological assessment and reporting requirements for development applications. The results of an ecological assessment report will allow Council to understand if the development will achieve the performance outcomes required by the overlay assessment values.

The framework may also include triggers for when additional reports or plans are required as part of the development application processes. This could include:

- Ecological assessment report
- Offsets delivery plan
- Vegetation management plan
- Ecological restoration plan
- Fauna management plan
- Habitat tree management plan

5.1.3 Green infrastructure

The Council region contains outstanding environmental assets including a diverse range of ecosystems across terrestrial, wetland, waterway, coastal habitats and marine areas. There are several thousand species of flora and fauna recorded from the region. Ecological corridors and habitat features help keep these species connected across the landscape.

Where a development is proposed that may impact on the mapped MLES values, Council may encourage green infrastructure design solutions to be considered during the concept planning phase of development design to ensure a healthy and connected green infrastructure network is maintained across the region.

There are many green infrastructure components which can be incorporated into the design with environmental values. Incorporating these solutions can assist with meeting avoidance and mitigation requirements if an environmental offset is triggered.

Some of the areas for Council to consider using the mapping would include ecological corridors. The mapped areas are important ecological features in protecting and maintaining the health and resilience of biodiversity within the urban footprint, and for the ongoing provision of ecosystem services. Ecological areas support wildlife breeding and refuge and describe a range of habitat types from native vegetation, wetland, and the floodplain areas to places with scattered vegetation which wildlife use to forage, move through, breed and shelter.

Table 12 Potential policy application for the identified values (mapping layers)

Value	Policy application
Established Corridor, Enhancement Urban Corridor, Stepping Stone Corridor	Development applications – clearing of native vegetation, green infrastructure, offset requirements, restoration plans. A development would need to demonstrate how it is avoiding or minimizing its impact on the ecological corridor functioning. Offsets may be triggered.
Core Habitat Area, Established Urban Nodes, Enhancement Urban Nodes	Development applications – clearing of native vegetation, green infrastructure, offset requirements, restoration plans, fauna management plans. A development would need to demonstrate how it is avoiding or minimizing its impact on the wildlife corridor functioning. Offsets may be triggered.
Riparian Regional Corridors	Development applications – clearing of native vegetation, green infrastructure, offset requirements, restoration plans. A development would need to demonstrate how it is avoiding or minimizing its impact on the aquatic corridor functioning. Offsets may be triggered.

Value	Policy application
Rehabilitation Areas	This overlay can be used at the lot plan level to prioritise areas for restoration or rehabilitation. Council may condition development applications to restore ecological values within the rehabilitation areas. These could be identified for MLES offsets.
Core Habitat Areas	Fauna and flora surveys required to evaluate the presence of native species and their habitats, movement and dispersal corridors and pathways. In addition to searches of current literature and ecological databases, this usually requires a comprehensive site survey using repeatable and approved survey methodology.
Local Significant Species Habitat and other MLES values mapped by the Expert Panel process	Fauna and flora surveys required to evaluate the presence of native species and their habitats, movement and dispersal corridors and pathways. In addition to searches of current literature and ecological databases, this usually requires a comprehensive site survey using repeatable and approved survey methodology. Of interest are priority species of the Council region.
Stepping Stone Habitat	Fauna and flora surveys required to evaluate the presence of native species and their habitats, movement and dispersal corridors and pathways. In addition to searches of current literature and ecological databases, this usually requires a comprehensive site survey using repeatable and approved survey methodology.

5.2 References

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Scotts, D. and Cotsell, N. (2014) Landscape Corridors of the Coffs Harbour Local Government Area. Coffs Harbour City Council, Coffs Harbour, New South Wales, Australia. Unpublished draft report.

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Appendix A – List of datasets used

All these were combined. Resistance map datasets –

- Roads – separated into different classes (i.e., main, secondary etc.) and used distance from roads in the model
- Zoning – i.e., council provided
- Native vegetation – threatened, remnant regrowth.
- A base vegetation layer was created from vegetation and water indices.

The following table provides a list of datasets used in the analyses and an abbreviated description of their associated metadata. Please refer to the original metadata files for more information and do not rely on the summary information presented here.

Code	Publication	Metadata Description	Projection and resolution	Source
AquaBAMM – non Riverine Aquatic conservation assessment - non-riverine	2011-10-04 (publication)	Assessment of the Aquatic Conservation Values (ACA) for non-riverine (lacustrine and palustrine) wetlands using the Aquatic Biodiversity Assessment and Mapping Methodology (AquaBAMM). Polygons visually checked at 1:100,000 scale and by topological consistency checks. Formal assessments show the AquaBAMM attributes to be accurate > 98% of the time.	Coordinate Reference System EPSG code: EPSG:4938 Title: EPSG Geodetic Parameter Dataset	Department of Environment and Science
AquaBAMM _ riverine Aquatic conservation assessment – Riverine	2011-09-19 (publication)	ACA for riverine wetlands using the AquaBAMM. The average accuracy of the 1:100,000 topographic drainage data this data set is based on is plus or minus 25 metres in the horizontal position of well defined detail and plus or minus 5 metres in elevation. Formal assessments show the AquaBAMM attributes to be accurate > 98% of the time.	Coordinate Reference System EPSG code: EPSG:4938 Title: EPSG Geodetic Parameter Dataset Date: 2007-07-16 (revision) Edition: Version 6.13	Department of Environment and Science
BPA (BAMM) SEQ Bioregions Biodiversity Planning Assessment v. 1.3	Beginning Date: Not Known Ending Date: 22 September 2008	The Remnant Unit data used in the assessment process is based on the Queensland Herbarium Survey and Mapping of 2005 Remnant Vegetation Communities and Regional Ecosystems of Queensland (September 2007). The Regional Ecosystem Mapping is mapped at a scale of 1:100,000 and has a minimum remnant polygon area of 5 hectares or minimum remnant width of 75 metres. The precision of polygon	Datum: GDA94 Projection: Geographics Spheroid: GRS1980	Department of Environment and Science

Code	Publication	Metadata Description	Projection and resolution	Source
		boundaries or positional accuracy of linework is +/-100 metres.		
BVG Broad vegetation groups - pre-clearing and 2019 remnant - Queensland series	*Date:* 2021-12 (publication)	Version 5.1 pre-clearing and 2019 remnant Broad Vegetation Groups of Queensland (BVG), derived from the regional ecosystem mapping. The 1:1 million BVG is added by lookup table derived from the Regional Ecosystem Description Database (REDD). The dominant BVG 1:1 million (DBVG_1M) is determined by percentages of each BVG.	Coordinate Reference System EPSG code: EPSG:4283 Title: EPSG Geodetic Parameter	Department of Environment and Science
FPC Wooded extent and foliage projective cover - Queensland 2013	2015-01-23 (publication)	FPC is the percentage of ground area occupied by the vertical projection of foliage. The wooded extent product has a nominal accuracy of 85%. The field data used to calibrate the imagery/FPC relationship was mostly collected over the period 1996-1999.	Projection: EPSG:3577 Horizontal Datum: GDA94 Spatial resolution: Ground sample distance: 30 (meters)	Department of Environment and Science
GCDI Queensland Ground Cover Disturbance Index – Version 6.13	Beginning Date: Ending Date: 2014-05-14	The Ground Cover Disturbance Index (GCDI) assesses aspects of rangeland biodiversity condition. It relates the ground cover time series statistics from the State Land and Tree Study (SLATS) to the Regional Ecosystem (RE) framework. The positional accuracy is primarily dependant on the accuracy of the Version 6.0B and draft Remnant Regional Ecosystems and Remnant Vegetation Cover, Queensland (September 2009). Positional accuracy is recorded in the metadata as Polygons 100m; Sites 10m	Datum: GDA94 Projection: Geographics Spheroid: GRS1980	Department of Environment and Science
Ordered drainage 100K - Queensland	*Date:* 2010-06-23 (publication)	This dataset is based on the GeoScience Australia 1:100,000 drainage network of Queensland (where 1:100,000 coverage exists) and has streams connected and directionalised with reaches ordered using Strahler method of stream ordering. The average horizontal accuracy is plus or minus 25 metres of well defined detail and the average	Coordinate Reference System EPSG code: EPSG:4938 Title: EPSG Geodetic Parameter Dataset	State of Queensland (Department of Natural Resources and Mines) 2015

Code	Publication	Metadata Description	Projection and resolution	Source
		vertical accuracy is plus or minus 5 metres.		
Baseline roads and tracks - Queensland	*Date:* 2019-12-19 (publication)	This dataset represents street centrelines of Queensland developed in compliance with the provisions of the Queensland Spatial Information Infrastructure Strategy (QSIIS) Standard 3. The street records are polylines with attribution including street name, road classification, route numbers (State and National), and unique identifier. This dataset is currently maintained for the Department of Natural Resources, Mines and Energy and is sometimes referred to as the SDRN basic (State Digital Road Network).	Coordinate Reference System EPSG code: EPSG:4938 Title: EPSG Geodetic Parameter Dataset	Department of Natural Resources Mines and Energy
Protected areas of Queensland	2022-03-28 (publication)	Protected areas of Queensland represent those areas protected for the conservation of natural and cultural values and those areas managed for production of forest resources, including timber and quarry material. These areas are defined spatially using DCDB (Digital Cadastre Database) parcels. These areas are captured as parcels from the DCDB or as a single record for each protected area.	Coordinate Reference System EPSG code: EPSG:4283 Title: EPSG Geodetic Parameter Dataset	Department of Environment and Science
Wetland data - version 5 - wetland areas - Queensland	2019-06-14 (publication)	This dataset provides mapping of the extent and type of wetlands at 1:100,000 scale across Queensland. Version 5.0 depicts the extent of wetlands in 2001, 2005, 2009, 2013 and 2017 based on rectified 2001/2005/2009/2013/2017 Landsat ETM+ imagery. The positional accuracy of wetland data mapped at a scale of 1:100 000 is /-75 metres. Regional Ecosystems Formal and informal assessments show regional ecosystem attributes to be accurate > 80% of the time.	Coordinate Reference System EPSG code: EPSG:4938 Title: EPSG Geodetic Parameter Dataset	Department of Environment and Science

Appendix B – Mapping assumptions and limitations

Biases

For conservation planning and mapping analyses there are inherent biases or limitations on the outputs. They will suffer to some degree from inconsistent, highly variable, or missing data. The analyses to map the urban corridors and nodes for the project area requires the consideration and combination of a wide range of data types across a large area and differing mapping units.

Data limitations

Data limitations will feature across most ecological value and corridor identification products. Data availability is a function of previous research, survey effort and publicly available datasets and data layers. Data sets used in mapping are publicly available thought the Queensland spatial portal, various government or non-government groups websites (e.g., Atlas of Living Australia) or supplied under licence agreement from Council. The generated models are not independently calibrated by empirical data collected in the field by the authors. Some data perceived to be valuable in this process may not be available or sourced in time for completion of the project.

Spatial data sets have inherent accuracy limitations, and therefore, the conclusions that can be drawn from derived products are equally constrained. These limitations need to be accounted for in the final outputs for each model and spatial layers generated throughout the project.

Expert panel

An expert panel was convened to review the draft results of the model and mapping outputs. The panel consisted of invited persons with knowledge of the biodiversity of the Council region and a sound understanding of ecological conservation and management principles. As far as possible, the combined expertise of participants covered the project area. The output of the panel process aimed to be justifiable and transparent. Data was captured digitally and mapped. The invitees and agenda for the workshop are provided in Appendix C – Expert Panel .

Scale of assessment

Availability of modelling platforms through ArcGIS or similar can also influence the level of analysis performed. The mapping undertaken by Redleaf utilises existing or derived ecological datasets (e.g., species records, regional ecosystem mapping) to identify ecological values across the landscape. The outputs provided here do not replace the need for detailed impact assessments relevant to specific developments or activities. However, the mapping products do provide a reliable spatial representation of the ecological values for policy implementation and further investigation (i.e., development assessment).

Assumptions

The mapping products identify significant values for input to decision-making processes when combined with other conservation maps, field data and other additional information. The corridor map does not suggest that only the corridor linkages should be preserved because other parts of the landscape could also be important. The corridors are also not a migration pathway, it simply depicts the easiest modelled route between neighbouring pairs of core habitat areas or nodes.

When comparing alternative corridor routes, the user needs to be aware that each linkage has varying costs associated with a point in the landscape. The central band indicates the best modelled movement pathway with the cost-weighted distance varying between band categories. These important differences between linkages were calculated using statistical analyses on the underlying data and provide a prioritised or ranked output for the underlying linkages.

The corridor model specifically focussed on linking priority nodes or remnant patches within the landscape. The modelled corridor was identified as the ‘easiest’ route by integrating expert knowledge into resistance surfaces surrounding human modification of the landscape. This model assumed a linear relationship between modification and resistance and did not consider varying levels of sensitivity that may attend species responses to modification.

Sensitivity analysis

Redleaf completes sensitivity analysis during the draft mapping product stage to test the outputs against the expert knowledge of our team. This allows for adjustments to input data sets and the assigned weights and associated scores of factors and their classes. For example, the linkage map has 5 clear steps:

1. GIS data layers
2. Corridor model development;
3. Resistance surface development;
4. Identification of habitat concentration areas, nodes or landscape integrity core areas; and
5. Linkage modelling.

Each step had an associated sensitivity analysis which involved statistical interrogation such as plotting graphs and distribution of data across models and model inputs. Weights and values were altered incrementally to observe the final outputs in contrast to known locations of animals (considering observation errors).

Appendix C – Expert Panel Terms of Reference

Draft Terms of Reference
Matters of Local Environmental Significance Expert Panel

BACKGROUND

Council has engaged Redleaf Environmental to refine and map the Fraser Coast Matters of Local Environmental Significance (MLES).

The mapping outputs will inform preparation of planning scheme provisions to support the appropriate level of protection for the MLES.

MLES refers to values and areas that are determined by a Local Government and identified in a planning scheme. MLES is not the same or substantially the same as Matters of National Environmental Significance (MNES) and or Matters of State Environmental Significance (MSES).

MLES is valuable biodiversity determined by a Local Government that cannot be the same, or substantially the same as MSES or MNES, although, they may spatially overlap in certain circumstances. For example, habitat for wildlife species that are not listed as 'vulnerable', 'endangered' or 'special least concern' under the *Nature Conservation Act 1992* (*NCA 1992*) or the *Environmental Protection Biodiversity Conservation Act 1999* (EPBC 1999) that is important locally may overlap with an area of MSES or MNES.

PURPOSE

The purpose of the Matters of Local Environmental Significance (MLES) Expert Panel is to discuss and provide expert advice and recommendations on matters relevant to development of MLES mapping and policy responses within the Fraser Coast.

You, or your organisation, has been identified as someone with local understanding and experience in the Fraser Coast region and surrounds with the expertise to inform the process for identifying and mapping the MLES.

The project will involve mapping local wildlife corridors including aquatic corridors and areas for rehabilitation. There will also be a focus on identifying landscape biodiversity values such as large tracts of vegetation, urban bushland, species richness and diversity, ecosystem uniqueness and climate change adaptation and refugia.

MEMBERSHIP

The Expert Panel membership will be voluntary and drawn from a diverse cross-section of the Fraser Coast community. The Expert Panel is to comprise the following members:

- Natural resource management groups
- Environmental consultants
- Local conservation focussed groups
- Council's Environment Advisory Group

- Development industry expert (e.g. development/planning consultant)
- Universities
- Representatives from relevant State Agencies
- Relevant Council Officers.

Members are to be persons with knowledge and experience of the ecological values of the Fraser Coast, specifically we are seeking expertise in the following areas:

- Fauna specialists – fish, frogs, mammals, reptiles, birds, waterbirds, waders / migratory species
- Flora specialist / botanist
- Vegetation mapping
- Coastal Habitats
- Marine Environments
- Wetlands Ecology
- Landscape Ecology
- GDEs (Groundwater Dependent Ecosystems).

APPOINTMENT PROCESS

Council is seeking expressions of interest to be involved in the Expert Panel. Successful members will be:

1. applicants who demonstrate a good understanding of environmental values of the Fraser Coast region, including a field of expertise if relevant; and
2. be able to show a history of involvement in, and understanding of, environmental issues.

DURATION OF THE APPOINTMENT

The project commenced in September 2021 and is anticipated to be finalised by April 2022.

There will be a few touch points with the Expert Panel and Council and the consultant with the first workshop scheduled to be held either 18 or 19 October 2021 (depending on Expert Panel members availability).

Membership as a panel member will be for the duration of the MLES project which is to be approximately six months from the commencement of the project.

The second Expert Panel workshop is expected to occur in February 2022 and a final date will be determined closer to the time.

An opportunity to be called upon again may arise after notification of an amended planning scheme in a few years' time however the panel members may choose not to partake in any further sessions beyond the completion of the current MLES project.

MEETING FEES

All appointments are voluntary roles and are not paid meeting fees.

ATTENDANCE

Members are encouraged to attend all meetings of the MLES Expert Panel for which reasonable notice will be given. It is expected there will not approximately two meetings for the duration of the project and details for these will be provided as arranged.

The first Expert Panel Workshop is proposed to be held 18 or 19 October 2021 in a location yet to be confirmed.

ROLES AND RESPONSIBILITIES OF MEMBERS

At the workshop you will be asked to review and refine lists of local significant species for flora and fauna based on a set of criteria. There will also be time during the workshop to identify areas of significance across the regional council area such as climate refugia or hotspots of biodiversity.

