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Fraser Coast Coastal Hazard Adaptation Strategy (CHAS)

Phase 2 Report – Coastal Hazards Scoping Paper

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Synopsis: This scoping study fulfils Phase 2 of the Queensland Government's process for developing a Coastal Hazard Adaptation Strategy. The report reviews existing information and data, and specifies further studies required to meet this aim.

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Executive Summary

The Fraser Coast Regional Council Coastal Hazard Adaptation Strategy (Fraser Coast CHAS) project is an important whole-of-Council framework and strategy to address coastal hazard risks in an integrated and coordinated way. It will outline how to respond and manage current and future coastal hazard risks including guiding change, informing decision making and prioritising actions across Council.

This report presents the Phase 2 Coastal Hazards Scoping study, in line with the QCoast$_{2100}$ Minimum Standards and Guidelines and accordingly sets the parameters for the technical work required to prepare the CHAS. This Phase 2 report has been prepared concurrently with the Phase 1 – Stakeholder and Community Engagement Strategy for the CHAS, to ensure alignment and to draw important linkages between the two.

A review of existing information relevant to the Fraser Coast CHAS has been undertaken. The review has identified the opportunities for alignment with the CHAS across whole-of-organisation strategies, key data that will be available for the CHAS and importantly informed the necessary additional studies to address key knowledge gaps and establish a basis for a risk assessment process in accordance with the Australian Standard for Risk Management (AS/NZS ISO 31000:2009).

Determined in consultation with the Council, the planning horizons proposed for the Fraser Coast CHAS are present-day, 2030, 2050 and 2100 and therefore hazard mapping representative of these years is required. The methodology for developing the necessary mapping products is described, using a combination of existing information and new studies.

Priority gap studies required to progress the CHAS include:

- Tailoring coastal hazard mapping for the CHAS, specifically development of storm tide hazard mapping to align with available erosion prone area mapping (CHAS Phase 3); and
- Asset register and GIS database refinement to ensure this information is fit for purpose (CHAS Phase 4).

These studies are required to be completed prior to commencing Phases 5-8 of the CHAS.

A project plan has been developed to identify indicative timing and resources for these earlier phases and the CHAS as a whole. Whole-of-project risks and mitigation measures are also documented to ensure that these are identified up-front and managed through the 8 phases.

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1 Background

1.1 Introduction and Purpose of Report

The Fraser Coast Regional Council Coastal Hazard Adaptation Strategy (Fraser Coast CHAS) has been aligned with the phases of the QCoast$_{2100}$ program and is funded by a grant agreement with the Local Government Association of Queensland (LGAQ).

The Coastal Hazard Risk, Vulnerability and Adaptation Assessment Scoping Study, the subject of this report, forms the key deliverable for Phase 2 of the Fraser Coast CHAS and has been prepared in accordance with the QCoast$_{2100}$ Program. It has been informed by the Key Directions Report and with workshop input from the Internal Technical Working Group (TWG).

This Scoping Report sets the baseline knowledge of coastal hazards relevant to the region and provides direction for the gap studies and technical assessments required to inform the remaining six (6) phases of the Fraser Coast CHAS.

Accordingly, this report addresses the following:

- Overview of the QCoast$_{2100}$ program and the key objectives and desired outcomes of a CHAS, including linkages with Council's corporate and strategic planning objectives.
- Summary of existing information on the known existing and future coastal hazard issues and existing corporate and strategic planning documents with linkage to the CHAS.
- Analysis of existing information and gaps, and a detailed outline of further works/studies to meet the QCoast$_{2100}$ Minimum Standards and Guidelines (MS&G), along with a preliminary 'risk screening' to identify local coastal communities, assets and values potentially exposed to coastal hazards. This assessment is underpinned by the State government's regional-scale coastal hazard area mapping products and Council's cadastral database. The outcomes of previous assessments concerning the erosion prone area are also presented.
- Project plan including timing, cost estimates, resources available and/or required and responsibilities.
- Identification of internal and external resources and capabilities required, including key stakeholders to support each phase of the project; along with the associated governance structures and decision-making requirements.
- Identification of how the implementation of the CHAS outputs and actions will be integrated into Council instruments, processes and operations.

Importantly, this scoping study has been prepared concurrently with Phase 1 of the CHAS which is the Stakeholder and Community Engagement Strategy. The intended engagement approach set out in the Phase 1 report has been integrated into the program plan.

1.2 Fraser Coast CHAS Project Overview

1.2.1 QCoast$_{2100}$ Program

Phases 1 and 2 of the Fraser Coast CHAS have been partially funded by the QCoast$_{2100}$ program which is a Queensland Government initiative governed by a Board comprising members from the Local Government Association of Queensland (LGAQ), Department of Environment and Science (DES) and Department of Local Government, Racing and Multicultural Affairs (DLGRMA).

The program has been designed to assist Queensland coastal councils with funding and technical support to progress the preparation of plans and strategies to address climate change related coastal hazard risks. The program is intended to guide decision-making across key areas of local government planning and operations, including:

- Corporate and operational planning;
- Financial planning (long term forecasts and annual budgets);
- Land use planning and development assessment;
- Infrastructure planning and management including roads, stormwater and foreshores;
- Asset management and planning including nature conservation, recreation, cultural heritage values and other public amenities;
- Community planning; and
- Emergency management.

The QCoast$_{2100}$ MS&G provide guidance to local government wishing to prepare a CHAS. The guidelines set minimum requirements that are to be included in a CHAS as well as providing information on leading practices. The minimum standards set a benchmark for undertaking such studies in Queensland so that coastal hazard adaptation decision-making is approached in a consistent and systematic manner. The MS&G are structured to address the key phases of a CHAS which are illustrated in Figure 1-1.

Figure 1-1 QCoast$_{2100}$ Phases

1.2.2 What is a Coastal Hazard Adaptation Strategy?

A CHAS is an important 'whole of organisation' document that provides the overarching framework and strategic direction for integrated decision making and coordinated action to respond to coastal hazard risks. The CHAS provides the 'plan' for how to respond and manage current and future coastal hazard risks including guiding change, informing decision making and prioritising actions across the organisation.

The process involves identifying coastal hazards, assessing vulnerabilities and risks to a range of assets (tangible and intangible), engaging with stakeholders and the community to select prepared adaptation options and determining the costs, priorities and sequencing of actions over time.

In summary, the CHAS:

- Identifies existing coastal hazard risks today and how they are expected to change or worsen in the future over different planning horizons between the present day and 2100;
- Assesses vulnerability and risks to a broad range of assets and values (e.g. community, ecological, built/economic, cultural);
- Identifies priorities - what are the most pressing or urgent risks that need responding to today and what can wait?
- Identifies adaptation options and actions to 'treat' or manage coastal hazard risks;
- Identifies 'tools' to deliver these actions;
- Outlines timing, staging and sequencing of actions over time;

- Defines roles and responsibilities – who does what?
- Identifies funding requirements and options; and
- Outlines monitoring and review expectations.

The preparation of a CHAS is also an important 'platform' to engage with stakeholders and the wider community to help identify priority assets and the most important things valued by people, their tolerance for coastal hazard impacts, their preferred adaptation options and responses to treat risks and priorities for implementation.

1.2.3 About Phases 1 and 2 of the CHAS

Phases 1 and 2 of the CHAS helps Council to 'get ready' and to understand where the organisation is now, and where it needs to be in order to prepare the CHAS and to make informed and confident decisions during the project and throughout implementation. It is therefore about establishing the 'plan' to complete the rest of the phases of the project (Phases 3 to 8). The outcomes of Phases 1 and 2 will also provide the basis for future funding applications under the QCoast$_{2100}$ Program. Phase 1 includes the stakeholder engagement plan which can be read in conjunction with this Scoping Paper.

The minimum requirements for Phase 2 as outlined in the QCoast$_{2100}$ MS&G are outlined below:

- Identify existing information that may inform the development of a CHAS;
- Collate existing information from across the organisation and other external sources e.g. coastal modelling, hazard mapping, shoreline management plans, asset management plans, evaluation of past coastal management activities;
- Identify relevant council instruments (policies, strategies, operating procedures or plans);
- Analyse the information gathered, to determine whether further investigations are required to meet the requirements of this guideline;
- Identify the timescales and planning horizons which the CHAS is to address;
- Estimate the internal and external resource requirements of the project e.g. hours, timing, costs, resources and responsibilities to support each phase of the project;
- Prepare a scoping study report that addresses:
    - Decision-making needs of each relevant council department e.g. what is the physical impact on an asset? When should an asset be upgraded? Which species are more vulnerable to sea level rise?
    - Known coastal hazard issues, including future hazards, and the localities potentially affected;
    - A broad description of assets (tangible and intangible) of potentially affected assets (both council and non-council). A list of the types of assets to consider, including tangible and intangible assets, is included in Annex III;
    - The risks and benefits to council of preparing a CHAS;
    - Information gaps and how these are to be addressed;

- Integration of a CHAS with other council instruments and processes;
- Barriers to the commencement or implementation of a CHAS (e.g. demonstrating need, data uncertainties, budgetary constraints, resource and capability gaps, and how they may be overcome;
- Key objectives and desired outcomes of a CHAS; and
- Governance structures for the next phases of a CHAS i.e. communication protocols, responsibilities, reporting etc.

1.2.4 CHAS Risk Assessment Framework

The CHAS will follow a risk assessment framework which is a robust methodology for dealing with outcomes that are uncertain or have limited data, or for impacts with uncertain timeframes. Uncertainties associated with future climate change present major challenges to coastal managers and the wider community, who need to consider and manage future risks. Decisions made today are likely to have ramifications for many decades (depending on the development or risk treatment measure), so consideration of an extended timeframe is essential, even though risks may not manifest for several decades.

The approach enables councils to prepare for impacts that are greater than expected, or manifest earlier than expected, by monitoring for trigger levels to implement management actions, developing short, medium and long-term strategies, and using a suite of strategies to reduce likelihood and consequence from coastal hazard risks. The use of a risk-based approach to managing coastal hazards is a requirement of the QCoast$_{2100}$ MS&G and accords with current international best practice for natural resource management.

Described below and presented schematically in Figure 1-2 are the steps involved in a risk assessment adjusted to suit coastal hazards:

- **Establish the Context –** the requirements of the coastal management plan, set by the project working group and/or guideline documents, provides the context of the risk assessment and intended outcomes. The context, objectives and performance indicators/targets shall be tailored to the scenario in consultation with local government and other key stakeholders and community.
- **Identify the Risks –** namely, beach erosion and recession, coastal inundation, wave overtopping and lower catchment flooding. The risks have and will impact upon coastal values, which include cultural, recreational, economic and ecological values, typically identified through consultation with local government, stakeholders and the community.
- **Analyse the Risks –** this involves considering the **likelihood** and **consequence** of the identified risks, to determine the overall level of risk (extreme, high, medium or low).

  The **likelihood** of risks largely relates to the extent of coastal hazards, now and in the future. The likelihood of erosion and recession (incorporating existing processes and future changes in hazard extents due to sea level rise) and coastal inundation (including wave overtopping, and changes with future sea level rise) at the immediate and future planning horizons is typically determined based upon historical data, local scale assessments, peer-reviewed literature and numerical modelling assessments.

The **consequence** of the risks will largely relate to the extent of existing or future development and the values associated with the coastal and land-based assets (both tangible and intangible) within the hazard areas.

The type of impact (e.g. short-term inundation compared with long term recession of land) is also considered when assessing the consequence of the different coastal hazards. It is the combined likelihood and consequence of the hazard that determines the level of risk.

The consequence and likelihood can be combined using GIS processing to determine and map the **level of risk** for assets and land in the coastal zone. Existing controls (e.g. by local government or other state agencies) that may reduce the level of risk are then considered and included as required. A register of the level of risk to various assets forms an output of the risk mapping process.

