



***Geoffrey Bay and Alma Bay (Arcadia)
Catchment Management Strategy
Report***

Table of Contents

<i>Section</i>	<i>Page</i>
1. Background	1
1.1 Introduction	1
1.2 Purpose	1
1.3 About Geoffrey and Alma Bays	1
1.4 Tenure	3
1.5 Planning Matters	3
2. Environmental Features	11
2.1 Catchments and Waterways	11
2.2 Landscape Features	11
2.3 Vegetation and Regional Ecosystems	13
3. Catchment Issues and Condition	17
3.1 Urban Impacts	17
4. Catchment Strategies	23
4.1 Background	23
4.2 Catchment Management Strategies	23
Appendix A	
Bibliography	
Appendix B	
Community Meeting Notes	
Appendix C	
Consultation Draft Workshop Results	
Appendix D	
Consultation Draft Strategies	
Appendix E	
Consultation-Draft Feedback	
Tables	
Table 2-1 Regional Ecosystem	14
Table 3-1 Geoffrey and Alma Bay Environmental Weeds	20
Table 4-1 Catchment Management Strategies	23
Figures	
Figure 1-1 Project Area	2
Figure 1-2 Tenure Map	3
Figure 1-3 Strategic Framework Maps	4
Figure 1-4 Natural Assets Overlay	4
Figure 1-5 Townsville City Plan Arcadia Zoning	5
Figure 2-1 Approximate Creek Locations	11
Figure 2-2 Magnetic Island Geology	12
Figure 2-3 Alma Bay Beach View to Devils Arch	13
Figure 2-4 Geoffrey Bay and Bremner Point	13

Figure 2-5 Looking South to Alma Bay and Bremner Point	13
Figure 2-6 Regional Ecosystems	14
Figure 3-1 Petersen Creek 'Mouth'	17
Figure 3-2 Petersen Creek Upstream of Marine Parade Pipes	17
Figure 3-3 Petersen Creek Drainage Obstruction	18
Figure 3-4 Alma Creek Upstream of the Footbridge	18
Figure 3-5 Alma Creek Footbridge	19
Figure 3-6 Gabul Way Erosion	19
Figure 3-7 Geoffrey Bay Foreshore Stabilising Strand Vegetation	22
Figure 3-8 Geoffrey Bay Foreshore Casuarina Buffer	22

Note to readers

The Geoffrey Bay and Alma Bay (Arcadia) Catchment Management Strategy Report was developed using community feedback and expert knowledge. The strategy provides guidance to community and stakeholders with an interest in the catchments of Geoffrey Bay and Alma Bay. The document and the strategies outlined within do not confer any implementation responsibilities for stakeholders and no decisions with respect to any potential funding for actions outlined in this strategy have been made.

Acknowledgements

Participants in the development of the Geoffrey and Alma Bays Catchment Management Strategy Report wish to acknowledge the funding received from Creek to Coral through the Australian Government's Caring for our Country program to implement the initial part of the project.

The project concept was inspired by Geoffrey Bay Coastcare. The group has been instrumental in attracting funding to undertake natural resource management works in the catchment and especially along the foreshore and waterways including Petersen Creek and Alma Creek.

Participants would also like to acknowledge the support and contribution made to the project by Townsville City Council's Integrated Sustainability Services.



CARING
FOR
OUR
COUNTRY

Disclaimer

Townsville City Council advises that this publication contains information based on scientific research, knowledge and understanding as well as perceptions and interpretations by the authors. The reader is advised that such information may be incomplete or unsuitable to be used in certain situations. While all care has been taken in the preparation of this document, Townsville City Council accepts no liability for any decisions or actions taken on the basis of the information contained in this document, or from conclusions drawn from interpreting the information. Readers should also be aware that some information might be superseded as a result of further scientific studies and evolving technology and industry practices.

1. Background

1.1 Introduction

Creek to Coral is Townsville City Council's healthy waters initiative. It promotes the concept that our creeks and waterways are all connected to the marine environment.

The initiative seeks to improve catchment management in the urban and peri-urban areas of Townsville, in order to help improve the water quality of our creeks, waterways and the inshore areas of the Great Barrier Reef Marine Park. It utilises catchment-based, total water cycle and community education and involvement approaches to natural resource management to achieve this aim.

Townsville City Council (TCC), through Creek to Coral, successfully applied for funding through the Australian Government's Caring for our Country (CfoC) 2010-11 Business Plan open call. The project titled "**Increasing community engagement in Townsville coastal catchments for Biodiversity**" provides funding and support for community based natural resource management in Townsville's coastal catchments.

The research and preparation of the Draft Geoffrey Bay and Alma Bay (Arcadia) catchment management strategy report was funded through the CfoC grant and in partnership with interested members of the Magnetic Island community. The overall project management, community consultation and subsequent finalisation of the strategy document were undertaken by Townsville City Council through its Creek to Coral initiative.

1.2 Purpose

The Geoffrey Bay and Alma Bay catchment management strategy acknowledges the range of information available that is relevant to the catchment including formal reports and studies incorporating expert opinion as well as the abundance of local knowledge and experience, (whether formally recorded or otherwise) gained through observation over time and the involvement in natural resource management within the catchments of Magnetic Island.

This report was prepared with limited resources and does not pretend to take into account the vast array of written material and human experience that is relevant to the Geoffrey Bay and Alma Bay catchments. Rather it is a brief scoping document drawing on a summary desktop review, one community workshop and several walk through reconnaissance visits. The report pieces together this information to provide a suite of higher level strategies to:

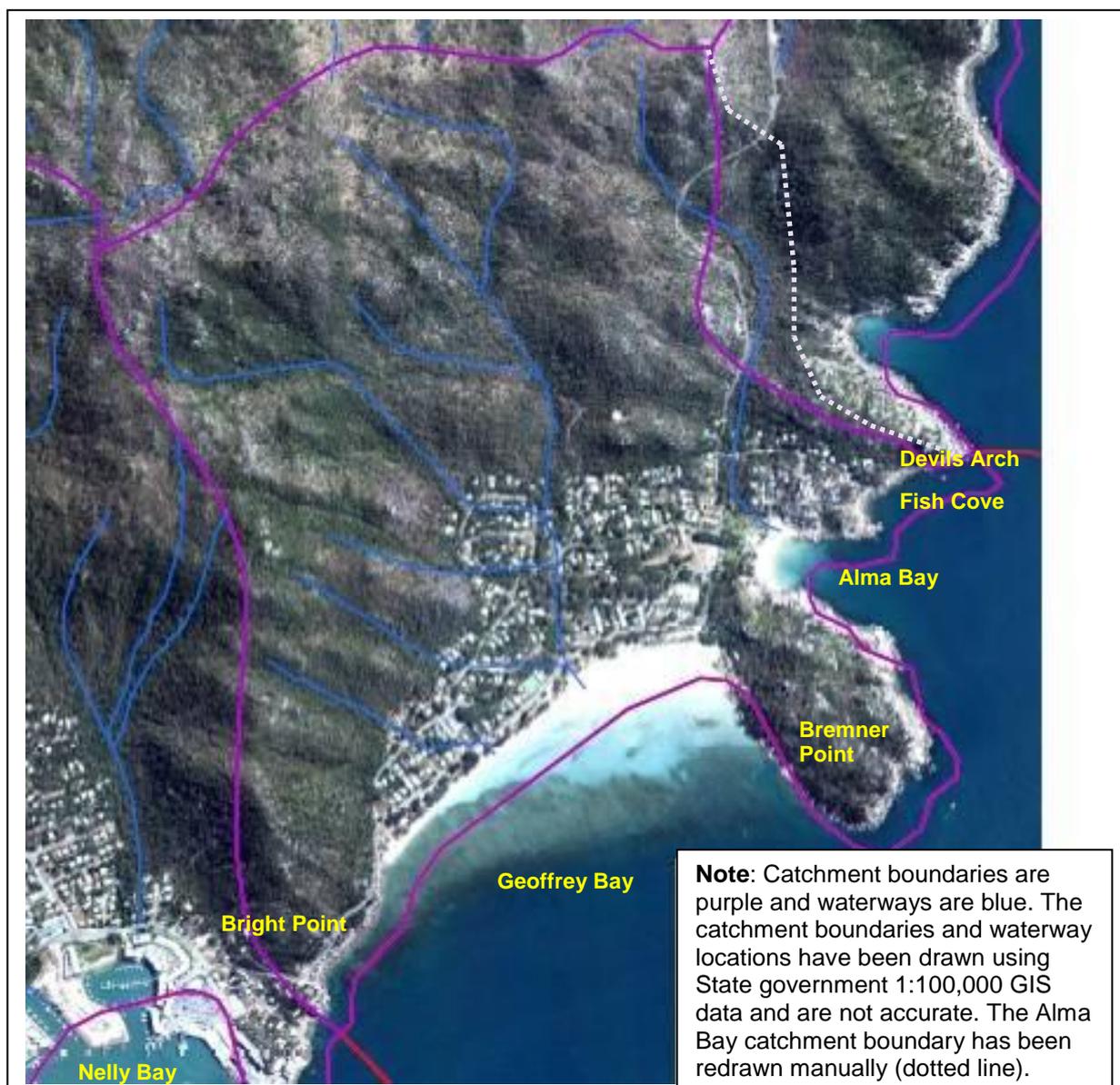
- Provide some basic information for community members and stakeholders not already involved in natural resource management on Magnetic Island and/or Geoffrey and Alma Bays;
- Catalyse discussion as a precursor to further action;
- Promote better working relationships between local government, government agencies, non-government organisations and the Magnetic Island community;
- Provide some strategic direction to assist with obtaining resources to implement identified strategies and priority actions.

Note: The document and the strategies outlined within do not confer any implementation responsibilities for stakeholders and no decisions with respect to any potential funding for actions outlined in this strategy have been made.

1.3 About Geoffrey and Alma Bays

Arcadia is the locality encompassing Geoffrey Bay and Alma Bay and is located to the east of Nelly Bay on Magnetic Island. Arcadia is the second largest settlement on Magnetic Island, by population, after Nelly Bay. The approximate boundary of the combined Geoffrey Bay and Alma Bay catchment and waterways location is shown in Figure 1-1.

Figure 1-1 Project Area



Note: Check on Devil's Arch

1.3.1 Magnetic Island values

Magnetic Island is located within the Great Barrier Reef World Heritage Area (WHA) and is surrounded by the Great Barrier Reef Marine Park. Detailed information about the values of Magnetic Island can be found in various publications including *Magnetic Island's World Heritage Values: A Preliminary Assessment* (Evans-Illidge 2004) and subsequent reports i.e. Kenchington and Hegerl (2005) and MICDA (2006) (see Appendix A).

Human activity in the Geoffrey Bay and Alma Bay catchment can have adverse impacts on the Great Barrier Reef WHA and its values and especially in near shore areas. Thoughtful natural resource planning and management within the Geoffrey Bay and Alma Bay catchment will assist with the overall maintenance of world heritage values on and adjacent to Magnetic Island and contribute to the resilience of the Great Barrier Reef.

The Wulgurukaba people are the Indigenous Traditional Owners of Magnetic Island with Melissa George, a Wulgurukaba woman, being one of the contributors to the MICDA and MINCA (2004) publication. Ms George notes the "evidence for past and continuing Aboriginal use of both

terrestrial and marine landscapes and resources” (p.32) and the significance and cultural values associated with the “*long-term Aboriginal occupation of a major near-shore island within the Great Barrier Reef Province*” (p.34) i.e. Magnetic Island.

1.4 Tenure

Arcadia is surrounded by State land and National Park (see Figure 1-2). With the exception of the National Park and Townsville City Council land assets i.e. parks, and reserves including roads and parts of waterways, most of the land in Arcadia is freehold.

Figure 1-2 Tenure Map



Note: Green shaded areas denote State Land. Red lines indicate the boundary of the National Park. NP indicates National Park. The green shading indicates Townsville City Council (TCC) parkland i.e. Alma Bay beach, and the orange shaded area is a TCC reserve.

1.5 Planning Matters

Townsville’s City Plan was gazetted on 17 October 2014 and came into effect on 27 October 2014. General themes for Magnetic Island identified through consultation while preparing the draft City Plan included:

- Integrating building designs with the environment;
- Improving water drainage and stormwater management;
- Connected walkways, connectivity to beaches and key tourist nodes and interpretative walks for tourists;

Geoffrey Bay and Alma Bay (Arcadia) Catchment Management Strategy

- Vegetation Protection – clearance control and approvals for vegetation removal;
- Protection of the shoreline and beaches;
- Revegetation – use of endemic Magnetic Island species only;
- Protection of biodiversity;
- Maximising and protecting heritage values;
- Protection of the marine environment

City Plan has incorporated the Magnetic Island themes into the Strategic Framework and this is reflected in the strategic framework mapping (Figure 1-3), the Natural Assets Overlay (Figure 1-4) and the Zonings (see Figure 1-5).

Figure 1-3 Strategic Framework Maps

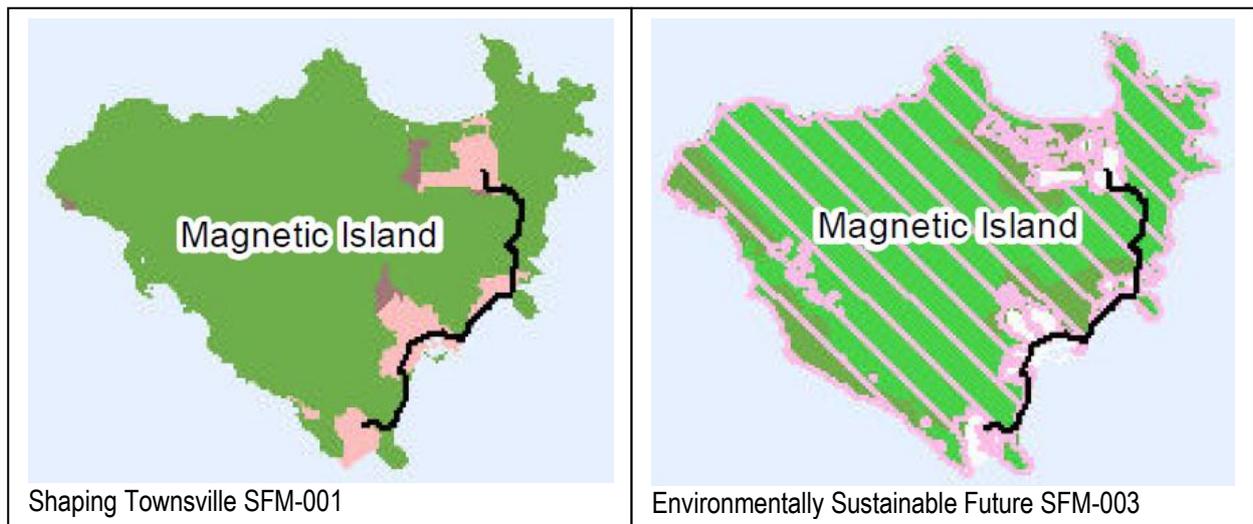


Figure 1-4 Natural Assets Overlay

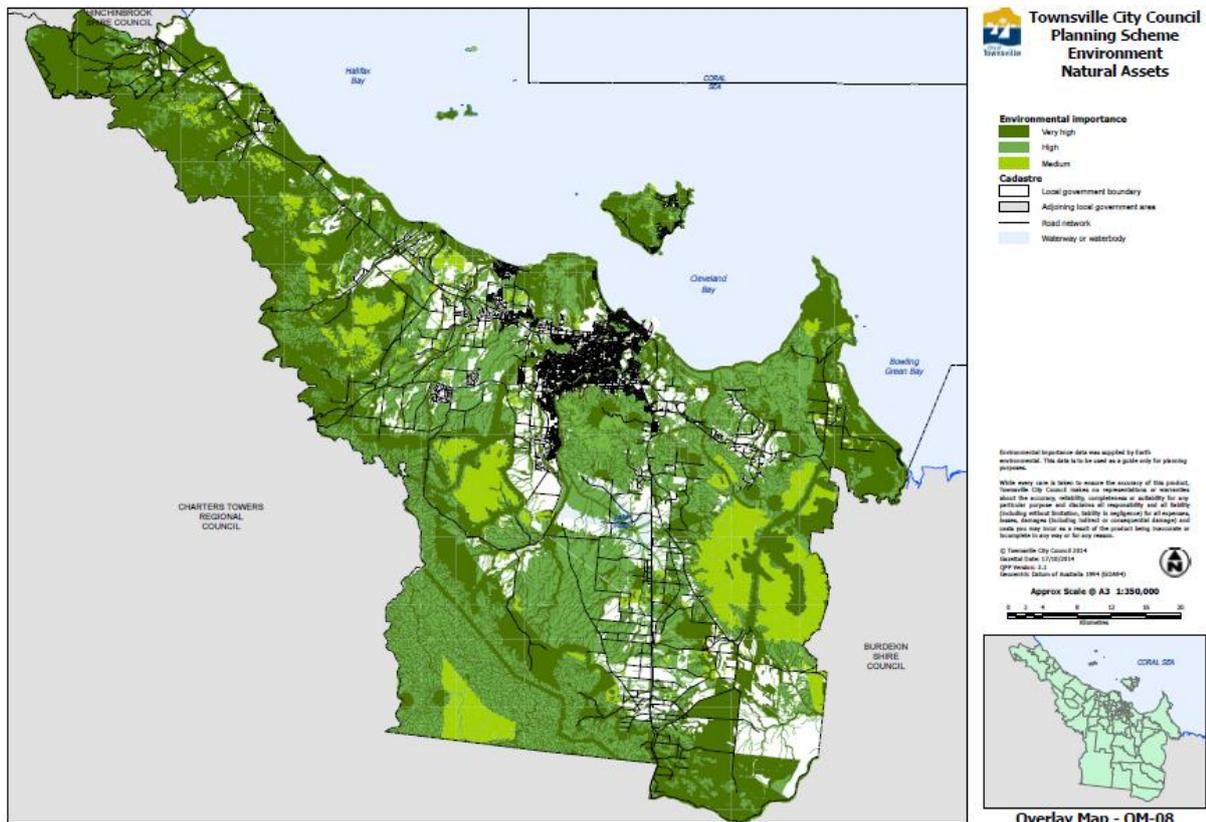


Figure 1-5 Townsville City Plan Arcadia Zoning



Note: From Townsville City Plan zoning map ZM-016. In the **Community facilities and open space zones category** Dark green = Environmental management and conservation. Light green = Open space. Yellow = Community facilities. Aqua = Sport and recreation. In the **Residential zones category** Light pink = Low density residential. Dark pink = Medium density residential. In the **Centre zones category** Orange = Mixed use. White is the road network and includes Petersen Creek below Hayles Avenue and the lower section of Alma Creek. Notations on the map are: MIV = Magnetic Island village, MIMD = Magnetic Island medium density and AC = Arcadia Central (from Precinct and Sub Precinct Legend).

City Plan Part 6 Zones provides detail and explanations about zone categories, precincts and zone codes including:

- the purpose of the code;
- the overall outcomes that achieve the purpose of the code;
- the performance outcomes that achieve the overall outcomes and the purpose of the code;
- the acceptable outcomes that achieve the performance and overall outcomes and the purpose of the code; and
- the performance and acceptable outcomes for the precinct.

Extracts from Part 6 Zones (City Plan 2014) relevant to Arcadia are included in the text box below

6.2 Residential zones category
6.2.1 Low density residential zone code
6.2.1.2 Purpose
 (3) The purpose of the zone will be achieved through the following overall outcomes:

(j) the natural bushland setting and village character of the northern beaches and Magnetic Island townships are maintained. Tourism accommodation in these communities is of a house compatible scale. (p.6-3)

Table 6.2.1.3 Self-assessable and assessable development (Part)

PO18 Tourist accommodation occurs only within the townships of Paluma, Balgal Beach, Toomulla, Toolakea and Saunders Beach and the Magnetic Island townships, and is compatible with the village character of these communities. (p.6-11)

6.2.2 Medium density residential zone code

Magnetic Island medium density precinct:

- a) the precinct allows for the growth of short term accommodation which minimises visual impact on the local natural setting, whilst providing opportunity for new investment in tourism;
- b) buildings within the precinct are low rise (up to 2 storeys in building height) and are located to capitalise on views and beachfront settings;
- c) building scale and massing limits the impact on the natural character of Magnetic Island when viewed from the ocean and foreshore; and
- d) new buildings are in a design style that builds local character by articulation of individual units, incorporating extensive planting and climatically responsive design elements.