Expert Panel members will be responsible for:

- ensuring that they are aware of and accurately represent respective stakeholder groups' views, where relevant.
- ensuring that outcomes of the panel are conveyed accurately to the relevant stakeholder groups; and
- ensuring that they do not participate in or try to influence discussion and recommendations on issues where they may have a material or personal interest.

Council representatives will be responsible for:

- ensuring appropriate liaison with the various departments and other stakeholder groups of Council;
- ensuring an appropriate level of involvement of relevant professional/technical staff at appropriate times and meetings;
- ensuring appropriate levels of administrative support;
- providing background information available through Council that is reasonably considered necessary to assist members to reach appropriate recommendations.

AGENDA AND MINUTES

Agenda Papers will be circulated to members not less than 5 business days before each meeting and a review of material will be required.

Meetings will be conducted using recognised meeting procedures and all members will be expected to conduct themselves in a respectful, courteous, and professional manner and show due regard to other members values and opinions.

ADMINISTRATION

Administration support will be provided by Fraser Coast Regional Council.

Resources such as meeting rooms will be made available by Fraser Coast Regional Council, to enable the Expert Panel to effectively perform its role.

MEDIA COMMENT AND CONFIDENTIALITY

Comments to the media on behalf of the Expert Panel shall only be made by Council or by another member of the Expert Panel with the approval of Council.

The Expert Panel does not have the power to speak on behalf of the Fraser Coast Regional Council. Members of the Expert Panel should appreciate that the Expert Panel may deal with sensitive matters of a confidential nature. The confidentiality of such information should be respected by all members.

CONFLICT OF INTEREST

Members of the Expert Panel must, having reviewed the agenda for a meeting, or when becoming aware of a potential conflict of interest, immediately advise the Chairperson and if appropriate leave the meeting whilst the matter is discussed and not participate in any decision making related to the issue.

COUNCIL CONTACT

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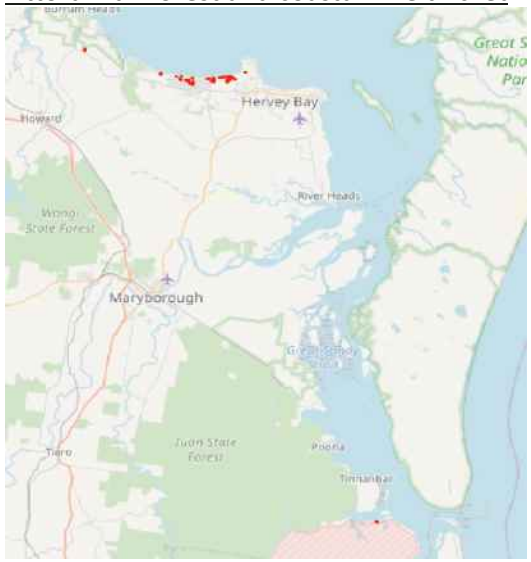
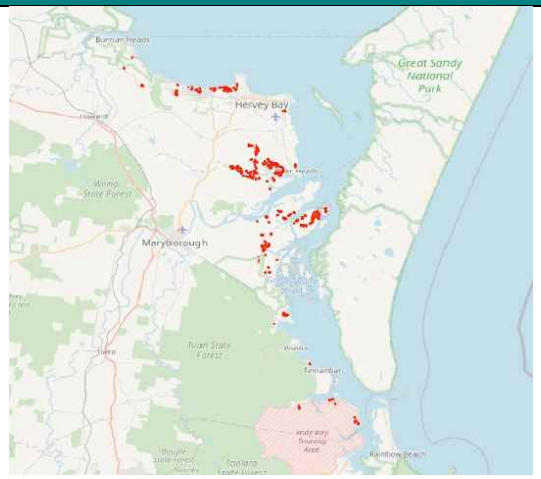
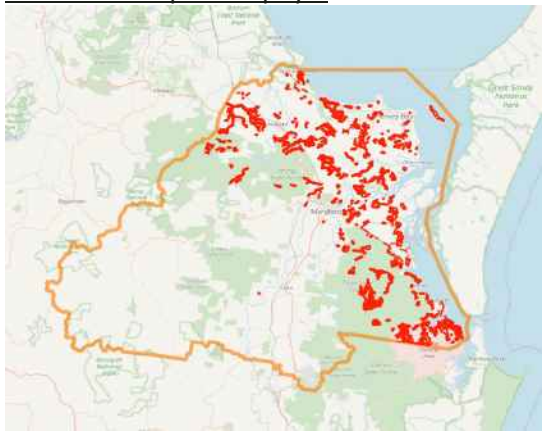
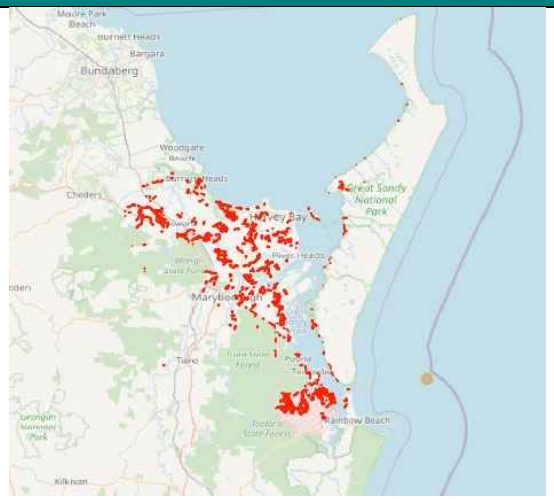
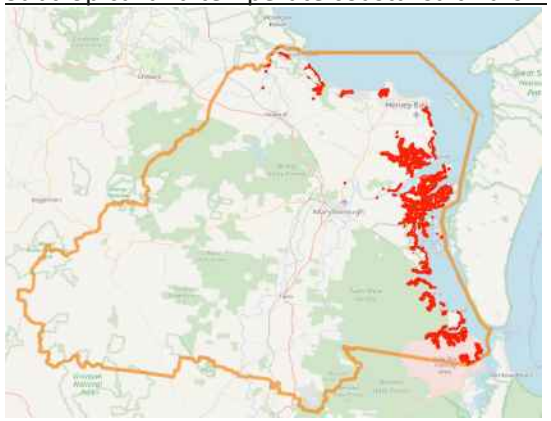
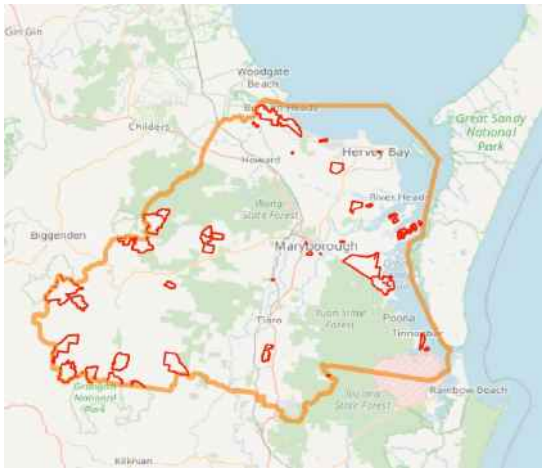
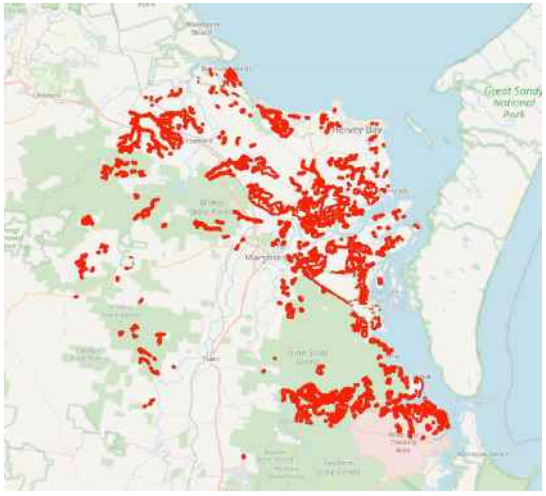
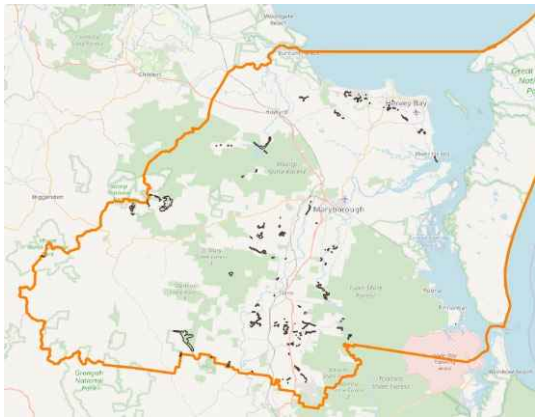
Appendix D – Expert Panel Recommendations

Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
MLES02	Ecosystem Buffers Littoral Rainforest and coastal vine thicket  Coastal Swamp Oak:	EPBC listed ecosystems within in the Fraser Coast region include Brigalow, littoral rainforest and coastal vine thickets, coastal swamp oak forest, poplar box grassy woodland, coastal swamp sclerophyll forest, lowland rainforest and subtropical and temperate coastal saltmarsh. These threatened ecosystems are at risk of ongoing degradation and fragmentation. Clearing to the boundary of these ecosystems can increase edge effects. Buffering these ecosystems and features is important for maintaining the integrity of the habitat features including supporting species diversity, habitat condition (e.g., minimise weed invasion) and vegetation structural integrity. These buffers can also protect groundwater and surface water interactions which can be important at a local scale. The buffer zone surrounding Protected Estate was identified as a MLES value. The buffer is to ensure these areas are protected from edge effects of adjacent land uses which may impact on the ecological values within the Protected Estate.	3.7 Ecosystem buffer 2.5 Climate change refugia	**Implemented** EPBC listed ecosystems that are found within the Fraser Coast region: Littoral Rainforest and coastal vine thicket: ecosystems that coincide with this ecological community (RE 12.2.2) were selected from QLD regional ecosystem and Redleaf updated regional ecosystem mapping. The layer was then buffered by 100 m (based on conservation advice from DAWE SPRAT profile). 'Intersection' was then applied to the layer to remove the community extent to give just the buffer. The layer was then clipped to the Fraser Coast Council boundary. Coastal Swamp Oak: ecosystems that coincide with this ecological community (RE 12.1.1 and 12.3.20) were selected from QLD regional ecosystem and Redleaf updated regional ecosystem mapping and then buffered by 30 m (based on conservation advice from DAWE SPRAT profile). 'Intersection' was then applied to the layer to remove the community extent to give just the buffer. The layer was then clipped to the Fraser Coast Council boundary.

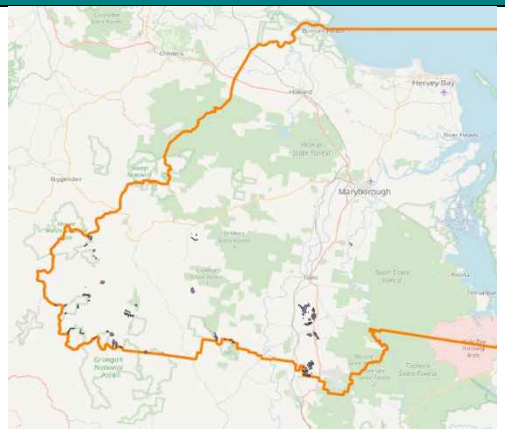
Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
	 Coastal swamp sclerophyll:  Lowland rainforest:			Coastal swamp sclerophyll: ecosystems that coincide with this ecological community (RE 12.2.7, 12.3.4, 12.3.5, 12.3.6 and 12.3.20) were selected from QLD regional ecosystem and Redleaf updated regional ecosystem mapping (using RE1). The layer was then buffered by 30 m (based on conservation advice from DAWE SPRAT profile). 'Intersection' was then applied to the layer to remove the community extent to give just the buffer. The layer was then clipped to the Fraser Coast Council boundary. Lowland rainforest: ecosystems that coincide with this ecological community (RE 12.5.13, 12.5.13a, 12.5.13b, 12.3.1, 12.12.16, 12.12.1 and 12.11.10) were selected from QLD regional ecosystem and Redleaf updated regional ecosystem mapping (using RE1). The layer was then buffered by 50 m (based on conservation advice from DAWE SPRAT profile). 'Intersection' was then applied to the layer to remove the community extent to give just the buffer. The layer was then clipped to the Fraser Coast Council boundary. Subtropical and temperate coastal saltmarsh: ecosystems that coincide with

Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
	 Subtropical and temperate coastal saltmarsh: 			this ecological community (RE 12.1.2) were selected from QLD regional ecosystem and Redleaf updated regional ecosystem mapping (using RE1). The layer was then buffered by 200 m based on QLD wetland mapping and expert panel recommendation. 'Intersection' was then applied to the layer to remove the community extent to give just the buffer. The layer was then clipped to the Fraser Coast Council boundary. Protected Estate: a 200 m buffer (as recommended by the expert panel) was applied to all protected areas and reserves using the 'SPS Protected Area Estates Refuge' layer within Fraser Coast boundary (excluding K'gari). 'Difference' was then applied to the protected areas and the protected areas buffer to give just the buffer. *Melaleuca* drainage lines: existing drainage lines were identified using a combination of the Queensland Broad Vegetation Group layer. BVG 22a (*Melaleuca spp*. open forests and woodlands on seasonally inundated lowland coastal swamps and fringing drainage lines (palustrine wetlands) and BVG 21a (*Melaleuca spp*. dry woodlands

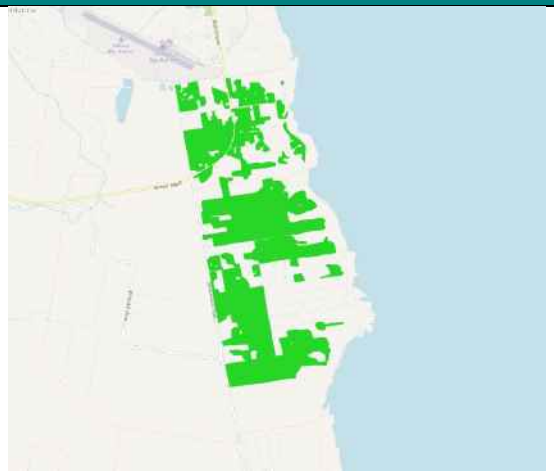
Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
	Protected Estate:  Melaleuca drainage lines  			to open woodlands on sandplains or depositional plains)) and combinations of both i.e., 21a/22a, were selected from BVG1M from the QLD Regional ecosystem and Redleaf updated regional ecosystem mapping. This was then buffered by 200 m in non-urban areas and 50 m in urban areas as per current state wetland mapping. These areas were then clipped to the urban areas. Mapping errors were corrected. This layer is the buffer of MLES07.

Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
MLES05	Rainforest Ecosystem buffers 	Rainforest ecosystems containing 'Of concern' and 'Endangered' vegetation are at risk of being lost or fragmented. Clearing to the boundary of these ecosystems can increase edge effects. The immediate areas surrounding these rainforest ecosystems provide buffers to protect the ecosystems from weed proliferation. These buffers are also important for maintaining the integrity of the habitat features including supporting species diversity, habitat condition and vegetation structural integrity. These ecosystems provide habitat for species including: *Acacia bakeri* marblewood, *Agathis robusta* kauri pine, *Ailanthus triphysa* white siris, *Alchornea thozetiana Bridelia exaltata* brush ironbark, Thozet's native holly, *Alocasia brisbanensis* cunjevoi, *Bridelia exaltata* brush ironbark, *Calamus muelleri* lawyer vine, *Callicarpa pedunculata* velvet leaf, *Coatesia paniculata* axe breaker, *Claoxylon tenerifolium subsp. tenerifolium* Queensland brittlewood, *Cryptocarya obovata* pepperberry, *Cupaniopsis wadsworthii* duckfoot, *Cyclophyllum*	3.7 Ecosystem buffer	**Implemented** All 'Of Concern' and 'Endangered' regional ecosystems that contain regrowth and HVR rainforest vegetation (as RE1) (including RE 12.2.1, 12.2.2, 12.3.2, 12.3.16, 12.3.17, 12.3.21, 12.5.13, 12.5.13a, 12.5.13b, 12.9-10.16, 12.12.1) were selected from the Queensland regional ecosystem mapping and the Redleaf regional ecosystem mapping. These were then buffered by 150 m as recommended by the expert panel. The rainforest vegetation was then clipped out to only include the buffer itself. Rainforests were clipped to the Fraser Coast boundary. Only RE 12.12.1, 12.2.2, 12.3.2, 12.5.13, 12.5.13a, 12.5.13b, 12.9-10.16 fell within the Fraser Coast boundary. Any obvious mapping errors were removed.

Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
		longipetalum brush canthium, *Dendrobium monophyllum* lily-of-the-valley orchid, *Dockrillia teretifolia*, *Dysoxylum gaudichaudianum* ivory mahogany, *Elaeocarpus eumundi* Eumundi quandong, *Elaeodendron australe var. australe* red olive plum, *Elattostachys bidwillii* smooth elattostachys, *Ficus racemosa var. racemosa* cluster fig, *Ficus macrophylla forma macrophylla* Moreton Bay fig, *Fitzalania bidwillii* southern fitzalania, *Flueggea leucopyrus* white currant shrub, *Glochidion lobocarpum* small-leaved cheese tree, *Monococcus echinophorus* burr bush, Nyssanthes diffusa barbed-wire weed, *Pilidiostigma rhytispermum* small-leaved plum myrtle, *Pipturus argenteus* native mulberry, *Psydrax odorata forma buxifolia* stiff canthium, *Tapeinosperma repandulum* tapeinosperma, *Triflorensia cameronii* Cameron's tarenna		
MLES06	Rainforest Ecosystems	Rainforests are a locally significant ecosystem containing high floristic richness and providing habitat for a range of fauna species. Clearing to	2.4 Species richness/diversity	**Implemented** All 'Least concern' regional ecosystems that contain remnant and HVR rainforest (RE 12.2.11, 12.11.3, 12.11.10, 12.12.13,

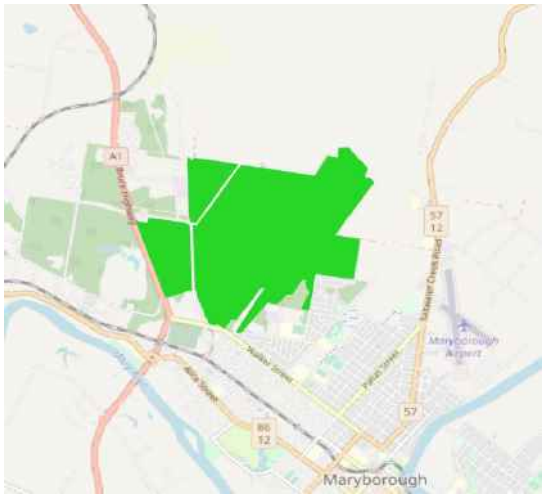
Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
		the boundary of these ecosystems can increase edge effects. This increases the pressure on the ecosystem and can increase weed density. Other impacts can include loss of floristic structure and the rainforest becoming susceptible to fire. Flora species associated with these ecosystems include: *Acronychia wilcoxiana* silver aspen, *Agathis robusta* kauri pine, *Bridelia exaltata* brush ironbark, *Calamus muelleri* lawyer vine, *Callicarpa pedunculata* velvet leaf, *Claoxylon tenerifolium subsp. tenerifolium* Queensland brittlewood, *Cryptocarya obovata* pepperberry, *Elattostachys bidwillii* smooth elattostachys, *Ficus racemosa var. racemosa* cluster fig, Ficus macrophylla forma macrophylla Moreton Bay fig, *Fitzalania bidwillii* southern fitzalania *Flueggea leucopyrus* white currant shrub, *Glochidion lobocarpum* small-leaved cheese tree, *Gynochthodes umbellata* Indian mulberry, *Monococcus echinophorus* burr bush, *Myrsine subsessilis subsp. subsessilis* red muttonwood, *Persoonia amaliae*	3.2 Ecosystems representation/uniqueness	12.12.16) were selected from the Queensland regional ecosystem mapping and the Redleaf regional ecosystem mapping. RE 12.2.11 and RE 12.11.3 were included based on recommendation from the expert panel due to the common presence of rainforest species within the understorey in the region. Regional ecosystems containing rainforest were clipped to the Fraser Coast boundary. RE 12.12.16, 12.12.13 and 12.11.10 fell within the Fraser Coast boundary. Any obvious mapping errors were removed.

Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
		Amalie's geebung, *Pilidiostigma rhytispermum* small-leaved plum myrtle,. *Psydrax odorata forma buxifolia* stiff canthium, *Tapeinosperma repandulum* tapeinosperma and *Triflorensia cameronii* Cameron's tarenna.		
MLES07	Melaleuca drainage lines 	Melaleuca drainage lines in the region are becoming increasingly degraded and fragmented, with pressure from clearing. These riparian systems help maintain good water quality, aquatic habitats and provide local connectivity for flora and fauna. Areas near Vernon conservation Park, Black Swamp Creek and Susan River are areas of significance. These drainage lines may also have road culverts which provide habitat for *Myotis macropus.*	2.5 Climate change refugia 1.2 Riparian corridor	**Implemented.** Existing drainage lines were identified using a combination of the Queensland Broad Vegetation Group layer. BVG 22a (*Melaleuca spp*. open forests and woodlands on seasonally inundated lowland coastal swamps and fringing drainage lines (palustrine wetlands) and BVG 21a (*Melaleuca spp*. dry woodlands to open woodlands on sandplains or depositional plains)) and combinations of both i.e., 21a/22a, were selected. Mapping errors were excluded/corrected. This layer was used to create the buffer for MLES02.
MLES27	Booral township	The Booral Township area is a large tract of vegetation containing remnant and high-value Regrowth vegetation of Least Concern and Endangered Regional Ecosystems. The geology in this area is unusual (unique to Booral), containing deeply weathered siltstone LZ5 on the coast	1.2 Riparian corridor 2.1 Core habitat 2.4 Species richness/diversity 3.4 Urban bushland	**Implemented.** This area was selected using Redleaf updated regional ecosystem vegetation mapping (2021). Selected areas include all remnant and high-value regrowth vegetation of all regional ecosystems, east of River Heads Road (excluding mangrove areas).

Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
		which provides habitat for unusual species of flora and fauna. Some of the unusual species of flora include *Acacia bakeri, Agathis robusta, Aglaia brownii, Byblis liniflora, Elaeocarpus eumundi, Ficus macrophylla forma macrophylla, Melaleuca dealbata, Planchonia careya*, *Pilidiostigma rhytispermum* and *Tapeinosperma repandulum.*		
MLES28	River Heads Township 	This area contains uncommon coastal vegetation consisting of mostly intact remnant regional ecosystems. This area contains an important stand of mangroves, rainforest and a diversity of flora species including the following: *Acacia bakeri, Agathis robusta, Aglaia brownii, Alectryon coriaceus, Claoxylon tenerifolium subsp. tenerifolium, Cyclophyllum longipetalum, Cyperus laevis, Fitzalania bidwillii, Notelaea ovata, Triflorensia cameronii, Acrodipsas illidgei* and historical records of *Ornithoptera richmondia.*	1.2 Riparian corridor 2.1 Core habitat 2.4 Species richness/diversity 3.4 Urban bushland	**Implemented.** This area was selected using Queensland regional ecosystem vegetation mapping containing remnant and high-value regrowth vegetation. The vegetation was selected using satellite imagery to pick up all stands of vegetation. Non-remnant areas were excluded.
MLES29	Burgowan/Walliebum – Important / High Biodiversity area	This large tract of remnant vegetation consists mostly of Least	2.1 Core habitat	**Implemented.**

Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
		Concern Regional Ecosystems. This patch has very high connectivity with limited fragmentation providing a large area of core habitat important for the survival of local flora and fauna species. This area is important habitat for species such as greater glider, microbats, flying foxes, echidnas, and other reptile and avian species. Species known within this area include: *Burchardia umbellata, Diuris chrysantha, Empusa habenarina, Leptospermum white, Prasophyllum brevilabre* and *Pultenaea borea.* This area is under significant pressure from inappropriate fire and land use activities. This area is an important upper catchment area with significant wetlands and melaleuca drainage lines significant to the Susan River.	2.4 Species richness/diversity	This area was selected by selecting all connected habitat in the area identified by the expert panel. The Queensland Regional ecosystem vegetation mapping was used to select all vegetation of Remnant and HVR status. The selected area is bound by Torbanlea Pialba Rd to the North. This layer was then dissolved to give a single shapefile. Non-remnant areas were excluded.
MLES30	Tinana urban bushland	This area is a large patch of intact vegetation in Tinana that contains areas of Remnant and high-value Of Concern regrowth and Least concern RE's. The habitat in this area is significant as it is a refuge for flora and fauna species that exist within the urban landscape of Tinana. This area is also adjacent to the Police	3.4 Urban bushland 2.2 Established nodes	**Implemented.** This area was selected using regional ecosystem vegetation mapping (Both Redleaf updated RE mapping 2021 and Queensland Government RE mapping) containing remnant and high-value regrowth vegetation. Non-remnant areas were excluded.

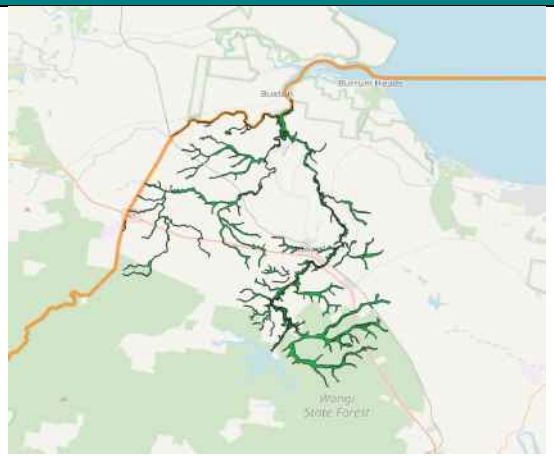
Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
		Paddock Conservation Park, allowing for movement of species between the two. This area is also a core habitat area for koalas and provides habitat for a range of flora including *Acacia neobrachycarpa* prickly wattle, *Cryptocarya obovata* pepperberry, *Iphigenia indica* iphigenia, *Styphelia sieberi* prickly heath and *Zieria furfuracea subsp. euthadenia* warty Zieria.		
MLES31	Fairfield Park urban bushland 	This area contains a range of locally significant values. Fairfield Park is a stand of urban bushland vegetation that contains koala habitat and food tree species. This may allow for the movement of koalas throughout the town and may act as a place of refuge. As the park contains large remnant vegetation, it acts as a refuge for fauna in the urban landscape. Fairfield Park is also the site of the Old Maryborough Town site, which is a heritage-listed historical area. The area is also culturally significant to the Butchulla people and contains a known bora	3.4 Urban bushland 2.2 Established nodes	**Implemented.** This area was selected using satellite imagery to pick up stands of vegetation within the park boundary. The vegetation within the park boundary is Remnant, High-value regrowth and non-remnant.

Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
		ring. This patch also contains vegetation listed as Of Concern.		
MLES32	Maryborough Rifle Range - Urban bushland 	The Maryborough Rifle Range is a large patch of remnant vegetation containing Least Concern and Of Concern vegetation in good condition. This patch of habitat is an intact representative of RE 12.5.4 and wetland drainage areas RE 12.3.11. This area is significant as it is a large stand of remnant vegetation occurring on the outskirts of Maryborough. This area is also connected spatially to areas of intact vegetation to the North between Torbanlea and Susan River.	2.1 Core habitat 3.4 Urban bushland	**Implemented.** This area was selected using regional ecosystem vegetation mapping (Both Redleaf updated RE mapping and Queensland Government RE mapping) containing remnant and high-value regrowth vegetation. Non-remnant areas were excluded.
MLES33	Hervey Bay Airport	This area near Hervey Bay Airport is a large patch of Remnant and High-value Regrowth Vegetation. This heathland area has a high species diversity gradient over a very short distance. It contains a range of unique species and is an important area for ground orchids. This area also contains a stand of Prickly leaved paperbark (*Melaleuca nodosa*). This area contains several flora species including: *Diuris alba* white double tail orchid, *Diuris chrysantha* double	2.4 Species richness/diversity 3.4 Urban bushland 3.5 Locally significant species habitat	**Implemented.** This area was selected using all Remnant and High-value Regrowth stands of vegetation within the area identified by the expert panel, South of the Hervey Bay Airport up to Raward Road. Non-remnant areas were excluded.

Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
		yellow tails, *Glossodia minor* small wax-lip orchid, *Leptospermum speciosum* showy tea-tree, and *Microtis parviflora* slender onion orchid.		
MLES34	Maryborough Motor Racing Park 	The Maryborough Motor Racing Park is a large patch of Remnant habitat that consists of 'Of concern' and 'Least Concern' vegetation. This area is important for conservation as it provides habitat and movement for flora and fauna species. This area has similar values to the adjacent Poona National Park with no barriers to movement for flora and fauna to the South-West. As well as containing significant wetland areas this area is important habitat for ground parrots, and also habitat for *Crinia tinnula* (in firebreaks and old gravel pits). This patch is connected by a riparian corridor to the Mary River to the	2.1 Core habitat 3.4 Urban bushland	**Implemented.** This area was identified as being significant for conservation by the expert panel. The value was then selected using Remnant and High-value regrowth vegetation including both Of Concern and Least Concern RE's (Non-remnant areas were excluded).

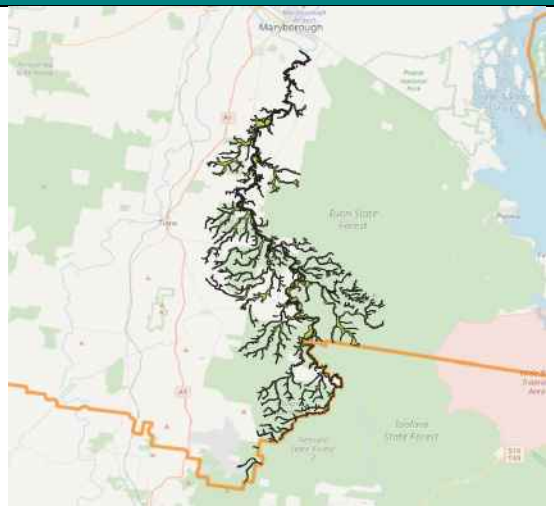
Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
		north. This area is subject to pressure from weed invasion, land degradation and loss of biodiversity, and is scheduled for future use as a motorbike racing park.		
MLES03	Saltwater Creek 	Saltwater Creek retains significant riparian vegetation that provides crucial habitat for a range of aquatic and terrestrial flora and fauna species. This area contains interesting vegetation communities like sedgelands and areas that contain *Casuarina glauca*, *Acrostichum speciosum,* *Leptospermum brachycarpum* and *Hibiscus tiliaceus.* This area is also habitat for freshwater turtles (particularly broad-shelled turtles and long-neck turtles). There are also large areas of wetland in this area. Saltwater Creek and surrounding wetland areas also well-known for housing a large number of butterfly species, and contains habitat for Illedge's ant-blue butterfly (*Acrodipsas illidgei*) that requires the presence of old growth Grey mangroves. The wetland areas in this system provide nesting habitat for a number of water bird species such as	1.2 Riparian corridor 2.5 Climate change refugia 3.4 Urban bushland	**Implemented.** The Saltwater Creek system was selected using the state wetland mapping. Polygons of Palustrine, Riverine and wetland areas that intersected and bordered the identified area of Saltwater Creek were selected.

Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
		Anseranas semipalmata and *Ephippiorhynchus asiaticus).*		
MLES04	Beelbi Creek - Riparian corridor 	Beelbi Creek connects large patches of habitat and borders two state conservation areas (Beelbi Creek conservation Park and Burrum Coast National Park). Beelbi Creek contains a variety of unique ecosystems that provide habitat for locally significant flora and fauna (including *Xeromys myoides*, water mouse in areas containing grey mangrove.) At the beginning of Beelbi Creek, there are drinking water reserve dams which feed town drinking water and are therefore important to protect. Locally significant flora species include *Iphigenia indica* iphigenia, *Glochidion lobocarpum* small-leaved cheese tree, *Limonium solanderi* native sea lavender and *Melaleuca dealbata* blue leaved paperbark.	1.2 Riparian corridor 2.4 Species richness/diversity 3.2 Ecosystems representation/uniqueness 3.5 Local significant species habitat	**Implemented.** The Beelbi Creek system was selected using the state wetland mapping, and state and Redleaf updated regional ecosystem mapping (particularly looking at areas on landzone 3). Polygons of palustrine, riverine and wetland areas that intersected and bordered the identified area of Beelbi Creek were selected.
MLES14	Burrum River system (including Isis, Gregory and Cherwell Rivers) - Biodiversity hotspot	This section of the Burrum River (downstream of Lenthalls Dam) is an important habitat area for a variety of native fish species. The river has high diversity of native fish species. Releases from Lenthalls Dam play a key role in maintaining hydraulic habitat and freshwater	2.4 Species richness and diversity	**Implemented.** The Burrum River system (including Isis, Gregory and Cherwell Rivers) was selected using the state wetland mapping and state and Redleaf updated regional ecosystem mapping (particularly looking at areas on landzone 3). Polygons of estuarine, palustrine, riverine and

Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
		flows to the estuary. Burrum River also has significant rocky reef habitat and shorebird habitat values (as seen in MLES41). The northern section of Burrum River is a dugong, sea turtle and tiger shark hotspot, intrinsically linked to Coffee rock coral reefs and Woodgate reef. There are also large razor clam beds from the mouth of the river to Beelbi, where sea turtles bask at low tide. The freshwater section of the Burrum River is the main raw water supply and offtake point for Hervey Bay town water. The upper section of the freshwater section has complex notophyll vine forest habitat for the Black Breasted Button Quail. There are significant pressures on the riparian vegetation from development and residents clearing riparian vegetation for views and access to the river. This area contains Locally significant plant species include *Acacia bakeri* marblewood, *Acalypha eremorum* soft acalypha, *Agathis robusta* kauri pine, *Corunastylis acuminata* pointed midge orchid, *Dodonaea viscosa subsp. cuneata* wedge leaf hop-bush, *Eucalyptus resinifera* red stringybark, *Leptospermum speciosum* showy tea-		wetland areas that intersected and bordered the identified area of the Burrum River system were selected.

Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
		tree, *Pilidiostigma rhytispermum* small-leaved plum myrtle.		
MLES15	Munna Creek system 	Munna Creek is a large creek system spanning a large distance across the western region of Fraser coast. containing a range of locally significant species, including remnant populations of cod, lungfish and freshwater turtles. This area has potential for restoration, as currently it is heavily modified but covers a large area within the landscape. Revegetation will help to retain rainfall and slow erosion. This area has not yet been surveyed for GDE's but is likely to have a strong groundwater connection.	1.2 Riparian corridor 1.3 Established corridor	**Implemented.** The Munna Creek system was selected using the state wetland mapping and State and Redleaf updated Regional Ecosystem mapping (particularly looking at areas on Landzone 3). Polygons of Riverine and wetland areas that intersected and bordered the identified area of the Munna Creek system were selected.
MLES22	Gutchy Creek - Riparian corridor 	Gutchy Creek is a very large creek system containing riparian vegetation that provides crucial habitat for a range of aquatic and terrestrial flora and fauna species. This area contains enough vegetation within this corridor for species to connect lower elevation habitat with higher elevation habitat. Gutchy Creek contains a number of wetland areas and billabongs that provide a significant role in drought as refugia for platypus, turtles and other	1.2 Riparian corridor 2.5 Climate change refugia	**Implemented.** The Gutchy Creek system was selected using the state wetland mapping and state and Redleaf updated regional ecosystem mapping (particularly looking at areas on Landzone 3). Polygons of riverine and wetland areas that intersected and bordered the identified area of the Gutchy Creek system were selected.

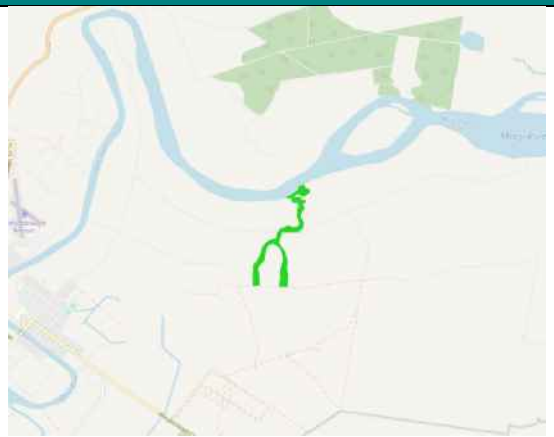
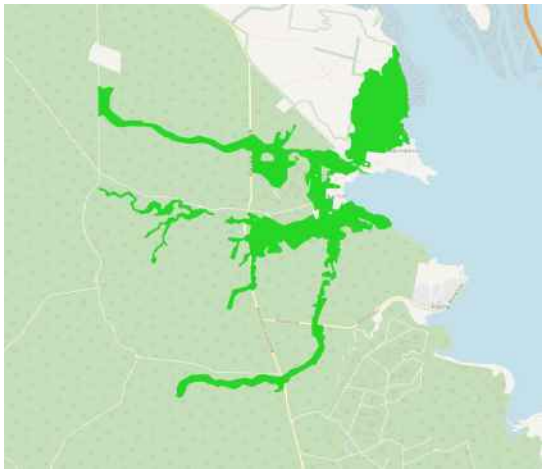
Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
		species that can move over land. Gutchy Creek is yet to be surveyed for GDEs but is likely to have a very strong groundwater connection as the Tiaro coal measures dominate this catchment and sedimentary geologies are usually porous). Gutchy creek contains habitat for platypus and freshwater turtle species, as well as containing diverse vegetation communities. This area also contains locally significant flora species, including *Acacia fasciculifera* scaly bark, *Ailanthus triphysa* white siris, *Angophora woodsiana* smudgee apple, *Astrotricha latifolia* silver leaf, *Barklya syringifolia* crown of gold tree, *Bridelia exaltata* brush ironbark, *Goodenia delicata* fanflower, *Hedraianthera porphyropetala* hedraianthera and *Homalium alnifolium* brown boxwood.		
MLES23	Tinana Creek system – Riparian corridor	Tinana Creek and its tributaries is a large creek system spanning south from Maryborough to the extent of the council border. The Tinana Creek system contains riparian vegetation that provides crucial habitat for a range of aquatic and terrestrial flora and fauna species. The system is very intact and carries a wide variety of	1.2 Riparian corridor 2.4 Species richness/diversity 2.5 Climate change refugia	**Implemented.** The Tinana Creek system was selected using the state wetland mapping and state and Redleaf updated regional ecosystem mapping (particularly looking at areas on Landzone 3). Polygons of lacustrine, palustrine, riverine and wetland areas that intersected and

Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
		interesting species including the White throated snapping turtle *(Elseya albagula),* Platypus and Pygmy perch. Tinana Creek is a significant area of habitat for White throated snapping turtles. Hatchlings of the species were released into Tinana Creek in 2019. Access to the banks of this river is critical for nesting of the species to occur. The nesting banks for this species is heavily impacted by pigs and eggs predated upon by goannas, foxes and pigs. Studies have proven that the population of Mary River cod *(Maccullochella mariensis),* the Mary River turtle *(Elusor macrurus)* and the Australian lungfish (*Neoceratodus forsteri*) are genetically distinct from other populations, hence the Tinana Creek system is incredibly important for the survival of these populations. The Mary River cod prefers deep waterholes that are well shaded and they spawn on structural woody habitat, therefore as Tinana Creek provides these critical habitat requirements it is essential to protect. This riparian system is important for aquatic species for providing shade, undercut banks and		bordered the identified area of the Tinana Creek system were selected.

Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
		instream structural habitat complexity. Riparian habitat also aids in stabilising banks and is a good regulator of water temperature. Tinana Creek has species geomorphological values that run along the western edge of the wallum coastal plain and 'carries' some high rainfall rainforest species of the Great sandy north towards Maryborough. The Tinana Creek area has a very high diversity of flora species including a large number of significant flora species.		
MLES24	Kauri Creek 	This area of habitat is a locally significant area that contains areas of water mouse habitat (*Xeromys myoides*) and interesting habitat containing Scribbly Gum (*Eucalyptus racemosa*). This area contains vegetation that is predominantly Remnant. Kauri Creek also provides habitat for the Ornate rainbow fish (*Rhadinocentrus ornatus)* which is listed as a priority species under the TSAP. This area is also significant as it borders the Great Sandy Conservation Park and contains similar ecological values. The Kauri Creek system also contains an intricate array of intertidal	1.2 Riparian corridor	**Implemented.** The Kauri Creek system was selected using the state wetland mapping and state and Redleaf updated regional ecosystem mapping to include areas of estuarine, palustrine and wetland areas that intersected and bordered the identified area of the Kauri Creek system. The edge of waterway from the Great Sandy Conservation Park was also buffered by 300m to include all known water mouse records. These two layers were clipped together and dissolved to form a single layer. Obvious mapping errors were removed.

Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
		sedgelands in its saltmarsh, molluscs along the drainage lines in the intertidal zone and the locally significant flora species *Calochlaena dubia* false bracken fern.		
MLES25	Susan River catchment 	The Susan River catchment is a large system containing a variety of interesting and ecologically significant values. The Susan River is an extensive estuary that provides valuable habitat for a diversity of fishes. The catchment is hydrologically well connected and consists mainly of wetlands areas. Susan River catchment contains both Palustrine and lacustrine, both freshwater and marine and winds through a large area of (mostly) State Land and freehold land and draining into the Mary River. The catchment provides habitat for a range of threatened, uncommon and locally significant (and unique) flora and fauna species. This system is important for connectivity of freshwater systems to estuarine systems for fish habitat. There are currently no barriers to fish passage and their protection is required to ensure this remains.	1.2 Riparian corridor 2.1 Core habitat 2.4 Species richness/diversity 3.2 Ecosystems representation/ uniqueness	**Implemented.** The Susan River system was selected using the state wetland mapping and state and Redleaf updated regional ecosystem mapping (particularly looking at areas on Landzone 3). Polygons of estuarine, palustrine, riverine and wetland areas that intersected and bordered the identified area of the Susan River system were selected.

Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
		Some locally significant flora species *Diuris chrysantha* double yellow tails, *Eucalyptus tindaliae* Queensland white stringybark, *Leptospermum whitei* White's tea-tree, *Melaleuca dealbata* blue leaved paperbark, *Melaleuca viridiflora var. viridiflora* broad leaved paperbark, *Myrsine subsessilis subsp. subsessilis* red muttonwood, *Prasophyllum brevilabre* short-lip leek orchid. The Susan River catchment is also Habitat for Illedge's ant-blue butterfly (*Acrodipsas illidgei*) that requires old growth Grey mangroves, and is also habitat for the Water mouse (*Xeromys myoides*).		
MLES35	Beaver Rock – Riparian corridor	This area is an important riparian corridor containing Remnant and High-value Regrowth vegetation. This riparian corridor is vital in connecting a large patch of remnant vegetation (including Poona National Park) to the Mary River, which is important in allowing the movement of flora and fauna between areas of intact habitat. *Melaleuca dealbata* blue leaved paperbark is known from this area. There are also known populations of (*Acrodipsas illidgei)*	1.2 Riparian corridor	**Implemented.** This corridor was selected to include areas of mapped vegetation from the Queensland regional ecosystem mapping and satellite imagery.

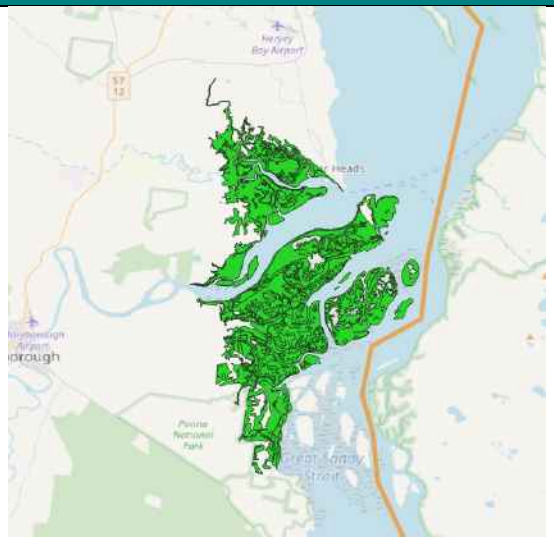
Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
		Illidge's ant-blue butterfly. *(Xylocarpus granatum)* Cannon-ball mangrove is known from the riverbank at the northern edge of mapped polygon. These records are at the southern limit for the species distribution.		
MLES37	Little Tuan Creek, Big Tuan Creek and Thangawang Creek – Riparian corridor 	Little Tuan Creek, Big Tuan Creek and Thangawang Creek are areas containing interesting ecosystems and species. This area contains interesting ecosystems such as mangrove flats, shorebird habitat and riparian vegetation all of which provide habitat for a diverse range of species. This area contains interesting local species including water mouse (*Xeromys myoides*) habitat (particularly Big Tuan Creek), habitat for the ornate rainbow fish *(Rhadinocentrus ornatus)* and a migratory shorebird high tide roost. Big Tuan Creek is significant as it is a freshwater system with intact	1.2 Riparian corridor 2.4 Species richness/diversity	**Implemented.** The entire Little Tuan Creek, Big Tuan Creek and Thangawang Creek system was selected using the state wetland mapping and state and Redleaf updated regional ecosystem mapping (particularly looking at areas on Landzone 3). Polygons of estuarine, lacustrine, palustrine, riverine and wetland areas that intersected and bordered the identified area of the creek systems were selected.

Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
		riparian areas that flows directly into the Great Sandy Strait.		
MLES38	Poona Creek 	Poona Creek is a significant riparian corridor with a complex system of tributaries and wetlands that contains several interesting ecosystems. There are a wide variety of species within this area. Poona Creek is also a significant dugong habitat area and fish breeding habitat area. Poona Creek provides unobstructed passage for native fish movement. There is an unusual mix of species (including MLES) in this area including: *Agathis robusta* kauri pine, *Archontophoenix cunninghamiana* piccabeen palm, *Austromyrtus dulcis* midyim berry, *Banksia spinulosa var. spinulosa* golden candlesticks, *Burchardia umbellata* milk maids, *Calochlaena dubia* false bracken fern, *Eucalyptus pilularis* blackbutt, *Eucalyptus resinifera* red stringybark, *Fimbristylis nutans* nodding fringe-rush, *Leptospermum whitei* Whites tea-tree, *Schizomeria ovata* crab-apple, *Tetratheca thymifolia* pink-eye, *Todea barbara* king fern, *Trochocarpa laurina* tree heath.	1.2 Riparian corridor 2.4 Species richness/diversity 3.2 Ecosystems representation/uniqueness	**Implemented.** The Poona Creek system was selected using the state wetland mapping and state and Redleaf updated regional ecosystem mapping (particularly looking at areas on Landzone 3). Polygons of estuarine, riverine and wetland areas that intersected and bordered the identified area of the Poona Creek system were selected.

Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
MLES40	Wondunna - Riparian corridor 	This drainage feature near Wondunna is a riparian corridor and wetland that contains a large stand of *Melaleuca quinquenervia*. This area also provides habitat for *Leptospermum speciosum* showy tea-tree and *Melaleuca dealbata* Blue leaved paperbark.	1.2 Riparian corridor 3.2 Ecosystems representation/uniqueness	**Implemented.** This area was identified by the expert panel as being of significance. The shapefile was selected using the state wetland mapping and state and Redleaf updated regional ecosystem mapping. Polygons of lacustrine, palustrine and wetland areas that intersected and bordered the identified area were selected. This polygon was then verified using satellite imagery and extended to the south to join habitat with MLES 25 Susan River catchment as per expert panel recommendations.
MLES55	Aquatic species habitat (Platypus, freshwater turtles, Australian lungfish, Mary River cod) 	The aquatic systems within the Fraser coast region, in particular Tinana Creek, Grahams Creek, Myrtle Creek, Mary River, Gutchy Creek are significant habitat for MLES aquatic species. These systems are important for providing refuge and spawning/nesting habitat for endemic, iconic & threatened species. These species include Platypus, freshwater turtles, Australian lungfish, Mary River cod, but habitat is also habitat for other aquatic species such as water-rats, and native frog and fish species. Ephemeral creeks with permanent	1.2 Riparian corridor 2.4 Species richness/diversity	**Implemented.** This large aquatic system was selected using the state wetland mapping and State and Redleaf updated Regional Ecosystem mapping (particularly looking at areas on Landzone 3). Polygons of Estuarine, Lacustrine, Palustrine, Riverine and wetland areas that intersected and bordered the identified area of the system were selected. Known records of the identified MLES aquatic fauna were corroborated against the selected areas to ensure hotspot areas were included.

Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
		waterholes provide habitat and refuge for platypus and turtle species.		
MLES09	Eli Creek system 	Eli Creek system is an important riparian corridor and wetland system. The selected area contains unique dune, mangrove and saltpan ecosystems that are of high ecological value and provide habitat for a variety of unique flora and fauna. This area provides habitat for *Turnix melanogaster* Black breasted button quail and (Ninox) *novaeseelandiae boobook* boobook owl. Marine connectivity is important for ecosystem health of the nearby coral reef. This area contains a highly connected reef-seagrass mangrove complex that supports healthy herbivorous fish migration from reef-seagrass-mangroves (Zann 2011). As coral and algae are in competition, herbivorous fish remove the algae so that coral larvae can settle, therefore enabling coral to out-complete the algae. These herbivores are essential for reef health (Zann 2011). There is also an area containing important rainforest vegetation upstream of Eli Creek that contains	1.2 Riparian corridor 2.5 Climate change refugia 3.4 Urban bushland	**Implemented.** The Eli Creek system was selected using the state wetland mapping and State and Redleaf updated Regional Ecosystem mapping (particularly looking at areas on Landzone 3). Polygons of Estuarine, Lacustrine, Palustrine and wetland areas that intersected and bordered the identified area of the system were selected. The Vegetation Management Act watercourses and drainage features layer using 'Eli Creek' as a selection was also used. Any obvious mapping errors were removed.

Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
		MLES flora species including *Acacia Bakeri* marblewood and *Acalypha eremorum* soft acalypha. This area supports a significant diversity of flora including: *Acacia bakeri* marblewood, *Acalypha eremorum* soft acalypha, *Agathis robusta* kauri pine, *Ailanthus triphysa* white siris, *Ficus macrophylla forma macrophylla* Moreton Bay fig, *Glochidion lobocarpum* small-leaved cheese tree, *Limonium solanderi* native sea lavender, *Melaleuca dealbata* blue leaved paperbark, *Melaleuca pachyphylla* wallum bottlebrush, *Melaleuca viridiflora var. viridiflora* broad-leaved paperbark, *Planchonia careya* cockatoo apple and *Tapeinosperma repandulum* tapeinosperma.		
MLES36	The Dimonds system – Important / High Biodiversity Area	The ecosystem near the Dimonds is a large unique wetland ecosystem. The vegetation is predominantly Remnant with some small patches of High-value regrowth. This area is recognised as containing significant natural features and is an important, well-preserved ecosystem containing valuable vegetation communities and habitat. Some of the significant ecological features within this value	2.4 Species richness/diversity 3.2 Ecosystems representation/uniqueness	**Implemented.** This large wetland system was selected using the state wetland mapping and State and Redleaf updated Regional Ecosystem mapping. Polygons of Estuarine, Lacustrine, Palustrine, Riverine and wetland areas that intersected and bordered the identified area of the system were selected. Known records of the identified MLES aquatic fauna were

Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
		are patterned fens, sand and mudflats, salt flats, mangroves and sea grass beds. This area within the Great Sandy Strait is important habitat that is frequently or occasionally used by six species of threatened marine turtle. Other threatened species that occur in the area include Dugong, Water mouse, Illidge's ant blue butterfly and Oxleyan pygmy perch, Australian humpback dolphin. Bottlenose dolphins also use flats in this area to hunt. This area also contains some of the most Eastern records of the Australian bustard (*Ardeotis australis*). This area is very low lying and is under threat of sea level rise (climate change).		corroborated against the selected areas to ensure hotspot areas were included.
MLES39	Tinnanbar – Important / High Biodiversity Area	Tinnanbar contains a large patch of Remnant vegetation that is of Endangered, Of Concern and Least Concern regional ecosystems. This patch borders the Great Sandy National Park and contains the same values, such as high biodiversity and unique flora and fauna species. It is known koala habitat.	2.1 Core habitat 3.1 Least concern RE's	**Implemented.** The expert panel identified the area and included all habitat containing Remnant vegetation of all regional ecosystems within the polygon. The habitat was clipped to the expert identified area and areas of National Park were excluded.