- **Evaluate the Risks –** in consultation with the Council and other stakeholders, the level of risk that is deemed acceptable, tolerable and intolerable is determined. Coastal hazard risks are prioritised and risk treatment measures are focused on the higher levels of risk that are deemed intolerable or unacceptable.
- **Treat the Risks –** the process of developing risk treatment options is directly related to reducing or eliminating intolerable risks. Tolerable (low) risks can be flagged for monitoring, with no further short-term actions necessary. Management options can be designed to reduce the likelihood of the risks (e.g. planning setbacks to reduce the likelihood of shoreline recession impacts) or the consequence of the risk (e.g. emergency management to reduce the consequence of a storm tide inundation) or both.

  Cost benefit analysis is then used to determine which of the risk treatments will provide the greatest benefit (relative to cost) in treating the highest priority risks. A transparent cost benefit analysis process ensures that other coastal management objectives are not compromised by the risk treatment or adaption option. For coastal management, innovative strategies may be required to provide benefits across the community and natural habitats and within the existing legislative framework.
- **Implement Management Strategies (Risk Treatments) –** A coastal management plan or strategy (such as a CHAS) is typically used to detail how the recommended management options (risk treatments) shall be implemented (costs, timeframes, etc.) and funded.

  Monitoring and Review – Monitoring and review has always been a component of sound coastal management. Within a risk assessment framework, risk levels are monitored for change (i.e. an increase or decrease in the level of risk over time) with management actions modified in response to such changes. This should occur, for example, following a rapid change to the physical environment due to a significant natural event (such as major storm tide inundation or coastal erosion) or when new sea level rise projections are published and adopted by regulatory agencies. At this time new hazard assessments may be required to underpin the updated risk assessment.

  Monitoring and review also provides for the outcome of management responses to be tracked against performance indicators. Setting triggers for management action linked to environmental

data (such as increases to mean sea level or shoreline recession) is a further tool to assist in the monitoring and review process. As triggers are approached, there is a clear signal to management agencies that action will need to be taken. Alternatively, as part of the review of plan, if the risk profile has not changed, it may be wise to continue to delay action.

For demonstrating how the risk management framework can be applied to a specific study area, example mapping from a previous project is presented in Figure 1-3. Using the AS/NZS ISO 3100:2009 Risk Management principles described above, the coastal erosion hazard is presented in terms of the likelihood of erosion extent (i.e. almost certain, unlikely and rare), as illustrated in left panel in Figure 1-3. There are many advantages to this approach:

- Ascribing likelihood to the hazard estimates provides transparency regarding the uncertainties, limitations and assumptions used to assess hazards. In addition, ascribing likelihood can educate coastal planners and the wider community that hazard lines are estimates only and not precise predictions of future shoreline response.
- Hazard probability zones convey the outcomes of sensitivity testing. The zones may be tightly or widely constrained, depending on the sensitivity to upper and lower bounds for climate change and other parameters.
- Describing the likelihood of the hazard enables councils and planners to consider impacts greater than expected or “worst case scenarios”, but also qualify such impacts (e.g. as a rare likelihood). The ‘rare’ hazard may be regarded in a similar fashion to the Probable Maximum Flood (PMF) zone used in floodplain management.

The consequence of the risk of erosion on the built, social and natural environment depends largely on the type of development and assets and their values. For the example shown in the middle panel of Figure 1-3, the assessment of consequence utilised existing mapping for ecological resources, existing surveys and consultation for highly important community assets and values, council’s mapping of assets including stormwater, wastewater, surf clubs and so on, and land use zoning. The consequence mapping also delineated the potential for loss of beach amenity in highly developed coastal areas and iconic beach localities.

The mapping of hazard likelihoods is combined with mapping of consequence through GIS geo-analysis to produce a ‘risk map’, such as that shown in the right panel of Figure 1-3 . The risk map details the level of risk from extreme to low for all assets and areas potentially affected by coastal erosion at each timeframe.

Fraser Coast Regional Council has previously assessed the risk to assets within the erosion prone area width (Cardno 2011; 2012). This previous work sets a robust foundation for the Fraser Coast CHAS and will likely guide the approach to coastal hazard risk assessment adopted for the project.

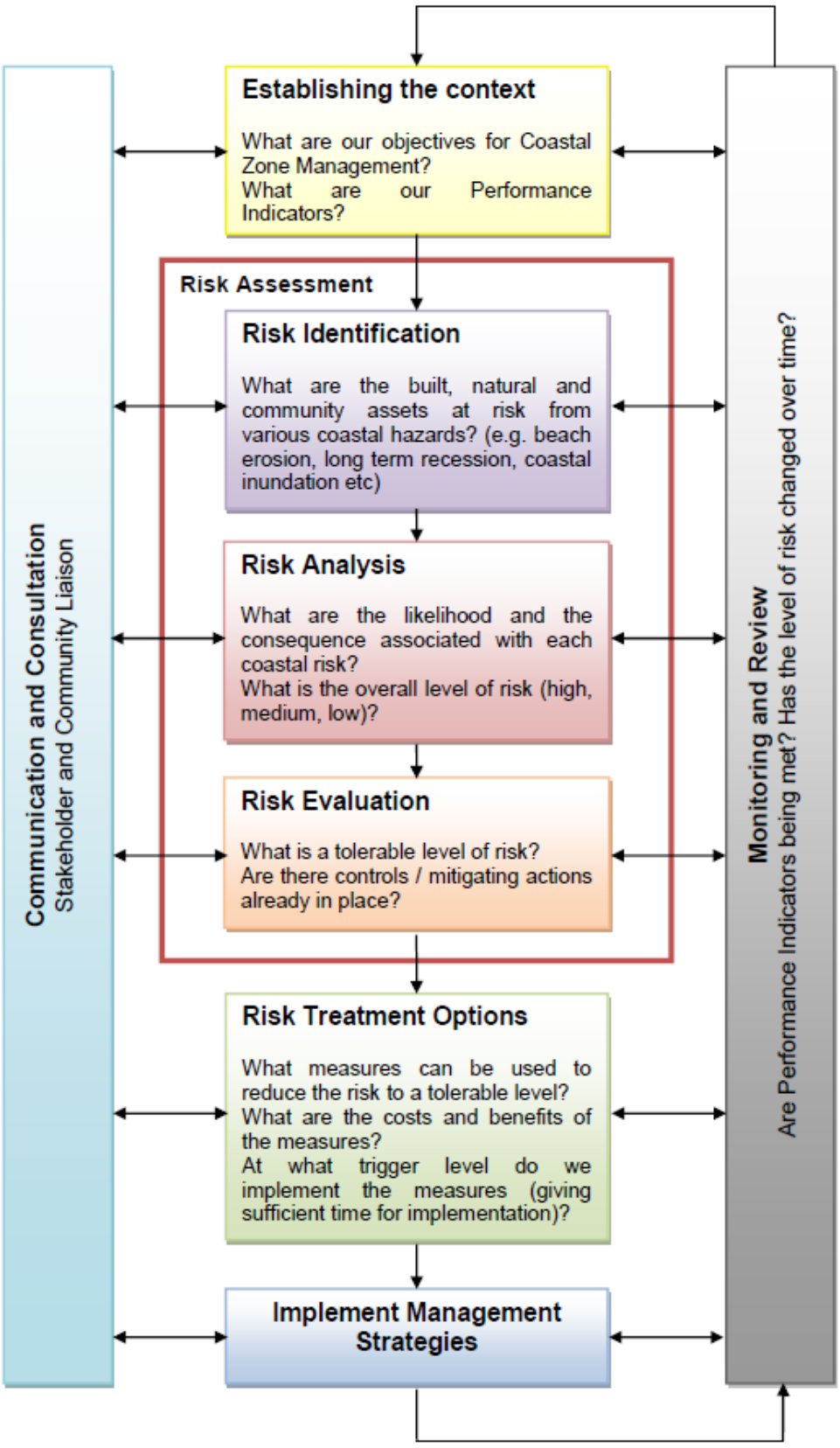


Figure 1-2 Risk Management Framework (AS/NZS ISO 31000:2009) adapted to Coastal Hazard Management (Rollason et al. 2010)

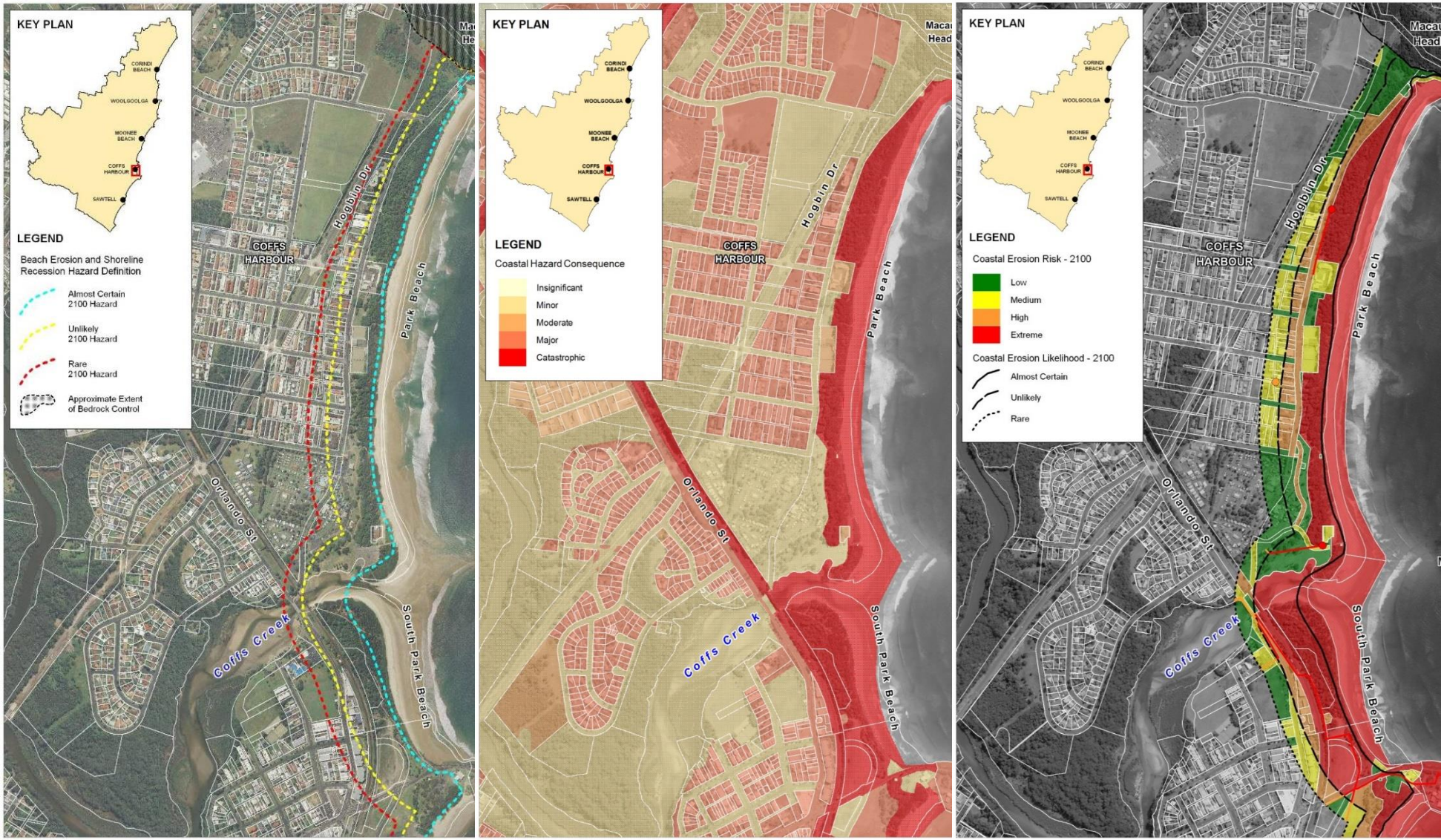


Figure 1-3 Example 2100 Coastal Hazard Likelihood, Consequence (middle) and Risk (right) Mapping (adapted from Rollason et al. 2010)