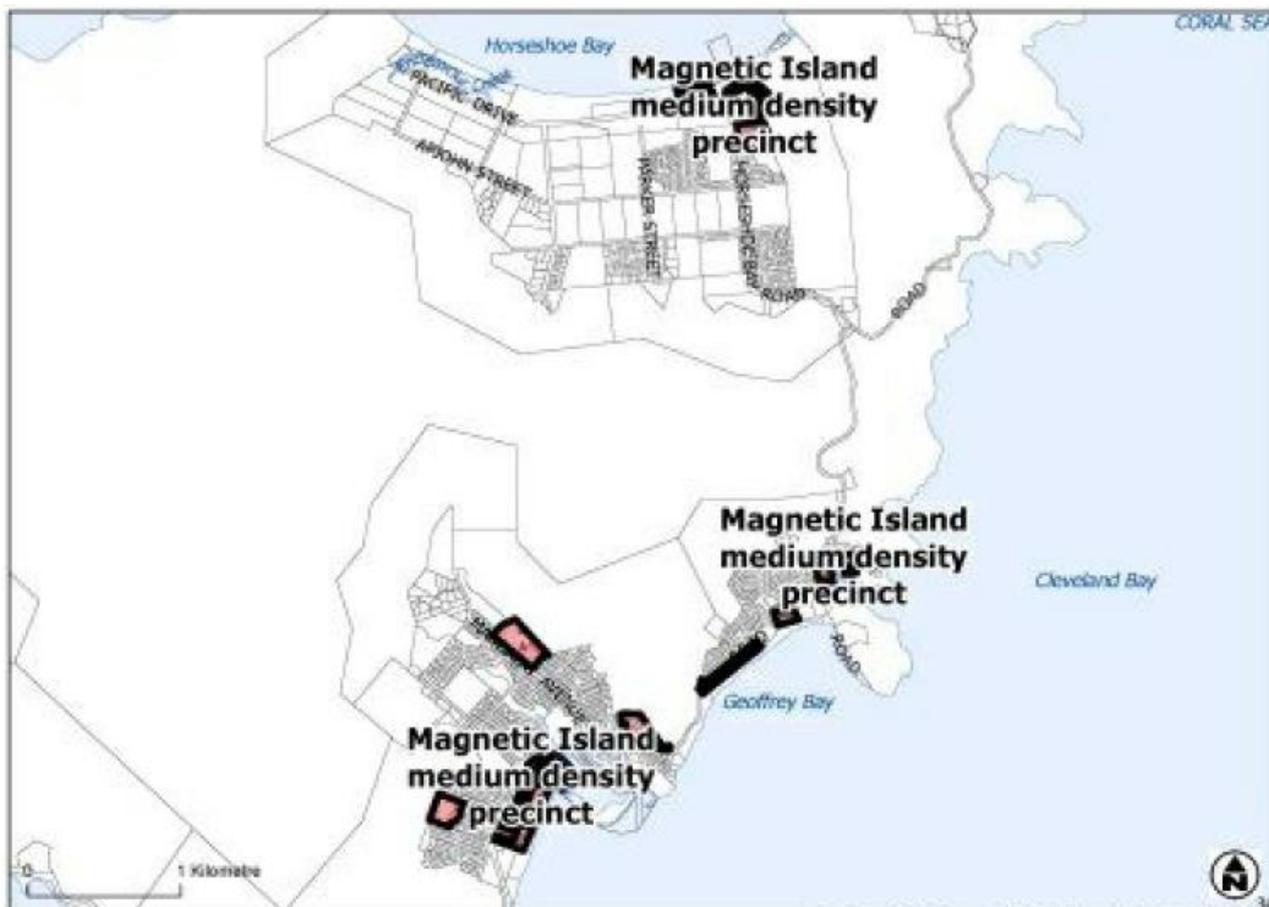


Figure 6.20 Magnetic Island medium density precinct

(p.6-30)

Table 6.2.2.3(a) Self assessable and assessable development (Part)

PO75 Building design and massing is consistent with the low density scale of the locality and articulates individual dwellings.

AO75 Building height does not exceed 2 storeys and is predominately in the form of single, single unit or multiple pavilions. Figure 6.37 – Magnetic Island indicative built form outcomes illustrates.

PO76 Design and articulation of buildings contribute to the creation of the local tropical character through:

- a) use of tropical building design typologies;
- b) natural setting of buildings within the landscape; and
- c) maximising views to the bay.

Figure 6.38 – Examples of the desired tropical building design typologies. (p.6-61)

6.3.7 Mixed use zone code

Magnetic Island villages precinct:

- a) development within this precinct supports the consolidation of retail, business, and service industry activities in dedicated activity nodes for residents and visitors to the various townships around Magnetic Island; and
- b) new buildings and streetscape treatments are in a design style that builds local character by articulation of buildings, incorporating extensive planting and the use of a variety of materials and finishes.

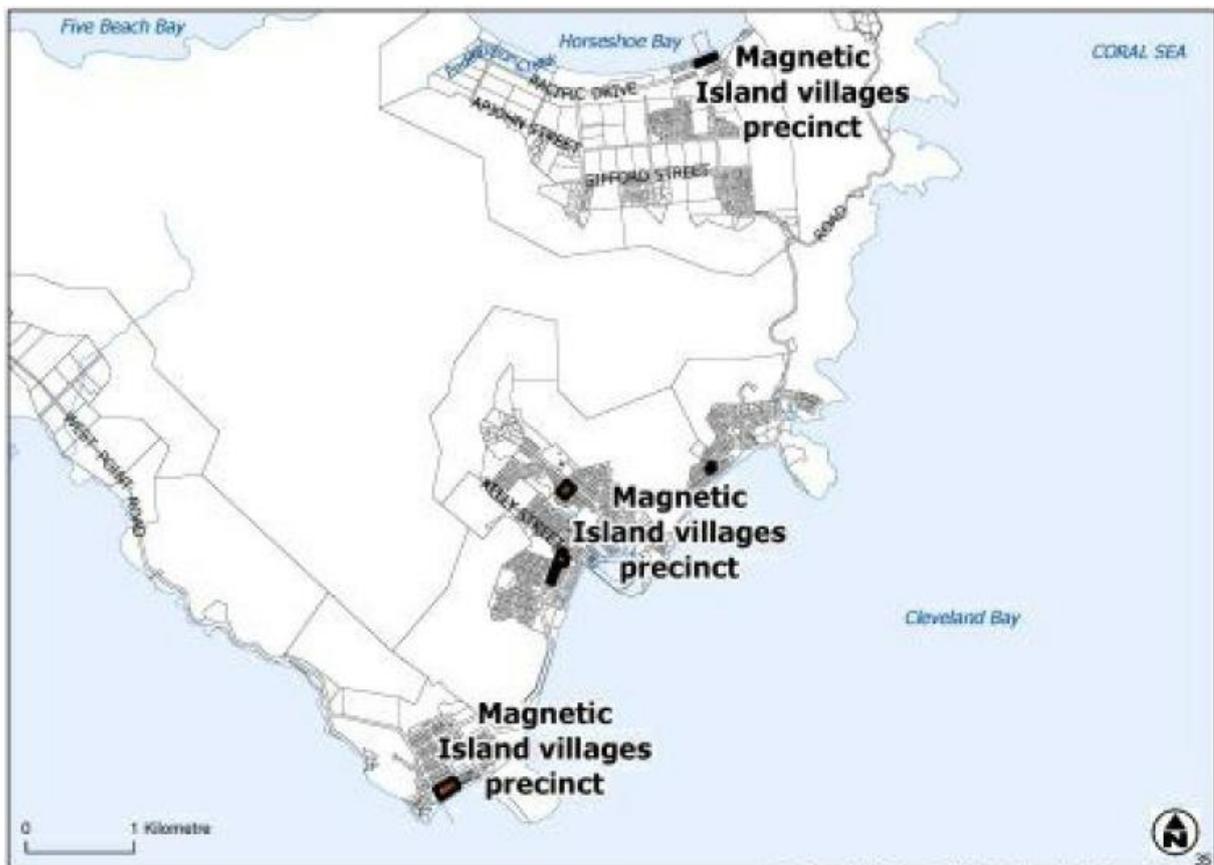


Figure 6.127 – Magnetic Island villages precinct

(p.6-241)

6.3 Centre zones category

Arcadia Central precinct:

- a) development facilitates the transformation of the precinct as a defined local centre of activity for Arcadia including uses such as shops, small offices, medium density residential and tourist accommodation;
- b) development creates a strong relationship with Marine Parade and Armand Way, by sleeving the precinct with buildings that are oriented to the street and screening car parking areas behind;
- c) development incorporates central community space with road frontage, located opposite the beach. Pedestrian connections are provided to surrounding uses such as the restaurants and cafes;
- d) buildings within the precinct are low medium rise (up to 4 storeys in building height) and the scale and massing of buildings limits the impact on the natural character of Magnetic Island; and

- e) new buildings and streetscape treatments are in a design style that builds local character by articulation of buildings, incorporating extensive planting and use of a variety of materials and finishes.



Figure 6.132 – Arcadia Central precinct

(p.6-246)

**Table 6.3.7.3—Self assessable and assessable development (Part)
Magnetic Island villages precinct**

PO21 Convenient and legible connections are provided for pedestrians and cyclists to the precinct, particularly having regard to linkages to the bay foreshore, residential areas in the community and the open space network.

Arcadia Central precinct

PO26 Development supports the creation of a new community node for Arcadia in accordance with Figure 6.141 — Arcadia Central precinct concept plan. (p.6-259)

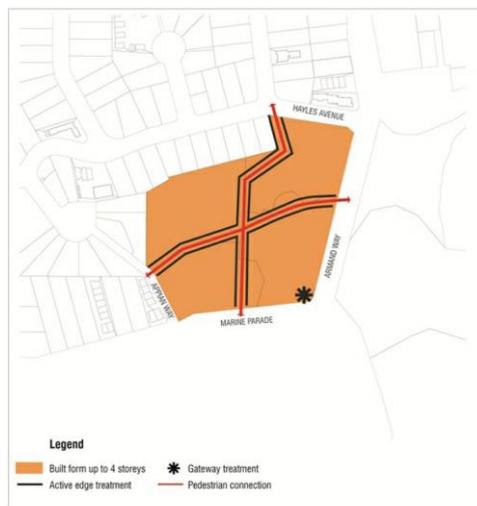


Figure 6.141 – Arcadia Central precinct concept plan

(p.6-261)

6.4 Community facilities and open space zone category

6.4.1 Sport and recreation zone code (p.6-227)

6.4.2 Open Space zone code (p.6-286)

6.4.2 Community Facilities zone code (p.6-292)

6.4.4 Environmental management and conservation zone code (p.6-299)

Note: PO is performance outcome and AO is acceptable outcome. Acceptable outcomes are not nominated for all performance outcomes.

1.5.1 Community planning

While City Plan is the most significant legislation based local planning instrument Townsville City Council acknowledges the significance of relevant planning and consultation done by others in and with the Magnetic Island community. Some of the key community planning documents and other reference material that should be considered when developing projects and preparing detailed action plans are listed in Appendix A.

One community planning document of particular relevance is *Towards 2020: The Magnetic Island Community Plan 2013-2020* (MICDA 2013) (the Community Plan).

 <p>Towards 2020 The Magnetic Island Community Plan 2013-2020</p> 	<p>"In 2001, the community of Magnetic Island through the leadership of the Magnetic Island Community and Commerce Association Inc (MICCA now MICDA) and the Department of State Development formulated 'A Community and Business Development Action Plan' for the community of Magnetic Island.</p> <p>Over the subsequent decade, many of the recommended actions of that roadmap were implemented and it validated many funding submissions. Eleven years on, the Magnetic Island Community Development Association (MICDA), with support from the Solar City Project decided to revisit the 2001 Plan and formulate a 2013 – 2020 Plan as a new roadmap." From the Preamble (p.5)</p>
--	---

Sections of the Community Plan that are relevant to Geoffrey Bay and Alma Bay catchment management are noted in the text box below.

2. Strategic Context

2.2 Community Assets and Capacities

People Assets (pp.6-7)

Location Advantages (p.7)

Environmental Assets (p.7)

2.3 Community Issues and Challenges

(all, pp.8-10) and especially:

Environmental Factors

- Wildlife loss – less curlews, road kill, dead turtles;
- Limited commitment to recycling;
- Completion and windup of the Solar City Project;
- Lack of environmental controls for lowlands;
- 27 species of plants and animals recorded on the Island are listed as 'endangered, rare or vulnerable'.

3. Our Community Vision Statement

"Our vision for Magnetic Island is a vibrant, inclusive and engaged community, which celebrates its unique

Island and village character, lifestyle, environment and diversity, and provides its residents with adequate income, employment and lifestyle opportunities.” (p.10)

4. Our Community Guiding Principles (pp.11-12)

5. Our Community Strategic Objectives (all, pp.12-14) and especially:

Pillar 4: OUR ENVIRONMENT
A community that sustains its natural and built environment.

Community Strategic Objectives:

- 4.1 Preserve and enhance our natural environment ensuring it remains sustainable, healthy and clean;
- 4.2 Focus on the enhancement of local flora, especially that which supports native fauna;
- 4.3 Preserve and maintain our significant heritage buildings and landmarks;
- 4.4 Promote enjoyment of the natural environment by maintaining, enhancing and extending the bush-walking network. (p.14)

6. Our Key Community Strategies, Priorities and Actions (pp.15-25)

Recommended Action 8: Enhancement of Magnetic Island’s Natural Assets

Key Steps

- 1. Collect together all current audit documentation and undertake gap analysis;
- 2. Develop an enhancement strategy;
- 3. Identify and attract necessary resources. (pp.19-20)

Recommended Action 9: MI Lowlands Natural Areas Conservation Strategy

Lowland natural areas and regrowth are important for wildlife, traditional owners, residents and tourists but poorly protected. We need an action plan to protect and restore them

Key Steps

- 1. Prepare project brief;
- 2. Collate existing resources;
- 3. Map and describe lowland natural areas and regrowth;
- 4. Identify priority areas for protection and restoration;
- 5. Identify mechanisms for protection and restoration;
- 6. Prepare protection and restoration plans for priority areas;
- 7. Implement priority actions with partners. (pp.20-21)

Recommended Actions 8 and 9 are particularly relevant and have been incorporated in the revised list of Geoffrey Bay and Alma Bay catchment management strategies.

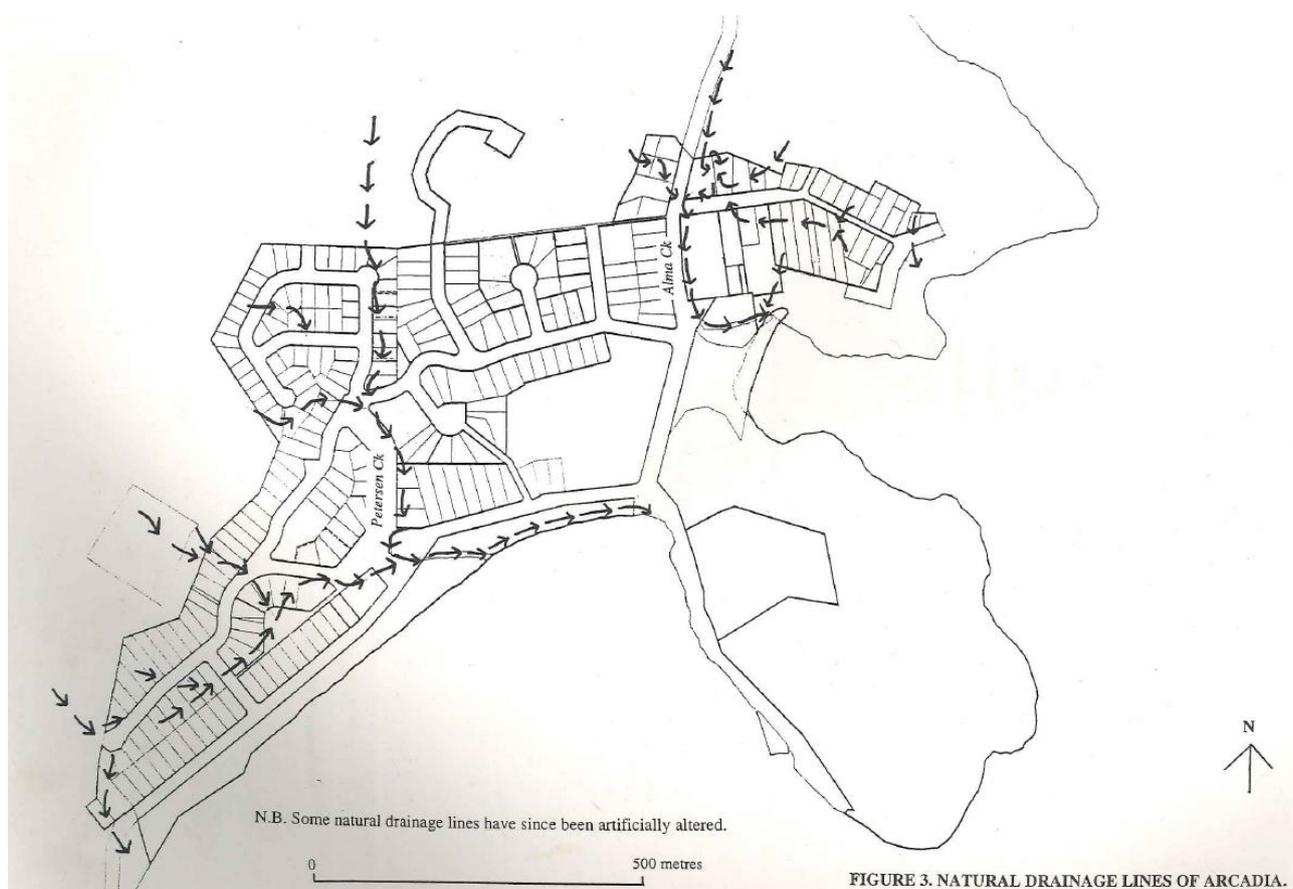
2. Environmental Features

2.1 Catchments and Waterways

The combined catchment area of Geoffrey Bay and Alma Bay is approximately 290 hectares. The catchments are inclusive of Arcadia which is located on a narrow coastal plain surrounded by the granitic hills of Magnetic Island. Bremner Point, a rocky peninsula, separates the larger Geoffrey Bay catchment from Alma Bay.

Petersen Creek is the main waterway flowing to Geoffrey Bay while Alma Creek is the only significant waterway in the Alma Bay catchment. The location of Petersen Creek is inaccurately represented on the state mapping as is Alma Creek and the coastline of Magnetic Island (see Figure 1-1). A more realistic representation of the location of the creeks is provided in Figure 2-1.

Figure 2-1 Approximate Creek Locations



Note: Map source is The Vegetation of Arcadia, Magnetic Island (O'Malley 1997).

Petersen Creek and Alma Creek are significant environmental features of Arcadia and are locally recognised as important linkages traversing the urban landscape and connecting the National Park to the foreshore and waters of the Great Barrier Reef WHA.

2.2 Landscape Features

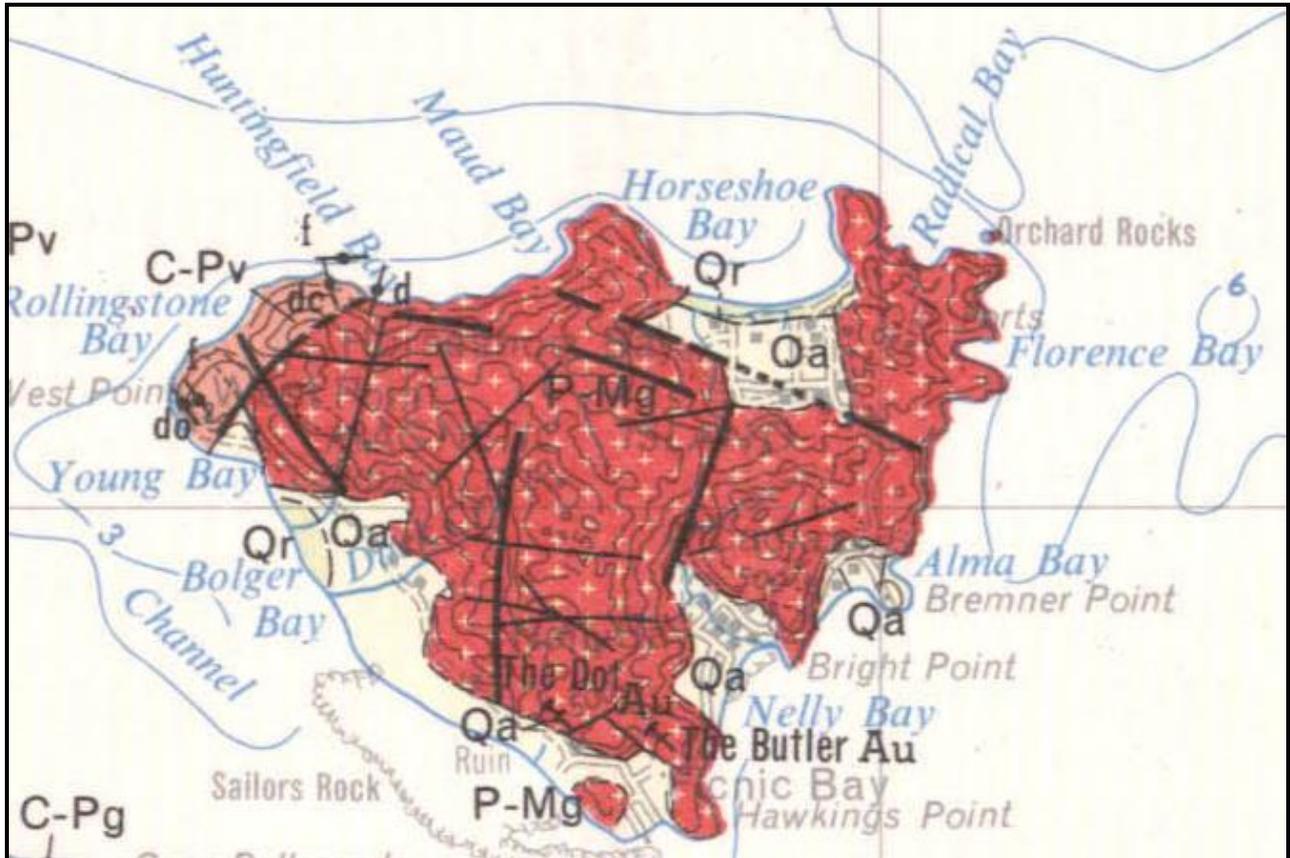
2.2.1 Geology

The geology of Magnetic Island is the major determinant of its distinctive landscape features with the island consisting almost entirely of granite hills with Mt Cook being the tallest peak at 497 metres. The rocks of Magnetic Island consist mainly of Permian to Mesozoic biotite granite and adamellite with minor quartz monzonite, quartz syenite, microgranite and hornblende-quartz gabbro (Townsville Sheet SE 55-14, Australia 1:250,000 Geological Series 1968, Bureau of Mineral Resources, Geology and Geophysics – Department of National Development) (P-Mg on

Figure 2-2). Mt Stuart consists of the same parent rock material as Magnetic Island and both features would have been formed at roughly the same time (give or take a few million years).