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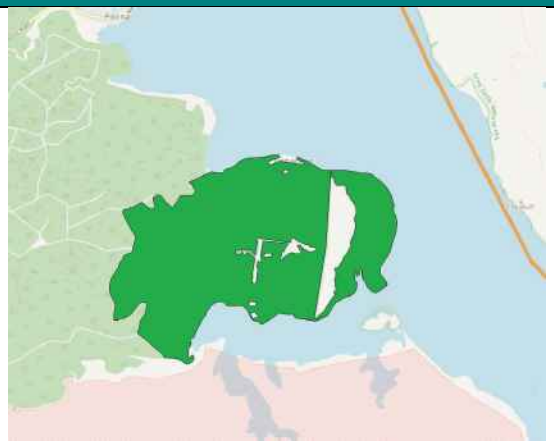
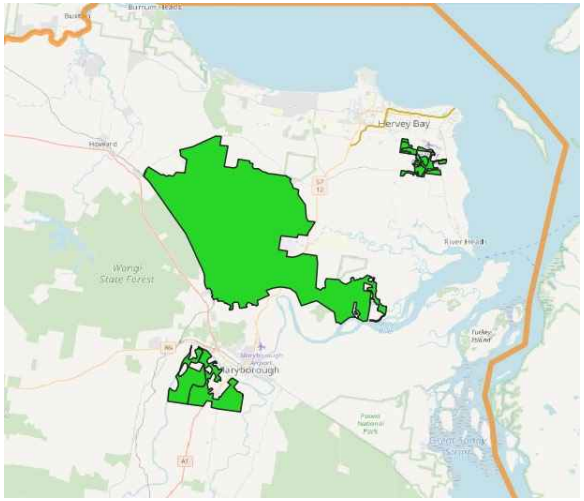
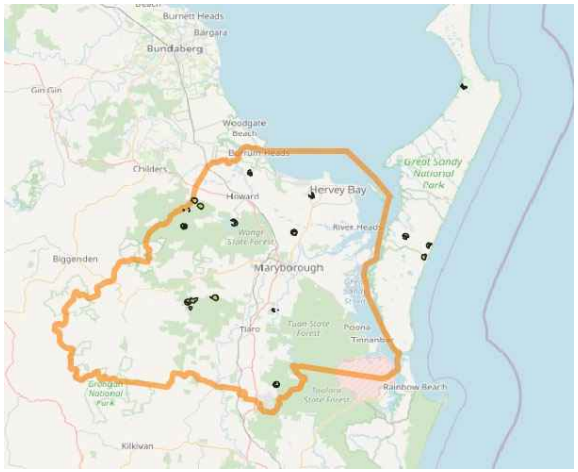
		This area contains interesting healthy ecosystems and is also an important wildflower area. This area hosts a highly diverse group of flora species including: *Acianthus fornicatus* large mosquito orchid, *Astrotricha glabra* smooth astrotricha, *Austromyrtus dulcis* midyim berry, *Banksia spinulosa var. spinulosa* golden candlesticks, *Burchardia umbellata* milk maids, *Burmannia disticha* forked burmannia, *Caladenia alata* fairy fingers, *Caleana major* flying duck orchid, *Corunastylis acuminata* pointed midge orchid, *Corymbia gummifera* red bloodwood, *Cryptostylis erecta* bonnet orchid, *Drosera binata* forked sundew, *Drosera spatulata var. gympiensis* spoon leaf sundew, *Eriostemon australasius* wax flower, *Erythrorchis cassythoides* climbing orchid, *Eucalyptus carnea* thick-leaves mahogany, *Eucalyptus resinifera* red stringybark, *Eucalyptus tindaliae* Queensland white stringybark, *Glossodia minor* small wax-lip orchid, *Leptospermum neglectum* coast tea-tree, *Leptospermum whitei* Whites tea-tree, *Macrozamia douglasii* gulbun, *Melaleuca linariifolia* flax-		

Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
		leaved paperbark, *Myrsine porosa* northern muttonwood, *Oxylobium robustum* shaggy pea, *Prasophyllum elatum* tall leek orchid, *Pterostylis nutans* nodding orchid, *Pterostylis ophioglossa* snake-tongue greenhood, *Pterostylis parviflora* tiny greenhood, *Tetratheca thymifolia* pink-eye, *Utricularia caerulea* blue bladderwort, *Xanthorrhoea macronema* bottlebrush grass tree, *Xerochrysum bracteatum* golden everlasting, *Zeuxine oblonga* hairy jewel orchid and *Zornia muriculata subsp. muriculata* upright Zornia.		
MLES10	Locally significant flora species 	*Nymphaea gigantea* is a least concern species that has recently been found in the region and is locally extinct in SEQ. *Marsilea mutica* is a MLES species which was only recently found at Booral and Tiaro. Other locally significant species (and their habitat) include i.e., Kauri Pines, *M. dealbata*.	2.4 Species richness/diversity 3.2 Ecosystems representation/ uniqueness	This MLES has been addressed during previous processes (Ecosure Threatened Species Action Plan 2019). During expert panel workshops, the expert panel provided a variety of views on the implementation strategy of this MLES, but there was no final agreement. As council and the expert panel could not come to a conclusion on how this MLES is to be implemented it was decided that this MLES was not a focus in this current process. The MLES presented is an example only and there are potentially many more Locally significant flora species.

Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
				Nymphaea gigantea, Marsilea mutica, M. dealbata and *Agathis robusta* records were selected from Atlas of Living Australia and clipped to the Fraser coast boundary (excluding K'gari). Records that fell within Least Concern ecosystems only were selected and buffered by 50m. Buffer point data in LC ecosystems.
MLES01	Koala Habitat 	The identified spatial areas contain areas of vegetation of primary or secondary koala habitat. Koalas are now listed as Endangered and are a MNES and MSES. The current QLD koala habitat mapping does not occur within the Fraser Coast region at this stage; therefore, it is important to identify areas of known koala habitat areas to better protect this iconic species. Koalas have been released at the Tandora property in the southeast of this polygon (expert info from workshop). The larger area is called Churchill Mines and is 11 000 hectares of unallocated State Land (USL). Evidence of koalas have been found in the larger area too (none found on ALA). This area has the potential to sustain a large population of koalas.	3.4 Urban Bushland 3.5 Local significant species habitat	**Implemented.** These areas were identified by the expert panel. The polygons were refined by selecting all stands of vegetation and cutting out any area that does not include large stands of trees. A section was added to the southeast that was identified during the workshop as a release site for koalas. Note: MLES56 was merged with MLES01

Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
		This area also serves as habitat for *Crinia tinnula*, reptiles, glossy black cockatoo, echidna, gliders and antechinus. Significant groundwater dependent ecosystems are present in this area.		
MLES08	Glider Habitats  1 of 2	Woodlands and forests of the Fraser coast LGA contain critical habitat for the Yellow-bellied glider (*Petaurus australis*) and Squirrel glider (*Petaurus norfolcensis*). These significant habitats are also important for arboreal mammals and hollow-reliant bird species.	3.5 Local significant species habitat	**Implemented.** The "Known" habitat output from the Ecosure species habitat mapping rules project was adopted without change. 1 of 2: *Petaurus norfolcensis* 2 of 2: *Petaurus australis* The Potential Habitat areas were not included due to the perceived inaccuracies and requires further survey effort to confirm these habitat features.

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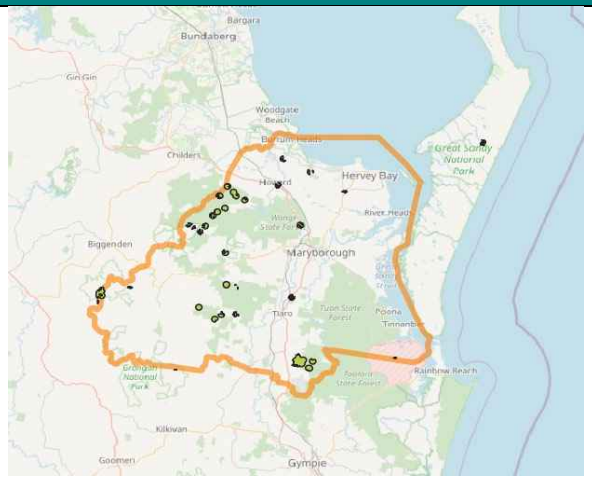
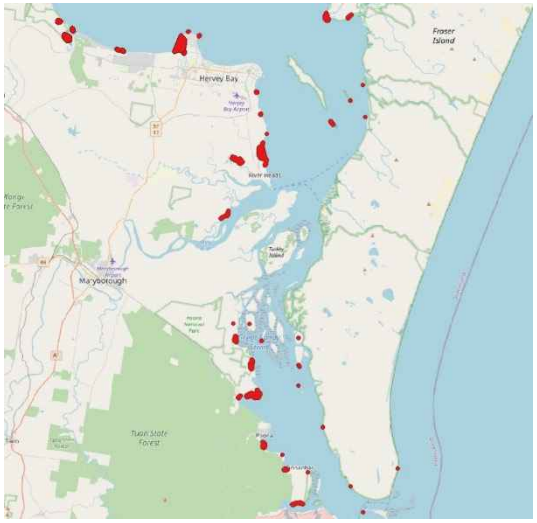
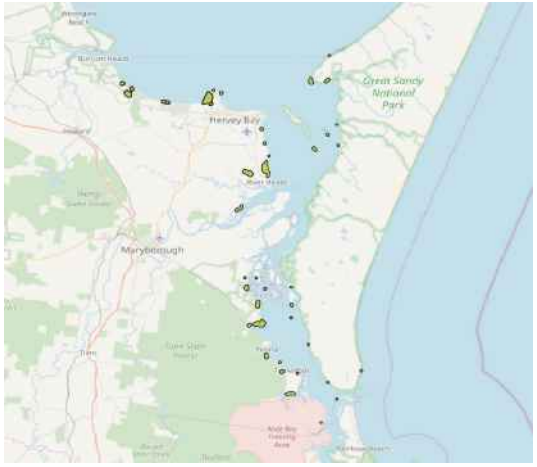
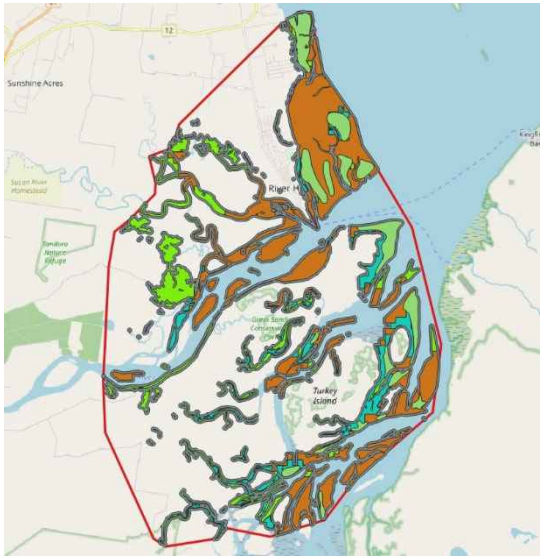
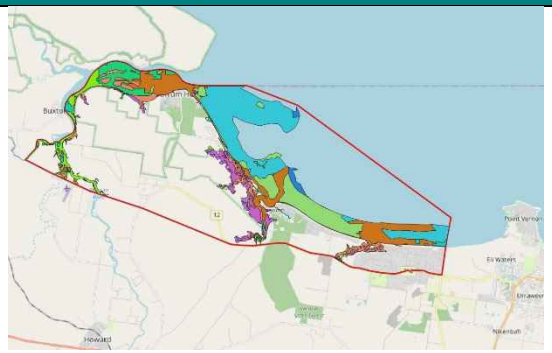
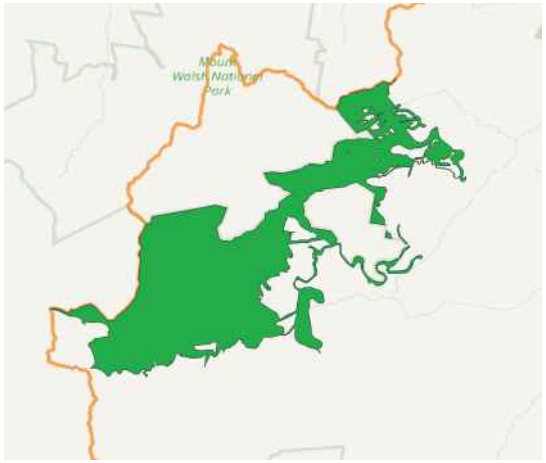
	 2 of 2			
MLES18	Flying fox camps 	The Fraser Coast is home to three species of flying fox which play a vital role in the conservation of native forests in the area. They are a keystone and highly intelligent species, whose presence adds significance to the already internationally recognised region. There are several camps around the Fraser Coast region, some that are nationally recognised roosts but many of which are locally significant roost sites. The roosts provide breeding and roosting habitat for the species.	2.4 Species richness/diversity 3.5 Locally significant species habitat	**Implemented.** Flying fox camp locations were provided by the expert panel as well as verified against the Department of Agriculture, Water and the Environment's online flying fox roost view tool. Roost locations were selected and buffered by 500 m (excluding residential areas). This buffer is provided. All vegetation identified using recent satellite imagery was then clipped to the 500 m buffer (including non-rem, remnant and HVR) to give possible habitat within 500 m of the roost known location. Roosts were labelled as 'active' or 'inactive' on the Nationally recognised flying fox roost tool, however Inactive

Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
				roosts were still included as flying foxes are known to move between new and old roost sites frequently. The roost locations, potential habitat (vegetation) and 500m buffer were supplied.
MLES41	Critical shorebird roosts  Zoomed in River Heads:	Migratory shorebird roosting habitat is located across many sites within the Fraser Coast Region. The species diversity and abundance of shorebirds vary at these roost sites. All roosts are important resting grounds for migratory shorebirds between September to May each year, and breeding grounds for resident shorebirds all year round. All mudflat areas adjacent to resting grounds are important feeding areas. The Fraser Coast coastal habitats between Burrum Heads and Tinnanbar have a high density of shorebirds, which reflects the more productive intertidal habitats of the Great Sandy Strait and the Mary River mouth. Most roost sites contain internationally significant concentrations of shorebirds. Migratory shorebirds found on the Fraser Coast that are listed as vulnerable, endangered or critically	2.5 Climate change adaptation and refugia areas 3.3 Coastal habitats 3.5 Local significant species habitat 3.7 Ecosystem buffers	**Implemented.** Study Group (2007) Shorebirds of the Burnett Coast: survey of critical high tide roosts. For the Burnett-Mary Regional Group for Natural Resources Management. The polygon layer provided by FCRC and the QWSG were combined together and then buffered by 250 m as recommended by the Expert Panel. The buffer distance of 250 m is aligned with the EPBC Act Policy Statement 3.21. "Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebirds species" Unbuffered: MLES41A – layer is the roost locations without the 250 m buffer applied Buffered: MLES41B – roosts buffered by 250 m

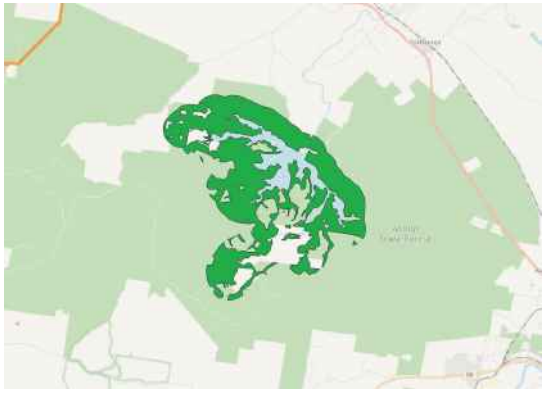
Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
		endangered under the EPBC Act: Bar-tailed Godwit, Greater Sand Plover, Australian Painted Snipe, Lesser Sand Plover, Red Knot, Far Eastern Curlew, Curlew Sandpiper and Great Knot. There are several identified threatening processes that can impact migratory shorebird roosts sites. These include human disturbances such as noise issues or physical harassment of birds (walking or driving on the beach, fishing). This is because migratory species are exhausted after migration and the first weeks following migration and last weeks prior to migration are crucial for their survival. Another ongoing threat would include mangrove colonisation which is invading some roosting habitats. Birds can still utilise the areas but it is thought to diminish their habitat values. The 250 m buffer aims to protect or minimise impacts to the migratory shorebirds and their roosting habitats.		
	MLES41B 			

Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
MLES51	Mary River estuary shorebird critical feeding areas 	The Mary River estuary hosts some of the biggest migratory shorebird roosts on the Fraser Coast in terms of species diversity and population size. Many of the species are listed under the EPBC Act. The area provides significant feeding habitat for the shorebirds including extensive mud flats, seagrass beds, and low energy sand bars. This is a dynamic ecosystem with many microhabitats and food resources which can be exposed or inundated depending on the tide. The lower the tide, the further towards sea the birds go. The feeding zone is HTE + 800m.	2.4 Areas of species richness and diversity 3.3 Coastal habitats	**Implemented.** Intertidal Central Queensland Layer (WetlandMapping Layer). Using the expert panel bounding layer, the Intertidal Central Queensland Layer (Wetland Mapping) was clipped by selecting the following four layers: "above MSL unconsolidated mud (claypan/saltpan)", "below MSL unconsolidated mud (mudflat/bank) - low energy", "consolidated low energy" and "strap (wide) seagrass)". These layers were clipped to MLES51C (boundary) polygon, then buffered with 100 m to create a high-value shorebird feeding area map. The 100 m buffer was recommended by the expert panel to help maintain the ecosystem functioning and connectivity with adjacent habitats. This may include groundwater interactions (e.g., seagrass beds rely on this connectivity). Clip: MLES51A Buffer: MLES51B Boundary: MLES51C
MLES52	Low-tide seagrass feeding areas	The Isis River and Burrum Heads estuary provides significant feeding habitat for EPBC Listed migratory	2.4 Areas of species richness and diversity 3.3 Coastal habitats	**Implemented.** Using the expert panel bounding layer, the Intertidal Central Queensland Layer

Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
		shorebirds including extensive mud flats, seagrass beds, and low energy sand bars. This is a dynamic ecosystem with many microhabitats and food resources which can be exposed or inundated depending on the tide. The lower the tide, the further towards sea the birds go. The feeding zone is HTE + 800m.		(Wetland Mapping) was clipped by selecting all available values clipped to MLES52B bounding layer. Saved as separate value called MLES52A. Clipped: MLES521A Bounding layer: MLES52B
MLES11	Mount Walsh – Important / High Biodiversity area 	The foothills between areas of Mount Walsh National Park are of significant value as they contain similar values as the National Park but are not protected as such. These extensive vegetative areas contain the same high biodiversity and unique values as the adjacent park. This area contains interesting and unique geology and landform that provide habitat for locally significant species of flora and fauna. Species known to occur within the area and may possibly occur in surrounding foothills of continuing habitat include: *Abrophyllum ornans* native hydrangea, *Acacia blakei subsp. blakei* Blake's wattle, *Acacia decora* pretty wattle, *Acacia neobrachycarpa* prickly wattle, *Acomis acoma* yellow daisy,	2.1 Core habitat 2.4 Species richness/diversity 2.5 Climate change refugia 3.2 Ecosystems representation/ uniqueness	**Implemented.** This area was selected using all continuous tracts of vegetation between existing sections of Mount Walsh National Park. Natural breaks in vegetation were used. Queensland Regional ecosystem vegetation mapping that contained Remnant and High-value regrowth vegetation of all Regional Ecosystems was used. Any obvious mapping errors were removed.

Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
		Adiantum hispidulum var. hypoglaucum rough maidenhair fern, *Ailanthus triphysa* white siris, *Amylotheca dictyophleba* rainforest mistletoe, *Archontophoenix cunninghamiana* piccabeen palm, *Argophyllum nullumense* silver leaf, *Astrotricha cordata* heart-leaf star hair, *Astrotricha latifolia* silver leaf, *Banksia spinulosa var.* collina hill banksia, *Callicarpa pedunculata* velvet leaf, *Calochlaena dubia* false bracken fern, *Claoxylon tenerifolium subsp. tenerifolium* Queensland brittlewood, *Coatesia paniculata* axe-breaker, *Comesperma hispidulum* match heads, *Commersonia dasyphylla* kerrawang, *Corymbia gummifera* red bloodwood , *Dampiera purpurea* mountain dampiera, *Diploglottis australis* native tamarind, *Elaeodendron australe var. australe* red olive plum, *Elattostachys xylocarpa* white tamarind, *Eucalyptus campanulata* gum-topped peppermint, *Eucalyptus dura* gum-topped ironbark, *Eucalyptus eugenioides* thin-leaved stringybark, *Flueggea leucopyrus* white current shrub, *Goodenia delicata* fan flower, *Goodenia glabra*		

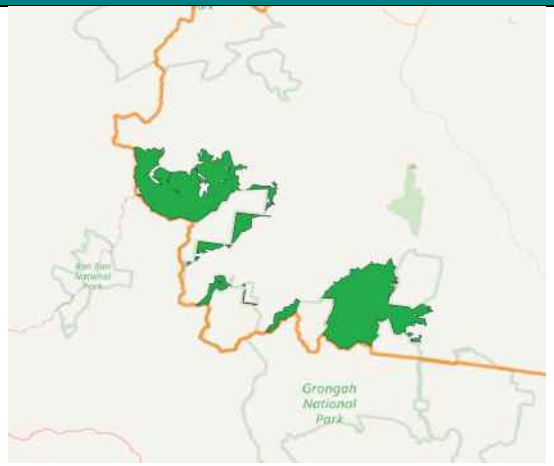
Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
		smooth goodenia, *Grevillea whiteana* spider-flower, *Gynura drymophila var. drymophila* gynura, *Harmogia densifolia* harmogia, *Hibbertia cistoidea* northern guinea flower, *Homalanthus stillingiifolius* small bleeding heart, *Kunzea ericoides* burgan, *Leptospermum variabile* variable tea-tree, *Lobelia gibbosa* native lobelia, *Logania albiflora* narrow-leaved logania, *Lomandra confertifolia subsp. confertifolia* cushion mat rush, *Marsdenia brevis* milk vine, *Neolitsea australiensis* green bolly gum, *Parsonsia leichhardtii* lobed silk pod, *Parsonsia plaesiophylla* veiny silk pod, *Persoonia amaliae* Amalie's geebung, *Persoonia cornifolia* broad-leaved geebung, *Podolobium ilicifolium* holly-leaved pea, and *Pultenaea borea* bush-pea.		

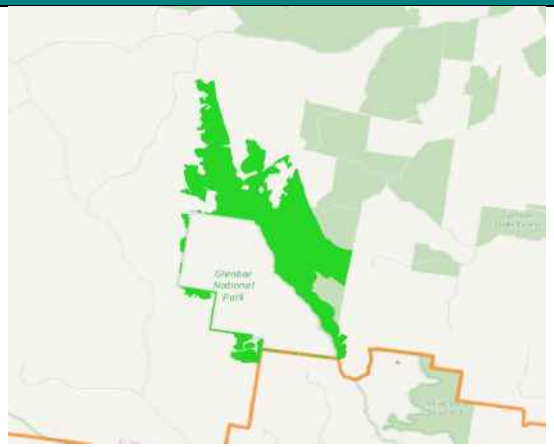
Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
MLES12	Lenthalls Dam - Important / High Biodiversity area 	Lenthalls Dam is a biodiversity area that contains significant ecological features such as large areas of rainforest, and several riparian corridors and creeks. Lenthalls Dam has a high level of biodiversity including mammal (particularly koala), fish and avian species. The Vulnerable (Qld and Aus. listed) *Turnix melanogaster* (Black Breasted button-quail) is also known to occur at Lenthalls Dam. This area is one of the very few locations (and the type of location) of vegetation community 12.3.11a. Lenthalls Dam is also culturally significant. Wongi waterholes within this area is also holds significance socially, environmentally and culturally. Bathymetric surveys found these waterholes reach depths greater than 5 m throughout their footprint. The depth profile in this chain of waterholes suggests drying out events are extremely rare. These waterholes are potentially fed from the Elliott formation. After large flows, backup from Lenthalls Dam artificially impounds this area, causing inundation of terrestrial and emergent	1.2 Riparian corridor 2.1 Core habitat 2.4 Species richness/diversity 2.5 Climate change refugia 3.2 Ecosystems representation/ uniqueness	**Implemented.** Lenthalls Dam was highlighted as a significant area by the expert panel. The boundary of Lenthalls Dam was selected and buffered by 1km. All Non-remnant areas were excluded.

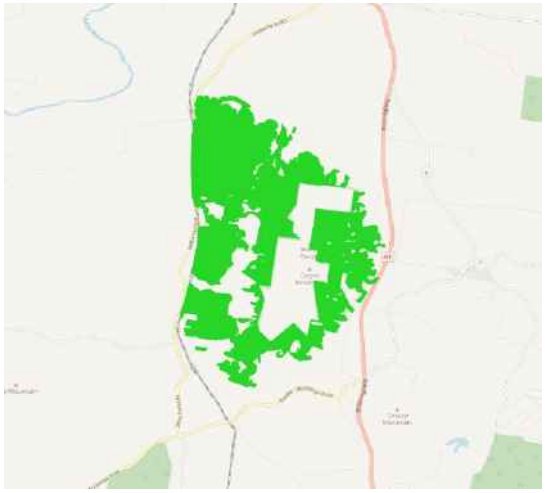
Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
		vegetation. Operating rules for Wongi waterholes aim to maintain the integrity of the waterholes by minimising the impact of inundation. The resource operations licence holder must remove all water contained above the natural full supply level of Wongi Waterholes as soon as practicable following the containment to reduce the extent and duration of flooding, minimising impacts on terrestrial plant species This area also contains *Gahnia* (native sedge) and has been identified as being important to the traditional owners of this area. Locally significant flora species within this area include: *Acacia bakeri* marblewood, *Agathis robusta* kauri pine, *Clematis aristata* old man's beard, *Cryptocarya obovata* pepperberry, *Cupaniopsis wadsworthii* duckfoot, *Cyperus platystylis* freshwater sedge, *Dendrocnide moroides* Gympie stinger, *Diploglottis australis* native tamarind, *Elattostachys xylocarpa* white tamarind, native tamarind, *Fitzalania bidwillii* southern fitzalania, *Goodenia delicata* fanflower, *Gynochthodes umbellata*		

Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
		Indian mulberry, *Iphigenia indica* iphigenia, *Myrsine subsessilis subsp. subsessilis* red muttonwood, *Parsonsia velutina* hairy silk pod, *Pilidiostigma rhytispermum* small-leaved plum myrtle, *Plectorrhiza tridentata* common tangle orchid, *Psydrax odorata forma buxifolia* stiff canthium, *Rhinerrhiza divitiflora* raspy root orchid, *Solanum corifolium* straggling nightshade and *Wilkiea huegeliana* veiny wilkiea.		
MLES13	Teebar - Area of ecosystem uniqueness 	This area contains is a relatively large patch of predominantly remnant vegetation surrounded by cleared grazing land containing unique igneous granite rock geology and unique species and ecosystems. The geology west of the power transmission easement is markedly different from the surrounding landscape – it comprises Tertiary sediments which equate to land zone 5 (and possibly 7). The geology east of the easement is sedimentary rocks of the Brooweena Formation (unit Rb - land zone 9/10). The vegetation is mostly open-forest to tall open-forest of mixed composition – species present include *Corymbia citriodora,*	2.1 Core habitat 2.4 Species richness/diversity 3.2 Ecosystems representation/ uniqueness	**Implemented.** This area was selected using all continuous tracts of vegetation using Queensland Regional ecosystem vegetation mapping. All mapped vegetation containing Remnant and High-value regrowth vegetation of all Regional Ecosystems were selected. Areas of national park and reserve were excluded.

Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
		C. trachyphloia, C. intermedia, Eucalyptus major, E. carnea (uncommon species in FCRC), *E. acmenoides, E. longirostrata, E. moluccana, Angophora leiocarpa* and *Lophostemon confertus*. There are also localised patches of *E. carnea* woodland with a dense *Xanthorrhoea johnsonii* understorey on red loamy soil. Large *C. citriodora* are present along Rifle Range and Teebar Hall Roads suggesting that the forest represents good quality habitat for arboreal mammals. There is also likelihood that the vulnerable species *Macrozamia parcifolia* may be present.		
MLES16	Grongah National Park	The foothills of Grongah National Park are of significant value as they contain areas of interesting vegetation and geology including large tracts of intact rainforest. The foothills that border Grongah National Park contain the same high biodiversity as the adjacent park. This area contains persistent drainage wetland areas which is important for climate change refugia for species. This area is an important area of	2.1 Core habitat 2.4 Species richness/diversity 2.5 Climate change refugia 3.2 Ecosystems representation/ uniqueness	**Implemented.** This area was selected using all continuous tracts of vegetation between existing sections of Grongah National Park. Queensland Regional ecosystem vegetation mapping that contained Remnant and High-value regrowth vegetation of all Regional Ecosystems was used, and non-remnant areas were excluded. This selection was then clipped to the Fraser coast boundary and National parks and reserves were excluded.

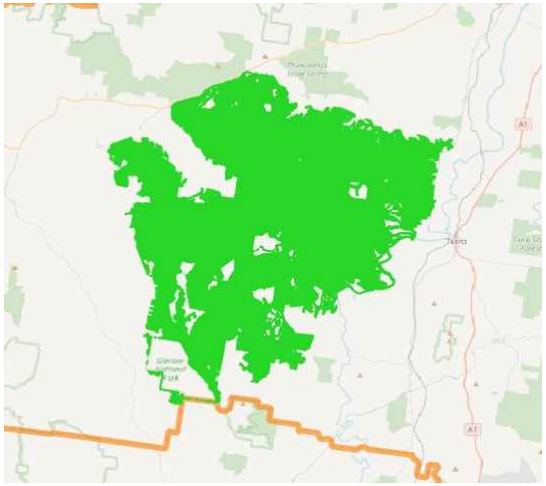
Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
		species richness and diversity. Locally significant flora species include: *Acalypha eremorum* soft acalypha, *Ailanthus triphysa* white siris, *Bridelia exaltata* brush ironbark, *Coatesia paniculata* axe breaker, *Coleus graveolens* flea bush, *Elattostachys xylocarpa* white tamarind, *Ficus racemosa var. racemosa* cluster fig, *Glochidion lobocarpum* small-leaved cheese tree, *Homalium alnifolium* brown boxwood, *Macrozamia macleayi* zamia palm, *Marsdenia pleiadenia* milk vine, *Monococcus echinophorus* burr bush, *Nyssanthes diffusa* barbed-wire weed, *Ozothamnus cassinioides* everlasting daisy, *Parsonsia leichhardtii* lobed silk pod, *Parsonsia velutina* hairy silk pod, *Psydrax odorata forma buxifolia* stiff canthium, and *Solanum corifolium* straggling nightshade.		Natural breaks in vegetation were used as a boundary of the shapefile selection.
MLES17	Glenbar National Park Foothills of Mt Urah	This area contains areas of significant vegetation and regionally uncommon geology, including large tracts of open forest and intact rainforest. This area is on the boundary of Glenbar National Park and is of similar value. As the vegetation is continuous it is also potential to be habitat for MNES and MSES present within the	2.1 Core habitat 2.4 Species richness/diversity 2.5 Climate change refugia	This area was selected using all continuous tracts of vegetation between existing sections of Glenbar National Park/Mt Urah. Queensland Regional ecosystem vegetation mapping that contained Remnant and High-value regrowth vegetation of all Regional Ecosystems was used, and non-remnant areas were excluded. This selection was

Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
		National parl. Locally significant flora species *Acacia fasciculifera* scaly bark, *Acalypha eremorum* soft acalypha, *Alocasia brisbanensis* cunjevoi, *Archontophoenix cunninghamiana* piccabeen palm, *Bosistoa pentacocca subsp. connaricarpa* ferny-leaved bosistoa, *Bouchardatia neurococca* union nut, *Brachychiton rupestris* Queensland bottle tree, *Bridelia exaltata* brush ironbark, *Claoxylon tenerifolium subsp. tenerifolium* Queensland brittlewood, *Clerodendrum longiflorum var. glabrum* long-flowered clerodendrum, *Coleus graveolens* flea bush, *Cyperus dietrichiae* sedge, *Dendrobium monophyllum* lily-of-the-valley orchid, *Diploglottis australis* native tamarind, *Dissiliaria baloghioides* blackheart, *Elattostachys xylocarpa* white tamarind, *Ficus macrophylla* forma macrophylla Moreton Bay fig, *Flindersia xanthoxyla* yellow-wood, *Indigofera trifoliata* indigo, *Iphigenia indica* iphigenia, *Marsdenia pleiadenia* milk vine, *Monococcus echinophorus* burr bush, *Neolitsea australiensis* green bolly gum, *Notelaea ovata* forest olive,	3.2 Ecosystems representation/ uniqueness	then clipped to the Fraser coast boundary and National parks and reserves were excluded. Natural breaks in vegetation were used as a boundary of the shapefile selection.