1.3 Project Governance Arrangements

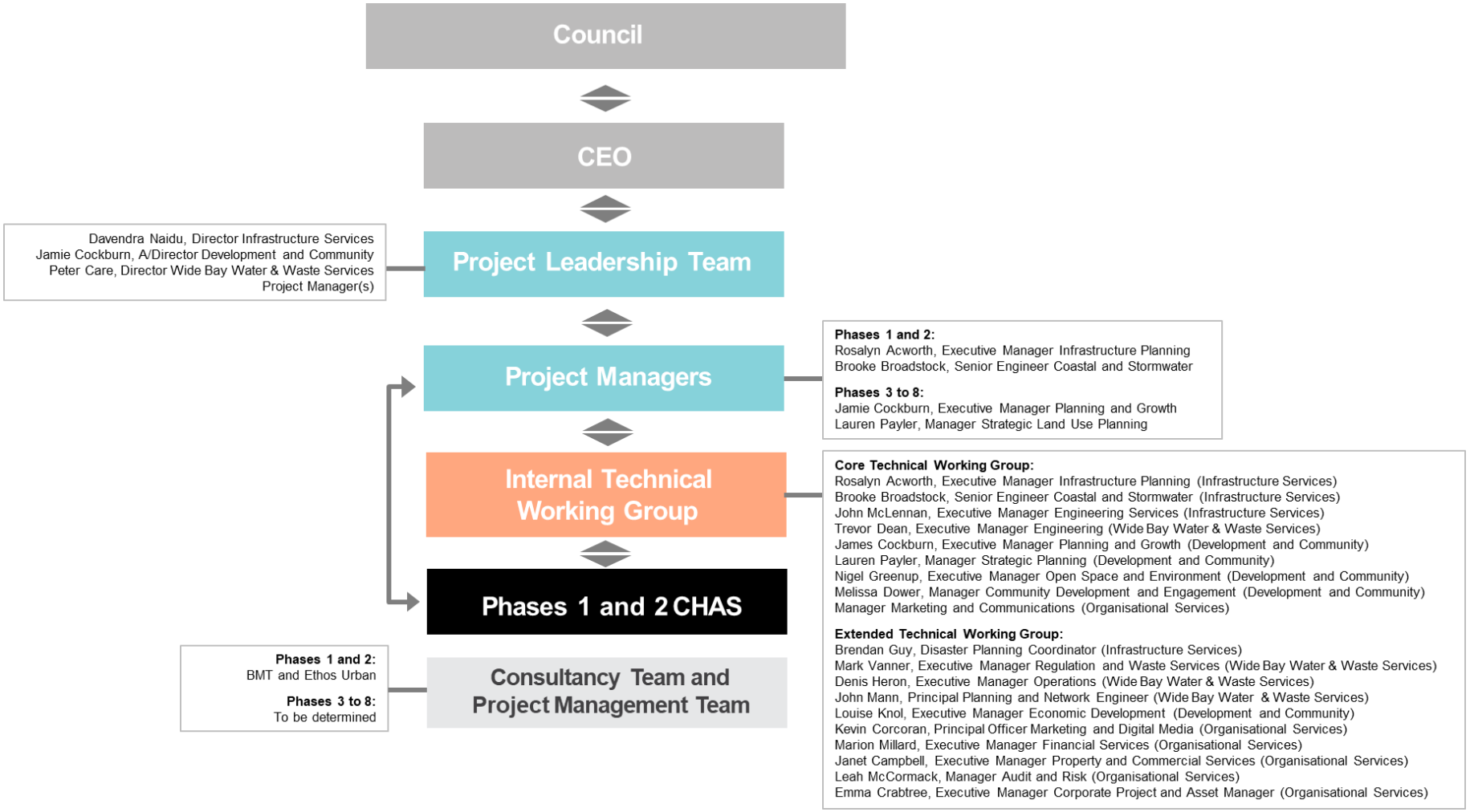
The internal governance structure for the Fraser Coast CHAS is set out in Figure 1-4 and has involved the establishment of a Project Leadership Team and Internal Technical Working Group (TWG) to oversee the project.

The purpose of the Project Leadership Team is to provide strategic guidance and project direction to the project team and consultant team in relation to project management, community engagement, design and development of the Fraser Coast CHAS and support alignment and interaction with other Council programs and priorities, where appropriate.

The role of the internal TWG is for officers from across the organisation to provide technical input into the development of the CHAS and in key areas relating to the CHAS. It will be important to ensure the CHAS delivers outputs that meet the decision-making needs of key business areas and operations across the Council.

Furthermore, the Technical Working Group is intended to include both a core and extended membership which will be leveraged throughout the CHAS depending on the particular phase requirements.

In preparing Phase 1 and Phase 2 of the CHAS, the TWG has participated in three workshops. A Councillor briefing was also completed on Tuesday 8 May 2018. These internal engagement activities assist in positioning the organisation for delivery of the subsequent six phases of the QCoast$_{2100}$ program.



Note: The people, position and department names in this diagram were correct as at June 2018. Although changes may occur throughout the life of the project, the overall project team structure will remain as outlined here.

Figure 1-4 Fraser Coast CHAS Internal Governance Structure

1.4 Key Drivers for the Fraser Coast CHAS

1.4.1 Fraser Coast CHAS Study Area

The Fraser Coast Regional Council is set within the broader Wide Bay Burnett (WBB) region and is bound to the south by Gympie Regional Council and to the north by Bundaberg Regional Council, which are both in various phases of preparing a CHAS. A map of the WBB region and local government areas is provided at Figure 1-5 below:

The Wide Bay Burnett region is characterised by a coastline with World Heritage listed and environmentally significant areas including Fraser Island and the Great Sandy Strait which are both within the Fraser Coast region; and complemented by rural hinterlands which contain good quality grazing and cropping land.

Figure 1-5 Map of the Wide Bay Burnett Region (Source: Wide Bay Burnett Regional Organisation of Councils Inc, 2018)

The Fraser Coast's region's coastline is partly north-facing into the water body of Hervey Bay, and an east-facing coastline adjoining the Great Sandy Strait. Fraser Island and some smaller islands are located east from the mainland coastline.

The entire coastline of the region's mainland and several precincts on Fraser Island's east and west coasts contain established localities, infrastructure and assets within the coastal environment as outlined below which aides understanding of the existing settlement, infrastructure and facilities in the region.

The natural beauty and ecological functioning of the coastline, Fraser Island, Great Sandy Strait and associated coastal waters and estuaries underpins tourism and supports the region's broader economy.

Accordingly, the study area for the Fraser Coast CHAS includes the region's coastline from Burrum Heads in the north, and south to Tinnanbar, along with Fraser Island. A map showing the entire land area and coastline of the Fraser Coast Regional Council is provided at Figure 4-1 with detailed maps of the coastal zones at Figure 4-2 to Figure 4-8.

The estimated resident population of the Fraser Coast region was 102,953 people in June 2016 (Queensland Government, 2017), with a significant proportion of the population living in coastal and tidally influenced communities.

The main coastal and tidally influenced localities in the region, and their respective estimated resident populations at June 2016, are as follows:

- Hervey Bay (52,806 people), including the suburbs of Craignish and Dundowran Beach.
- Maryborough (22,520 people).
- Toogoom (2,108 people).
- Burrum Heads (1,685 people).
- River Heads (1,567 people).
- Booral (761 people).
- Poona (486 people).
- Boonooroo – Tuan (413 people).
- Maaroom (222 people).

The key characteristics of the region that are relevant to the CHAS are outlined below.

- **Environmental**: The region contains ecosystems of world significance (Fraser Island, Great Sandy Strait) along with a number of other significant environmental features associated with coastal foreshores, rivers/waterways and riparian areas, National Parks and State forests and other sensitive ecosystems.
- **Cultural**: The region has a rich cultural heritage including Indigenous (islands, coast etc), South Sea Islander, European (Maryborough) and other nationalities that have become a part of the Fraser Coast.

- **Settlement pattern**: The region includes two principal urban centres, being Hervey Bay and Maryborough located in the north and north-eastern portion of the Council area; with the broader region containing a number of rural/hinterland and coastal townships and settlements and a large hinterland area dominated by forestry and grazing.

  The general residential settlement patterns overall include a low density scale of residential settlement with the predominant housing form in the urban localities being single detached dwellings on standard residential allotments, with park/rural residential style living at the southern coastal townships and on the outskirts of the main urban areas.

  - **Hervey Bay** is maturing into a 'complete city' after a period of rapid growth from its roots as a series of separate communities and 'fishing villages' along the urban area's coastline. This linear form with a number of key centres/nodes has characterised the town and continues to be a core consideration in its future growth framework. The Hervey Bay urban area has a linear form as a result of its historical development which culminated in the original villages of Pialba, Torquay, Scarness and Urangan forming together to create a conglomerate urban area. Significant growth has also seen the creation of additional suburbs at Eli Waters, Urraween and Kawungan that adjoin and connect to the south of the original villages.

    The main 'heart' of Hervey Bay including administrative, health and retail facilities are located at Pialba and slightly inland from the foreshore.

    Nodes at Pialba, Scarness, Torquay and Urangan on and in proximity to the Esplanade, support medium and higher density tourism and residential development in the form of townhouses, multi-storey units and mixed uses.

    The northern side of the Esplanade along the Hervey Bay foreshore is in public ownership and is characterised by a unique landscape setting that incorporates significant native trees and, in many locations, a densely vegetated foreshore. The Esplanade includes a number of recreation areas, beach entries, parks with play equipment, caravan parks, sailing club and surf lifesaving club buildings and some cafés along the foreshore.

  - **Maryborough** is a reinvigorated but still authentic Queensland city built on its rich heritage, traditional manufacturing and cane industries and is set on the Mary River that is tidally influenced. The Maryborough CBD and key public facilities are located along the Mary River.

  - **Coastal towns** nestled into their environment that have historically experienced significant growth pressures. The coastal townships in particular include those north of the Hervey Bay urban area: Burrum Heads, Toogoom, Craignish/Dundowran; and those to the south-east and located within the Great Sandy Strait: Poona, Boonooroo, Tuan, Tinnanbar and Maaroom.

- **Accessibility**: The key road access point to the Fraser Coast region is via the Bruce Highway which extends inland from Tiaro in the south to Howard in the north. Maryborough is directly accessed from the Bruce Highway and Hervey Bay via Hervey Bay- Maryborough Road an inland road that connects Hervey Bay and Maryborough. Additional key transportation features in the region include the Hervey Bay airport (located south of Urangan), the Boat Harbour marina (Urangan) and the Fraser Island barge facility at River Heads.

The Hervey Bay Esplanade as a whole extends from Urangan to Point Vernon and includes some 20 kilometres of walking/bike tracks. The coastal towns in the north of the region are accessed via road links from Hervey Bay and the Bruce Highway. The coastal towns in the south are accessed via a single road link to and from Maryborough, with no further road access north or south.

- **Topography**: The topography of the Hervey Bay urban area ranges from low coastal lands to a ridgeline at the approximately two (2) kilometres from the coast that runs along Scarness and Pialba. The land beyond (south) of this ridgeline contains low wetland areas. Foreshore and streets between the foreshore and Boat Harbour Drive retain a coastal charm of streets and housing in a variety of styles interspersed with a lagoon system particularly in the Torquay and Urangan areas. The topography of the coastal townships, both north and south, is best described as relatively flat coastal lowlands.

1.4.2 Key Drivers and Benefits for Council in preparing a CHAS

The Fraser Coast region has significant urban development, infrastructure and assets within the coastal environment. The region is internationally renowned for its natural environment which includes Fraser Island and underpins tourism and economic prosperity. Being aware of and understanding coastal hazard risks allows improved management of the urban and coastal environment, protection of the assets and things of most value to the community, and a reduction in the risk of hazards to people, property and assets (tangible and intangible).

The Fraser Coast CHAS will provide a better understanding of the most pressing current coastal hazard risks faced by the community today, and identify how existing risks will change or worsen in the future. The consequences or impacts of these changing risks to Council operations, infrastructure and community assets, and the built environment and natural environment will be outputs of the study.