In addition to the granite formation described above Magnetic Island has a slightly older rock formation (Carboniferous to Permian) at West Point consisting of intermediate and acid flows and pyroclastics (C-Pv on Figure 2-2). This formation is not present in the Geoffrey Bay and Alma Bay catchments.

Figure 2-2 Magnetic Island Geology



Note: Geological information obtained from Townsville Sheet SE 55-14, Australia 1:250,000 Geological Series 1968, Bureau of Mineral Resources, Geology and Geophysics – Department of National Development. In addition to intermediate and acid flows and pyroclastics C-Pv is described as having “rare conglomerate, sandstone, shale, siltstone and coal”.

Colluvial scree is present at the base of the granite hills at Arcadia with narrow coastal plains between the foot slopes and foreshore. The geology here is described as “Alluvium and colluvium” (Qa) (from the Quaternary period) and is present in both Alma Bay and Geoffrey Bay catchments with the Geoffrey Bay deposits being more extensive than Alma Bay.

Bremner Point is mistakenly mapped as Quaternary alluvium/colluvium (Qa) when it is in fact granite (P-Mg). An alternative (less complex) geological map can be found in Sandercoe (1990) and that map is reproduced in Jackes (2010).

2.2.2 Headlands

The granite headlands that create Alma Bay and Geoffrey Bay are significant environmental features with Bright Point separating Nelly Bay catchment from Geoffrey Bay catchment and Devils Arch (see Figure 2-3) separating Alma Bay from Whitfield Cove to the north. As mentioned Bremner Point (see Figure 2-4 and Figure 2-5) separates Alma Bay from Geoffrey Bay and is a prominent feature of both catchments. Most of Bremner Point is included in Magnetic Island National Park, albeit it isolated from the main body of the park.

Figure 2-3 Alma Bay Beach View to Devils Arch



Figure 2-4 Geoffrey Bay and Bremner Point



Figure 2-5 Looking South to Alma Bay and Bremner Point



2.3 Vegetation and Regional Ecosystems

Regional Ecosystems (REs) are mapped and described under the *Vegetation Management Act 1999* and provide an indication of the vegetation communities present in Queensland. The REs in Geoffrey Bay and Alma Bay catchments, as mapped by the Department of Natural Resources and Mines (DNRM) (Queensland Herbarium), are shown in Figure 2-6 and described in Table 2-1.

2.3.1 Regional Ecosystem numbering and accuracy

REs have a three part numbering system with the first part/number indicating the bioregion, the second the land zone and the third being the vegetation community.

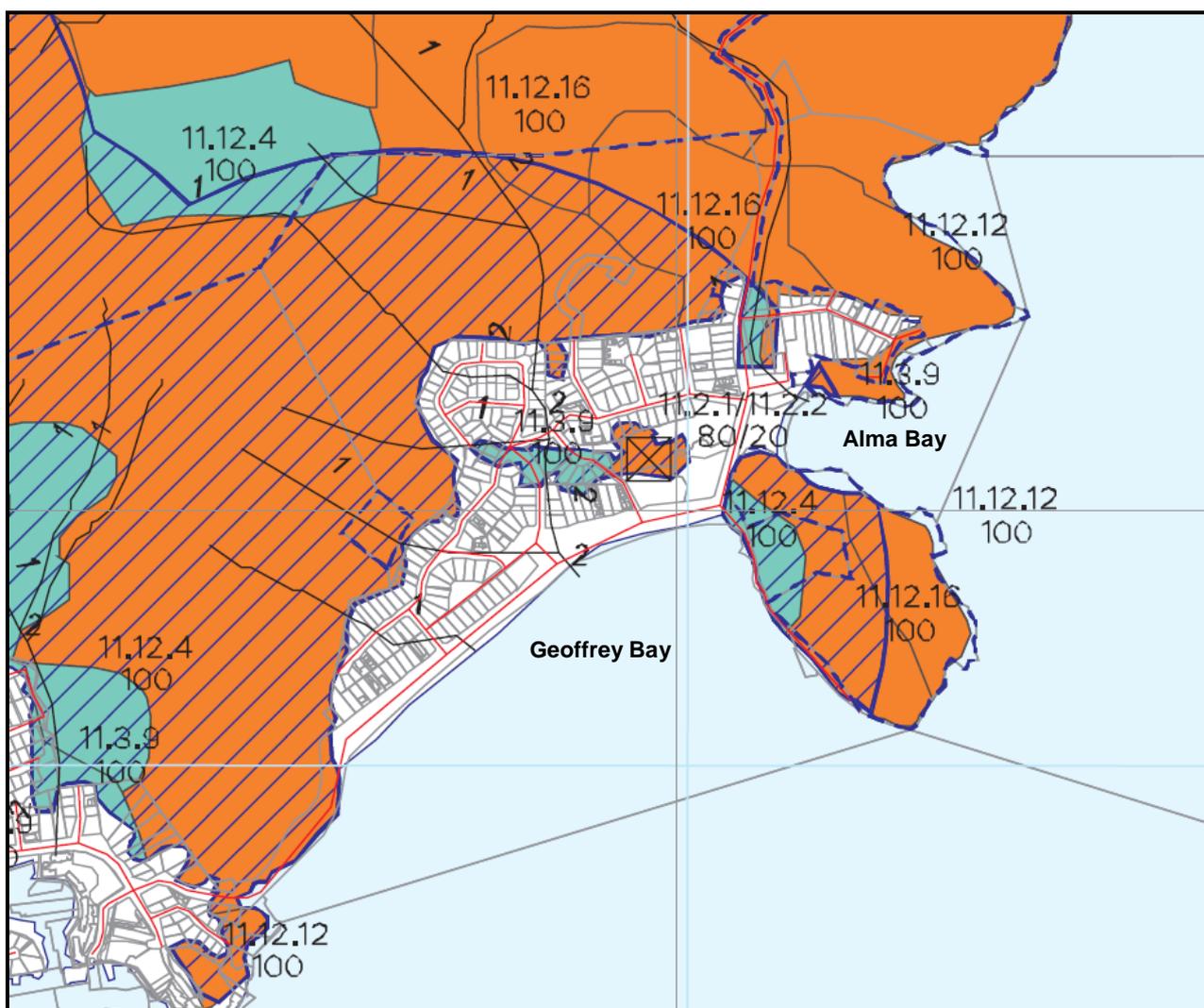
The REs in the catchments are within the Brigalow Belt (North) bioregion (indicated by 11). Three land zones are indicated as being present i.e. 2 is coastal dunes, 3 is alluvial and 12 is acid volcanics e.g. granite. The lowland vegetation communities (land zones 2 and 3) are described as

woodlands and/or strand vegetation while the upland communities (land zone 12) vary from closed forest to open shrub land.

Given the scale of the RE mapping (1:100,000) it is not overly accurate in some instances including in the Geoffrey Bay and Alma Bay catchments. Of most interest are the lowland vegetation communities which have been extensively cleared and are under the most threat from urban impacts.

Most notably in Arcadia the RE mapped as 11.3.9 appears to be incorrect and REs 11.2.1 and 11.2.2 also need to be verified. The lowland vegetation was observed during site visits and is described in section 3.

Figure 2-6 Regional Ecosystems



Note: Orange indicates the Regional Ecosystems (RE) is 'Of Concern' while green indicates 'Least Concern' REs. The blue lines/stripes indicate 'Essential Habitat'.

Table 2-1 Regional Ecosystem

Regional Ecosystem and Description	VM Status
11.2.1 (Sparse) Open woodland of <i>Corymbia tessellaris</i> , <i>C. clarksoniana</i> and <i>Melaleuca viridiflora</i> (which may be locally dominant). Other associated species include <i>Acacia crassicarpa</i> , <i>Pandanus spiralis</i> and <i>Acacia spp.</i> The ground layer is generally grassy and includes species such as <i>Heteropogon contortus</i> and various forbs.	Of Concern

<p>Occurs on flat Quaternary coastal dunes.</p>	
<p>11.2.2 (Mid dense) <i>Ipomoea pes-caprae</i> and <i>Spinifex sericeus</i> grassland +/- <i>Casuarina equisetifolia</i>. <i>Casuarina equisetifolia</i> varies from clumps of open-forest, to woodland, to isolated trees. Other scattered trees or shrubs may be present including <i>Pandanus tectorius</i>, <i>Hibiscus tiliaceus</i>, <i>Terminalia muelleri</i>, <i>Alphitonia excelsa</i>, <i>Caesalpinia bonduc</i> and <i>Cupaniopsis anacardioides</i>. The ground layer is quite dense, and includes <i>Ipomoea pes-caprae</i>, <i>Cyperus pedunculatus</i>, <i>Bulbostylis barbata</i>, <i>Aphyllodium biarticulatum</i> (prostrate form), and <i>Spinifex sericeus</i>. Several species are prostrate, but the only climbing vine is <i>Cassytha pubescens</i>. Occurs on Quaternary coastal fore dunes and beaches.</p> <p>Major vegetation communities include: 11.2.2a: Grassland with <i>Heteropogon triticeus</i>, various other grasses and herbaceous spp. Includes narrow prostrate strandline vegetation.</p> <p>11.2.2b: Complex of vegetation on Quaternary coastal dunes and beaches. Characterised by <i>Casuarina equisetifolia</i>, which varies in structure from clumps of open-forest, to woodland, to isolated trees. Other scattered trees may be present including <i>Pandanus tectorius</i>, <i>Hibiscus tiliaceus</i>, <i>Terminalia muelleri</i>, <i>Alphitonia excelsa</i>, and <i>Cupaniopsis anacardioides</i>. There may be a shrublayer of <i>Clerodendrum spp.</i>, <i>Caesalpinia bonduc</i>, <i>Vitex trifolia</i> and/or <i>Scaevola taccada</i>. The ground layer usually includes <i>Eragrostis interrupta</i>, <i>Thuarea involuta</i>, <i>Eriachne triodioides</i>, <i>Spinifex sericeus</i>, <i>Ipomoea pes-caprae</i>, <i>Canavalia rosea</i> and <i>Cyperus pedunculatus</i>. There is usually a distinct zonation along the strandline. On gentle to moderately sloping foredunes and immediate swales, usually within 200 m of the high tide mark. Occurs in environments subject to salt-laden winds. Associated with exposed and loose aeolian (wind-transported) pale siliceous sands.</p>	<p>Of Concern</p>
<p>11.3.9 (Sparse) <i>Eucalyptus platyphylla</i> +/- <i>Corymbia clarksoniana</i> +/- <i>C. intermedia</i> +/- <i>E. tereticornis</i> +/- <i>Lophostemon suaveolens</i> woodland. This association has a grassy groundlayer, with species including <i>Heteropogon contortus</i>, <i>Sorghum nitidum</i>, <i>Chrysopogon fallax</i>, <i>Alloteropsis semialata</i> and <i>Aristida holathera</i>, or with heavier grazing short grasses such as <i>Chloris spp.</i>, <i>Fimbristylis dichotoma</i>, <i>Cyperus spp.</i>, <i>Schizachyrium fragile</i> and <i>Ectrosia leporina</i>. Occurs on Cainozoic alluvial plains, on sandy surface with clay subsoil. Usually with "wet" influence, either closely adjacent to major river, or undergoes inundation relatively frequently. May occur in wet depressions.</p> <p>Major vegetation communities include: 11.3.9a: <i>Eucalyptus acmenoides</i> +/- <i>E. drepanophylla</i>, +/- <i>E. platyphylla</i> woodland</p>	<p>Least Concern</p>
<p>11.12.4 (Dense) <i>Araucaria cunninghamii</i> is a common emergent from the general canopy layer with is 15-28 metres high. Canopy species include <i>Paraserianthes toona</i>, <i>Ficus virens</i>, <i>Canarium australicum</i>, <i>Alstonia scholaris</i>, <i>Pouteria pohlmaniana</i>, <i>Cleistanthus dallachyanus</i> and <i>Backhousia citriodora</i>. Common shrub or understory species are <i>Mackinlaya macrosciadea</i>, <i>Baloghia inophylla</i>, <i>Polyalthia nitidissima</i>, <i>Bosistoa brassii</i> and <i>Aglaia sapindina</i>. The sparse ground layer includes species such as <i>Scleria sphacelata</i> and <i>Adiantum hispidulum</i>. Vines and epiphytes are common and include <i>Microsorium punctatum</i>, <i>Cissus oblonga</i>, <i>Tetrastigma thorsborneorum</i>, <i>Smilax australis</i> and <i>Pisonia aculeata</i>. <i>Eucalyptus moluccana</i> often associated with lower slopes on sandy sites. Occurs on low hills, ranges and boulder strewn slopes formed from Mesozoic to Proterozoic igneous rocks including granite.</p> <p>Major vegetation communities include:</p>	<p>Least Concern</p>

<p>11.12.4a: Semi-evergreen vine thicket with open patches of <i>Acacia fasciculifera</i>, <i>Archidendropsis thozetiana</i>, <i>Pleiogynium timorense</i> and various other species.</p>	
<p>11.12.12 (Sparse) <i>Araucaria cunninghamii</i> woodland or open-forest. Occurs on coastal hills often with boulder strewn slopes that are formed on Mesozoic to Proterozoic igneous rocks.</p>	Of Concern
<p>11.12.16 (Sparse) Mixed low woodland to shrubland. Canopy species include <i>Lophostemon grandiflorus</i>, <i>Canarium australianum</i> <i>Pleiogynium timorense</i>, <i>Acacia leptostachya</i>, <i>A spirorbis subsp. solandri</i>, <i>Cochlospermum gillivraei</i> +/- <i>Eucalyptus drepanophylla</i> +/- <i>Eucalyptus portuensis</i> +/- <i>Corymbia tessellaris</i> +/- 'C'. <i>dallachiana</i> and semi-evergreen vine thicket species. Ground layer is often dominated by <i>Triodia stenostachya</i>. Occurs on coastal ranges formed on Mesozoic to Proterozoic igneous rocks.</p> <p>Major vegetation communities include: 11.12.16a: <i>Acacia julifera</i> shrubland +/- <i>Eucalyptus drepanophylla</i>.</p> <p>11.12.16d: Grassland with scattered shrubs or trees or very open shrubland / low woodland with <i>Triodia stenostachya</i>, <i>Heteropogon contortus</i>, <i>H. triticeus</i>, <i>Cymbopogon bombycinus</i>, <i>C. ambiguus</i> +/- <i>Cochlospermum gillivraei</i> +/- <i>Araucaria cunninghamii</i> +/- <i>Corymbia dallachiana</i> +/- <i>C. tessellaris</i></p> <p>11.12.16x1: Grassland with scattered shrubs to low very open scrub. Various grasses may be dominate: <i>Heteropogon contortus</i>, <i>H. triticeus</i>, <i>Themeda triandra</i>, <i>Sarga plumosum</i>, <i>Cymbopogon bombycinus</i>, <i>C. ambiguus</i>, <i>Eriachne mucronata</i> and <i>Triodia stenostachya</i>. Occurs on rhyolite or granite hills, headlands and islands.</p>	Of Concern

Note: Descriptions form Regional Ecosystem Description Database_v6_0b_2009 (REDD).

2.3.2 Essential habitat

RE mapping includes an indication of Essential Habitat for rare and threatened species. Essential Habitat (EH) in the catchments (see blue hatched areas on Figure 2-6) is for the Common Death Adder (*Acanthophis antarcticus*), which has a Rare status under Queensland's *Nature Conservation Act 1992* (NCA).

Essential habitat for this snake is described as "under deep leaf litter or low foliage in shrubland (heathland), woodland and tall forest, especially undisturbed eucalypt forest." and includes REs: 11.2.1, 11.2.2, 11.3.9, 11.12.12, 11.12.16, 11.12.17, 11.12.18, 11.12.19, 11.12.20, 11.12.21.

3. Catchment Issues and Condition

3.1 Urban Impacts

Issues and catchment condition were observed during site visits in 2013 and derived from information provided by Magnetic Island community members at a community meeting (see Appendix B and C).

In general terms the upland areas are in good condition while the lowland areas vary between highly disturbed and relatively intact depending on tenure and management regimes. The main environmental impact on catchment condition is a result of urban settlement and associated infrastructure.

3.1.1 Altered waterways

The original drainage lines and creeks have been partly altered as a result of the urbanisation of Arcadia with the current drainage network intersecting both public and private land (see Figure 2-1). Natural overland flow paths have been altered and smaller creek tributaries have been redirected in the catchment of both bays and especially in lowland areas of Geoffrey Bay e.g. Geoffrey Bay scrub.

The road network is mostly uncurbed with stormwater runoff free to move overland or along roadways which act as stormwater drainage lines. Pipes have been installed to allow stormwater to pass under some roads and in particular under Marine Parade (Arcadia Road), Hayles Avenue, McCabe Court, Olympus Crescent and Alma Bay.

Figure 3-1 Petersen Creek 'Mouth'



The downstream sections of Alma Creek and Petersen Creek have been significantly altered by engineering works with the outflow of Petersen Creek constricted by pipes (see Figure 3-1). While low to medium flow volumes are able to escape from Petersen Creek relatively unhindered higher volume flows are backed up behind Marine Parade. The situation is exacerbated by the damming effect resulting from the retention of debris by the pipes.

Figure 3-2 Petersen Creek Upstream of Marine Parade Pipes



The diminished flushing of the creek also results in a build-up of sediment/sand which is then stabilised by salt water tolerant vegetation exacerbating the restriction at the creek mouth caused by road infrastructure (see Figure 3-2 and Figure 3-3). The diminished flushing of creeks also reduces the extent of intertidal habitat and potential for fish nursery areas.

Figure 3-3 Petersen Creek Drainage Obstruction



The mouth of Alma Creek has been channelised with concrete walls (see Figure 3-4). Outflow is further restricted by a foot bridge at the northern end of Alma Bay beach (see Figure 3-5). The pipes under Alma Creek bridge were removed to improve flows following community representation to Council.

Figure 3-4 Alma Creek Upstream of the Footbridge



Figure 3-5 Alma Creek Footbridge



3.1.2 Erosion

Erosion is a natural, ongoing process associated with weathering and sedimentation. In general the rate of erosion is kept in check by vegetation and groundcover. Apart from the ongoing background weathering and erosion of the Magnetic Island landscape it appears that the Geoffrey Bay and Alma Bay catchments are 'relatively' stable. The exception occurs in urban areas where the land surface is disturbed. The most notable erosion during the 2013 site visits was in the vicinity of the recently constructed Gabul Way downslope of Arcadia Road (see Figure 3-6). Given the nature of the soils in this catchment any construction work on gradients greater than 3% could result in erosion and sediment movement, as with the Gabul Way site.

Figure 3-6 Gabul Way Erosion



3.1.3 Weed invasion

Arguably the most significant catchment management issue across the Geoffrey Bay and Alma Bay catchments is the prevalence of non-native plants species (weeds) in the 'natural' environment. The weed invasion is predominantly a result of the 'escape' of exotic species from urban gardens and the subsequent proliferation in the natural landscape.

While weed invasion is mostly associated with the interface between urban and non-urban areas there are also outbreaks in natural areas as a result of the relocation of seed and vegetation fragments by animals, wind and water. Control of weeds in the urban interface including; waterways, foreshore and isolated vegetation patches, is possible however eradication of weeds from the island is highly unlikely without radical changes to policy and community attitudes i.e. invasive non-native species banned from the island.