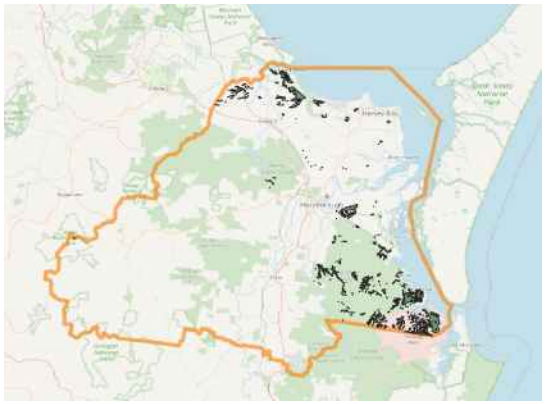
Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
		Nyssanthes diffusa barbed-wire weed, *Parsonsia leichhardtii* lobed silkpod, *Parsonsia velutina* hairy silkpod, *Pipturus argenteus* native mulberry, *Solanum corifolium* straggling nightshade, *Tephrosia juncea* native pea, *Teucrium modestum* native germander, *Triflorensia cameronii* Cameron's tarenna and *Zornia muriculata subsp. muriculata*, upright zornia.		
MLES19	Mount Bauple - Important / High Biodiversity area 	The foothills of Mount Bauple are of significant value as they contain areas of diverse vegetation and geology - including large tracts of intact rainforest. The foothills that border Mount Bauple National Park contain the same high biodiversity and unique values as the adjacent park. This area is elevated with igneous rock due to past volcanic activity and with high scientific value due to the presence of diverse ecosystems and many flora species that are uncommon in the region as well as a number of protected species. The name Bauple relates to a tree which grows there commonly known as the 'bopple' nut, the commercial Queensland nut tree *Macadamia integrifolia.* Wild	1.2 Riparian corridor 2.1 Core habitat 2.4 Species richness/diversity 2.5 Climate change refugia 3.2 Ecosystems representation/ uniqueness	**Implemented.** This area was selected using all continuous tracts of vegetation (Using Queensland Regional ecosystem vegetation mapping) that contained Remnant and High-value regrowth vegetation of all Regional Ecosystems. The selection was bordered to the west by Netherby Road, other borders to the selection were natural breaks in vegetation. Mount Bauple was clipped out of the selection. National Park and reserves were clipped out.

Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
		populations of this species are important genetic repositories for the macadamia industry. A very culturally significant area for local indigenous people. A high diversity of flora species are present here, including *Acacia bakeri* marblewood, *Acacia fasciculifera* scaly bark, *Acalypha eremorum* soft acalypha, *Agathis robusta* kauri pine, *Ailanthus triphysa* white siris, *Alocasia brisbanensis* cunjevoi, *Anthocarapa nitidula* incense cedar, *Barklya syringifolia* crown of gold tree, *Bouchardatia neurococca* union nut. *Bridelia exaltata* brush ironbark, *Bulbophyllum schillerianum* red rope orchid, *Calochlaena dubia* false bracken fern, *Claoxylon tenerifolium subsp. tenerifolium* Queensland brittlewood, *Coleus graveolens* flea bush, *Cyperus curvistylis* sedge, *Cyperus sculptus* sedge, *Cyperus tetraphyllus* black fruited sedge, *Dendrobium gracilicaule* leopard orchid, *Dendrobium monophyllum* lily-of-the-valley orchid, *Dendrobium speciosum* king orchid, *Dinosperma melanophloium* black-barked doughwood, *Diploglottis australis* native tamarind, *Dissiliaria muelleri*		

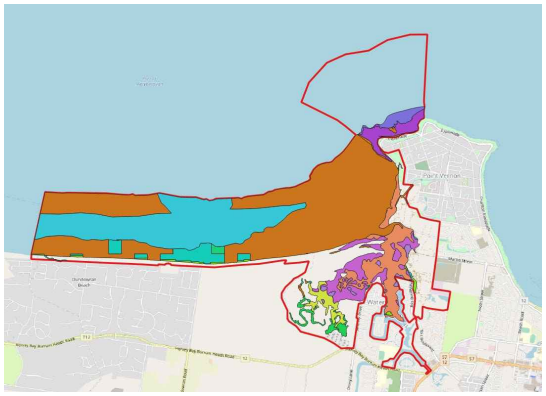
Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
		Mueller's redheart, *Dockrillia teretifolia* rat's tail orchid, *Elattostachys bidwillii* smooth elattostachys, *Elattostachys xylocarpa* white tamarind, *Ficus racemosa var. racemosa* cluster fig, *Flindersia xanthoxyla* yellow-wood, *Gossia punctata* dotted myrtle, *Gynura drymophila var. drymophila*, *Homalium alnifolium* brown boxwood, *Mackinlaya macrosciadea* blue umbrella, *Monococcus echinophorus* burr bush, *Myrsine subsessilis subsp. subsessilis* red muttonwood, *Notothixos cornifolius* kurrajong mistletoe, *Nyssanthes diffusa* barbed-wire weed, *Oberonia complanata* oberonia, *Oberonia palmicola* soldiers crest, *Parsonsia leichhardtii* lobed silkpod, *Parsonsia plaesiophylla veiny* silkpod, *Parsonsia velutina* hairy silkpod, Pilidiostigma glabrum plum myrtle, *Pipturus argenteus* native mulberry, *Plectorrhiza brevilabris* small tangle orchid, *Plectorrhiza tridentata* common tangle orchid, *Prostanthera ovalifolia* purple mint bush, *Pseudoweinmannia lachnocarpa* rose marara, *Psydrax odorata forma buxifolia, Rhinerrhiza divitiflora* raspy		

Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
		root orchid, *Sarcochilus ceciliae* fairy bells, *Solanum corifolium* straggling nightshade.		
MLES20	St Mary - Important / High Biodiversity area 	St Mary is a very large area of remnant core habitat of which a large portion is Least Concern Regional Ecosystem. This area has a very high level of flora species diversity. One undescribed but recognised taxon is present, *Samadera sp*. (St Mary P. Grimshaw+PG2159) St Mary quassia. This plant is found only in St Mary. This area is also important habitat for gliders. Some of the regional ecosystems within this area contain subtle variations in flora composition which make the ecosystems unique. Flora include: *Acomis acoma* yellow daisy, *Agathis robusta* kauri pine, *Amylotheca dictyophleba* rainforest mistletoe, *Archontophoenix cunninghamiana* piccabeen palm, *Astrotricha latifolia* silver leaf, *Callicarpa pedunculata* velvet leaf, *Callitris endlicheri* black cypress pine, *Calochlaena dubia* false bracken fern, *Claoxylon tenerifolium subsp. tenerifolium* Queensland brittlewood, *Clerodendrum longiflorum var. glabrum* long-flowered clerodendrum, *Dendrobium*	1.2 Riparian corridor 2.1 Core habitat 2.4 Species richness/diversity 2.5 Climate change refugia 3.2 Ecosystems representation/ uniqueness)	**Implemented.** The expert panel described that all connected habitat within the area of St Mary's is of significance. All connected vegetation within this area was selected and large areas of non-remnant were clipped out. The shapefile was then trimmed to exclude small outlier polygons not connected to the main polygon. The shapefile was then dissolved to create a single layer. Areas of National Park were also excluded.

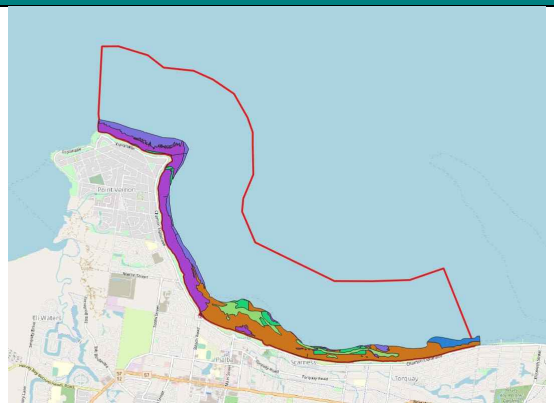
Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
		gracilicaule leopard orchid, *Goodenia delicata* fanflower, *Goodenia glabra* smooth goodenia, *Hibbertia oligodonta* guinea flower, *Homalanthus stillingiifolius* small bleeding heart, *Hovea lorata* purple pea, *Hovea parvicalyx* hovea, *Leptospermum neglectum* coast tea tree, *Lomandra confertifolia subsp. confertifolia* cushion mat rush, *Notothixos cornifolius* kurrajong mistletoe, *Oberonia complanata* oberonia, *Oxylobium robustum* shaggy pea, *Parsonsia plaesiophylla* veiny silkpod, *Pityrodia salviifolia*, *Prostanthera ovalifolia* purple mint bush, *Samadera sp.* (St Mary P. Grimshaw PG2159) St Mary quassia, *Sarcochilus dilatatus* brown sarcochilus, *Solanum corifolium* straggling nightshade, *Tapeinosperma repandulum* tapeinosperma, *Wilkiea huegeliana* veiny wilkiea and *Zieria furfuracea subsp. euthadenia* warty zieria.		

Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
MLES21	Woocoo National Park - Important / High Biodiversity area 	The foothills of Woocoo National Park are of significant value as they contain predominantly of Remnant condition and contain the same high biodiversity and unique values as the adjacent park. This area contains areas of rainforest that provides habitat for locally significant and unique species of flora and fauna (including the Vulnerable Grey-headed flying-fox (*Pteropus poliocephalus).* Gliders, Black Breasted button quails and Bettongs inhabit the national park therefor it is also likely their habitat may extend outside of the National Park boundary.	1.2 Riparian corridor 2.1 Core habitat 2.4 Species richness/diversity 2.5 Climate change refugia 3.2 Ecosystems representation/ uniqueness	**Implemented.** This area was selected using all continuous tracts of vegetation outside the boundary of Woocoo National Park. The vegetation was selected using Queensland Regional ecosystem vegetation mapping that contained Remnant and High-value regrowth vegetation. Non-remnant areas and areas of National Park and reserve were excluded.
MLES26	Wallum and heath systems 	Areas containing wallum and heath vegetation are significant ecosystems within Fraser Coast. They are progressively being lost and fragmented across the region. Several of the last remaining stands of heath vegetation are of 'least concern' status and due to limited protection available, are declining rapidly. These heathy vegetation communities contain a high diversity of flora and are important habitat for species such as the Wallum froglet (*Crinia tinnula*).	2.4 Species richness/diversity 3.2 Ecosystems representation/ uniqueness	**Implemented.** Polygons containing Broad Vegetation Group (BVG) 29a (Heathlands and associated scrubs and shrublands on coastal dune fields and inland montane locations) were selected using the Queensland Government BVG mapping. This selection was then clipped to the Fraser Coast boundary and state protected areas (national park and reserves) were excluded. K'gari was excluded.

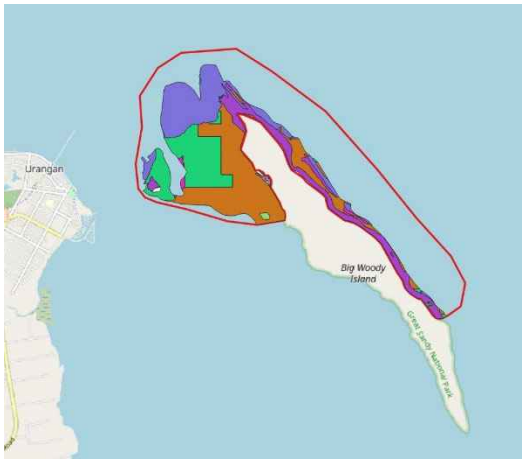
Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
		Heath vegetation and dune systems are being fragmented (particularly in areas such as Burrum heads) and their hydrology is being negatively impacted. Sand mining is a threat to these habitats and altering the hydrology of wetlands. These heathy vegetation communities contain a high diversity of flora especially ground orchids and are important fauna habitat. Locally significant flora species include: *Amperea xiphoclada var. xiphoclada* broom spurge, *Caustis blakei subsp. blakei* foxtails, *Corunastylis psammophila* midge orchid, *Dampiera sylvestris* blue fan flower, *Dillwynia glaberrima* heathy parrot pea, *Dipodium punctatum* pink hyacinth orchid, *Diuris chrysantha* double yellow tails, *Drosera spatulata var. gympiensis* spoon-leaf sundew, *Epacris pulchella* wallum heath, *Eriostemon australasius* wax flower, *Eucalyptus bancroftii* Bancroft's red gum, *Hakea sericea* silky hakea, *Leptospermum whitei* White's tea-tree, *Prasophyllum brevilabre* short-lip leek orchid, *Pterostylis parviflora* tiny greenhood, *Thelymitra nuda* plain		

Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
		sun orchid, *Utricularia lateriflora* small bladderwort, *Xanthorrhoea macronema* bottlebrush grass tree, *Xyris operculata tall* yellow-eye.		
MLES42	Eli Creek - Gatakers Bay - Dundowran; reef seagrass and mangrove network. 	This area is the westernmost section of the reef–seagrass–mangrove network of the Burnett-Mary region, and part of the Southernmost mainland coral reefs on the East coast of Australia. (Zann 2011). This connectivity within this network is important for fish movement from one system to the other. These fish are important in maintaining the health of coral reefs to reduce algal overgrowth. High ecological values are found in these networks. This area contains high species and habitat diversity. This area has been colonised by coral and created ecotones and a habitat mosaic that includes the dune system and sandy beach at the top of Point Vernon where turtles nest along the sandy beach. This area also contains an 'incipient' coral reef, where the coral growing over the rocks is starting to form a limestone reef. There are gravelly outcrops of coral, sort coral, sea fans and other octocorals growing on the coral rubble towards	2.4 - Areas of species richness and diversity 3.3 - Coastal habitats 3.5 - Local significant species habitat	**Implemented.** Zann (2011) The Use of Remote Sensing and Field Validation for Mapping Coral Communities of Hervey Bay and the Great Sandy Strait and Implications for Coastal Planning Policy. Master's Thesis, University of Queensland Intertidal Central Queensland Layer (Wetland Mapping Layer). Using the expert panel bounding layer, the Intertidal Central Queensland Layer (Wetland Mapping) was clipped by selecting the following four layers: "above MSL unconsolidated mud (claypan/saltpan)", "below MSL unconsolidated mud (mudflat/bank) - low energy", "consolidated low energy", "strap (wide) seagrass)", "Intertidal coral", "Low energy boulders", "Low energy gravel" and "Low energy sand". These layers were clipped to MLES51C (boundary) polygon, then buffered with 100m to create a high-value shorebird feeding area map.

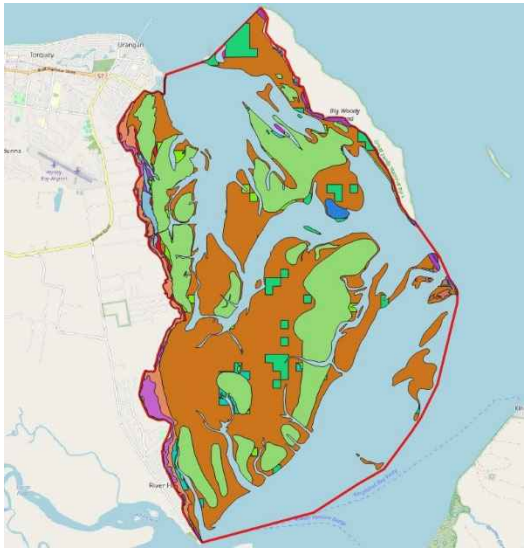
Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
		Dundowran. A high diversity of molluscs wash up on the Dundowran beach from this area (Murex, cowries and strombs). There is a loggerhead sea turtle nesting area to the east in Gatakers Bay. An area specifically between Dundowran Beach and Eli Creek provides a corridor for fish movement, as well as a number of endangered shark species. It is also an important sea snake habitat and an important area for ecological processes. Conservation values identified in this area are strong reef-building capacity, high richness of species and ecosystems, rarity, indicator species, High latitude specialists, functional connectivity as well as connectivity between reeds and other ecosystems (Zann 2011). The hydrological connectivity has been restored after the bund was removed and the system is now fully reinstated.		Clipped: MLES42A Boundary: MLES42B This value is directly adjacent to MLES45.
MLES45	Coral reef and rocky shore systems	Hervey Bay coral reefs have three different systems - massive corals, flower corals and rocky shore. This	2.4 - Areas of species richness and diversity 3.3 - Coastal habitats	**Implemented.** Intertidal Central Queensland Layer (WetlandMapping Layer).

Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
		area consists mainly of flower coral reefs dominated by Turbinaria high latitude specialists. The 15 km of nearshore, turbid water coral reefs (Zann 2011) is an important area for coral trout that moved into new areas since coral bleaching in 2017. There is evidence that the Hervey Bay reefs are the southernmost known reef-building coral reefs on the east coast of mainland Australia. It has the highest percentage cover hard coral (>85%) growth in Hervey Bay (46 species). These biodiversity hotspots have high-values for species richness, diversity and evenness, rarity, presence of high latitude species, endemism, species at their range limits and large-massive species. Throughout Hervey Bay the Eli Creek system and Gatakers Bay were the best-connected reefs to mangrove / saltpan / saltmarsh and to seagrass beds, which is important for dugongs and green turtles. This area has strong connections to seagrass beds and dugongs and turtles frequent these reefs, especially around Torquay. These seagrass areas are groundwater dependent. Mangrove	3.5 - Local significant species habitat	Using the expert panel bounding layer, the Intertidal Central Queensland Layer (Wetland Mapping) was clipped by selecting the following layers: – Consolidated - low energy – Intertidal coral – Low energy boulders – Low energy gravel – Low energy intermediate consolidation – Low energy sand – Ovoid seagrass – Strap (wide) seagrass. These layers were clipped to MLES45B (boundary) polygon and named MLES45A. Clipped: MLES45A Boundary: MLES45B This value is directly adjacent to MLES42.