The overall **benefits** of preparing a CHAS as informed by the findings from Workshop 1 with the TWG include:

- Economic investment confidence and sustainability - providing greater certainty for development and investment thereby providing a more confident business environment;
- Better and more informed decisions, including improved land use planning decisions and integration with master planning projects;
- Supporting asset management planning, preventative maintenance and implementing measures to mitigate and minimise risk, seeking to ensure more resilient assets;
- Informing financial planning including long term financial forecasts and annual budgets, and is particularly helpful for planning ahead for higher cost adaptation options that may be required in the future; and
- Managing community expectations and building confidence.

With respect to the benefits associated with planning for coastal hazard adaptation, the CHAS project has the ability to facilitate:

- Identifying cost effective and fit for purpose adaptation actions;
- Opportunities for regional and stakeholder collaboration on adaptation actions;
- Demonstrating a readiness for investment opportunities and innovation; and
- Demonstrating leadership and good governance to the community and other local governments.

In order to facilitate effective organisational response to current and future risks of coastal hazards, it is important to firstly establish a shared understanding of:

(1) The coastal hazards in the local government area that need action or a response and how they are defined;

(2) The different inundation impacts of coastal hazards; and

(3) The risks associated with coastal hazards to communities, assets and values and the most pressing or important coastal hazard risks that need to be addressed today, and those that can be addressed at a future time.

1.4.3 What are Coastal Hazards?

Coastal hazards include coastal erosion, storm tide inundation, tsunami and cyclones. While catchment flooding is not normally considered to be a coastal hazard, riverine and coastal waterway flooding can be significantly exacerbated by coastal hazards particularly for many low lying coastal communities throughout the Fraser Coast region. For example, a flooding event which coincides with a high tide could be a significantly larger event than the same rainfall event coinciding with a low tide. This report primarily focuses on the coastal hazards of storm tide inundation and coastal erosion, in accordance with the QCoast$_{2100}$ program and funding guidelines. However, Council recognises the potential for so-called ‘coincident flooding events’ to impact the region and intends to assess the likelihood and extent of this hazard as part of a future local catchment flood and drainage studies.

The State Planning Policy July 2017 (SPP) defines natural hazard to mean a naturally occurring situation or condition, such as flood, coastal erosion or storm tide inundation, with the potential for loss or harm to the community, property or environment.

Coastal erosion and storm tide inundation are forms of coastal hazards that can have either permanent or temporary inundation impacts, depending on natural coastal processes. The SPP defines these types of coastal hazards as follows:

- Storm tide inundation as being the temporary inundation of land by abnormally high ocean levels caused by cyclones and severe storms; and
- Coastal erosion means the loss of land or the removal of beach or dune sediments by wave action, wind action, tidal currents or water flows or permanent inundation due to sea level rise.

For the CHAS and in accordance with State Planning Policy, coastal hazards may result in:

(1) Temporary or permanent loss of land due to shoreline erosion.

(2) Permanent inundation due to sea level rise.

(3) Temporary inundation due to storm tide.

Understanding the different inundation impacts is critical to inform potential exposure and consequences for at risk communities, assets and values and options for adaptation and risk treatment.

1.4.4 What are the Risks associated with Coastal Hazards?

Local government organisations are subject to a broad range of risks and have risk management frameworks in place to manage and respond to such risks. For coastal hazards, there are some fundamental organisational risks or 'drivers' for why local governments are taking action on coastal hazard risks. These same 'drivers' for taking action can also become serious risks to the organisation if no action or inappropriate action is undertaken.

The local government organisational drivers for acting on coastal hazard risk management are identified in Figure 1-6.

The aim is to make informed policy and confident decisions based on robust technical information, good science, and best practice approaches to support the long-term sustainability and financial viability of the Council. It is also about planning to protect those things that are most important to a sustainable lifestyle for Fraser Coast residents and the region's unique attributes which support a thriving economy.

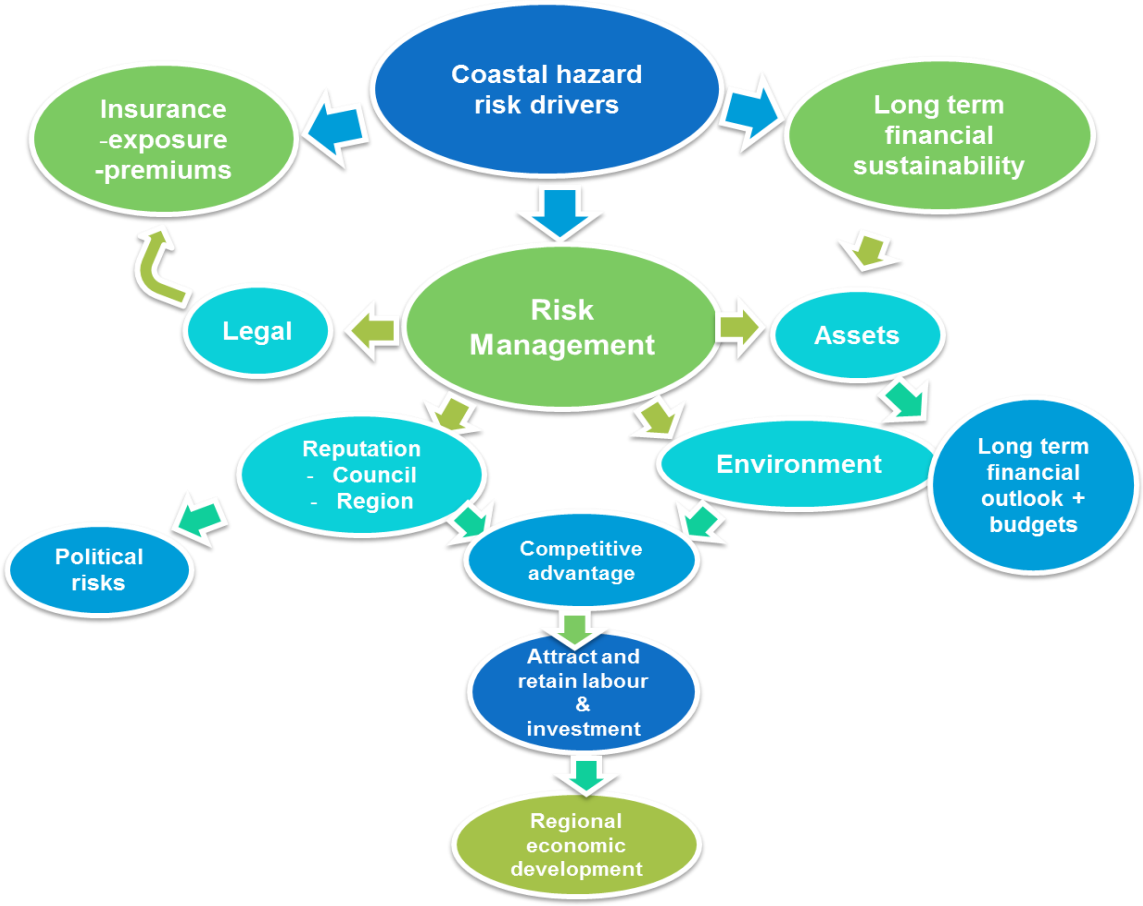


Figure 1-6 Organisational Drivers for Acting on Coastal Hazards (Ethos Urban)

For coastal hazards, effort should focus on understanding the current coastal hazard risks faced by communities and assets and understanding how these risks are expected to change or intensify over time due to climate change. Understanding the consequences of these risks is also critical to identifying the priority at-risk assets and communities that need risk treatment now and, those risks that can be addressed at a future time.

For Fraser Coast, this also means having a good understanding of how coastal hazards will influence or impact the organisation and the consequences for Council's business areas, operations, service provision and infrastructure and impacts on the built, natural and cultural environments.

This solid understanding, founded on robust technical information and a detailed risk assessment, is fundamental to supporting Council in making informed and confident decisions to plan, prioritise and respond to these risks.

In summary, the risks associated with coastal hazards include:

(1) Risk to people (life), built environment and property;

(2) Risk to assets, infrastructure and services, such as:

(3) Risk to the natural environment, cultural and liveability risks;

(4) Financial sustainability risks, affecting long term financial forecasts and annual budgets;

(5) Social and economic prosperity considerations including reputational risks (loss of visitation), competitive advantage and economic investment and confidence;

(6) Legal and liability risks, including the duty of care of a governing authority; and

(7) Insurance considerations.

The way in which Council responds to these risks will influence the consequences of the impacts to the local government area and wider region. In a nutshell, it makes 'good business sense' and is 'good governance' to ensure all key risk areas can be addressed and prioritised in a comprehensive, coordinated and integrated way.

Fraser Coast Regional Council controlled assets likely to be exposed to potential coastal hazard risks include, but are not limited to:

- Roads;
- Stormwater network;
- Water supply and reticulation systems;
- Sewerage reticulation and treatment systems;
- Council's built assets relating to its operation;
- Recreational marine facilities such as boat ramps, jetties and pontoons;
- Natural areas such as wetlands, waterways and coastal environments;
- Parks, foreshores, open space and associated embellishments such as picnic shelters, BBQ facilities, public toilet facilities, playgrounds, pedestrian/cycling paths, boardwalks etc; and

- Community facilities such as halls, swimming pools.

In the context of these assets, the potential impacts from coastal hazards include:

- Foreshore parks and recreation areas are damaged and the lifestyle activities valued by communities are adversely impacted;
- Inundation of public infrastructure (e.g. roads);
- Degradation of freshwater wetland systems;
- Salinisation of surface and groundwater supplies;
- Inability to operate essential services (e.g. because of power loss and/or inaccessible roads);
- Loss, damage or impaired function of essential infrastructure (e.g. sewerage pumping stations);
- Some communities experiencing inundation; and
- Degradation of natural recreation, cultural and tourism assets (e.g. beaches, foreshores, parks, wetlands, etc.).

There are several infrastructure providers (some Council controlled) within the coastal environment of the local government area such as state-controlled roads, electricity infrastructure, airport, health service infrastructure and harbour infrastructure that will need to be considered. The Phase 1 stakeholder communication and engagement strategy identifies key stakeholders and the way they are intended to be engaged with across all phases of the CHAS. The specific engagement approach will need to be confirmed for each phase, and will also be guided by the level of input the stakeholder groups would like to have. The input of these stakeholders will be critical to understanding their risk profile and their views on adaptation options. There may be specific adaptation actions that these stakeholders want to take, and in addition to this, certain adaptation approaches that Council may want to invest in may have implications for these stakeholders and their assets.

It is also important to recognise that many assets and values important to the region are not traded in markets and are therefore more difficult to value because market prices are not available as a guide. This is especially true of many ecological, community and cultural assets. It is essential to 'cost' and value these intangible assets as part of the risk assessment. To value these assets, 'non-market valuation' techniques need to be applied by collecting site specific information or transferring the values from existing studies that estimate the values of similar assets in similar contexts.

Coastal hazard risks extend across all parts of the organisation and as such, it is fundamentally important to have an integrated and coordinated approach to coastal hazard risk management.

2 Statutory Context and Corporate Objectives

A high-level review of the statutory context and key documents are outlined below to confirm the current strategic response to coastal hazard risk management, and the interrelationship of the CHAS with corporate priorities.

2.1 Planning Act 2016

The Planning Act 2016 took effect in July 2017 and is the result of the State government's recent planning reform process.

Amongst other reforms, the Act now includes provisions for a Feasible Alternatives Assessment Report (FAAR).

In summary, the outcomes from the CHAS project, including the coastal hazard mapping, risk assessment and evaluation of a suite of adaptation options, will provide the technical evidence for the FAAR and will help inform the land use planning responses to coastal hazard risks in the planning scheme.

If there are zoning changes required because of unacceptable or intolerable coastal hazard risks and impacts and, the Minister is satisfied the FAAR has been prepared in accordance with the Minister's Rules and Guidelines (including consideration of a range of adaptation options and it's determined that a planning change is the only feasible alternative to address risk), no compensation is payable.

2.2 State Planning Policy 2017

The current State Planning Policy (SPP) commenced on 3rd July 2017 and provides policy requirements for coastal hazards that must be integrated into a planning scheme. The content of the document must therefore be given due consideration in the drafting of the new planning scheme.

Part E of the SPP deals specifically with storm tide inundation and erosion prone areas under the State interest for natural hazards, risks and resilience.