A reconnaissance of the Arcadia catchment provided a snapshot of weed species in the landscape with Lantana and Snakeweed being prominent in the mid to upper reaches. The lowlands and foot-slopes i.e. residential areas, have a wide variety of weeds species many of which are common garden plants grown for their hardiness in the dry tropical North Queensland environment. A list of the weeds observed during site visits to the Geoffrey and Alma Bays catchment is provided in Table 3-1. The list is by no means comprehensive and does not include information collected by community members and groups over time.

Table 3-1 Geoffrey and Alma Bay Environmental Weeds

Common Name	Scientific name	Common Name	Scientific name
Sisal Hemp	<i>Agave sisalana</i>	Stinking Passion Flower	<i>Passiflora foetida</i>
Calico plant, Joy weed	<i>Alternanthera dentata</i>	Guava	<i>Psidium guajava</i>
Lessor Joy Weed	<i>Alternanthera denticulata</i>	Succulent purple	<i>Rhoeo spathaceae</i>
Mexican Coral Vine	<i>Antigonon leptopus</i>	Red Natal Grass	<i>Rhynchelytrum repens</i>
Para Grass	<i>Brachiaria mutica</i>	Mother-in-law Tongue	<i>Sansevieria trifasciata</i>
Mother of Millions	<i>Bryophyllum delagoense</i>	Flannel Weed	<i>Sida cordifolia</i>
Yellow Oleander	<i>Cascabela thevetiana</i>	Common Sida	<i>Sida rhombifolia</i>
Pink Periwinkle	<i>Catharanthus roseus</i>	Devils Fig	<i>Solanum torvum</i>
Mossman River Grass	<i>Cenchrus echinatus</i>	Singapore daisy	<i>Sphagneticola trilobata</i>
Rhodes Grass	<i>Chloris sp</i>	Snake Weed (Blue)	<i>Stachytarpheta jamaicensis</i>
Coconut Palm	<i>Cocos nucifera</i>	Townsville Lucerne	<i>Stylosanthes humilis</i>
Streaked Rattlepod	<i>Crotalaria pallida</i>	Cinderella Weed	<i>Synedrella nodiflora</i>
Poinciana	<i>Delonix regia</i>	Yellow Bells	<i>Tecoma stans</i>
Hyptis, Mintweed	<i>Hyptis suaveolens</i>	Fragrant Thunbergia	<i>Thunbergia fragrans</i>
Knobweed	<i>Hyptis capitata</i>	Blue Thunbergia	<i>Thunbergia grandiflora</i>
Lantana	<i>Lantana camara</i>	Laurel clock vine	<i>Thunbergia laurifolia</i>
Siratro	<i>Macroptilium atropurpureum</i>	Goats Head Burr	<i>Tribulus terrestris</i>
Guinea Grass	<i>Megathyrsus maximus</i>	Tridax Daisy	<i>Tridax procumbens</i>

Note: This is not a complete list of the exotic species present in the catchment. Additionally some species may be naturalised in Australia and not considered to be weeds e.g. Coconuts and Goats Head Burr. An additional weed list compiled through community projects is included in Appendix D.

3.1.4 Non-native animals

Pigs were an issue on Magnetic Island in the past however there was an effort to eradicate them and the effort seems to have been effective as there have been no reports of feral pigs on the island in recent years. The main issue with pigs was disturbance of the landscape in the mid and upper catchment resulting in accelerated erosion.

While not easily quantifiable domestic pets (cats and dogs) are known to have impacts on native wildlife through predation and displacement. In particular domestic cats that become feral are difficult to control given the nature of the Magnetic Island landscape, including opportunities to shelter in the rocky hills. Domestic animals are unlikely to have a direct impact on physical catchment condition although impacts on biodiversity are possible. There do not appear to be any studies that define the extent of the impact of domestic animals on native fauna on Magnetic Island so impacts on biodiversity are also unknown.

An issue raised at the public meeting (see Appendix C) was the introduction of Agile Wallabies to the island displacing and/or competing with the local rock wallabies for resources. While Agile Wallabies are native animals they are not 'native' to Magnetic Island and may be considered to be a pest animal due to their disruption to Magnetic Island's established ecosystem especially in the vicinity of the lowlands and foot-slopes.

3.1.5 Coastal Processes

Coastal processes are a climate driven natural phenomenon and are therefore susceptible to climate variability. At present the Geoffrey Bay and Alma Bay foreshores do not appear to be adversely impacted by climate change as a result of the rise in sea level around Magnetic Island over the last 100 years (estimated at between 12 and 22 centimetres based on IPCC figures of 1.7 ± 0.5 mm per year). Recent records of sea level rise measured at Cape Ferguson near Townsville show an average increase of 2.9mm every year between 1991 and 2006, an acceleration over the previous average of 1.2mm per year (based on measurements from 1959).

This is only a snapshot view and the cumulative impacts of climate change and sea level rise are difficult to predict. We can predict a higher probability of erosion pressure on foreshores over time as a cumulative impact of sea level rise and an increase in the frequency and/or severity of storms.

Geoffrey Bay and Alma Bay foreshores were relatively unaffected by Cyclone Yasi compared to the more exposed and susceptible bays of Magnetic Island e.g. Horseshoe Bay and Nelly Bay. This is due to both the orientation of the bays and the buffering effect of the headlands, which will provide some level of protection into the future depending on the severity and direction of storms. It is noted that Cyclone Althea had a significant impact on Geoffrey Bay and Alma Bay and that the observation about Cyclone Yasi does not represent the long term history of the area or the volatile nature of coastal processes in the erosion prone zones.

Figure 3-7 Geoffrey Bay Foreshore Stabilising Strand Vegetation



Figure 3-8 Geoffrey Bay Foreshore Casuarina Buffer



While not confirmed through long term scientific monitoring it appears from personal observation and anecdotal evidence that one of the main land based influences on coastal processes on the island results from human induced changes to creek and catchment hydrology. This in turn affects the natural movement of sand from waterways to the coast reducing the amount of material available for the subsequent building of coastal dunes. Dunes then provide a buffer from storm weather for the landward areas. The larger the dune (i.e. larger volume of sand), the better the buffer.

After the initial formation, especially following storm weather that removes sand, the dunes are colonised by strand vegetation which in turn serves to hold sand in place and continue to build dunes with additional material provided by wave and wind action. Over time casuarinas and other beach front vegetation takes hold and provide an extra layer of protection. Maintaining native vegetation on the foreshore is the best protection mechanism for our coastal dunes. Geoffrey Bay provides a good example with formal parkland in poorer condition than areas that are colonised by native strand vegetation.

Without detailed studies it is difficult to determine the impact of sand movement on coastal processes created by the alterations to the flow of Geoffrey Bay and Alma Bay creeks. What we do know is that the natural flow paths and hydrological processes have been interrupted by human infrastructure to the detriment of the natural environment. We also know that appropriate management of foreshore areas will encourage dune building and provide ongoing protection against storm weather.

4. Catchment Strategies

4.1 Background

The draft catchment strategies (see Appendix D) were derived from the ideas suggested in the 2013 community meeting (see Appendix B and Appendix C) and the consideration of the following factors:

- The condition of the catchment;
- Environmental hazards and threats (issues/pressures);
- Past, current and planned actions;
- Land tenure;
- Relevant legislation;
- Community awareness and capacity;
- Resource availability; and
- Governance arrangements.

4.2 Catchment Management Strategies

Comments about the consultation draft document (see Appendix E) were considered and the draft strategies were amended to incorporate those comments (see comparison of draft and revised strategies in Appendix D).

The management action categories and associated actions have been revised to better address the issues identified by the Magnetic Island community and support a more coordinated approach to natural resource management in the Geoffrey and Alma Bays catchment and across Magnetic Island. It is recognised that there are significant interrelationships and overlap between management categories and activities e.g. habitat management and awareness/capacity building, which need to be considered to maximise resource use effectiveness when designing projects and programs. The revised strategies are listed in Table 4-1.

Table 4-1 Catchment Management Strategies

Number	Strategy
Coordination and governance	
1	Investigate possibilities for improved communication and engagement processes for natural resource management planning and project coordination utilising existing island networks and in particular to involve Council as a collaborative partner. Note: Constraints include volunteer commitment and meeting times i.e. nights and weekends vs Council office hours.
Community awareness and capacity	
2	Build on the body of existing knowledge and work to develop a 'Caring for Magnetic Island' (CMI) guide (for non-National Park (NP) areas) with generic text: <ul style="list-style-type: none"> • Acknowledging the island is in a World Heritage Area and the inherent values; • Identifying important natural areas and values; • Providing advice on how Magnetic Island can be managed so that the natural values are protected and not adversely impacted. Provide specific text on natural resource planning and management for separate / multiple audiences including: <ul style="list-style-type: none"> • Council, including town planners, roads, parks, beaches, stormwater and drainage, natural areas, post-cyclone clean-up crews, etc.; • Residents; • Visitors (domestic and international); • Magnetic Island active natural resource managers (this may be an acknowledgement

Geoffrey Bay and Alma Bay (Arcadia) Catchment Management Strategy

	<p>section and list of current projects and historic efforts).</p> <p>Note: The guide could also be re-designed as an online resource through: www.whatsonmagneticisland.com.au. A large body of knowledge/work can be found on this website that could be used to start this process. Also see MI Community Plan (MICDA 2013).</p>
3	<p>Develop a thematic communications campaign to accompany the Caring for Magnetic Island (CMI) guide to encourage organised and opportunistic removal of weeds from natural areas while helping to raise awareness of the role of urban gardens in weed propagation and spread.</p> <p>The campaign would be integrated with existing activities and utilise existing publications, networks and web presence.</p> <p>Note: See MI Community Plan (MICDA 2013) and other island material for ideas and people matters information when developing the campaign. Component parts of the campaign could include:</p> <ul style="list-style-type: none"> • Supporting the compilation of weed information and expansion of the existing website i.e. www.whatsonmagneticisland.com.au, to include a comprehensive weed information section; • Update and/or print Magnetic Island's worst weeds leaflet (~13 years old). The leaflet would be a part of the web weed information and/or included in the CMI guide; • Develop Magnetic Island thematic communications to add to Learnscapes page http://www.creektocoral.org/learnscapes/index.htm; • Friends of National Parks weed management workshop.
Habitat management	
4	<p>Develop an integrated habitat management strategy for Geoffrey and Alma Bay catchment either separately and/or as a sub component of the Caring for Magnetic Island (CMI) guide.</p> <p>Notes:</p> <ol style="list-style-type: none"> 1. Stage 1 collates existing information relating to habitat values and past and current natural resource and habitat management efforts in the Geoffrey and Alma Bay catchment and especially via the work of Geoffrey Bay Coastcare and Olympus Crescent Coastcare including draft management plans for various working sites. Also identify and describe the natural attributes of the catchment including; landforms, wetlands and waterways, flora and fauna, vegetation communities, significant species and areas, Traditional Owner values, etc. 2. Stage 2 identifies information gaps and investigates ways to fill the gaps e.g. fine scale habitat mapping. <p>This should be followed by identification of threats and opportunities and then strategies and actions to maintain the values can be developed.</p> <p>The strategy could be used as the 'documented' basis for ongoing monitoring, planning and prioritisation, maintenance and protection and potential expansion of rehabilitation works.</p> <p>The habitat management strategy would include a weed management strategy also linked to the CMI guide and generic information with specific application to Geoffrey and Alma Bay catchment through the collated mapping, weed list and existing community managed sites.</p> <p>The strategy and products could also be used as a base for local funding applications e.g. Geoffrey Bay Coastcare, and/or Magnetic Island scale.</p>
5	<p>Investigate the potential for a local Creekwatch program on the island utilising the existing network of people and groups involved in catchment management and waterway and foreshore rehabilitation.</p> <p>Note: Groups are already doing Creekwatch to some extent so this would provide a more consistent monitoring approach and could be integrated with existing and planned activities. It is another avenue for promoting rehabilitation efforts and supporting community</p>

Geoffrey Bay and Alma Bay (Arcadia) Catchment Management Strategy

	events e.g. facilitating waterway clean ups, while adding to the suite of actions that could attract future resources.
Foreshore management	
6	<p>Collate available information relevant to foreshore management in the Geoffrey Bay and Alma Bay catchment as a component of the Habitat Management Strategy (see 4). This is inclusive of Council management practices such as foreshore mowing and maintenance and sand extraction especially in relation to delivery of sand to beaches, dune building and habitat management e.g. Rainbow Bee-eaters and turtle nesting areas.</p> <p>Identify information gaps and implement necessary studies to determine the extent of foreshore management issues that need to be addressed and likely solutions.</p> <p>Note: Likely solutions could include:</p> <ul style="list-style-type: none"> • vehicle access management in foreshore parkland including maintenance vehicles e.g. slasher, to prevent damage to turtle and rainbow bee-eater nesting areas; • Allowing strand vegetation to recolonise foreshore areas .
7	Include foreshore management matters in the Geoffrey Bay and Alma Bay catchment section of a Caring for Magnetic Island guide.
Stormwater and water quality management	
8	Review current stormwater management arrangements to develop a process to ensure cross catchment consultation prior to new works.
9	<p>Conduct a hydrological study for the Geoffrey Bay catchment to quantify the volume and frequency of runoff and sediment movement through the catchment to inform waterway infrastructure upgrades and waterway management requirements including required widths of riparian buffers.</p> <p>Note: Townsville City Plan (2014) includes provisions for waterway buffers as part of the Natural Assets Overlay. Additional information derived from studies in Geoffrey Bay could be incorporated in future updates of the overlay.</p>
10	<p>Investigate potential for public infrastructure upgrades associated with waterways e.g. single span bridges for Petersen Creek and Alma Creek.</p> <p>Note: This has been identified as a key catchment issue that needs to be addressed.</p>
11	<p>Work cooperatively with developers and property owners at the concept planning stage to provide ideas for incorporating catchment appropriate water sensitive urban design (WSUD) features in future developments e.g. grassed swales instead of concrete drains.</p> <p>Note: Provisions are included in the Townsville City Plan reflecting the requirements of the State Planning Policy and State interests water, which require all new developments to incorporate water sensitive urban design (WSUD) measures to meet defined stormwater management objectives.</p>
Wildlife management	
12	<p>Investigate the extent and impact of domestic animals on native wildlife with the intent of developing management interventions to reduce identified impacts.</p> <p>Note: QPWS and Townsville City Council records and studies will be key information sources, particularly in relation to feral animals and the Picnic Bay landfill. This information would be collated as the first stage of investigation and would also be a component of the Caring for Magnetic Island background material/research.</p>
13	Investigate the impact of introduced Agile Wallabies on endemic Rock Wallabies
14	Investigate retrofitting beachfront areas with turtle friendly lighting and include turtle-friendly lighting requirements for new beachfront development in urban turtle nesting areas including Geoffrey Bay and Alma Bay.
15	<p>Conduct surveys of terrestrial habitat and wetlands and waterways to identify and describe fauna in the catchment to provide a better understanding of fauna use of the catchment, including wildlife corridors.</p> <p>Note: This would inform habitat management strategies and actions (see Strategy 4).</p>

Appendix A

Bibliography

References

Department of Environment and Heritage Protection 2013, *Environmental Protection (Water) Policy 2009 Ross River Basin and Magnetic Island Environmental Values and Water Quality Objectives Basin No. 118 including all waters of the Ross River Basin, and adjacent coastal waters (including Magnetic Island)*, State of Queensland.

Department of National Parks, Recreation, Sport and Racing 2013, *Magnetic Island (Yunbenun) Management Statement 2013*, State of Queensland.

Department of Sustainability, Environment, Water, Population and Communities 2010, *Magnetic Island, Queensland Region EPBC Act policy statement 5.1*, Australian Government, Canberra.

Evans-Illidge, E. (ed.) 2004, *Magnetic Island's World Heritage Values: A Preliminary Assessment*, Magnetic Island Community Development Association Inc. (MICDA) and Magnetic Island Nature Conservation Association Inc. (MINCA).
(Available at <http://www.whatsonmagneticisland.com.au/world-heritage>)

Magnetic Island, Queensland Region EPBC Act policy statement 5.1

About this policy statement

The Magnetic Island Policy Statement is one of a series of *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) policy statements aimed at providing more detailed guidance on how the EPBC Act may apply to specific places, species, ecological communities or industry sectors and activities.

The Magnetic Island Policy Statement is designed to assist a person proposing to take an action on or around Magnetic Island decide whether or not they require EPBC Act referral. The policy statement should be read in conjunction with other relevant EPBC Act policy statements, in particular, EPBC Act Policy Statement 1.1 - Significant Impact Guidelines: Matters of National Environmental Significance.

The key elements of this policy statement were developed during consultation with scientific experts, State and Territory threatened species officers and environmental consultants. The policy statement has been available for public comment and, where appropriate, changes have been made. The document will be reviewed and updated as new information becomes available.

<http://www.environment.gov.au/resource/magnetic-island-queensland-region-epbc-act-policy-statement-51>

(Also available at <http://www.whatsonmagneticisland.com.au/world-heritage>)

Jackes, Betsy 2010, *Plants of Magnetic Island (3rd Edition)* online

The *Plants of Magnetic Island (3rd Edition)* is also available as a pdf in 12 parts for manageable downloading.

Available at http://www-public.jcu.edu.au/discovernature/JCUPRD1_065131

Kenchington, R. and Hegerl, E. 2005, *World Heritage Attributes and Values Identified for Magnetic Island and the Surrounding Marine Environment*,

MICDA 2006, *Review of Kenchington and Hegerl (2005) "World Heritage Attributes and Values Identified for Magnetic Island and the Surrounding Marine Environment"*, Magnetic Island Community Development Association Inc.

(Available at <http://www.whatsonmagneticisland.com.au/world-heritage>)

MICDA 2013, *Towards 2020: The Magnetic Island Community Plan 2013-2020*, Magnetic Island Community Development Association Inc.

O'Malley, A. 1997, *The Vegetation of Arcadia, Magnetic Island*, (unpublished) report to the Southern Cross University (School of Resource Science and Management), Lismore.

Geoffrey Bay and Alma Bay (Arcadia) Catchment Management Strategy

Sandercoe, C. 1990, *Vegetation of Magnetic Island*, Technical Report No.1, Queensland National Parks and Wildlife Service, Brisbane.

Williams, P. and Centurino, P. 2007, Vegetation dynamics, fuel loads and fire in an “of concern” regional ecosystem on Magnetic Island National Park. A 25 year study: 1982 to 2007, Internal department Report, Queensland Parks and Wildlife Service, Townsville.

Geoffrey Bay and Alma Bay (Arcadia) Catchment Management Strategy

From Tony O'Malley (could not find public access copies):

- Environment North's Magnetic Island Protection of Significant Vegetation;
- Grier's Vegetation Character and Significance: Magnetic Island Towns and Bays;
- TCC owned or managed land: natural area survey and management: Magnetic Island.

Other relevant detailed studies and consultation have occurred and these should be referred to too e.g. O'Malley's Significant Vegetation of Magnetic Island land subject to development assessment, NPRSR's Magnetic Island Management Statement 2013, etc.

Appendix B

Community Meeting Notes

Geoffrey Bay/Alma Bay catchments strategy community meeting - 23 March 2013

A meeting with community members organised by Creek to Coral (Townsville City Council - TCC) to inform the preparation of the Geoffrey Bay and Alma Bay Catchment Management Strategy (a guide for natural resource management actions in Arcadia).