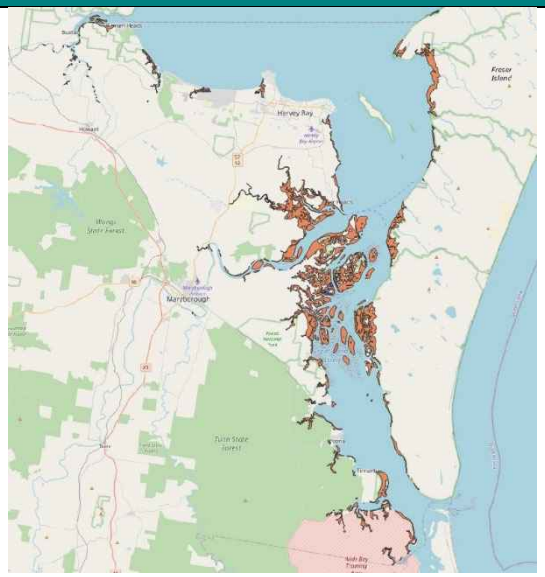
Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
		estuaries in this system are important. A significant feature of Hervey Bay's reefs was found to be the number of species that were either rare, at their range limits or typified high latitudes. Other significant values in this region include several biodiversity hotspots, high morphological plasticity in corals, and regionally significant species records. Rocky shore areas are beach stone curlew nesting areas (resident shorebirds).		
MLES46	Dayman Spit Seagrass 	Dayman Spit consists of mostly seagrass and is an important shorebird feeding area included in the directory of important wetlands. Many of these species sighted using this area are species that are nesting in the Capricorn Bunker group and migratory species from norther Australia and Asia. Dugongs are also known to use this area and frequent the area between here and the coral reefs off Torquay. Seagrass creates nutrient sinks to buffer or filter nutrient and chemical inputs to the marine environment, absorbing nitrogen and phosphorus. Seagrass is	2.4 - Areas of species richness and diversity 3.3 - Coastal habitats 3.5 - Local significant species habitat	**Implemented.** Intertidal Central Queensland Layer (WetlandMapping Layer). Selected "Consolidated - low energy", "Low energy boulders", "Low energy gravel", "Low energy sand" and "Ovoid seagrass" from Wetland info, saved as separate value called MLES46A. Clipped: MLES46A Bounding layer: MLES46B

Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
		eaten by dugongs, green turtles, sea urchins and some fish. Hervey bay is an important dugong feeding area as they are seagrass community specialists. This area is also an important area as migratory seabirds, sea eagles and other raptors feed on large schools of herring. The areas of mudflat within this section are also feeding habitat for unusual migratory tern species and whimbrels. Freshwater connectivity is an important ecological feature.		
MLES47	Finger corals 	Round Island and Woody Island have large aggregations of finger corals, such as *Acropora* and other soft corals. The nearby Pulgul Creek mangroves and Dayman spit and Booral seagrasses provide habitat connectivity for coral reef fish species. Woody Island is in the top 5 localities for species richness and diversity, highest overall values for rarity, high latitude species, range limits and endemism. It also has high-values for reef forming species (*Acropora*) and local morphs (i.e., *Acropora digitifera*).	2.4 - Areas of species richness and diversity 3.3 - Coastal habitats 3.5 - Local significant species habitat	**Implemented.** Selected all available values from the Intertidal Central Queensland Layer (WetlandMapping Layer), clipped to Fraser MLES49B bounding layer. Saved as separate value called MLES49A. Clipped: MLES47A Bounding layer: MLES47B

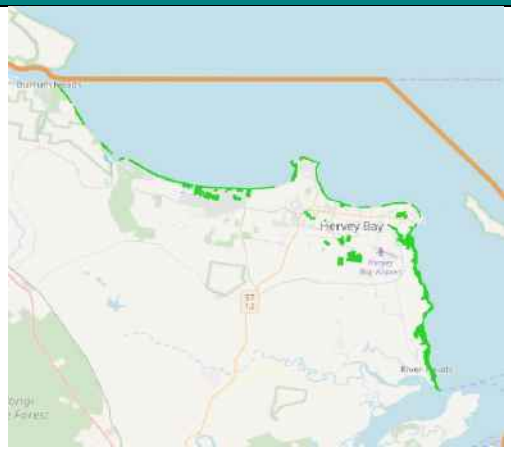
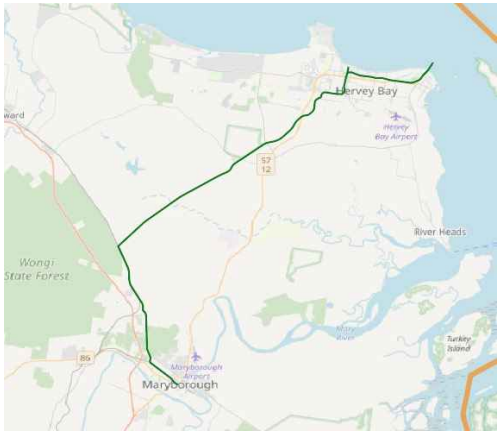
Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
MLES48	Urangan and Maaroom Coastal Habitats  Maaroom boat ramp 	Oyster reefs, like coral reefs, provide structures where marine plants and animals can live. Ben Gilby, at the University of the Sunshine Coast, says oyster reefs are an extremely important part of coastal landscapes. About 85% of oyster reefs have been lost globally. Where it has been artificially recreated, fish diversity and abundance has risen more than sixteen-fold in about three years. These reefs are important for Bingus (mud oysters), especially in the Booral wetlands. These sharp oysters are used for cultural practices and considered to be a locally significant species. According to Chamara *et al.*, leaf oysters (*Isognomon ephippium*) have been identified as a reef-building shellfish species that may be used in coastal restoration as they are more tolerant to poor water quality than other native oysters. Leaf oysters are found at the aquifer fed boat ramp near Maaroom.	2.4 - Areas of species richness and diversity 3.3 - Coastal habitats 3.5 - Local significant species habitat	**Implemented.** Selected "Molluscs" from Intertidal Central Queensland Layer (WetlandMapping Layer), saved as separate value called MLES48A. Clipped: MLES48A Bounding layer: MLES48B https://www.abc.net.au/news/2021-10-16/oyster-shell-waste-artificial-reef/100538272 https://www.researchgate.net/publication/351275204_Leaf_oysters_Isognomon_ephippium_as_a_potential_candidate_for_shellfish_reef_restoration

Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
MLES49	Booral Wetlands - Important / High Biodiversity area 	Booral wetlands, between Woody Island and the mouth of the Mary River, is important for dugong habitat, turtle habitat, seabird feeding habitat, extensive seagrass beds, shorebird roosting sites and blue mangrove butterfly habitat. Extensive continuous meadows of light *Zostera capricorni* were present on the mudbanks on the northern bank adjacent to the mouth of the Mary River. Seagrass meadows provide a wide range of ecological services. Seagrass meadows in the Great Sandy Strait region are susceptible to sedimentation damage caused by flooding, suffering from both the lack of light cause by turbid water and from deposited mud (Robertson and Lee Long, 1991). The recovery of seagrass meadows after flooding is dependent on prevailing environmental conditions and may be impeded by pollutants from urban and coastal development. Connectivity between the seagrass meadows, mangroves and the nearby coral reefs is important for fish and for health of the reef. Herbivorous	2.4 - Areas of species richness and diversity 3.3 - Coastal habitats 3.5 - Local significant species habitat	**Implemented.** Selected all available values from the Intertidal Central Queensland Layer (WetlandMapping Layer), clipped to Fraser MLES49B bounding layer. Saved as separate value called MLES49A. Clipped: MLES49A Bounding layer: MLES49B

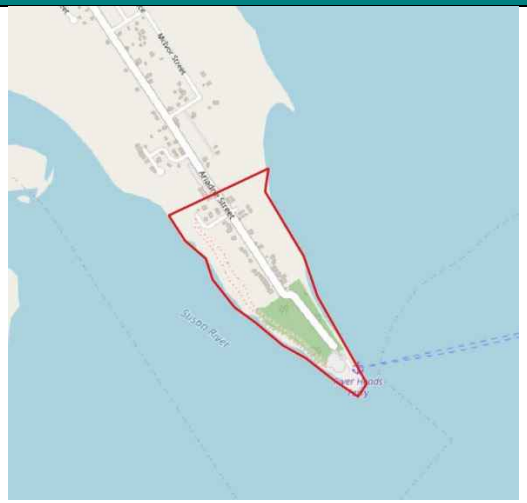
Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
		fish living in the mangroves and on seagrass meadows can remove algae from the coral reefs (MLES48) to give the coral a competitive advantage and improve coral health. Algal overgrowth of the seagrass leads to poorer seagrass health. Careful processing of nutrients in the wastewater discharge from Pulgul Ck STP prior to release would reduce likely algal overgrowth on seagrass meadows. This area regularly receives flood discharge from the Mary River which episodically impacts the area. Seagrasses in the area take about 3-4 years to recover (Campbell and McKenzie 2004). Locally significant flora species found within this area include *Abutilon albescens* lantern bush, *Alyxia stellata* black chain fruit and *Argusia argentea* octopus bush.		
MLES50	Mangroves and saltmarshes	Australia's mangroves and saltmarshes are, as quoted by the Australian Department of Environment and Energy, 'ecologically important ecosystems that link the land and sea'. They	2.4 - Areas of species richness and diversity 3.3 - Coastal habitats 3.5 - Local significant species habitat	**Implemented.** Selected "Mangroves (undifferentiated)" and "Mangroves and other trees (undifferentiated)" from the Intertidal Central Queensland Layer

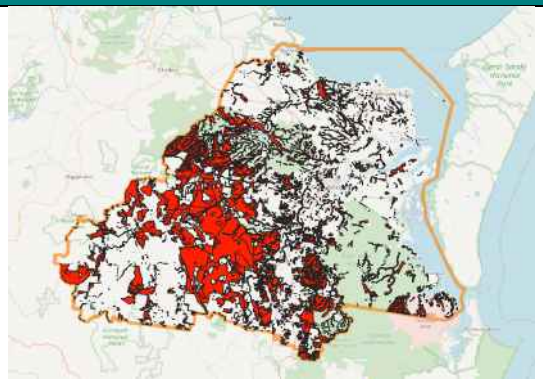
Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
		provide habitats for a range of species. The Fraser coast region contains all 4 ecosystems that make up 'Saltmarsh', those being 'bare' saltpan (Important for migratory shorebird feeding and roosting); Succulents/samphires (fiddler crab and mangrove crab habitat); Sedges (Freshwater seeps experiencing saltwater inundation, notable water mouse habitat) and Saline grassland which is priority watermouse habitat). The boundary between mangroves and saltmarsh is also priority water mouse habitat. Significant losses of mangroves can have a devastating impact to species that rely on them. These intertidal communities of plants are adapted to grow in the salty foreshores of coastal lakes and estuaries. Mangroves provide feeding and breeding habitat for fish, birds, crustaceans and insects. It acts as filters for nutrients and sediments, reduces erosion and maintain water quality, as well as act as carbon sinks. Butterflies fly in from north Queensland in spring and migrate down the east coast of Australia, breeding on coastal mangroves.		(WetlandMapping Layer), saved as separate value called MLES50A. Australian Department of Environment and Energy, 2016 https://www.awe.gov.au/sites/default/files/documents/factsheet-wetlands-mangroves-saltmarshes.pdf

Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
		These mangroves also provide food for caterpillars, some of them having adapted to only feeding on Grey Mangroves, especially those that grow on the riverbanks of the Mary River. As mangroves grow older, they hollow out and create ideal habitat for microbats too. Grey mangroves are steadily declining, and even if new ones appear it would take a long time for them to create similar habitat to that which is needed for the breeding and survival of species that depend on them. Some threats to mangroves include reclamation for development, shore protection such as seawalls, changes to freshwater and tidal flows, rubbish and pollution, weed invasion. This area is also important habitat for water mouse (*Xeromys myoides*).		
MLES67	Hervey Bay Urban bushland	The Hervey Bay urban footprint contains several diverse bushland areas, which are a mix of natural vegetation, regeneration and mixed species revegetation. All these areas, whatever their shape or scale, provide vital habitat for wildlife. Many contain significant species or are highly biodiverse. Some should also be seen as part of a vegetation	3.4 Urban bushland	**Implemented.** Patches of vegetated urban bushland were identified by the expert panel and selected.

Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
		corridor, permitting movement of marsupials, for example, through the landscape. Some are part of a riparian corridor. In particular Gregs Vineforest is a rainforest ecosystem that is uncommon in the urban area with locally significant flora species such as *Acacia bakeri;* JR Stocks Park vegetation is dominated by *Livistona decora* an iconic species in the Dundowran Beach. Other Urban bushland MLES include Ghost Hill, that provides significant local habitat with high species richness in both fauna (birds) and flora. Currently 60+ species of birds can be found on either side of Main Street.		
MLES68	Hervey Bay Rail Trail corridor 	The Hervey Bay Rail trail corridor was highlighted as an area that currently has value as a wildlife corridor and has the potential for rehabilitation to aid movement of wildlife into the future.	1.4 Enhancement corridor – urban	**Implemented.** This area was highlighted as an area of interest by Fraser Coast councillors at the expert panel response discussion. The Hervey Bay Rail Trail location was provided by Fraser Coast Regional council and was buffered by 20m to include all areas of vegetation.

Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
MLES43	Point Vernon - Coral Reef Biodiversity hotspot 	The fault line in Hervey Bay is potentially important for groundwater, as the aquifer is at Point Vernon. Point Vernon has a high species diversity, as well as being the southernmost coral reef on the east coast. This is a significant value that is neither State nor Federally protected. There is an important shorebird feeding area in front of Parraweena Park, as well as the tidal area at Gatakers Bay that acts as a nursery area for sharks and other marine animals. Importantly, this area is significant, having a turtle rookery at Point Vernon.	3.2 Ecosystem representation and/or uniqueness 3.3 Coastal habitats 3.7 Ecosystem buffers	**Not Implemented.** Based on expert panel recommendation, this MLES decision was split at the fault line and dissolved so the western half forms part of MLES42 and the eastern half forms part of MLES45. Intertidal Central Queensland Layer (WetlandMapping Layer)
MLES44	River Heads Peninsula - groundwater connectivity	River Heads Peninsula is part of the Maryborough formation with a rocky aquifer and is connected through groundwater to the marine environment.		**Not Implemented.** This MLES was briefly discussed during expert panel workshop but need a much more detailed investigation in order to correctly capture the values present. This is potentially an issue that Fraser Coast council may wish to explore further but has been not implemented as part of the current MLES identification process.

Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
				
MLES53	Point Vernon to Burrum Heads - Waterbird feeding habitat	Isis River, upstream from Buxton, feeding habitat. Bird feed on large sandbanks during very low tides.		**Not Implemented.** More information required.
MLES54	Freshwater ecosystems	Freshwater ecosystems are important for turtles, lungfish, Mary River cod, water mice (Tandora, Beelbi Creek), eastern snake-necked turtles and bettongs (locally threatened species)		**Not Implemented.** Incorporated into MLES55.
MLES57	BBBQs and buffers	Black-breasted button-quails are a threatened species with habitat found in the Fraser Coast region.	3.5 Local significant species habitat 3.7 Ecosystem buffers	**Not Implemented.** Black breasted Button-quails are associated with the habitat mapped in this MLES, however the mapping is based on essential habitat for BBBQ, which is a MSES.

Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
				This layer was therefore not implemented in this current project.
MLES58	Ghost Hill Rainforest birds	Ghost Hill Ridgeline Rainforest (RE 12.5.13) provides significant local habitat with high species richness in both fauna (birds) and flora. Currently 60+ species of birds can be found on either side of Main Street.	2.4 Areas of species richness and diversity 3.4 Urban bushland	**Not Implemented.** Incorporated into MLES67.
MLES59	Climate change and further west	Climate change can affect the clearing of old mangroves, which removes habitat for butterfly species that rely on mangrove systems. Emphasis should also be placed on retaining large areas of habitat further out west from coast.	2.5 Climate change adaptation and refugia areas	**Not Implemented.** More information required.
MLES60	Tinana Creek			**Not Implemented.** Incorporated into MLES2.
MLES61	Big Tuan Creek and Poona Creek	Both are freshwater creeks with intact riparian flowing directly into the Great Sandy Strait	1.2 Riparian corridors	**Not Implemented.**

Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
				Incorporated into the broader aquatic corridor mapping.
MLES62	Mary River Estuary and Great sandy strait	Supports a diversity of intertidal flora including mangrove forests, saltmarshes and seagrass meadows; and provides habitat for numerous wetland dependent species including waterbirds, marine mammals, marine reptiles, fish and invertebrate species at critical stages of their life cycle.	2.4 Species richness and diversity 3.3 Coastal habitats	**Not Implemented.** Has RAMSAR protections.
MLES63	Wanggoolba Creek – K'gari	Supports a diversity of aquatic species that is thought to be considered high when compared to other creeks on the island.	2.4 Species richness and diversity 3.3 Coastal habitats	**Not Implemented.** Part of K'gari Fraser Island National Park. Protected already.
MLES64	Biodiversity Hotspot - Wongi Waterholes	Ecologically and culturally significant area.	2.4 Species richness and diversity 2.5 Climate change adaptation and refugia areas 3.5 Locally significant species habitat	**Not Implemented.** Already has protections by DES.
MLES65	Burrum River estuary	Burrum River estuary habitat	3.3 Coastal Habitats	**Not Implemented.** Incorporated into MLES 14
MLES66	Gundiah to Tiaro Waterholes	Mary River Turtles prefer flowing streams with complex habitat. Adults found in deep (up to 6m) pools,	3.5 Locally significant species habitat	**Not Implemented.** More information required.

Code	Special Feature Description	Panel Comments on MLES Values	Sub-category	Methodology Notes
		juveniles in shallower water up and downstream of the riffles. Giant Barred Frog – Mary River northern most distribution limit. Stream dependent frog and depends upon forested streams - riparian rainforest. Is limited to the parts of the catchment where rainforest is the natural riparian vegetation.		