The policy requires that the '*risks associated with natural hazards, including the projected impacts of climate change, are avoided or mitigated to protect people and property and enhance the community's resilience to natural hazards'*.

There are specific State interest policies that support this State interest and these are:

(1) 'Natural hazard areas are identified' – and this includes (d) storm tide inundation and erosion prone areas;

(2) 'A fit-for-purpose risk assessment is undertaken to identify and achieve an acceptable or tolerable level of risk for personal safety and property in natural hazard areas';

(3) 'Land in an erosion prone area is not to be used for urban purposes, unless the land is located in (a) an urban area in a planning scheme….';

(4) 'Development in …storm tide inundation or erosion prone natural hazard areas: (a) avoids the natural hazard area; or (b) where it is not possible to avoid the natural hazard area, development mitigates the risks to people and property to an acceptable or tolerable level';

(5) 'Development in natural hazard areas (a) supports and does not hinder disaster management capacity and capability, (b) directly, indirectly and cumulatively avoids an increase in the exposure or severity of the natural hazard and the potential for damage on the site or to other properties (c) avoids risks to public safety and the environment from the location of the storage of hazardous materials and the release of these materials as a result of a natural hazard, (d) maintains or enhances the protective function of landforms and vegetation that can mitigate risks associated with the natural hazard';

(6) 'Community infrastructure is located and designed to maintain the required level of functionality during and immediately after a natural hazard event';

(7) 'Coastal protection work in an erosion prone area is undertaken only as a last resort where coastal erosion or inundation presents and imminent threat to public safety or existing buildings and structures…'; and

(8) In an erosion prone area within a coastal management district, development does not occur unless it cannot be feasibly located elsewhere and is (a) coastal dependent development; or (b) temporary, readily relocatable or able to be abandoned; or (c) essential community infrastructure or (d) minor redevelopment of an existing permanent building; and (9) development permitted in policy 8 mitigates the risks to people and property to an acceptable or tolerable level'.

A key outcome of the CHAS will be a risk assessment and it will be important to ensure that the CHAS outputs, particularly any mapping outputs, are of a sufficient resolution and fit-for-purpose to inform a future planning scheme review. To be useful for the planning scheme, the CHAS should identify areas of acceptable, tolerable and intolerable/unacceptable risk. This information can then inform land use policy in the planning scheme reflecting a risk-based planning approach to coastal hazard risk management which means that land use can be tailored or 'graduated' to the level of risk including the consideration of appropriate triggers or impacts for when adaptation actions should be implemented.

2.3 Fraser Coast Planning Scheme

The Fraser Coast Planning Scheme 2014 was the first planning scheme for the Fraser Coast region following the local government amalgamation in 2008. The Fraser Coast region was formed from the previous local government areas of Hervey Bay City, Maryborough City, Woocoo Shire and part of Tiaro Shire.

As part of the highest order strategy for the local government area, the Strategic Framework sets the overarching policy framework for development in the region. The overall settlement patterns is focussed on the consolidation of key centres within a clear and structured centres hierarchy and section 3.2.2 of the planning scheme states:

'The Fraser Coast settlement pattern provides for the planned expansion of urban areas in a configuration which supports a clearly defined hierarchy of centres that is matched to community need'

Specific growth and settlement pattern considerations of relevance to the CHAS include:

- The majority of growth is focussed into the Maryborough and Hervey Bay principal centres;
- The Pialba, Torquay, Scarness and Urangan foreshore precinct nodes within Hervey Bay include precincts containing land in the high density residential zone and are intended to be 'vibrant places exhibiting attractive landscaping and buildings that respond to the sub-tropical climate';
- The coastal towns of Burrum Heads and River Heads 'provide for tourism and recreational activities associated with their coastal setting and enjoy high levels of access to employment and facilities in Hervey Bay'. These will experience 'modest growth' and include a district level centre within each; and
- The remaining coastal towns and villages including Toogoom, Poona, Tinnanbar, Maaroom and Boonooroo are acknowledged as containing '*a mix of permanent residences and holiday homes as well as small-scale commercial and tourism offerings'*. Importantly for the CHAS, 'the size of these communities and their identified role has been intentionally managed in recognition of '*their vulnerability to coastal hazards, the predicted impacts of climate change and the limited availability of social infrastructure' (in addition to the need to protect their individual character, natural values and intimate sense of place.*

With regard to economic and environmental considerations associated with the planning scheme:

- The planning scheme acknowledges that additional industries will be attracted to the Fraser Coast such as cultural and sporting events, major conferences, clean and green businesses, film production, emerging rural industries, and aquaculture;
- The maintenance of natural features is of particular importance to the ongoing growth of Hervey Bay's tourism industry, which is internationally recognised for its eco-adventure offerings.

The planning scheme also contains the Coastal Protection Overlay Code which corresponds to Council's existing coastal hazard overlay mapping and a key element of the code's purpose is:

> *'to ensure development in the coastal zone is designed, constructed and operated to avoid the social, financial and environmental costs arising from the adverse impacts of coastal hazards, taking into account the predicted effects of climate change'*

Whilst Council's existing planning scheme contains robust provisions to ensure land use planning decisions address coastal hazards and the predicted impacts of climate change; the CHAS will assist in informing updated mapping and to better understand the potential hazards and to adopt a 'risk-based planning' approach in future revisions of the planning scheme.

2.4 Alignment with Council Strategies and Corporate Objectives

The CHAS will provide an important foundation to supporting the achievement of a number of Council plans and strategies, and it will be important to position the CHAS showing these direct relationships across the organisation.

Opportunities for alignment of the CHAS with relevant Council strategies, instruments and policies are outlined below. These can be updated and expanded on as the project team engages with internal Council stakeholders, or as plans are updated by Council. These are outlined at Table 2-1

below, and a further component at Table 2-2 outlines the non-Council driven strategies that are also of relevance.

Table 2-1 Integration with Council strategies/policies for further consideration and investigation

Council Strategy/Plan	Links with CHAS
Fraser Coast Community Plan 2031	The Community Plan overarches the Corporate Plan, service delivery and projects, the annual report and budget and other long-term strategies and policies. The plan has key themes consistent with the Corporate Plan including Our Governance, Our Community, Our Economy, Our Environment, Our Movement and Access, and Our Places and Spaces. The Community Plan highlights key elements of relevance to the CHAS. It is noted that these elements are consistent with the 'key drivers' to prepare a CHAS as previously addressed in this document and the CHAS will evidently support the achievement of a number of the objectives and intentions of the Community Plan. Equally, the Community Plan sets up a guiding strategy for engagement and advocacy of projects which will be a fundamental consideration in the drafting of the Phase 1 reporting: • **Engagement –** the knowledge, experience and wisdom held by community members of all ages, cultures and abilities is sought and utilised to shape the future of the region, with their views advocated at all tiers of government • **Environmentally responsible economy** – ensure the local economy is robust and captures maximum patronage • **Regional enterprise** – economic development supports fisheries, agriculture, tourism and other activities in regional areas to create diverse economic, employment and social benefits to the Fraser Coast region • **Business attraction/partnerships** – Council proactively pursues investment into the region to stimulate commercial and economic development and complement existing businesses. • **Natural Attractions & Cultural Heritage** – Natural attributes of the region such as National Parks, coastal, inland and cultural heritage attractions are promoted to form the basis for new economic growth opportunities. • **Planning** – Local planning instruments establish a growth strategy for the region that considers the potential impacts of climate change, sustainable settlement patterns and buildings, biodiversity and economic diversity.
Corporate Plan 2014-2018	It is understood that Council are in the process of updating the Corporate Plan, and it is anticipated that this updated version will be reviewed as part of latter phases of the CHAS as it becomes available. The existing Fraser Coast Regional Council Corporate Plan 2014-2018 is Council's overarching document to guide governance and strategic service delivery. The Corporate Plan includes a vision supported by performance indicators for governance; community; economy; environment; movement and access; and our places and spaces. The overall vision for the Fraser Coast region as expressed in the Corporate Plan (and drawn from the Fraser Coast Community Plan 2031) is for: *'A diverse, strong and well governed region of vibrant places connected as a whole by our community spirit, respect for our natural environment and our innovative and diverse economy'.* The CHAS will provide an important foundation to supporting the achievement of the vision and supporting elements identified in the plan. The key linkages are outlined in the table below and it is evident that the CHAS aligns with corporate objectives across a range of interest areas.

<table>
<tr><th>Council Strategy/Plan</th><th>Links with CHAS</th></tr>
<tr><td></td><td>The Council has a clear driver toward long term efficient and innovative asset management, supporting greater investment and economic activity in the region, managing and promoting coastal resources; along with informing and empowering the community through engagement.
<table>
<tr><th>Key strategic themes</th><th>Relevant elements</th></tr>
<tr><td>Our Governance
‘We are decisive, display strong leadership, foster positive relationships and form cohesive partnerships to benefit the community’</td><td>• Engaging communities – deliver the community’s expressed desires through innovative community engagement activities
• Accountability and leadership – our policies and procedures are clear and consistent; balance regulation with facilitation and only regulate in the community’s interest
• Service provision – Services and assets are managed in an efficient and cost effective manner optimising the whole of life value to the community</td></tr>
<tr><td>Our Community
‘The Fraser Coast will foster and support a healthy and engaged lifestyle’</td><td>• Community Spirit and Belonging – support a diverse range of experiences that promote community inclusiveness, participation and enjoyment
• Safeguarding Community and Well-being – promote the Fraser Coast lifestyle as a balance between work, family and physical well-being
• Cultural Diversity – The Fraser Coast community values and protects its heritage
• Embracing and Celebrating Creative Arts – support the celebration of festivals, events and the arts across the region</td></tr>
<tr><td>Our Economy
‘The Fraser Coast Region creates local jobs in an innovative and diverse community to support a vibrant economy’</td><td>• Supporting a Diverse and Innovative Economic base – be recognised as a region that is open for business and where it’s easy to do business
• Supporting Tourism and Event Opportunities – grow tourism by promoting the diversity and natural attractions of our region</td></tr>
<tr><td>Our Environment
‘Promote and protect a diverse and healthy natural environment with an abundance of native flora and fauna and rich ecosystems’</td><td>• Protecting, Restoring and Enhancing the Environment – Preserve and value our natural environment through effective strategies
• Maintaining Unique Biodiversity – Develop, implement and manage strategies to protect the health of the region’s ecosystems
• Managing our Natural Resources and Infrastructure Sustainably</td></tr>
<tr><td>Our Movement and Access
‘The Fraser Coast has effective transport and pedestrian pathway networks connecting the region’</td><td>• Road networks – develop a high quality integrated transport network that enhances connectivity and effective movement</td></tr>
</table></td></tr>
</table>

Council Strategy/Plan	Links with CHAS	
		• Marine services – Support and facilitate well located boating access and associated parking facilities • Pedestrian and Cycle Movement – develop interconnected networks that promote accessible alternative transport options
	Our Places and Spaces 'Our Communities are vibrant hubs that welcome people and interact'	• Create Vibrant City Centres and Precincts – create a sense of place through vibrant social hubs and city precincts • Spaces for Everyone – provide outdoor places, spaces and corridors for the safe enjoyment of people at all stages of life • A Region of Well-designed Cities and Townships – design urban settlement patterns which are consolidated around existing centres with small dispersed rural and coastal communities; manage and accommodate growth in the region by developing a planning framework that protects and enhances character and heritage
Our Sustainable Fraser Coast Charter	The intention of the 'Our Sustainable Fraser Coast Charter' is to educate, motivate and support the community, business and industry partners in establishing, implementing and achieving sustainability for the betterment of the region. The Fraser Coast Regional Council recognises and commits to ensuring a balance between sustainable modern living, the needs of the economy, society and the environment and will: • provide a clear commitment of Council's intent to achieve a sustainable community within the Fraser Coast and to exercise community leadership on sustainable development; • provide guidance on key decisions that impact on the sustainability of the region; and • exercise leadership by incorporating sustainability policies, strategies and practices into Council's own operations and decision-making processes. The four pillars of embedding sustainability within the organisation are identified in the Charter, and it is specifically identified that a number of the key 'principles' for each pillar have direct relevance to the CHAS including the sustainable approach to land use planning. The Charter forms a positive touchstone for the CHAS. It signals the Council's agreed framework within which to approach projects with a sustainability 'filter' and closely aligns with the CHAS objectives.	
2017-2018 Capital Works Budget	The 2018/2018 budget for capital works identifies financial resources dedicated to a range of projects, including those associated with coastal areas, with estimated values out to the 2026/2027 financial year. Project examples of relevance to the CHAS include Esplanade Precinct works (Scarness, Torquay, Urangan), foreshore landscaping, Esplanade lighting, jetties, boardwalks and piers, Urangan pier restoration, stormwater rehabilitation and beach pipes, tourism infrastructure. Budget allocation has also been directed to community resilience, disaster preparedness via a disaster management levy.	