Meeting notes

1 TCC scribed notes and community participant comments from written material (butcher's paper)

Groups working in Arcadia (or could be)
Geoffrey Bay and Alma Bay Coastcare Groups
NQCC with MINCA and MICDA through Everyone's Environment project funding
National Park volunteers

MICDA

MI Community Plan relevance:

Action 8 Enhance MI natural assets

Action 9 MI lowland areas conservation (most loss/threatened)

Action – expand the community website (whatsonmagneticisland.com.au) to include a comprehensive weed information section including control methods and a section on alternative native plants to replace exotic garden varieties such as periwinkle

Action - update and print Magnetic Island's worst weeds leaflet (~ 12 years old) (could be expanded into a weed control guide) (print 4000 copies for the island and some spares)

Street sweeping - not during leaf fall season – the timing is too arbitrary. Drainage often clogged.
Weeds on vacant land

Need for enforced weed control on vacant blocks – regardless of weed status e.g. class 1, 2 or 3 under Land Protection Act

Residential rubbish pick up by Council

Single span bridge for Petersen Creek (and other MI waterways), to allow outflow and reduce debris accumulation, scouring and other issues

People throw rubbish in drains/creeks as dump is closed (waste management)

Diagram of Petersen Creek/Bowls Club drainage

Individuals independently doing weed removal/control

Action – Information, support and advice to individuals who want to work on weed control/habitat management especially at the NP-urban interface

Action – Survey of attitudes/beliefs/behaviours of local landowners with regard to catchment issues and knowledge and willingness to participate in management actions

Geoffrey Bay and Alma Bay (Arcadia) Catchment Management Strategy

1 Creekwatch group building on existing groups/integrated actions (see 9)
2 Raise awareness of access to USL/NP and maintain easements in good condition i.e. clean of weeds
3 plan to allow good condition individual riparian areas
4 hydrological studies for island bays/catchments as for Horseshoe Bay
5 share knowledge about weed species 'weedsmart'
6 infrastructure upgrade to enable 'natural' waterway flow regimes
7 strategy to provide some balance between NRM/environment, social, economic and cultural values e.g. Traditional Owner interests
8 coastal erosion and creek sediment outflow issues need to be addressed wholistically. Includes sand distribution, groundwater seepage, water quality, creek obstruction (culverts/roads),
9 record existing activities and plans (and past efforts) as part of the integrated island management strategy MINCA/MICDA/MIRRA/NQCC/Geoffrey Bay coastcare MI Community Plan Everyone's Environment project x 5 creeks Townsville City Planning Scheme
10 clean up rubbish blocking waterways

Notes by agenda item*
Welcome and meeting objectives
<p>TCC</p> <ul style="list-style-type: none"> • To advise the strategy and guide NRM actions for the catchment <p>The strategy will:</p> <ul style="list-style-type: none"> • Set direction for NRM activities at a strategic level • Identify projects for council and community to apply for funding e.g. Caring for our Country (CfoC) and Biodiversity Fund • Comment - No current budgeted actions • Comment - Catchment environmental values are defined in city plan overlay • Comment - Consultation necessary to identify values and problems from local communities
Catchment management
<ul style="list-style-type: none"> • Comment - USL transfer to NP is on hold as part of the 'new' Qld government policy. USL is generally treated as part of the NP and managed as such e.g. fire management lines etc. QPWS is looking at different funding models including use of volunteers for management
Natural resource management (NRM) and catchment issues
<p>QPWS/DNPRSR</p> <ul style="list-style-type: none"> • Issue - Lantana is the main issue in the upper Arcadia catchment • Action – Use Splatter-gun (works well for orange lantana) and follow-up with fire as a management tool. Ongoing monitoring required • Issue - Minor weeds around water holes in USL at present with potential for spread into National Park. There are safety issues around actions in these areas and DNPRSR duty of care when community is involved so sub-contractors will be required • Action - Integrated weed management strategy and control plans • Issue - Agile Wallabies (introduced) are displacing Rock Wallabies. Released from koala park and while they are native they are not endemic to the island • Action - Assessment of impacts of Agile Wallabies on Rock Wallabies and suggest

solutions to accommodate both or move Agile Wallabies before Rock Wallabies are 'vanquished'

MICDA

- Issue - Weed spread (garden escapees) from the urban interface
- Issue - Weed cover on urban area vacant lots especially near state land. Non-resident/absentee owners. Weeds not controlled and vacant blocks harbour weeds and contribute to seed banks and spread
- Comment - Need to have a process that addresses weed issues on vacant lots
- Action – thematic awareness and education. Define the main/priority species and develop a guide for the island and/or update the previous weed identification guide

Geoffrey Bay Coastcare

- Issue - past mistakes including Alma Creek which was cleared years ago and every year blows out
- Comment - reserve should be an ecological reserve
- Issue - planning including high density around creek mouths. Need to look at zoning near creek mouths
- Comment - Important to utilise all applicable overlays and consult all relevant parties re the required practices in reference to each overlay/category
- Issue - narrowing of Alma Creek channel (mangroves) and sub-par drainage (e.g. piped bridges). Needs an ongoing maintenance plan
- Issue - Weeds being thrown into creek area
- Comment - Council needs to be more active in creek management
- Comment - Sand needs to be able to flow through creeks to renourish the foreshore as it did in the past

Community member

- Action - Need to prioritise issues for action
- Issue - Domestic animals (cats and dogs) as predators and displacing native wildlife
- Comment - Council responsibility as there is no parks legislation to deal with the issue
- Issue – Constricted creek flow and particularly Petersen Creek. Bridges and pipes need to accommodate sufficient volumes of water and allow debris to pass through to maintain natural areas and habitat upstream as well as to provide sufficient drainage
- Issue – Disparate signage and in particular walking trail location i.e. alignment between maps and trails. The large sign at Alma Bay is incorrect (Jo knows the sign)
- Comment - The DNPRSR website is the only place where the correct walking track maps can be found
- Comment - Signage and other nature based recreation strategy components to be looked at but not in progress yet
- Action - QPWS website being reviewed and then Council tracks need to be added
- Action – Improve the quality of informative signage and especially coordinated, consistent messages and maps of walking tracks and other public facilities. Coordination required across the catchment and island
- Issue - Timing of weed control activities e.g. guinea grass brush cutting timed BEFORE seeding. Maintenance schedules on a large scale can be difficult e.g. the right time to control a particular species might be the same as 90% of the weeds. Timing issues between TCC departments and then with community and QPWS
- Action – Working group for weed control coordination needed involving the people involved on ground. Work with all parties involved with NRM in the catchment (and across the island) to develop a weed management strategy including generic tactics and timing of weed control actions and community events. Incorporate a weed control framework (forest restoration framework is a possible example)
- Issue - Drainage near the Bowls club i.e. water retention as a result of the 'bridge' over Petersen Creek. Debris collects behind the bridge and water backs up including into the

bowls club. McCabe Cres bridge washed away. Walkway now creates a dam and water ponds behind it. Mosquitoes etc.

- Issue - Changing stormwater drainage is often done as a squeaky wheel solution
- Issue – Lowland blocks being filled with no reference to surrounding areas is a broader planning issue
- Comment - Integrated stormwater management planning is required including provision for consultation with neighbours before any works are designed and installed
- Comment - Behaviour change can be a less expensive solution to stormwater management issues than infrastructure
- Issue - Ad hoc and infill works can disrupt drainage patterns
- Comment - Overlays coordination required and maybe use overlays could be used as starting point for guidance. New subdivisions can be planned for
- Comment - Need a stormwater drainage plan for existing urban areas and especially to incorporate roads
- Comment - Run-off is often subterranean with only larger rainfall events entering waterways and causing creeks to flow
- Issue - Intertidal habitat impacted by management intervention
- Issue – Bridges as obstructions to waterway flow regimes are the main creek issue contributing to sediment build up, damming and weed expansion
- Comment - Need a long term plan for both drainage and habitat to enable outflows to be unrestricted again. This then needs to be included in capital budgets
- Comment - Are any hydrological studies similar to Horseshoe Bay planned?
- Action - Hydrological study of the catchment using new Council modelling software should improve understanding of catchment hydrology
- Comment - Recognise roads as stormwater drainage features
- Issue - Septic tanks impacting water quality in the catchment
- Action - Check on how many dwellings are hooked up to sewage (Rob Hunt)
- Action - Initiate Creek-Watch in the area
- Issue – Enabling access to USL and NPs for management purposes while preventing private use
- Action - Maintain access over Council land/easements to USL and National Parks blocks for management purposes
- Comment – Need a process for design and subsequent construction of infrastructure on the island
- Issue - Downy Thorn Apple (white flowers) on Junction track (may be a native solanum)
- Comment – Council can issue notices or take actions for declared weeds (1 and 2), fire hazard or vermin issue
- Comment - Guinea grass is an issue that needs a coordinated approach
- Comment - Weeds could be used as the focal point for coordinated management
- Comment - Needs the upper catchment to be managed as a 'first' priority for weeds
- Comment - Weeding groups and also individuals do weeding
- Action - Coordination required across all spheres

Community member

- Action - Email based hotline for notifying TCC about weed outbreaks
- Issue – Mechanical weed control using a backhoe (Picnic Bay) and then rain resulting in erosion and sediment movement
- Comment - Need people who know what they are doing working on environmental management
- Action - Weed management plan based on landscape ecology
- Issue – Lack of water quality monitoring and cost
- Action - Sharing information required across the island
- Issue - Foreshore trees are being undermined
- Comment - What plans to halt the erosion?
- Comment - Natural dune building as a potential solution

Geoffrey Bay and Alma Bay (Arcadia) Catchment Management Strategy

- Issue - Ground water seepage and other causes of coastal erosion e.g. climate change
- Comment - [Coastal Habitat Adaptation Strategy] in place and included in consideration for the planning scheme. Not available at present
- Action - Understanding of beach profiles and surveys required
- Comment - Is JCU doing any surveys?
- Issue – Red tape prevents sand extracted from creeks being used on beaches
- Comment - Sand from creeks should be able to be used on beaches
- Issue - Climate change
- Issue - Response to natural disasters does not necessarily take environmental matters into consideration
- Comment - Council could act as a coordinating body for NRM issues in particular
- Comment - Council role now is partly to prioritise after disasters and then take action
- Comment - Disaster response needs to take into account the strategy and NRM
- Issue - Creek crossing private properties is a coordination issue and requires a catchment management approach
- Comment - Gustav Creek action and leading by example is working
- Action - Dissemination of the strategy to all interested
- Action - Send an Executive Summary of the strategy locally with the rates notice
- Comment – Catchment strategy must connect environmental, social, cultural and economic components/issues
- Comment – At least 1 month is required for review of the draft strategy

Current NRM activities

Who are the active working groups in the area?

Geoffrey Bay Coastcare

- Cost of tree planting etc 110 trees propagated by Tony and Gary (\$130) (\$2000 on contractors for weed removal and mulching)
- Also discussions with planters about future funds (Everyone's Environment)

Bowling Club

- Working bee 6 years ago was very successful

MICDA

- Clean up Magi mid-winter hopefully

QPWS and volunteers

Individual actions

Ideas on addressing NRM issues in the catchment

[Most of these were mixed in with the Issues session and have been separated out after all notes were collated]

Identifying studies, photographs and other reference material

Community members emailed reference materials to TCC/Creek to Coral 14 April 2013

Initial list of main issues:

1. Weeds and management access
2. Drainage/stormwater
3. Education and awareness
4. Coastal erosion and creek roles in beach sand renourishment
5. Water quality

Appendix C

Consultation Draft Workshop Results

Appendix C Section 3 Community Feedback (from Consultation Draft) with additional material provided in response to the draft

3.1 Background

The main pathway for community input to the strategy was via a meeting arranged by Creek to Coral/Townsville City Council held at the Magnetic Island Bowls Club in Arcadia on Saturday 23 March 2013. At the meeting participants were also invited to provide further input after the event by submitting any additional material to Creek to Coral/Townsville City Council.

3.2 Community Meeting/Workshop

Magnetic Island community members were invited to attend the workshop through island networks including but not limited to Geoffrey Bay Coastcare, Magnetic Island Community Development Association (MICDA) and Magnetic Times. A community tree planting was held prior to the workshop with participants of the tree planting invited to have morning tea at the bowls club and attend the workshop afterwards.

The meeting was structured to work through the Pressure – State – Response model for catchment management (see Agenda in the text box below) to identify the main issues (pressures), current activities and potential strategies and actions (response) to address the identified issues. These were refined to arrive at the results presented in the following sections. The 'raw' results of the workshop are included in Appendix B.

Meeting Agenda

1: Welcome and meeting objective

- Proposed agenda
- Current Caring for our Country (CfoC) project
- Future funding applications

2: Catchment management (i.e. natural resource management (NRM) using water catchments as the management unit boundary). Defining the catchment (State)

3: Identifying NRM issues in the Geoffrey and Alma Bay catchments (Pressure/State)

4: Current NRM activities in the catchments (including what TCC is doing e.g. Greening and Waterways Team (GAWT), and working with community e.g. Geoffrey Bay Coastcare) (State)

5: Ideas on addressing NRM issues in the catchment (Response)

6: Identifying studies, photographs and any other reference material that could help with preparing the catchment strategy (Pressure/State/Response)

3.2.1 Catchment issues and condition

The sorted and categorised list of issues raised at the community meeting is provided in Table 3-1. It is recognised that some of the issues could be included in more than one category.

Table 3-1 Catchment Issues Identified

Code	Issue description	Issue ID
Coastal management and erosion including disaster response		
C1	Intertidal habitat impacted by management intervention	20
C2	Foreshore trees are being undermined	21
C3	Ground water seepage and other causes of coastal erosion e.g. climate change	22
C4	Red tape prevents sand extracted from creeks being used on beaches [also S8]	23
C5	Climate change	24
C6	Response to natural disasters does not necessarily take	25

Geoffrey Bay and Alma Bay (Arcadia) Catchment Management Strategy

	environmental matters into consideration	
Fauna		
F1	Agile Wallabies (introduced) are displacing Rock Wallabies. Released from koala park and while they are native they are not endemic to the island	26
F2	Domestic animal impact on native wildlife	27
	<ul style="list-style-type: none"> • Sand extraction and realigning creeks degrades intertidal habitat, e.g. fish nursery • Fauna habitats not yet mapped e.g. overwintering butterfly aggregation sites, orange-footed scrub fowl mounds, etc • Vehicles on foreshores compact soil for nesting turtles and rainbow bee-eaters. • Mown and irrigated foreshores degrade turtle and bee-eater nesting habitat. • Lighting disorientates turtle hatchlings (This happened in 2013 at Alma Bay resulting turtle hatchling deaths). 	Consultation draft feedback (CDF)
	<p>Native vegetation</p> <ul style="list-style-type: none"> • RE mapping doesn't show some valuable native vegetation e.g. Geoffrey Bay Scrub (which is endangered under EPBC), Geoffrey Bay foreshore vegetation including the Casuarinas, Paperbarks and Ipomoea, mangroves in Petersen and Alma Creeks etc. • Vandalism of foreshore vegetation for views 	CDF
Information, education and awareness		
I1	Disparate signage and in particular walking trail location i.e. alignment between maps and trails. Example - the large sign at Alma Bay is incorrect	28
Planning, coordination and governance		
P1	Planning including high density around creek mouths [statutory]	29
P1	insufficient building setbacks from creeks	CDF
	Environmental reserves aren't adequately protected, e.g. Alma Creek Reserve and Geoffrey Bay Scrub don't have conservation tenure	CDF
P2	Enabling access to USL and NPs for management purposes while preventing private use [catchment] [statutory]	30
P3	Creek crossing private properties is a coordination issue and requires a catchment management approach [catchment]	31
P4	Past mistakes including Alma Creek which was cleared years ago and every year blows out [catchment]	32
P5	Lowland blocks being filled with no reference to surrounding areas is a broader planning issue [statutory]	33
P6	Safety issues around actions in these areas (USL and National Park) so sub-contractors will be required [statutory] [catchment]	34
Stormwater management and drainage, waterway management		
S1	Street sweeping the timing is too arbitrary (not during leaf fall season). Drainage often clogged	1
S2	Drainage near the Bowls club i.e. water retention as a result of the 'bridge' over Petersen Creek. Debris collects behind the bridge and water backs up including into the bowls club. McCabe Cres bridge washed away. Walkway now creates a dam and water ponds behind it. Mosquitoes etc. Diagram of Petersen Creek/Bowls Club drainage	2
S3	Narrowing of Alma Creek channel by concrete drain (mangroves) and sub-par drainage (e.g. piped bridges)	3 plus CDF
S4	Constricted creek flow and particularly Petersen Creek. Bridges and pipes need to accommodate sufficient volumes of water and allow debris to pass through to maintain natural areas and habitat upstream	4

Geoffrey Bay and Alma Bay (Arcadia) Catchment Management Strategy

	as well as to provide sufficient drainage	
S5	Bridges as obstructions to waterway flow regimes are the main creek issue contributing to sediment build up, damming and weed expansion	5
S6	Changing stormwater drainage is often done as a squeaky wheel solution	6
S6	Dysfunctional stormwater drainage is patched up rather than designing, funding and installing functional infrastructure	CDF
S7	Ad hoc (with no reference to surrounding areas) and infill works can disrupt drainage patterns	7 -8
S8	Red tape prevents sand extracted from creeks being used on beaches (Nelly Bay)	23
	Stormwater management and drainage is not adequately based on science and regard for intertidal habitat values and GBR World Heritage values e.g. mangroves, saltwater couch and fish nursery areas are excavated. Altering natural drainage lines and hydrological regimes threatens valuable natural areas e.g. Geoffrey Bay Scrub	CDF
Waste management		
M1	Residential rubbish pick up by Council	17
M2	People throw rubbish in drains/creeks as dump is closed (waste management) or they don't appreciate natural areas or realise negative impacts	18 plus CDF
M3	Weeds being thrown into creek area	19
	Well-meaning post-cyclone clean up damages natural areas	CDF
Water quality		
Q1	Septic tanks impacting water quality in the catchment	35
Q2	Lack of water quality monitoring and cost	36
Q3	Mechanical weed control using a backhoe (Picnic Bay) and then rain resulting in erosion and sediment movement	37
Weeds		
W1	Weeds on vacant urban land and environmental weeds on occupied urban land, especially near state land. Non-resident/absentee owners. Weeds not controlled and vacant blocks harbour weeds and contribute to seed banks and spread	9-11 plus CDF
W2	Weed spread (garden escapees) from the urban interface	12
W3	Timing of weed control activities e.g. guinea grass brush cutting timed BEFORE seeding. Maintenance schedules on a large scale can be difficult e.g. the right time to control a particular species might be the same as 90% of the weeds. Timing issues between TCC departments and then with community and QPWS	13
W4	Lantana is the main issue in the upper Arcadia catchment	14
	Huge Yellow Oleander infestations on Bremner Point and Whitfield Cove	CDF
W5	Minor weeds around water holes in USL at present with potential for spread into National Park. There are safety issues around actions in these areas and DNPRSR duty of care when community is involved	15
W6	Downy Thorn Apple (white flowers) on Junction track (may be a native solanum)?	16
	People (including some Council workers) are uncertain whether certain species are native or weeds. Weeds on Council-managed land.	CDF

Note: Comments received in response to the Consultation Draft are included in brown text and noted as CDF i.e. consultation draft feedback.

Some of the issues identified also provide an idea of the condition of parts of the catchment. These comments were taken into account and used to provide focus for further on ground assessment of catchment condition.

3.2.2 Current and past actions

While not a comprehensive list some of the groups and past and current actions taking place in the Geoffrey and Alma Bay catchment noted at the community meeting include:

- Geoffrey Bay and Olympus Crescent Coastcare Groups – ongoing approved habitat restoration including weed management and revegetation works at various public sites in Geoffrey and Alma Bays including Petersen Creek, Alma Bay creek and the adjoining reserve, Geoffrey Bay Scrub and Geoffrey Bay foreshore;
- North Queensland Conservation Council project with MINCA and MICDA and Geoffrey Bay Coastcare through Everyone’s Environment funding - works on 5 Magnetic Island creeks including Petersen Creek (Geoffrey Bay);
- National Park volunteers – Saturday activities organised and supervised by Qld Parks and Wildlife Service;
- Individuals independently doing their own weed removal and control;
- Magnetic Island Bowls Club have organised a creek clean up in the past (2007);
- MICDA - World Ocean Day 2011; and
- MICDA – mid winter Magnetic Island clean up planned.

Note: Brown text indicates modification to the consultation draft.

3.2.3 Other comments/questions/reference material

Additional comments from the meeting that were not identifiable as issues or actions are included in Table 3-2.

Table 3-2 General Comments

Category and Comments
<p><u>Signage</u></p> <ul style="list-style-type: none"> • The Department National Parks R Sport and Recreation website is the only place where the correct walking track maps can be found. • Signage and other nature based recreation strategy components to be looked at but not in progress yet
<p><u>Stormwater management</u></p> <ul style="list-style-type: none"> • Behaviour change can be a less expensive solution to stormwater management issues than infrastructure • Run-off is often subterranean with only larger rainfall events entering waterways and causing creeks to flow. • Are any hydrological studies similar to Horseshoe Bay planned?
<p><u>Weed control</u></p> <ul style="list-style-type: none"> • Council can issue notices or take actions for declared weeds (1 and 2), fire hazard or vermin issue
<p><u>Coastal erosion</u></p> <ul style="list-style-type: none"> • What plans to halt the [beach] erosion? • [Coastal Habitat Adaptation Strategy] in place and included in consideration for the planning scheme. Not available at present • Is JCU doing any surveys? • Council role now is partly to prioritise after disasters and then take action
<p><u>Catchment strategy general</u></p> <ul style="list-style-type: none"> • Gustav Creek Catchment action is happening and leading by example is working • Catchment strategy must connect environmental, social, cultural and economic components/issues • At least 1 month is required for review of the draft strategy
<p><u>Reference material</u></p>

- MI Community Plan (MICDA coordinated) - including:
 - Action 8 Enhance MI natural assets
 - Action 9 MI lowland areas conservation (most loss/threatened)
- Townsville City Planning Scheme
- Other reference material (submitted after the meeting by Tony O'Malley)

3.3 Suggested Future Actions

As mentioned potential strategies and actions were suggested during the meeting and were subsequently extracted from the full range of comments. The suggestions that could be used to develop strategies and actions are listed in Table 3-3.