Council Strategy/Plan	Links with CHAS
	In addition, significant resources are identified toward coastal protection, primarily in the northern part of the Council area.
Fraser Coast Economic Development Strategy 2015-2019	The Fraser Coast Economic Development Strategy has been established on a six pillar economy with the intention of growing and diversifying the economic base. In addition, the strategy identifies that investment in a number of priority projects will 'transform the economy' and bolster employment and investment. Priority projects of relevance to the CHAS include the Urangan Harbour redevelopment and the Hervey Bay dive wreck. Furthermore, 'Tourism and Events' forms Pillar Six of the plan in particular states: *'The Fraser Coast is Australia's premier nature-based holiday destination, attracting more than 660,000 visitors per year'* – noting that the focus for this tourism has been on Fraser Island and whale-watching. There is an aspiration in the strategy to achieve a significant increase in tourist spending and the identified mechanisms to achieve this growth are outlined in the plan. Of relevance to the CHAS are the focus on sports and events tourism and nature-based tourism along with niche markets tourism – marine, natural etc. Although not explicitly stated in the plan, the manner in which the region's coastal assets and coastlines are managed will have an implication for the achievement of the strategy's objectives. Equally so, the opportunities identified in the plan associated with the harbour redevelopment and the shipwreck could be dovetailed into the CHAS initiatives. Furthermore, all of the economic 'pillars' need to be given due consideration when undertaking the future CHAS phases.
Fraser Coast Esplanade Tourist Precincts Master Plan 2011-2031	A Masterplan was prepared in 2011 for the foreshore precincts within the Hervey Bay urban area – Pialba, Scarness, Torquay and Urangan. In recognition that these former fishing villages had merged together in a conglomerated and linear urban form, the purpose of the masterplan was to identify and facilitate individual precinct 'identities' and identify opportunities within each precinct to garner future investment and support each precinct in further developing as prominent tourist nodes. Whilst each precinct has an articulated identity and specific actions within the masterplan, there are some commonalities of relevance for the CHAS – namely the intention for future investment within each key node driven by a combination of focussed physical enhancements and events/activations. Some key actions within each precinct include: Pialba – *A Place for Adventure* – further development of the Wetside Water Park, development of an 'older youth' adventure playground, skate park and 'seaside events' focus. Scarness – *A Place to Play Night and Day* – focus on making this precinct a more amenable, bright and well-frequented destination with lighting enhancements, improved beachside amenities – change sheds, eating facilities Torquay – *A Place for Health and Wellbeing* – improvements to the existing public facilities and potential redevelopment of the surf club facility and consideration toward improved co-location of facilities. Urangan – *A Place for Pier Culture* – intending to have a refined beach style with arts and culture facilitated through gateway and façade enhancements, along with pier 'build outs' and enhancements.

Council Strategy/Plan	Links with CHAS
Fraser Coast Camping Options Strategy	The recommendations in this report are aimed at positioning the Fraser Coast as an active camping community and destination of choice for camping, caravanning and RV users. The Fraser Coast is ideally situated to take advantage of the growing caravan and camping tourism market given the region's combination of rural and coastal environments providing natural beauty, cultural, recreational and heritage experiences. The CHAS may inform any work undertaken by Council in reviewing the provision of services and infrastructure for foreshore camping areas. The CHAS may also be a consideration for further iterations of this strategy.
Fraser Coast Cultural Strategy 2015-2019	This strategy acknowledges the need for celebrating, valuing and protecting cultural diversity, supporting arts and culture, and protecting cultural diversity and that this is central to community wellbeing. Whilst not directly relevant to the CHAS it is a document worth referencing given that it is an important element of Council's and the community's vision for an inclusive region and emphasises the importance of cultural elements to the region's lifestyle factors.
Fraser Coast Regional Events Strategy 2020	The regional events strategy is intended to identify the Fraser Coast's ability for hosting events, to identify a fulsome event calendar and to ensure that an events focus occurs to support the Fraser Coast's position as a highly desirable place to live, work, invest and play. Of particular relevance to events in a 'coastal context', the strategy identifies 'Sporting and Recreation Events' and acknowledges: *'The attractiveness of the Fraser Coast's natural attributes is reinforced with the region hosting a number of major sport and recreation events – particularly where the major event is reliant on the natural environment, climate, weather and beach aspects. Fraser Coast Regional Council continues to leverage from its natural environment and is very supportive of water and land based sporting events including a significant investment in a new Regional Sports Precinct and Facility'.* The importance of events, and those of a water-based nature or reliant on the 'beach' to the Fraser Coast's overall positioning is acknowledged and will be an important consideration for the CHAS moving forward particularly in relation to the utility of event spaces and foreshore/beachfront amenity and functioning.
Hervey Bay CBD Urban Renewal Master Plan	Due to topography, and the reasonably setback for the Pialba commercial and 'CBD' elements from the Esplanade and areas subject to coastal hazard impacts, an exhaustive review of this masterplan document has not been undertaken. It is noted that the CHAS will inform future iterations of the master plan, particularly if the CBD 'edges' near the Pialba foreshore parkland precinct are revisited.
Walk and Cycle Strategy 2015	This strategy identifies the vision and required actions to support ongoing improvements to the walking and cycling networks. This is a strategy that will benefit from the findings of the CHAS and will need to be updated to reflect the CHAS outcomes.
Local Disaster Management Plan	The Local Disaster Management Plan is an important resource for the Council and community. It sets out a scope and risk assessment of potential hazards and critical infrastructure along with strategies for capacity building, prevention, response and recovery. This plan will be a key implementation tool for the CHAS, and additionally it will be important for the current disaster management needs and strategies to be addressed by the CHAS.
Asset Management Plans	Asset management plans will be informed by the outcomes of the CHAS and will benefit from updating in this regard. It will be important to ensure the CHAS outcomes are fit for purpose for the business and operational needs of asset management and planning. This is also critical to making informed financial decisions on infrastructure investment.

Table 2-2 Integration with Other Relevant Strategies (non-Council)

Strategy/Plan	Links with CHAS
Bundaberg-Fraser Coast Tourism Opportunity Plan 2009-2019	Catalyst projects identified within the tourism opportunity plan which may be relevant to consider in preparation of the CHAS, or where the CHAS may be able to assist in informing site selection are outlined below: *Fraser Island: significant upgrades to the key visitor sites on Fraser Island including Lake Mackenzie, Eli Creek and Indian Head.* *Fraser Island Boutique Eco-lodge: A boutique eco-lodge development on Fraser Island to cater for the 4-5 star market complementing the island's established eco-tourism accommodation and attractions.* *Fraser Island Indigenous Tourism Experiences Opportunities to develop a range of Indigenous tourism experiences on Fraser Island to capitalise on the island's rich Aboriginal cultural heritage and the established eco-tourism market.* *Hervey Bay Marina Re-development and World Heritage Biodiversity Interpretive centre: Re-development of the Urangan Harbour to provide expanded marina facilities including commercial marine services, dry berth facility, accommodation, retail, shopping, dining, entertainment and landscaped community parklands. The project should incorporate a substantial World Heritage biodiversity Centre which would be an all-weather attraction focussed on interpreting all aspects of Fraser Island and the associated marine environment including the region's other signature natural attraction, the whales.* *Hervey Bay Food and Beverage Attraction: A major all weather visitor attraction focussed on food and beverage to complement this established theme in Bundaberg. Possibilities include liquor, organic fruit and nuts, organic chocolate, and locally sourced seafood.* *Fraser Coast Convention and Entertainment Centre: A multi-purpose convention and entertainment centre with amenities to include meeting and function facilities to cater for a 350+ seated event, or large scale standing and seating entertainment function (including trade shows and concerts) exceeding 3000 people (which may be linked to a branded hotel).*
Fraser Coast Destination Plan prepared by Tourism and Events Queensland	The Tourism and Events Queensland 2020 vision for Fraser Coast is articulated in the Fraser Coast Destination Plan and states that the region is *'globally recognised for world class personal natural encounters, World Heritage Listed Fraser Island and as Australia's number one whale experience destination.'* Key target markets to support growth in the Fraser Coast visitor economy that are consistent with those identified in the Council's economic strategy and are relevant for consideration of the CHAS include: • Drive Tourism, including growing RV market • Sports and Events Tourism • Niche markets (marine, natural and cultural heritage and agri-tourism) • Nature-based tourism (including fishing)

2.5 Partnership Opportunities

Potential opportunities for partnerships and collaboration with other stakeholders should be explored, especially where there are interface issues or areas that would benefit from joint or coordinated risk treatment responses across jurisdictions to ensure optimal coastal management outcomes.

A preliminary list of possible joint projects is identified below (Table 2-3) and will be discussed and confirmed with the TWG and, can be updated and expanded on as external stakeholders are engaged as part of the CHAS.

Table 2-3 Preliminary list of opportunities for joint projects/alignment with external/ regional programs

Organisation	Potential Opportunities for Joint Projects/Alignment
Gympie Regional Council (GRC)	Opportunity to partner with the Gympie Regional Council in undertaking a joint storm tide hazard assessment. A proposed scope of work for this project has been issued to both GRC and FCRC and is documented in the latter sections of this report.
Bundaberg Regional Council	Bundaberg Regional Council have commenced the undertaking of Phases 3-8 of the Bundaberg region's CHAS. Whilst there may not be opportunities to partner on the technical work components there may be information sharing opportunities.
Wide Bay Burnett Regional Organisation of Councils (WBBROC)	The WBBROC network will provide an opportunity for the Wide Bay Burnett local government areas undertaking their respective CHAS projects to share learnings from the projects, and consider from a strategic perspective aspect like adaptation options.
University of the Sunshine Coast (USC)	An opportunity exists to engage with USC particularly the work being undertaken by the Sustainability Research Centre.
Key business and industries	An opportunity exists to consider partnership discussions with key business and industry stakeholders where alignment with regard to future adaptation options is of mutual benefit to both parties. Examples include the Hervey Bay Boat club and marina, and key business owners and operators within the Hervey Bay tourist precincts.

3 Previous Work & Existing Knowledge

3.1 Introduction

A review of previous climate change and coastal hazard studies is provided in this section. The review focuses on assessments of sea level rise, storm tide and shoreline erosion hazards that are expected to influence the Fraser Coast CHAS. Consideration is also given to Council's asset database, financial register and other relevant local government strategies expected to inform risk treatment measures and adaption responses developed for the CHAS.

3.2 Intergovernmental Panel on Climate Change (IPCC 2014)

The global average rate of sea level rise (SLR) measured over the last century was 1.7 mm/year (Church et al. 2010). Global tide gauge and satellite altimeter data suggest this rate is accelerating, as illustrated in Figure 3-1. SLR is predicted to continue, in order of decreasing contribution:

- Ocean water expanding gradually as it heats (thermal expansion).
- The melting of glaciers.
- Retreat of the Greenland ice shelf.
- Antarctic ice losses.

Even if greenhouse gas emissions were stabilised at present-day levels, SLR is expected to continue for hundreds of years because of thermal expansion alone (e.g. Harper 2012).