Table 3-3 Base for Strategies and Actions

	Suggested Future Actions (from community consultation)	Who
Coastal erosion and disaster response		
1	Natural dune building as a potential solution to beachfront erosion	15
2	Understanding of beach profiles and surveys required	16
3	Sand from creeks should be able to be used on beaches	17
	Catchment management allows natural delivery of sand to beaches	CDF
4	Disaster response needs to take into account the strategy and NRM	19
Fauna		
5	Assessment of impacts of Agile Wallabies on Rock Wallabies and suggest solutions to accommodate both or move Agile Wallabies before Rock Wallabies are 'vanquished'	J3
6	Council responsibility for domestic animals (cats and dogs) as there is no parks legislation to deal with the issue	I2
	Fauna surveys and descriptions e.g. species lists, habitat mapping including nesting sites, corridor identification etc.	CDF
	Flora Vegetation surveys and descriptions e.g. species lists, regrowth mapping on public land	
Information, education and awareness		
7	Expand the community website (whatsonmagneticisland.com.au) to include a comprehensive weed information section including control methods and a section on alternative native plants to replace exotic garden varieties such as periwinkle	B1
8	Dissemination of the strategy to all interested	20
9	Send an Executive Summary of the strategy locally with the rates notice	21
10	Update and print Magnetic Island 's worst weeds leaflet (~ 12 years old) (could be expanded into a weed control guide) (print 4000 copies for the island and some spares)	B2
11	Information, support and advice to individuals who want to work on weed control/habitat management especially at the NP-urban interface (M. Woodward)	B5
12	Survey of attitudes/beliefs/behaviours of local landowners with regard to catchment issues and knowledge and willingness to participate in management actions (M. Woodward)	B6
13	Raise awareness of access to USL/NP and maintain easements in good condition i.e. clean of weeds	T2
14	Share knowledge about weed species 'weedsmart'	T5
15	Thematic awareness and education. Define the main/priority species and develop a guide for the island and/or update the previous weed identification guide	L2

Geoffrey Bay and Alma Bay (Arcadia) Catchment Management Strategy

16	Signage - QPWS website being reviewed and then Council tracks need to be added	1
17	Improve the quality of informative signage and especially coordinated, consistent messages and maps of walking tracks and other public facilities. Coordination required across the catchment and island	2
18	Sharing information required across the island	14
Planning, coordination and governance		
19	Plan to allow good condition individual riparian areas	T3
20	Strategy to provide some balance between NRM/environment, social, economic and cultural values e.g. Traditional Owner interests	T7
21	Record existing activities and plans (and past efforts) as part of the integrated island management strategy	T9
22	Integrated weed management strategy and control plans	J2
23	[Alma Bay] reserve should be an ecological reserve and needs an ongoing maintenance plan including for the creek	O1
24	In relation to planning issues it is important to utilise all applicable overlays and consult all relevant parties re the required practices in reference to each overlay/category. Need to look at zoning near creek mouths	O2
25	Need to prioritise issues for action	I1
26	Working group for weed control coordination needed involving the people involved on ground. Work with all parties involved with NRM in the catchment (and across the island) to develop a weed management strategy including generic tactics and timing of weed control actions and community events. Incorporate a weed control framework (forest restoration framework is a possible example)	3
27	Need a long term plan for both drainage and habitat to enable outflows to be unrestricted again. This then needs to be included in capital budgets	7
28	Integrated stormwater management planning is required including provision for consultation with neighbours before any works are designed and installed	8
29	Need a stormwater drainage plan for existing urban areas and especially to incorporate roads. Recognise roads as stormwater drainage features	9
30	Overlays coordination required and maybe use overlays could be used as starting point for guidance. New subdivisions can be planned for	10
31	Need a process for design and subsequent construction of infrastructure on the island	11
32	Maintain access over Council land/easements to USL and National Parks blocks for management purposes	12
33	Coordination required across all spheres. Weeds could be used as the focal point for coordinated management. Needs the upper catchment to be managed as a 'first' priority for weeds. Guinea grass is an issue that needs a coordinated approach	13
	Assigning priority for weed management should be based on proper weed survey and knowledge	CDF
34	Council could act as a coordinating body for NRM issues in particular	18
35	Weed management plan based on landscape ecology	G1
36	Need people who know what they are doing working on environmental management	G2
Stormwater management and drainage, waterway management		
37	Single span bridge for Petersen Creek and Alma Creek (and other MI waterways), to allow outflow and reduce debris accumulation, scouring and other issues	B4 plus CDF
38	Hydrological studies for island bays/catchments as for Horseshoe Bay	T4
39	infrastructure upgrade to enable 'natural' waterway flow regimes	T6

Geoffrey Bay and Alma Bay (Arcadia) Catchment Management Strategy

40	Coastal erosion and creek sediment outflow issues need to be addressed wholistically. Includes sand distribution, groundwater seepage, water quality, creek obstruction (culverts/roads),	T8
41	Council needs to be more active in creek management	O3
42	Sand needs to be able to flow through creeks to renourish the foreshore as it did in the past	O4
43	Hydrological study of the catchment using new Council modelling software should improve understanding of catchment hydrology	4
	Wetland and waterway mapping and description, including seasonal tributaries	CDF
Waste management		
44	Clean up rubbish blocking waterways	T10
Water quality		
45	Creekwatch group building on existing groups/integrated actions	T1
46	Check on how many dwellings are hooked up to sewage	5
47	Initiate Creek-Watch in the area	6
Weeds		
48	Need for enforced weed control on vacant blocks – regardless of weed status e.g. class 1, 2 or 3 under Land Protection (Pest Management and Stock Routes) Act	B3
	Council should enforce weed control equally across all landholders includes Council land	CDF
49	Maintain easements in good condition i.e. clean of weeds	T2
50	Lantana control - use Splatter-gun (works well for orange lantana) and follow-up with fire as a management tool. Ongoing monitoring required	J1
51	Need to have a process that addresses weed issues on vacant lots	L1
52	Email based hotline for notifying TCC about weed outbreaks	G3

Note: Comments received in response to the Consultation Draft are included in brown text and noted as CDF i.e. consultation draft feedback.

Some of the ideas can be translated directly to produce management strategies while other ideas may be a sub component or action associated with a strategy. The key strategies and sub component actions have been extracted from Table 3-3 to form the basis of the draft strategies proposed in Appendix D.

Appendix D

Consultation Draft Strategies

Appendix D Section 5 Catchment Strategies (from Consultation Draft)

5.1 Considerations

The draft catchment strategies outlined in this section were derived from the ideas suggested in the community meeting and the consideration of the following factors:

- The condition of the catchment;
- Environmental hazards and threats (issues/pressures);
- Past, current and planned actions;
- Land tenure;
- Relevant legislation;
- Community awareness and capacity;
- Resource availability; and
- Governance arrangements.

5.2 Suggested (Draft) Strategies

The strategies are divided into management categories and activities to address related issues. It is recognised that there will be overlap between categories and some significant interrelationships between the various activities e.g. habitat management and awareness/capacity building.

For a Catchment Strategy to be most effective ideally the individual strategies and actions would be implemented in an integrated manner. However resource constraints and other factors often make this difficult so the implementation of individual components will also help achieve the objective of improving the environmental, biophysical and ecological values and functions of the Geoffrey and Alma Bay catchment for the common good.

The main land management and rehabilitation strategies for the Geoffrey Bay and Alma Bay catchment system are discussed below. Some of the strategies need to be implemented island wide with Geoffrey/Alma Bay catchment components incorporated as appropriate.

Note: Strategies are presented as suggestions for discussion only. No consultation has been undertaken with entities that may have potential implementation responsibilities at this point. Further, no decisions with respect to any potential funding of actions outlined below have been made.

5.2.1 Coordination and governance

Individuals and groups are working on natural resource management in the Geoffrey Bay and Alma Bay catchment and are contributing to the maintenance of remnant vegetation and native habitat and the rehabilitation of waterways and foreshores. There are also wildlife carer groups on the island that care for injured native animals and return them to the bush, air or sea when recovered.

Island communication networks appear effective for coordinating projects and events, and for informing interested community members about what's happening on the island (and elsewhere). There are also good working relationships between community groups and individuals and the key natural resource managers on the island i.e. QPWS and TCC. NQ Dry Tropics is also involved in natural resource management on the island from time to time. More recently the North Queensland Conservation Council partnered with island groups (MINCA, MICDA, Geoffrey Bay Coastcare) to secure funding for creek restoration works through the Queensland Government's Everyone's Environment program.

With the number of interested community members and the variety of environmental improvement and management activities occurring across the island it may be beneficial to establish an overarching network to coordinate these function and activities.

DRAFT Strategy 1: Establish an overarching coordination network (nominally called the Magnetic Island Environmental Management Network (MIEMN) for the purposes of discussion) to act as an ‘umbrella’ network for existing community groups, government agencies, industry, education and research bodies, NGOs, Traditional Owners and NRM service providers.

Addresses community feedback: ‘Sharing information required across the island’

5.2.2 Community awareness and capacity

While community awareness and capacity was not raised as a specific issue at the community meeting there were a number of solutions suggested based on increasing community awareness and capacity.

DRAFT Strategy 2: Develop a ‘Caring for Magnetic Island’ guide for residents and visitors to Magnetic Island. The guide would outline practical measures that can be undertaken by residents and visitors to address issues such as weed incursions. The guide would also outline potential cross island actions and catchment specific actions for each of the island’s urban catchments e.g. Geoffrey Bay and Alma Bay catchment. The guide to be developed using existing studies, reports and other relevant information, combined with community knowledge and feedback.

Addresses community feedback: ‘Survey of attitudes, beliefs and behaviours of local landowners with regard to catchment issues and knowledge and willingness to participate in management actions’

DRAFT Strategy 3: Develop a thematic communications campaign to encourage organised and opportunistic removal of weeds from natural areas while also helping to raise awareness of the role of urban gardens in weed propagation and spread.

Specific actions could include:

- Expand the community website (e.g. www.whatsonmagneticisland.com.au) to include a comprehensive weed information section including control methods and a section on alternative native plants to replace exotic garden varieties such as periwinkle; and
- Update and print Magnetic Island’s worst weeds leaflet which is ~12 years old. The leaflet could be expanded into a weed control guide and/or included in the ‘Caring for Magnetic Island’ guide.

Addresses community feedback: ‘Provide information, support and advice to individuals who want to work on weed control/habitat management especially at the NP-urban interface; Share knowledge about weed species via technology e.g. ‘weedsmart’ app; Thematic awareness and education; Define the main/priority species and develop a guide for the island and/or update the previous weed identification guide’.

5.2.3 Habitat management

Habitat management is a broad category covering aquatic and terrestrial habitat and including pest management (exotic plants/weeds and feral animals), access (facilitated and restricted) and waste management (e.g. rubbish in creeks and garden waste). The main habitat management issue identified in the Geoffrey and Alma Bay catchment was weed control.

DRAFT Strategy 4: Develop and integrated weed management strategy for Geoffrey and Alma Bay catchment. Collate information relating to past and current habitat management efforts in the Geoffrey and Alma Bay catchment. This would become the basis for monitoring, maintenance and expansion of any rehabilitation works.

The weed management strategy would outline a variety of weed management methods that could be employed depending on a number of factors including; the type/s of weeds and plant biology/ecology, condition of native vegetation and regeneration potential/difficulty, level of

infestation, proximity to waterways, soil type and condition, proximity to intact native vegetation, surrounding land use, edge length and weed encroachment, time of year and seasonality, accessibility, available resources and level of community involvement.

Addresses community feedback: 'Weed management plan based on landscape ecology; Work with all parties involved with NRM in the catchment (and across the island) to develop a weed management strategy including generic tactics and timing of weed control actions and community events. Incorporate a weed control framework (forest restoration framework is a possible example); Coordination required across all spheres. Weeds could be used as the focal point for coordinated management. Needs the upper catchment to be managed as a 'first' priority for weeds. Guinea grass is an issue that needs a coordinated approach; Council could act as a coordinating body for NRM issues in particular; Maintain access over Council land/easements to USL and National Parks blocks for management purposes; Working group for weed control coordination needed involving the people involved on ground; Need for enforced weed control on vacant blocks – regardless of weed status e.g. class 1, 2 or 3 under Land Protection (Pest Management and Stock Routes) Act Need to have a process that addresses weed issues on vacant lots; Maintain easements in good condition i.e. clean of weeds; Lantana control - use Splatter-gun (works well for orange lantana) and follow-up with fire as a management tool. Ongoing monitoring required; Email based hotline for notifying TCC about weed outbreaks'.

DRAFT Strategy 5: Facilitate waterway clean ups and investigate the potential for a local Creekwatch group on the Island.

Addresses community feedback: 'Clean up rubbish blocking waterways; Creekwatch group building on existing groups/integrated actions Initiate Creek-Watch in the area; Council needs to be more active in creek management; Sand needs to be able to flow through creeks to renourish the foreshore as it did in the past; Coastal erosion and creek sediment outflow issues need to be addressed holistically. Includes sand distribution, groundwater seepage, water quality, creek obstruction (culverts/roads)'

5.2.4 Foreshore management (erosion)

Foreshore erosion and disaster response were mentioned together at the community meeting. There were no suggestions for strategic direction associated with this highly variable issue and these matters may be best addressed as part of the coordination and governance processes.

DRAFT Strategy 6: Collate available information relevant to foreshore management in the Geoffrey Bay and Alma Bay catchment, identify information gaps and implement necessary studies to determine the extent of foreshore management issues that need to be addressed.

Addresses community feedback: 'Understanding of beach profiles and surveys required'

DRAFT Strategy 7: Include foreshore management matters in the Geoffrey Bay and Alma Bay catchment section of a Caring for Magnetic Island guide.

Addresses community feedback: 'Natural dune building as a potential solution to beachfront erosion; Sand from creeks should be able to be used on beaches; Disaster response needs to take into account the strategy and NRM'

5.2.5 Stormwater management including water quality

Stormwater run-off from urban areas can create water quality issues that need to be managed prior to the runoff entering natural waterways and wetlands. The stormwater quality issues raised at the community meeting included: septic tank outfall impacting water quality in the catchment and rubbish in waterways and riparian areas.

DRAFT Strategy 8: Review current stormwater management arrangements to develop a process to ensure cross catchment consultation prior to new works.

Addresses community feedback: Integrated stormwater management planning is required including provision for consultation with neighbours before any works are designed and installed; Need a stormwater drainage plan for existing urban areas and especially to incorporate roads. Recognise roads as stormwater drainage features

DRAFT Strategy 9: Conduct a hydrological study for the Geoffrey Bay catchment to quantify the volume and frequency of runoff and sediment movement through the catchment to inform waterway infrastructure upgrades and waterway management requirements.

Addresses community feedback: 'Hydrological studies for island bays/catchments as for Horseshoe Bay; Hydrological study of the catchment using new Council modelling software should improve understanding of catchment hydrology'

DRAFT Strategy 10: Investigate potential for waterway infrastructure upgrades, (e.g. a single span bridge for Petersen Creek) as this is a key catchment issue to be addressed.

Addresses community feedback: 'Infrastructure upgrade to enable 'natural' waterway flow regimes; Single span bridge for Petersen Creek (and other Magnetic Island waterways), to allow outflow and reduce debris accumulation, scouring and other issues'

DRAFT Strategy 11: Work cooperatively with developers and property owners to incorporate water sensitive urban design (WSUD) features in future developments as appropriate e.g. grassed swales instead of concrete drains.

5.2.6 Wildlife management

Wildlife management is covered by legislation and is relatively well defined. The two matters identified for the Geoffrey/Alma Bay catchment require some level of investigation to determine the impacts associated with the issues.

DRAFT Strategy 12: Investigate the extent and impact of domestic animals on native wildlife with the intent of developing management interventions to reduce the impacts.

DRAFT Strategy 13: Investigate the impact of Agile Wallabies on Rock Wallabies

Strategy revision comparison

Number	Draft Strategy	Revised strategy
1	Establish an overarching coordination network (nominally called the Magnetic Island Environmental Management Network (MIEMN) for the purposes of discussion) to act as an 'umbrella' network for existing community groups, government agencies, industry, education and research bodies, NGOs, Traditional Owners and NRM service providers	<p>Coordination and governance</p> <p>Investigate possibilities for improved communication and engagement processes for natural resource management planning and project coordination utilising existing island networks and in particular to involve Council as a collaborative partner.</p> <p>Note: Constraints include volunteer commitment and meeting times i.e. nights and weekends vs Council office hours.</p>
2	Develop a 'Caring for Magnetic Island' guide for residents and visitors to Magnetic Island. The guide would outline practical measures that can be undertaken by residents and visitors to address issues such as weed incursions. The guide would also outline potential cross island actions and catchment specific actions for each of the island's urban catchments e.g. Geoffrey Bay and Alma Bay catchment. The guide to be developed using existing studies, reports and other relevant information, combined with community knowledge and feedback	<p>Community awareness and capacity</p> <p>Build on the body of existing knowledge and work to develop a 'Caring for Magnetic Island' (CMI) guide (for non National Park (NP) areas) with generic text:</p> <ul style="list-style-type: none"> • Acknowledging the island is in a World Heritage Area and the inherent values; • Identifying important natural areas and values; • Providing advice on how Magnetic Island can be managed so that the natural values are protected and not adversely impacted. <p>Provide specific text on natural resource planning and management for separate / multiple audiences including:</p> <ul style="list-style-type: none"> • Council, including town planners, roads, parks, beaches, stormwater and drainage, natural areas, post-cyclone clean-up crews, etc.; • Residents; • Visitors (domestic and international); • Magnetic Island active natural resource managers (this may be an acknowledgement section and list of current projects and historic efforts). <p>Note: The guide could also be re-designed as an online resource through: whatsonmagneticislandcom.au</p> <p>A large body of knowledge/work is scattered across the website that could be used to start this process. Also see MI Community Plan (MICDA 2013).</p>
3	Develop a thematic communications campaign to encourage organised and opportunistic removal of weeds from natural areas while also helping to raise awareness of the role of urban gardens in weed propagation and spread.	<p>Develop a thematic communications campaign to accompany the Caring for Magnetic Island (CMI) guide to encourage organised and opportunistic removal of weeds from natural areas while helping to raise awareness of the role of urban gardens in weed propagation and spread.</p> <p>The campaign would be integrated with existing activities and utilise existing publications, networks</p>

Geoffrey Bay and Alma Bay (Arcadia) Catchment Management Strategy

	<p>Specific actions could include:</p> <ul style="list-style-type: none"> • Expand the community website (e.g. www.whatsonmagneticisland.com.au) to include a comprehensive weed information section including control methods and a section on alternative native plants to replace exotic garden varieties such as periwinkle; and • Update and print Magnetic Island's worst weeds leaflet which is ~12 years old. The leaflet could be expanded into a weed control guide and/or included in the 'Caring for Magnetic Island' guide. 	<p>and web presence.</p> <p>Note: See MI Community Plan (MICDA 2013) and other island material for ideas and people matters information when developing the campaign.</p> <p>Component parts of the campaign could include:</p> <ul style="list-style-type: none"> • Supporting the compilation of weed information and expansion of the existing website i.e. www.whatsonmagneticisland.com.au, to include a comprehensive weed information section; • Update and/or print Magnetic Island's worst weeds leaflet (~13 years old). The leaflet would be a part of the web weed information and/or included in the CMI guide; • Develop Magnetic Island thematic communications to add to Learnscaapes page http://www.creektocoral.org/learnscaapes/index.htm; • Friends of National Parks weed management workshop.
	<p>Habitat management</p>	
<p>4</p>	<p>Develop an integrated weed management strategy for Geoffrey and Alma Bay catchment. Collate information relating to past and current habitat management efforts in the Geoffrey and Alma Bay catchment. This would become the basis for monitoring, maintenance and expansion of any rehabilitation works and include: weed management methods the type/s of weeds and plant biology/ecology, condition of native vegetation and regeneration potential/difficulty, level of infestation, proximity to waterways, soil type and condition, proximity to intact native vegetation, surrounding land use, edge length and weed encroachment, time of year and seasonality, accessibility, available resources and level of community involvement</p>	<p>Develop an integrated habitat management strategy for Geoffrey and Alma Bay catchment either separately and/or as a sub component of the Caring for Magnetic Island (CMI) guide.</p> <p>Notes: Stage 1 is to collate existing information relating to habitat values and past and current natural resource and habitat management efforts in the Geoffrey and Alma Bay catchment and especially via the work of Geoffrey Bay Coastcare and Olympus Crescent Coastcare including draft management plans for various working sites. Also identify and describe the natural attributes of the catchment including; landforms, wetlands and waterways, flora and fauna, vegetation communities, significant species and areas, Traditional Owner values, etc.</p> <p>Stage 2 is to identify information gaps and investigate ways to fill the gaps e.g. fine scale habitat mapping.</p> <p>This should be followed by identification of threats and opportunities and then strategies and actions to maintain the values can be developed.</p> <p>The strategy could be used as the 'documented' basis for ongoing monitoring, planning and prioritisation, maintenance and protection and potential expansion of rehabilitation works.</p> <p>The habitat management strategy would include a weed management strategy also linked to the CMI guide and generic information with specific application to Geoffrey and Alma Bay catchment through the collated mapping, weed list and existing community managed sites.</p>

Geoffrey Bay and Alma Bay (Arcadia) Catchment Management Strategy

		The strategy and products could also be used as a base for local funding applications e.g. Geoffrey Bay Coastcare, and/or Magnetic Island scale.
5	Facilitate waterway clean ups and investigate the potential for a local Creekwatch group on the Island	<p>Investigate the potential for a local Creekwatch program on the island utilising the existing network of people and groups involved in catchment management and waterway and foreshore rehabilitation.</p> <p>Note: Groups are already doing Creekwatch to some extent so this would provide a more consistent monitoring approach and could be integrated with existing and planned activities. It is another avenue for promoting rehabilitation efforts and supporting community events e.g. facilitating waterway clean ups, while adding to the suite of actions that could attract future resources.</p>
	Foreshore management	
6	Collate available information relevant to foreshore management in the Geoffrey Bay and Alma Bay catchment, identify information gaps and implement necessary studies to determine the extent of foreshore management issues that need to be addressed	<p>Collate available information relevant to foreshore management in the Geoffrey Bay and Alma Bay catchment as a component of the Habitat Management Strategy (see 4). This is inclusive of Council management practices such as foreshore mowing and maintenance and sand extraction especially in relation to delivery of sand to beaches, dune building and habitat management e.g. Rainbow Bee-eaters and turtle nesting areas.</p> <p>Identify information gaps and implement necessary studies to determine the extent of foreshore management issues that need to be addressed and likely solutions.</p> <p>Note: Likely solutions could include:</p> <ul style="list-style-type: none"> • vehicle access management in foreshore parkland including maintenance vehicles e.g. slasher, to prevent damage to turtle and rainbow bee-eater nesting areas; • Allowing strand vegetation to recolonise foreshore areas .
7	Include foreshore management matters in the Geoffrey Bay and Alma Bay catchment section of a Caring for Magnetic Island guide	Include foreshore management matters in the Geoffrey Bay and Alma Bay catchment section of a Caring for Magnetic Island guide.
	Stormwater management including water quality	
8	Review current stormwater management arrangements to develop a process to ensure cross catchment consultation prior to new works	Review current stormwater management arrangements to develop a process to ensure cross catchment consultation prior to new works.
9	Conduct a hydrological study for the Geoffrey Bay catchment to quantify the volume and frequency of runoff and sediment movement through the catchment to inform waterway infrastructure upgrades and waterway management requirements	Conduct a hydrological study for the Geoffrey Bay catchment to quantify the volume and frequency of runoff and sediment movement through the catchment to inform waterway infrastructure upgrades and waterway management requirements including required widths of riparian buffers.

Geoffrey Bay and Alma Bay (Arcadia) Catchment Management Strategy

		Note: Townsville City Plan (2014) includes provisions for waterway buffers as part of the Natural Assets Overlay. Additional information derived from studies in Geoffrey Bay could be incorporated in future updates of the overlay.
10	Investigate potential for waterway infrastructure upgrades, (e.g. a single span bridge for Petersen Creek) as this is a key catchment issue to be addressed.	Investigate potential for public infrastructure upgrades associated with waterways e.g. single span bridges for Petersen Creek and Alma Creek. Note: This has been identified as a key catchment issue that needs to be addressed.
11	Work cooperatively with developers and property owners to incorporate water sensitive urban design (WSUD) features in future developments as appropriate e.g. grassed swales instead of concrete drains	Work cooperatively with developers and property owners at the concept planning stage to provide ideas for incorporating catchment appropriate water sensitive urban design (WSUD) features in future developments e.g. grassed swales instead of concrete drains. Note: Provisions are included in the Townsville City Plan reflecting the requirements of the State Planning Policy and State interests water, which require all new developments to incorporate water sensitive urban design (WSUD) measures to meet defined stormwater management objectives.
	Wildlife management	
12	Investigate the extent and impact of domestic animals on native wildlife with the intent of developing management interventions to reduce the impacts	Investigate the extent and impact of domestic animals on native wildlife with the intent of developing management interventions to reduce identified impacts. Note: QPWS and Townsville City Council records and studies will be key information sources, particularly in relation to feral animals and the Picnic Bay landfill. This information would be collated as the first stage of investigation and would also be a component of the Caring for Magnetic Island background material/research.
13	Investigate the impact of introduced Agile Wallabies on endemic Rock Wallabies	Investigate the impact of introduced Agile Wallabies on endemic Rock Wallabies
New 14		Investigate retrofitting beachfront areas with turtle friendly lighting and include turtle-friendly lighting requirements for new beachfront development in urban turtle nesting areas including Geoffrey Bay and Alma Bay.
New 15		Conduct surveys of terrestrial habitat and wetlands and waterways to identify and describe fauna in the catchment to provide a better understanding of fauna use of the catchment, including wildlife corridors. Note: This would inform habitat management strategies and actions (see Strategy 4).

Appendix E

Consultation-Draft Feedback

Appendix E Consultation Draft Feedback

Consultation Draft – Geoffrey Alma Bays Catchment Management Strategy report
 Combined comments and associated amendments incorporated in the revised draft (November 2014) and updated March 2015

Section	Comment	Action/comment
	¹ The Coconut tree is NOT a weed or pest plant and you will find it is endemic to Australia. The nonsense about the Coconut has to stop. Captain Jimmy Cook back in 1770 named Palm Island for why	It may be naturalised in places (endemic) however it is not native
	¹ If this doc. that you have created is to be used as a reference can you see it if possible to access or create accurate maps of the waterways/drains from heads to tails. (Top to bottom) (Top of the ranges to the beach)	No resources for doing the on ground work required for fine scale mapping
	¹ As with above. Could an accurate USL/Nat Park map with firebreaks noted to drawn up. Nat Parks in Picnic may have something in this line already. "In the old days" the council used to create/maintain the firebreaks with a grader then some of us young fellas learnt how to drive and slide the car between the trees keeping the tracks clear. The fires of the "old days" are not as common today because of the minimizing of the vacant pineapple paddocks into suburbia but the tracks (Where possible and appropriate) could still be kept up to maintain access to the USL/Nat Park and as a buffer between the suburban garden and USL as a primary and secondary stop gaps to the National Park beyond. I see this as a Nat Parks expense with the council as the contractor.	As above
	¹ At the beginning of the document it should be noted clearly the distinction between what is seen to be wanted and what can be done in relation to Freehold and other. For example I maintain my right to do (within the law) what I want on my freehold. That the volunteer groups can only do what is allowed and supervised by the governing body e.g. if works are happening on freehold then the property owner must be present to supervise the works and sign off as happy. Nat Parks must play the active supervising role as would Council. Any of the Island self- help groups should have a plan and supervision by the relevant governing mob.	Rights on Freehold land are embedded in legislation and not discussed in the catchment management context
	¹ If it makes any difference. The Common Death Adder is common to the whole of Magnetic Island's high lands coming down to the suburban flat country in the dry. Absolute caution should be exercised when working on the slopes to wear protective gear as they hide really well and blend in with the background when sunbaking on a rock and can be easily stepped on resulting in potential attack/defense	Essential habitat is based on 'rules' made up by EHP. Work practice on MI could refer to the need to be aware of the presence of snakes
	¹ When dealing with the Island could the governing bodies be dealt with by the same name so that we can read with fluency of understanding who is who and responsible for what. NRM; Nat Park: Dept of ????????? etc.	State Govt keeps changing the names, roles etc.
Appendix A	¹ Field notes "Petersen Creek – constricted flow diverts the creek along the beach" is incorrect. All the creeks, as they come to the beach dune flow toward the East. Only when a heavy rain event will they blow straight out thru the beach dune to the sea and then depending on the sea height (tide) and amplitude will that breakthrough be shaped, only to reclose to normal after a period of restoration. What I call the "Wash-away" of Nelly Bay Beach near the old helipad is an example. That creek used to flow behind the beach to Gustav Creek. Gustav creek used to flow to the east to under the	This is an assumption of mine based on observation. Low flows will follow the path of least resistance which can result from restrictions

Geoffrey Bay and Alma Bay (Arcadia) Catchment Management Strategy

	hill slope of Nelly Bay in the “Old days”. Whenever you get ship wrecked go over the sand beach dune to the creek behind for water.	whether natural or human induced
	¹ Gustav Creek Catchment Care Group may have been left out	
	² I don't think this document makes enough of the World Heritage status of the island, that is generally not valued. Whenever the Island is described as “(just) a suburb of Townsville” that special status is devalued. And this status has both significant environmental and economic benefits if only both were much better and forcefully articulated from the top down.	Magnetic Island is within the Great Barrier Reef World Heritage Area (WHA) and acknowledged in s1.3.1
	² I concur with Tony that we do have a range of highly committed and very knowledgeable groups working with and supporting ‘us’. This is one of the most cost effective and useful things that could happen. I have made several comments below that TCC needs to do directly to improve its own housekeeping	Agreed
Weeds	<p>² Weeds list as in the document is very incomplete. It happens that as part of another grant and right now, I am being tasked with trying to put together a comprehensive online and hard copy Island Weeds Guide – can we work together on this as a matter of urgency? Within the confines of this report weeds needs to be tackled holistically, urban gardens, any empty land of any tenure, street verges etc.</p> <p>Education is needed (with strong National Parks input) about new escapees that are threatening to become weeds as well. (e.g. “mock orange” smells lovely, but certainly spreads like wildfire)</p> <p>This not only needs to be at Island plant sources, but as so many avail themselves of the cheap mainland prices (at Bunnings et al) this also needs to be part of weed education</p> <p>I regret to concur that one of the biggest spreaders of weeds would be Council's own trucks and those of contractors either moving around the Island or bringing weeds seeds in from the mainland. (will not waste space citing examples – will supply if needed) A proper wash-down procedure HAS to be made to take place and on the mainland please.</p> <p>Yes, more emphasis on the removal of weeds for habitat recovery is needed.</p>	<p>Not intended as a comprehensive species list and based on a brief reconnaissance of the two main creeks and readily accessible areas.</p> <p>Work on Weeds Guide?</p> <p>Agree about education and other points and perhaps these are components of one or more of the strategies e.g. habitat management</p>
Community themes	² While the list given in the report reflects the workshop very adequately, it implies by omission that this is all the thought that has gone into the Arcadia region, when in fact there has been over the years, a myriad of research / mapping / planning work done to articulate the values (and degradations) of this area.	Moved to Appendix as past tense and MI Community Plan incorporated in final strategies and s1.5.1
Title page	³ A truer title is “Natural resource management strategy for Arcadia catchment” because it's not just about catchment (water) management; it's also about habitat, fauna, weeds, etc (which the strategy includes). CFOC funding is for MNES, i.e. World Heritage Areas and values, threatened species and ecological communities, etc, so the biodiversity side of things is important.	Catchment defines the geographic area and is not specifically about managing water. Rather it is about managing the natural resources and people behaviour within

Geoffrey Bay and Alma Bay (Arcadia) Catchment Management Strategy

		the catchment as a geographic 'unit'.
1.2 Purpose p.1	³ I agree this SHOULD have been the purpose of the strategy but it wasn't achieved. The strategy doesn't synthesize available knowledge. There is plenty more available knowledge that hasn't been considered e.g. Magnetic Island EPBC Policy Statement, World Heritage values, mapping of significant vegetation at Arcadia by community, fauna records including turtle nesting records, draft management plans and species lists for Alma Creek Reserve and Geoffrey Bay Scrub, mapping and description of original waterways and wetlands and subsequent changes, etc.	Reworded section to reflect the level of detail included in the document commensurate with available resources
1.3 Introducing p.1	³ A couple of community people I've spoken to about the document find it user-unfriendly. I think it has value in providing guidance to Council. Council might use the strategy as a tool to apply to Australian and Queensland government for funding for Council to do more strategies, but it would be better if Council focused on directly supporting local community groups who have been doing the catchment management planning and on ground work for years	Resources expended on the report were minimal and hopefully the report will assist in gaining resources for the community. References added in new s 1.3.1 and Appendix A becomes the Bibliography/ Reference guide
1.3 p.1	³ Its not the second largest in area	"by population" added to clarify
1.3 para 1 added	³ Wulgurukaba are the Traditional Owners of Magnetic Island. Arcadia and the catchment is within the Great Barrier Reef World Heritage Area.	Added new section 1.3.1
Figure 1 p.2	³ The catchment boundary is wrong. The catchment boundary should extend further east towards Whitfield Cove to include all of Alma Creek. "Devils Arch" is north of where you have shown it (on the point). The name of the cove is "Fish Cove".	Amended and notes added
1.4 p.2	³ What about offshore tenure? It's a catchment management strategy yet there is no mention of what the catchment flows into; i.e. the GBR Marine Park. The strategy should describe the marine environment of Geoffrey and Alma Bays. Both are Marine National Park GREEN zones, both support seagrass, coral reefs, turtles and dugongs i.e. water quality is IMPORTANT. Isn't this a Creek to CORAL project? This is a strategy within the GBR WORLD HERITAGE AREA.	New section 1.3.1
1.4 Tenure, p.2	² I may be wrong on this point and QPWS will quickly supply an accurate answer, but I am of the opinion that there is now NO USL in the Arcadia catchments at all	Confirmed State Land via Qld Globe. 125 hectare block west/south and 46 ha block north. May be intended as extensions to the NP but hasn't happened yet
Figure 1.2 p.3	³ It is a state government reserve that council took over management of explicitly for environmental purposes when the state was looking to dispose of state reserves. What does "vacant" mean? It's not vacant of environmental values	Vacant land was the description included on a map prepared by TCC. Changed to reserve.

Geoffrey Bay and Alma Bay (Arcadia) Catchment Management Strategy

<p>1.5 Planning directions</p>	<p>³Other TCC planning directions to refer to include Community Plan, Chenoweth’s Environment and Biodiversity Study for TCC; Environment North’s Magnetic Island Protection of Significant Vegetation; Grier’s Vegetation Character and Significance: Magnetic Island Towns and Bays; and TCC’s TCC owned or managed land: natural area survey and management: Magnetic Island.</p> <p>The strategy shouldn’t just be informed by TCC’s planning directions and consultation for the island and Arcadia. Council should acknowledge and respect relevant planning and consultation done by others. Considering this strategy is largely funded by Australian Government, studies and consultation about matters of national environmental significance on the island should receive special consideration, eg SEWPaC’s Magnetic Island EPBC Act Policy Statement; Kenchington’s World Heritage Attributes and Values Identified for Magnetic Island and the surrounding Marine Environment; MICDA’s Magnetic Island World Heritage Values. Other relevant detailed studies and consultation have occurred and these should be referred to too, eg O’Malley’s Significant Vegetation of Magnetic Island land subject to development assessment; O’Malley’s Vegetation of Arcadia Magnetic Island; Sandercoe’s Vegetation of Magnetic Island; NPRSR’s Magnetic Island Management Statement 2013, etc.</p> <p>Considering this is meant to be a community-based strategy, an essential document to integrate is Magnetic Island Community Development Association’s Magnetic Island Community Plan, based on extensive community consultation. This document includes the highly relevant Magnetic Island Lowlands Natural Areas Conservation Strategy with a strategy, key steps, objectives, timeline, partners, resources and success indicators (copy attached).</p>	<p>Incorporate City Plan component (see s1.5) which commenced 27 October 2014.</p> <p>Add section 1.5.1 Reference to community planning documents</p>
<p>Figure 1.3 p.4</p>	<p>³This figure is wrong (shows Olympus Crescent as higher density) and was updated by TCC in subsequent consultation. It is superseded by the recently released Draft Planning Scheme zoning map (which also has a major error acknowledged by TCC, showing Alma Creek Reserve for higher density). If you’re going to use any figure here, please use the official legal endorsed Townsville City Plan 2005: “Map 4.8(b) - District 8 - Magnetic Island”.</p>	<p>See above and revised/new section 1.5</p>
<p>Figure 2.1 p.5</p>	<p>³The mouth of Petersen Ck is further east and runs along the top of the beach. Original survey plans I previously submitted confirm this. Years ago Council tried to stabilize the creek mouth and rock walled it. After years of negotiation, Council has been allowing the creek to return to its natural position. Your map showing the creek in the artificial position gives Council ammunition to start bulldozing open the artificial opening again after we’ve spent so much effort. The natural position is so much better because it stays open longer and facilitates more frequent flushing and provides intertidal habitat. The tributaries of the two main creeks should also be shown. The tributary locations shown in Figure 1.1 are incorrect. Please include a map of the original waterways which I have already provided and attached again. A lot of the original drainage features have been compromised by Council and development but still operate in high rainfall events and drive natural processes. The map of original watercourses would help people understand how the system originally worked and this would help inform future strategies. For example, Geoffrey Bay Scrub is on an old western tributary of Petersen Ck; it is EPBC-listed endangered Semi Evergreen Vine Thicket and its presence and survival are directly related to the original waterway and ongoing hydrological processes.</p>	<p>Substituted for O’Malley 1997 Map (see Figure 2-1)</p>
<p>Figure 2.2 p.6</p>	<p>³There is a more accurate map in Sandercoe 1990 Vegetation of Magnetic Island.</p>	<p>Referenced including</p>

Geoffrey Bay and Alma Bay (Arcadia) Catchment Management Strategy

		replicated in Jackes 2010
Figure 2.3 p.7	³ Devil's Arch is a small feature north of Fish Cove	Amended
2.3.2 Essential habitat p.11	³ Observed in Alma Creek Reserve.	
2.3.3 Fine resolution mapping p.11	<p>³Magnetic Island EPBC Act Policy Statement maps Matters of National Environmental Significance at Arcadia (figure 2 on page 13), in particular the Geoffrey Bay Scrub Semi Evergreen Vine Thicket. This strategy is funded by CFOC; its reasonable to ask that the strategy discusses and maps MNES values, given a map is available.</p> <p>We need to first identify and map the values in the catchment to know what are the assets before we can develop strategies for their management.</p> <p>Local scale, ground-truthed mapping of vegetation and habitat will enable well-informed strategies to be developed. The following areas warrant mapping:</p> <ul style="list-style-type: none"> • Mangroves and other intertidal vegetation at the mouths of Petersen Creek and Alma Creek and the eastern end of Geoffrey. • Native vegetation along Geoffrey Bay foreshore including the Casuarinas, Paperbarks and strand vegetation. • known significant habitat e.g. turtle nesting areas, rainbow bee-eater nesting areas, orange-footed scrub fowl nesting areas, trees with hollows, butterfly over-wintering aggregations sites, bare rumped sheath tail bat habitat, etc. • World Heritage values • natural areas on public land that community groups have been managing with approval from TCC and/or QPWS i.e. National Park around Olympus, Alma Creek Reserve, Geoffrey Bay foreshore, Geoffrey Bay Scrub, Petersen Creek 	<p>Reference to EPBC policy in Appendix A.</p> <p>No resources to do the mapping however it is on the 'to do' list</p>
3.2 community meeting p.12	³ The workshop was great but just one event amongst many other NRM community workshops at Arcadia in the last few years e.g. Turtle Nesting workshop, Geoffrey Bay Scrub weed management demonstration, Olympus Crescent Coastcare open day, community weeding working bees, MICDA's 2013 Magnetic Island Community Plan, etc.	Happy to include a chronology of events and actions beyond those already listed if provided
3.2 community meeting p.12	³ There should be a section here for issues raised in submissions after the workshop. Council said people could raise additional issues through submissions and these would be considered and incorporated as a formal part of the consultation process	Moved to Appendix C as context material. Additional material added and noted
Table 3.1 p.12 C4	³ Sand shouldn't be extracted in first place. Treat the cause, not the symptom.	Opinion about recorded comments. No edits
Table 3.1 added after F2	<ul style="list-style-type: none"> • ³Sand extraction and realigning creeks degrades intertidal habitat, e.g. fish nursery • Fauna habitats not yet mapped e.g. overwintering butterfly aggregation sites, orange-footed scrub fowl mounds, etc • Vehicles on foreshores compact soil for nesting turtles and rainbow bee-eaters. • Mown and irrigated foreshores degrade turtle and bee-eater nesting habitat. • Lighting disorients turtle hatchlings. This happened in 2013 at Alma Bay resulting turtle hatchling deaths <p>Native vegetation</p>	Added to Appendix C