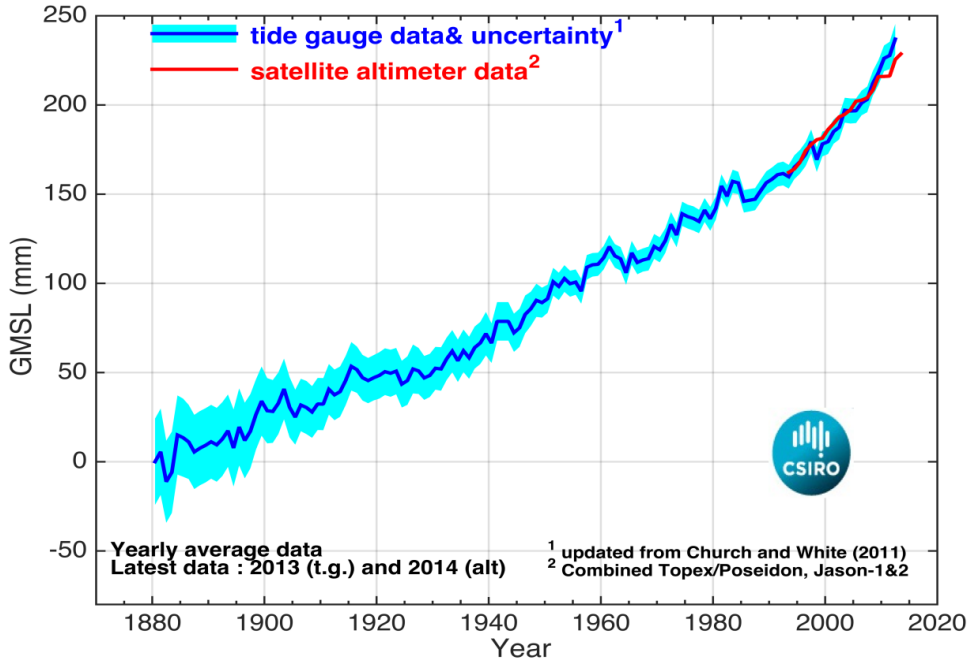


Figure 3-1 Global Mean Sea Level Rise (CSIRO/ARC 2014)

The Intergovernmental Panel on Climate Change Fifth Assessment Report (IPCC 2014) provides SLR projections for a range of global greenhouse gas emission scenarios. The projections for SLR (and other climate variables reported by the IPCC) rely heavily on the Coupled Model Intercomparison Project, Phase 5 (CMIP5) which is a collaborative climate modelling process coordinated by the World Climate Research Programme.

Table 3-1 and Table 3-2 summarise projected increases to global mean surface air temperature and global mean sea level for the four principal emission scenarios, or Representative Concentration Pathways (RCPs). The global SLR projections are also illustrated in Figure 3-2. The IPCC give the following descriptions to the RCPs:

- RCP2.6: global greenhouse gas emissions peak between 2010 and 2020 and substantially decline thereafter.
- RCP4.5: global greenhouse gas emissions peak around 2040 and decline thereafter.
- RCP6.0: global greenhouse gas emissions peak around 2080 and decline thereafter.
- RCP8.5: global greenhouse gas emissions peak continue to rise throughout the 21st century.

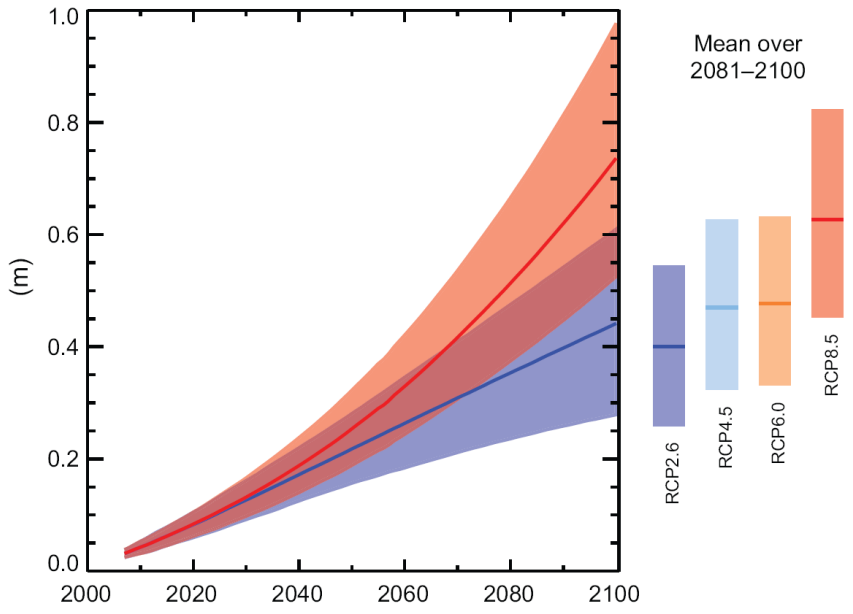


Figure 3-2 Projections of Global SLR Relative to 1986-2005 Mean Sea Level (IPCC 2014)

Table 3-1 Projected Change in Global Mean Surface Air Temperature (IPCC 2014)

Scenario	2046 – 2065 Mean & *likely* range (ºC)	2081 – 2100 Mean & *likely* range (ºC)
RCP2.6	1.0 (0.4 to 1.6)	1.0 (0.3 to 1.7)
RCP4.5	1.4 (0.9 to 2.0)	1.8 (1.1 to 2.6)
RCP6.0	1.3 (0.8 to 1.8)	2.2 (1.4 to 3.1)
RCP8.5	2.0 (1.4 to 2.6)	3.7 (2.6 to 4.8)

Table 3-2 Projected Change in Global Mean Sea Level (IPCC 2014)

Scenario	2046 – 2065 Mean & *likely* range (m)	2081 – 2100 Mean & *likely* range (m)
RCP2.6	0.24 (0.17 to 0.32)	0.40 (0.26 to 0.55)
RCP4.5	0.26 (0.19 to 0.33)	0.47 (0.32 to 0.63)
RCP6.0	0.25 (0.18 to 0.32)	0.48 (0.33 to 0.63)
RCP8.5	0.30 (0.22 to 0.38)	0.63 (0.45 to 0.82)

3.3 Commonwealth Climate Change & Coastal Hazard Studies

3.3.1 Climate Change in Australia (DOE, CSIRO, BOM)

The Climate Change in Australia website consolidates reports and information about climate change projections for Australia. This initiative, including new scientific assessment and research, has been funded by the Australian Government Department of the Environment (DOE), the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and the Australian Bureau of Meteorology (BOM).

As briefly discussed above in Section 3.2, the global average rate of sea level rise measured over the last century was 1.7 mm/year (Church et al. 2010). CSIRO/ACE CRC (2014) analysed Australian tide gauge data and satellite observations and concluded that the global rate of SLR over the last few decades has been substantially larger, estimated to be 3.1 ± 0.4 mm/year since 1992. A similar rate of recent SLR for east coast Australia was also reported by Wainwright and Lord (2014) and White et al. (2014).

Climate Change in Australia provides coastal and marine SLR projections, recognising that the rates of SLR are not uniform around Australia. The regional assessments for Australia build on local data analysis and the CMIP5 model using downscaling techniques and report SLR projections for the range of RCPs used by the IPCC. In addition to SLR, projections for 'sea allowance' are provided which represent the minimum distance required to raise an asset to maintain the current frequency of breaches under projected SLR. The sea allowance projections take into account the nature of extreme sea levels (storm surge) along the Australia coastline.

With reference to the Fraser Coast region, the nearest reporting location is Brisbane. The projections for SLR and sea allowance are summarised in the tables below (CSIRO & BOM, 2015). These projections, together with considerations of IPCC and State policy recommendations, form the basis for SLR allowances adopted for the CHAS. This is discussed further in Section 3.6.

Table 3-3 Projected Mean Sea Level Rise Brisbane (CSIRO 2015)

Scenario	2030 Mean & *likely* range (m)	2090 Mean & *likely* range (m)
RCP2.6	0.13 (0.09 to 0.17)	0.39 (0.23 to 0.55)
RCP4.5	0.13 (0.09 to 0.17)	0.47 (0.31 to 0.65)
RCP8.5	0.14 (0.09 to 0.18)	0.65 (0.45 to 0.87)

Table 3-4 Projected Sea Allowance Brisbane (CSIRO 2015)

Scenario	2030 Minimum distance (m)	2090 Minimum distance (m)
RCP2.6	0.14	0.52
RCP4.5	0.14	0.63
RCP8.5	0.15	0.89

3.3.2 CoastAdapt (NCCARF)

CoastAdapt provides links to several national coastal hazard mapping and visualisation products and tools that are useful for communicating hazards and preliminary risk screening, including:

- Coastal Risk Australia.
- Shoreline Explorer.

Coastal Risk Australia is a tool for visualising and communicating coastal inundation hazards. Due to many simplifications and regional-scale assumptions the developers of the tool recommend that it is not used as the basis for adaptation response. CoastAdapt also provides technical guidelines regarding SLR (Church et al. 2016) which provide projections that follow CSIRO & BOM (2015).

Shoreline Explorer incorporates three datasets that are useful for regional scale risk screening:

(1) Sediment Compartments and their Characteristics: The Australian coast has been divided into 359 discrete units, or sediment compartments, within which there are broadly homogeneous features that may include geology, landform types, near-shore currents and sediment availability and movement.

(2) Smartline (Geoscience Australia): A single, consistent map of coastal landforms for the entire Australian coast, representing geomorphic features located up to 500 m landward of the high water mark. The Smartline map divides the coastline into distinct segments; within each, multiple GIS attributes describe the dominant coastal landforms (refer Figure 3-3 for a screenshot within the Fraser Coast region). Smartline is provided in CoastAdapt at two resolutions:

(a) At the simplest level, a single map layer can be used to display the coast classified five different landform categories based on very broad differences in the composition and erodibility of coastal landforms.

(b) At the second level of detail, separate layers can be displayed showing the location and extent of more differentiated but still quite broadly-defined coastal landform types or groups, such as hard rocky shores (of several types, e.g. cliffed and sloping), sandy beaches (e.g., backed by bedrock or by soft sediment terrain), soft-rock shores of several types, and others.

(3) Water Observations from Space (Geoscience Australia): Displays historical surface water observations derived from Landsat 5 and Landsat 7 satellite imagery for all of Australia from 1987 to 2014. The mapping provides a high-level understanding of where water is usually present, where it is seldom observed and where inundation of the surface has been occasionally observed by satellite.