Geoffrey Bay and Alma Bay (Arcadia) Catchment Management Strategy

	<ul style="list-style-type: none"> RE mapping doesn't show some valuable native vegetation e.g. Geoffrey Bay Scrub (which is endangered under EPBC), Geoffrey Bay foreshore vegetation including the Casuarinas, Paperbarks and Ipomoea, mangroves in Petersen and Alma Creeks etc. Vandalism of foreshore vegetation for views 	
Added to P1	³ insufficient building setbacks from creeks	Added to Appendix C
After P1	³ Environmental reserves aren't adequately protected, e.g. Alma Creek Reserve and Geoffrey Bay Scrub don't have conservation tenure	Added to Appendix C
S2	³ Council has approved buildings in stormwater inundation areas	
S3 added	³ Narrowing of Alma Creek channel by concrete drain (mangroves) and sub-par drainage (e.g. piped bridges)	Added to Appendix C
S4 added	³ Constricted creek flow and particularly Petersen Creek and Alma Creek mouth.	Added to Appendix C
S6 suggested alternate	³ Dysfunctional stormwater drainage is patched up rather than designing, funding and installing functional infrastructure.	Added to Appendix C
Added after S8	³ Stormwater management and drainage is not adequately based on science and regard for intertidal habitat values and GBR World Heritage values e.g. mangroves, saltwater couch and fish nursery areas are excavated. Altering natural drainage lines and hydrological regimes threatens valuable natural areas e.g. Geoffrey Bay Scrub.	Added to Appendix C
M2 added	³ People throw rubbish in drains/creeks as dump is closed (waste management) or they don't appreciate natural areas or realise negative impacts	Added to Appendix C
Added after M3	³ Well-meaning post-cyclone clean up damages natural areas	Added to Appendix C
W1	³ If you did a survey, I'm sure you would find more environmental weeds on occupied urban land than vacant urban land. There are a number of misperceptions in this table that Council is perpetuating by including them without researching the facts first	Added to Appendix C
W4	³ This is state land and a state responsibility	
W4 added	Lantana is the main issue in the upper Arcadia catchment. Huge Yellow Oleander infestations on Bremner Point and Whitfield Cove	Added to Appendix C
W6 added	³ People (including some Council workers) are uncertain whether certain species are native or weeds. Downy Thorn Apple (white flowers) on Junction track (may be a native solanum)? Weeds on Council-managed land.	Added to Appendix C
W6	³ These sorts of comments should be referred to QWPS and not recorded in the strategy other than a general comment as I have suggested. If it wasn't for volunteer work by community groups, Council-managed land might be the weediest of all. There should be a Traditional Owner section acknowledging that there are TO values and sites and these need to be incorporated into the strategy	Recorded public comments and no further edits
3.2.2 Current and past actions p.14	<ul style="list-style-type: none"> ³Geoffrey Bay and Olympus Crescent Coastcare Groups – ongoing approved habitat restoration including weed management and revegetation works at various public sites in Geoffrey and Alma Bays including Petersen Creek, Alma Bay creek and the adjoining reserve, Geoffrey Bay Scrub and Geoffrey Bay foreshore; North Queensland Conservation Council project with MINCA and MICDA and Geoffrey Bay Coastcare through Everyone's Environment funding - works on 5 Magnetic Island creeks including Petersen Creek (Geoffrey Bay); 	Added to Appendix C
Table 3.3 p.15 added after 3	³ Catchment management allows natural delivery of sand to beaches	Added to Appendix C
Table 3.3 added	³ Fauna surveys and descriptions e.g. species lists, habitat mapping	Added to

Geoffrey Bay and Alma Bay (Arcadia) Catchment Management Strategy

after 6	including nesting sites, corridor identification etc. Flora Vegetation surveys and descriptions, eg species lists, regrowth mapping on public land	Appendix C
Table 3.3 33	³ Not necessarily true. Depends on their significance, extent, method of dispersal, whether NPRSR is obliged to manage them anyway if they're on state land and a declared species etc. There might be some lowland weeds that are particularly nasty or threatening significant species or habitat and therefore might be a higher priority. Assigning priority should be based on proper weed survey and knowledge	Added to Appendix C
Table 3.3 37	³ Alma Creek bridge has been raised with Council by numerous local ratepayers as priority issue for more than a decade, including on-site inspections with Council and formal submissions.	
37 added	³ Single span bridge for Petersen Creek and Alma Creek	Added to Appendix C
41 added	³ Council needs to be more active in sustainable creek management	
Added after 43	³ Wetland and waterway mapping and description, including seasonal tributaries	Added to Appendix C
44	³ What is meant by "rubbish"? Hopefully not native vegetation or sand	
48	³ Council should enforce weed control equally across all landholders, including itself. It is discriminatory to target vacant blocks and not occupied blocks where a lot of the worst weeds are located	Added to Appendix C
49	³ This sort of action usually results in Council going in and slashing the lot, weeds and natives, thereby removing habitat and spreading weeds further. Need first to identify and map the worst weeds and discuss the best control method.	
51	³ Discriminatory	
Post table 3.3 (p.17)	³ with a strategy. All ideas need to be verified factually first. The key strategies and sub component actions have been extracted from Table 3-3 to form the basis of the strategies proposed in section 5.	Text added
4.1.1 Drainage patterns p.18	³ Please include map of original drainage lines; I provided one in my submission	See new Figure 2-1
4.1.1 para 1	³ The original drainage lines have been partly altered as a result of the urbanisation of Arcadia with the current drainage network intersecting both public and private land. The road network is mostly uncurbed with stormwater runoff free to move overland or along roadways which act as stormwater drainage. Pipes have been installed to allow stormwater to pass under some roads and in particular under Marine Parade (Arcadia Road), Hayles Avenue, McCabe Court and Olympus Crescent and Alma Bay.	Text added to s3.1.1
4.1.1	³ The pipes under Alma Creek bridge were removed a few years ago to improve flows following community appeals to Council.	Text added to s3.1.1
4.1.1 para 3	³ Please provide evidence that salt water tolerant vegetation adds significantly to the restriction at the creek mouth. My observations are that significant flows will wash out the vegetation and stabilized sediment/sand. See photos of Alma Creek washouts provided as part of previous submission. Bottom line is the narrow bridge and building approvals in inundation areas are the causes.	Sounds like a research project. No resource to provide 'evidence'
4.1.1	The diminished flushing of the creek also reduces intertidal habitat e.g. fish nursery, which is particularly relevant given the sites are within the GBRWHA and both Geoffrey and Alma Bays are Marine National Park Green zones.	Text added to s3.1.1
4.1.1	³ The mouth of Alma Creek has been channelised with concrete walls (see Figure 4-6) and confined by a foot bridge (see Figure 4-5 and 4-6). Olympus Crescent Coastcare has removed weeds and facilitated natural regeneration on the northern side of the creek with TCC permission. This is the site of a recent turtle nesting.	Added to Appendix C text added to para 4
Figure 4.4 p.19	³ Early survey plans of Arcadia show this as the natural route of lower	

Geoffrey Bay and Alma Bay (Arcadia) Catchment Management Strategy

	Petersen Creek. Of course in extreme rainfall events the creek flows straight out to sea.	
	Response Creek mouth varies naturally over time and generally has a natural 'type' based on geology, bioregion, climate and geomorphology	
Figure 4.6 p.20	³ showing flows undercutting drain floor	Added to Appendix C
4.1.2 Erosion p.20 para 2	³ This was an approved Geoffrey Bay Coastcare weed management and reveg site that was dozed by Council for Gabul Way with no notice or opportunity to retrieve plantings. Council proposed no reveg or weed management following the Gabul Way works. Geoffrey Bay Coastcare successfully lobbied Council to fund us to reveg and manage weeds in the site, but the funding doesn't cover any of the project management costs. This demonstrates the ongoing poor understanding by Council of coastal and catchment management and expectation that community groups will clean up Council's mess for peanuts	
4.1.3 weed invasion p.21	³ Council's planning scheme could require new development to minimize earthworks, be set back from waterways, retain existing native vegetation, and only use local native species in landscaping in World Heritage Areas. The list of the catchments main weeds is provided	Appendix C para 2 text added. New planning in scheme commenced 27 October 2014
Table 4.1 p.22	³ What's the source of the weed list? Plenty of omissions: Clerodendrum (exotic sp), Rubber vine, Leucaena, Bougainvillea, Quisqualis, Merrimea (exotic sp), Ipomoea (exotic sp), Bauhinia, Slipper plant, Tamarind, coral berry, Cascara, Castor oil, Bellyache bush, list goes on... We have mapped the extent of many of these. Goats Head Burr - Tribulus terrestris (Native, not weed)	There is a potential native i.e. <i>Tribulus cistoides</i> , but haven't seen it yet. Flowers are different to <i>T. terrestris</i> which is naturalised in Australia and a declared weed in other states
Figure 4.8	³ This method is not best practice. MoM left on rocks can easily be dislodged by rock wallabies etc and each leaf then produces more plants. Best method is to bag it and compost under black plastic. Periwinkle method is not suitable if has already set seed. PLEASE can we instead have a proper discussion of recommended weed management methods per species per situation?	Removed
	³ Figure 4-8 shows a patch of Periwinkle (also Mother of Millions - MoM) on a shallow soil cap on Devil's Arch. Method for removal was hand pulling. Periwinkle and MoM were also found in cracks and depressions where sediment and/or moisture have collected. MoM is placed on bare rock with soil removed from its roots. Periwinkle left on rocks if available or pulled and dropped.	Removed
Figure 4.12 p.24	³ Mother-in-law Tongue invasion of turtle nesting habitat and native Clerodendrum Ideally have close up photo of weeds otherwise some people might think the <i>Clerodendrum inerme</i> is a weed. The mother in law patch has been significantly reduced by Geoffrey Bay Coastcare. Please give us some credit.	Removed
(after 4.1.4) Coastal processes p.25	³ "Coastal processes are a climate driven natural phenomenon and are therefore susceptible to climate variability. At present the Geoffrey Bay and Alma Bay foreshores do not appear to be adversely impacted by climate change as a result of the rise in sea level around Magnetic Island over the last 100 years (estimated at between 12 and 22 centimetres based on IPCC figures of 1.7 + 0.5 mm per year)."	Revised text now in section 3

Geoffrey Bay and Alma Bay (Arcadia) Catchment Management Strategy

	<p>What evidence is this assessment based on?</p> <p>There has been shoreline recession of a couple of metres along the western half of Geoffrey Bay in the last decade evidenced by exposure of the drainage infrastructure near Bright Avenue, by the erosion and loss of large casuarinas, and by the fact that casuarinas we planted a decade ago four metres from the seaward edge are now being eroded. This is not to say the dunes won't build up again naturally.</p>	
Coastal processes para 3	<p>³More so than cyclones, it is extreme rainfall events that delivers sand to the foreshore.</p> <p>Based on what evidence? Arcadia was massively affected by Cyclone Althea. One of the impacts was deposition of sand onto the Geoffrey Bay dunes and mass germination of Casuarinas which Council removed (the sand and Casuarinas).</p>	See above
Coastal processes para 4	<p>³"Compared to Nelly Bay it appears that the influence is minimal."</p> <p>Not a relevant comparison as Nelly Bay coastal processes are also affected by the massive harbour structure. It is premature to suggest minimal influence until the studies are done.</p>	See above
Added at para 4	<p>³Council extracts sand from Petersen and Alma Creeks and uses it for general works; Council has approved urban subdivision in Petersen Creek (upstream of Hayles Avenue) and has proposed medium density development in the mouth of the creek in the new draft planning scheme; all of which compromise the ability of sand to be delivered to the foreshore. Council mows much of Geoffrey and Alma Bay foreshores reducing sand-trapping vegetation.</p> <p>Olympus Crescent Coastcare and Geoffrey Bay Coastcare have removed weeds and propagated, planted and maintained local native coastal and riparian vegetation on local foreshores and waterways to maintain and enhance natural coastal processes</p>	See above

Note: ¹ and ² and ³ indicate the source of the separate comments received about the Draft document. Section column includes page number (p.x) as per the consultation draft. Page column indicates where amendments occur in the revised draft and/or includes relevant comments.

Draft strategies section 5

Section/page	Submission comments
5.1 Considerations p.27	<p>³What about environmental values?</p> <p>Response to comment</p> <p>It is a specific term used in the EPP (Water) and can confuse things so was not included as a term. Further work is required to define values</p>
5.2 Draft suggested strategies 5.2.1 pp.27-8 Strategy 1	<p>³Disagree that this should be a key strategy; its more bureaucracy. NQDT already have a Sustainable Coasts website with a network of coastal NRM community groups including island groups. http://wiki.nqdrytropics.com.au/index.php?title=Sustainable_Coasts</p> <p>Response to comment</p> <p>Strategies revised and comparison of draft and revised included in Appendix D</p>
Strategy 1 Coordination	<p>² There is very effective communication and co-ordination on the Island – and I do not think that any new mechanisms need to be put into place. However, I think that we generally do not invite Council to Island planning or discussion events and they occur ad hoc when needed. Mainly because we tend to meet at night or at the weekend – as community members are environmental volunteers and gainfully occupied in the working week! However, if Council / staff would like to be more involved, tell us who to add to the email invitation list</p> <p>Response to comment</p> <p>Noted and amended</p>
5.2.2 Community awareness and capacity p.28	<p>³A higher priority audience for a “caring for Magnetic Island” guideline than residents and visitors is Council. More than anyone, Council actions impact on the catchment. As recently as last week Council took away truckloads of sand out of Alma Creek and trashed native vegetation and habitat in the process. Council could lead by example and improve their own practices before advising residents and visitors how to care for the island. We would gain most by Council improving its catchment management.</p> <p>Develop a “Caring for Magnetic Island” guide for Council, including town planners, roads,</p>

Geoffrey Bay and Alma Bay (Arcadia) Catchment Management Strategy

	<p>parks, beaches, stormwater and drainage, natural areas, post-cyclone clean-up crews, etc. The guide would acknowledge that the island is part of the GBR World Heritage Area and identify important natural areas and values and provide advice on how these areas can be planned for and managed so that their natural values are protected and not negatively impacted.</p> <p>Response to comment (As above) Strategy 2 added</p>
Strategy 2 Care guide	<p>² We have the makings of this guide already scattered across the www.whatsonmagneticisland.com.au website, certainly resources made available to improve this would be welcome (as we are back to the few willing and knowledgeable horses here) However, I must concur with Tony's sharp comments about contractors and utilities staffs who do manage to trash more than they conserve. This MUST be addressed</p> <p>Response to comment Noted and amended</p>
5.2.2 p.28 Strategy 3	<p>³Olympus Crescent Coastcare has received Friends of National Parks funding for activities including a weed management workshop this year. We have run similar workshops in the past. Some of these strategies sound more like Council preparing a strategy to support future funding applications to support Council activities rather than Council acknowledging and supporting existing initiatives taken by community</p> <p>Response to comment Any Creek to Coral applications for funding involving natural resource management on Magnetic Island would be on the basis of both supporting existing community initiatives and adding to the ability of Council to manage its own public land and natural areas where there is little or no community activity. Natural areas are not seen in the same light as formal parks i.e. needing a high level of maintenance. Natural areas therefore receive less internal financial support from Council than formal parks</p>
Strategy 3 Thematic guide	<p>² While I appreciate that this document is dealing with the area that encompasses just one of our villages, so much of what would be in such a guide is applicable to all inhabited bays, and we do only have 1000 households (approx) all up, so any such resources should be applicable Island wide, with specific sections for each "bay" or catchment, where these might have unique matters to be described</p> <p>Response to comment Noted</p>
5.2.3 Habitat management p.28-9	<p>³The current strategies for habitat management only include weed management, creek rubbish removal and creekwatch. Managing habitat is much more than just removing weeds and rubbish. There also needs to be habitat mapping, description, assessment, planning and protection.</p> <p>Response to comment That is the point of the habitat management plan. The actions are things that can be done and are being done</p>
5.2.3	<p>³ A key reason for managing weeds is to facilitate habitat recovery. (Comment: Olympus Crescent and Geoffrey Bay Coastcare don't do weed management just to get rid of weeds; the driving objective is habitat recovery)</p> <p>Response to comment Added to para 1 This is why it was included as weed management strategy originally as it is more likely to gain traction with Council as most staff are more likely to relate to weed management than the broader concept of habitat management</p>
Strategy 4 suggested wording	<p>³Develop and integrated habitat management strategy for Geoffrey and Alma Bay catchment. Collate information relating to habitat values and past and current habitat management efforts in the Geoffrey and Alma Bay catchment. Identify and fill information gaps. This would become the basis for monitoring, maintenance and expansion of any rehabilitation works. The strategy would investigate how habitat on Council land could be better protected e.g. the Council reserve on Alma Creek which Olympus Crescent Coastcare have restored with Council approval and federal and state environmental grants over the last decade. (Comment: The importance of habitat protection is evidenced by Council's recent draft planning scheme that proposed to rezone the Alma Creek Reserve for medium density development after the community has spent a decade of volunteer labour and federal and</p>

Geoffrey Bay and Alma Bay (Arcadia) Catchment Management Strategy

	state environment funds rehabilitating it.)
	Response to comment Incorporated
5.2.3 para 2 suggested wording following on from Strategy 4	³ The habitat management strategy would include a weed management strategy outlining a variety of weed management methods that could be employed depending on a number of factors including; the type/s of weeds and plant biology/ecology, condition of native vegetation and regeneration potential/difficulty, habitat values, significant species or vegetation types, level of infestation, proximity to waterways, soil type and condition, proximity to intact native vegetation, surrounding land use, edge length and weed encroachment, time of year and seasonality, accessibility, available resources and level of community involvement and level of Council or NPRSR involvement. (Comment: Council could acknowledge that Olympus Crescent and Geoffrey Bay Coastcare have working draft habitat and weed management strategies and knowledge built up over more than a decade including advice from experts and that this knowledge could form a basis for the habitat and weed management strategy)
	Response to comment Incorporated
Addresses community feedback: p.29	³ Discriminatory and unfounded. Refers to “vacant lots” from community issues
	Response to comment From community feedback i.e. an opinion
Strategy 5 p.29	³ This should not include removal of sand and native vegetation simply because someone argues it causes flooding without evidence
	Response to comment Not relevant to Creekwatch activities which was the basis of the strategy
5.2.4 Foreshore management (erosion)	It was suggested that Council’s foreshore mowing practices and creek sand extraction practices should be reviewed so that foreshore vegetation might recover and trap more sand and so that more sand might travel down creeks to reach the beach and increase the sand budget.
Strategy 6 added	³ Review Council’s creek sand extraction practices and foreshore mowing practices to improve sand delivery to beaches and dune building.
	Response to comment Incorporated
Strategy 9 p.30 added	³ and waterway management requirements and development-free waterway buffers. Waterway infrastructure upgrades should protect and restore ecological values including Great Barrier Reef World Heritage values
	Response to comment Incorporated
Strategy 10 p.30 added	³ Petersen Creek and Alma Creek)
	Response to comment Included
Strategy 11 p.30	³ It would be a better strategy to include it in the planning scheme so it was a condition of development approval rather than trying to work with a developer after they’ve got an approval
Strategy 11 suggested wording	³ Include provisions in the planning scheme so that developers and property owners are required to incorporate water sensitive urban design (WSUD) features in future developments as appropriate e.g. grassed swales instead of concrete drains.
	Response to comment Incorporated through Notes
5.2.6 Wildlife management p.30	³ What about turtle and rainbow bee-eater nesting areas etc?
	Response to comment Incorporated
Strategy 12 Domestic and feral animals	² I think a check with QPWS and with Council’s own records (perhaps Citiwaste) will reveal that a deal of work was done on this a few years ago – and particularly in relation to feral animals and the tip. However, checking on this might save a deal of time and energy. I would particularly concur with Tony’s comments on turtle friendly lighting (for ALL Beachfronts) and foreshore parking and beautification at the expense of nesting areas. There needs to be a better balance struck here
	Response to comment Noted

Geoffrey Bay and Alma Bay (Arcadia) Catchment Management Strategy

Added after Strategy 13	<p>³ Investigate retrofitting beachfront areas with turtle friendly lighting. Include turtle-friendly lighting requirements in the planning scheme for new beachfront development in turtle nesting areas including Geoffrey Bay and Alma Bay.</p> <p>Manage vehicles in foreshore parkland (including Council slasher) so that turtle and rainbow bee-eater nesting areas are not damaged or compacted. Don't turf and irrigate foreshore parkland as this reduces nesting area suitability.</p> <p>Conduct surveys of terrestrial habitat and wetlands and waterways to identify and describe fauna in the catchment and understand fauna use of the catchment, including wildlife corridors.</p>
<p>Response to comment Incorporated</p>	
New	<p>³ DRAFT Strategy 14: Identify and describe the natural attributes of the catchment, including landforms, wetlands and waterways, flora and fauna, vegetation communities, significant species and areas, Traditional Owner values, etc. This should be followed by identification of threats and opportunities, and then strategies to maintain the values can be developed</p>
<p>Response to comment Included as the base component (Stage 1) of the habitat management strategy for Geoffrey and Alma Bay catchments</p>	
Strategy 14	<p>² Also ^{3,s} DRAFT 14 to start with the positives of the natural attributes then deal with the threats and how to eliminate or mitigate</p>
<p>Response to comment Noted</p>	

Note: ¹ and ² and ³ indicate the source of the separate comments received about the Draft document. Section column includes page number (p.x) and/or section and/or draft strategy as per the consultation draft.

Additional weed list provided with reference to Table 3-1.

Present weeds include the following:

- Bellyache bush
- Captain Cook tree
- Castor oil plant
- Coral vine
- Guinea grass
- Lantana
- Merrimeea
- Mickey mouse bush
- Mother of millions
- Mother-in-laws tongue
- Periwinkle
- Plastic plant
- Rubber vine
- Sisal hemp
- Snakeweed
- Tecoma

Note: Source is word document titled OLYMPUS CRESCENT COASTCARE PROJECT May 2008 (ALMA BAY COASTCARE.doc)

Clerodendrum (exotic sp), Rubber vine, Leucaena, Bougainvillea, Quisqualis, Merrimeea (exotic sp), Ipomoea (exotic sp), Bauhinia, Slipper plant, Tamarind, coral berry, Cascara, Castor oil, Bellyache bush - list goes on

Note: Source is comments included in Consultation Draft_Geoffrey-Alma Bays Catchment StrategyV2 ^{3s} comments.doc