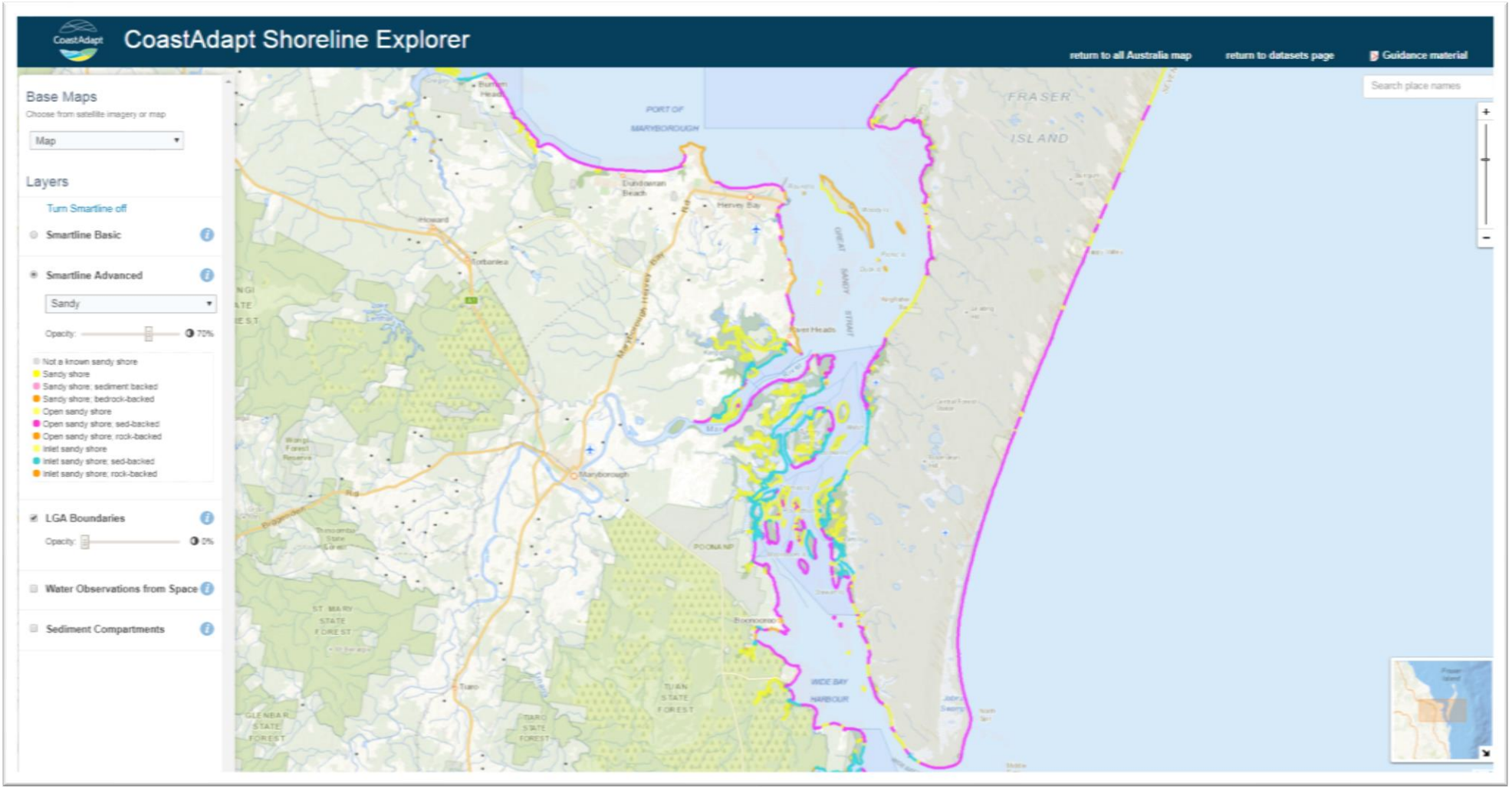


Figure 3-3 CoastAdapt Shoreline Explorer Screenshot (NCCARF 2017)

3.4 State Coastal Hazard Mapping & Studies

Under the Queensland State Planning Policy, 'coastal hazards' refer to:

(1) Temporary or permanent loss of land due to shoreline erosion;

(2) Permanent inundation due to sea level rise; and

(3) Temporary inundation due to storm tide.

Plans showing the indicative extent of each hazard for the entire state have been produced by the Department of Environment and Science (DES). The state coastal hazard area plans are of a regional scale. Detailed assessments that meet or exceed the minimum standards described in the Coastal Hazard Technical Guide (DEHP 2013) can be used to support amendments to the plans. The plans relevant to the Fraser Coast region are listed in Table 3-5 and can be accessed via the DES website.

Table 3-5 State Coastal Hazard Area Maps for the Fraser Coast Region

Plan name	Link
9347-12 Isis Junction	https://environment.ehp.qld.gov.au/coastal-hazards/data/pdf/9347-12_isis_junction.pdf
9447-434	https://environment.ehp.qld.gov.au/coastal-hazards/data/pdf/9447-434.pdf
9447-431 Burrum Heads	https://environment.ehp.qld.gov.au/coastal-hazards/data/pdf/9447-431_burrum_heads.pdf
9447-433 Burrumba	https://environment.ehp.qld.gov.au/coastal-hazards/data/pdf/9447-433_burrumba.pdf
9447-432 Burrum Heads South	https://environment.ehp.qld.gov.au/coastal-hazards/data/pdf/9447-432_burrum_heads_south.pdf
9447-423 Toogoom	https://environment.ehp.qld.gov.au/coastal-hazards/data/pdf/9447-423_toogoom.pdf
9447-133 Gatakers Bay	https://environment.ehp.qld.gov.au/coastal-hazards/data/pdf/9447-133_gatakers_bay.pdf
9447-132 Point Vernon	https://environment.ehp.qld.gov.au/coastal-hazards/data/pdf/9447-132_point_vernon.pdf
9347-21 Cherwell River	https://environment.ehp.qld.gov.au/coastal-hazards/data/pdf/9347-21_cherwell_river.pdf
9447-34 Howard	https://environment.ehp.qld.gov.au/coastal-hazards/data/pdf/9447-34_howard.pdf
9447-314 Beelbi Creek	https://environment.ehp.qld.gov.au/coastal-hazards/data/pdf/9447-314_beelbi_creek.pdf
9447-311 Craignish	https://environment.ehp.qld.gov.au/coastal-hazards/data/pdf/9447-311_craignish.pdf
9447-244 Dundowran	https://environment.ehp.qld.gov.au/coastal-hazards/data/pdf/9447-244_dundowran.pdf
9447-241 Pialba	https://environment.ehp.qld.gov.au/coastal-hazards/data/pdf/9447-241_pialba.pdf

Plan name	Link
9447-214 Urangan	https://environment.ehp.qld.gov.au/coastal-hazards/data/pdf/9447-214_urangan.pdf
9447-243 Nikenbah	https://environment.ehp.qld.gov.au/coastal-hazards/data/pdf/9447-243_nikenbah.pdf
9447-242 Doolong Flat	https://environment.ehp.qld.gov.au/coastal-hazards/data/pdf/9447-242_doolong_flat.pdf
9447-213 Mangrove Point	https://environment.ehp.qld.gov.au/coastal-hazards/data/pdf/9447-213_mangrove_point.pdf
9447-321	https://environment.ehp.qld.gov.au/coastal-hazards/data/pdf/9447-321.pdf
9447-23 Susan River	https://environment.ehp.qld.gov.au/coastal-hazards/data/pdf/9447-23_susan_river.pdf
9447-224 Bingham	https://environment.ehp.qld.gov.au/coastal-hazards/data/pdf/9447-224_bingham.pdf
9447-323 Aldershot	https://environment.ehp.qld.gov.au/coastal-hazards/data/pdf/9447-323_aldershot.pdf
9447-322 Dundathu	https://environment.ehp.qld.gov.au/coastal-hazards/data/pdf/9447-322_dundathu.pdf
9447-223	https://environment.ehp.qld.gov.au/coastal-hazards/data/pdf/9447-223.pdf
9447-222	https://environment.ehp.qld.gov.au/coastal-hazards/data/pdf/9447-222.pdf
9548-42	https://environment.ehp.qld.gov.au/coastal-hazards/data/pdf/9548-42.pdf
9548-13	https://environment.ehp.qld.gov.au/coastal-hazards/data/pdf/9548-13.pdf
9548-31	https://environment.ehp.qld.gov.au/coastal-hazards/data/pdf/9548-31.pdf
9548-24	https://environment.ehp.qld.gov.au/coastal-hazards/data/pdf/9548-24.pdf
9548-32	https://environment.ehp.qld.gov.au/coastal-hazards/data/pdf/9548-32.pdf
9548-23	https://environment.ehp.qld.gov.au/coastal-hazards/data/pdf/9548-23.pdf
9547-41	https://environment.ehp.qld.gov.au/coastal-hazards/data/pdf/9547-41.pdf
9547-14	https://environment.ehp.qld.gov.au/coastal-hazards/data/pdf/9547-14.pdf
9547-43	https://environment.ehp.qld.gov.au/coastal-hazards/data/pdf/9547-43.pdf
9547-42	https://environment.ehp.qld.gov.au/coastal-hazards/data/pdf/9547-42.pdf

Plan name	Link
9547-13	https://environment.ehp.qld.gov.au/coastal-hazards/data/pdf/9547-13.pdf
9547-34	https://environment.ehp.qld.gov.au/coastal-hazards/data/pdf/9547-34.pdf
9547-31	https://environment.ehp.qld.gov.au/coastal-hazards/data/pdf/9547-31.pdf
9547-33	https://environment.ehp.qld.gov.au/coastal-hazards/data/pdf/9547-33.pdf
9547-32	https://environment.ehp.qld.gov.au/coastal-hazards/data/pdf/9547-32.pdf
9446-441	https://environment.ehp.qld.gov.au/coastal-hazards/data/pdf/9446-441.pdf
9446-414 Tinana	https://environment.ehp.qld.gov.au/coastal-hazards/data/pdf/9446-414_tinana.pdf
9446-411 Maryborough	https://environment.ehp.qld.gov.au/coastal-hazards/data/pdf/9446-411_maryborough.pdf
9446-442	https://environment.ehp.qld.gov.au/coastal-hazards/data/pdf/9446-442.pdf
9446-413	https://environment.ehp.qld.gov.au/coastal-hazards/data/pdf/9446-413.pdf
9446-412	https://environment.ehp.qld.gov.au/coastal-hazards/data/pdf/9446-412.pdf
9446-14 Kalah Creek	https://environment.ehp.qld.gov.au/coastal-hazards/data/pdf/9446-14_kalah_creek.pdf
9446-11 Boonlye Point	https://environment.ehp.qld.gov.au/coastal-hazards/data/pdf/9446-11_boonlye_point.pdf
9546-44 Boemingen	https://environment.ehp.qld.gov.au/coastal-hazards/data/pdf/9546-44_boemingen.pdf
9446-43 Tiaro	https://environment.ehp.qld.gov.au/coastal-hazards/data/pdf/9446-43_tiaro.pdf
9446-42 Tinana Crossing	https://environment.ehp.qld.gov.au/coastal-hazards/data/pdf/9446-42_tinana_crossing.pdf
9446-13 Big Tuan	https://environment.ehp.qld.gov.au/coastal-hazards/data/pdf/9446-13_big_tuan.pdf
9446-12 Boonooroo	https://environment.ehp.qld.gov.au/coastal-hazards/data/pdf/9446-12_boonooroo.pdf
9546-43 Fig Tree Lake	https://environment.ehp.qld.gov.au/coastal-hazards/data/pdf/9546-43_fig_tree_lake.pdf
9446-24 Big Angle	https://environment.ehp.qld.gov.au/coastal-hazards/data/pdf/9446-24_big_angle.pdf
9446-21 Kauri Creek	https://environment.ehp.qld.gov.au/coastal-hazards/data/pdf/9446-21_kauri_creek.pdf

Plan name	Link
9546-34 Inskip Point	https://environment.ehp.qld.gov.au/coastal-hazards/data/pdf/9546-34_inskip_point.pdf

The GIS layers shown in the plans are publicly available and can be accessed via the Queensland Government Queensland Spatial Catalogue – QSpatial:

http://qldspatial.information.qld.gov.au/catalogue/

The State-declared erosion prone areas and storm tide inundation hazard areas are described further below. The properties affected by the State's 'default' hazard areas are presented in Section 4 of this report.

3.4.1 State-Declared Erosion Prone Area

Statutory erosion prone areas are declared under section 70 of the *Coastal Protection and Management Act 1995* (Coastal Act) by reference to an erosion prone area plan.

These plans have been developed to assist development assessment and to inform the preparation of planning instruments, such as planning schemes and regional plans under the *Sustainable Planning Act 2009*.

Erosion prone areas have been declared for all coastal local government areas in Queensland. The Fraser Coast Region Plan FCR3A is available online via DES website:

https://www.ehp.qld.gov.au/coastal/development/assessment/pdf/fraser-coast-erosion-prone-area-plan.pdf

The erosion prone areas apply to land subject to inundation by the Highest Astronomical Tide (HAT) by the year 2100 or at risk from sea erosion. On land adjacent to tidal water the erosion prone area is defined by whichever of the following methods gives the greatest width:

(1) 40 m buffer from the present-day HAT contour.

(2) Calculated erosion distance shown in Table 1 of the statutory plan.

(3) Permanent inundation due to SLR in 2100 (defined by present-day HAT plus 0.8 m).

The 40 m buffer from present-day HAT (component 1) generally applies within estuarine areas not exposed to open coast processes. This approximate method is intended to account for the migration of channels within tidal waterways with natural (undeveloped) shorelines.

The calculated erosion distance (component 2) is intended to cater for the potential loss of land for open coast locations. Both short term (storm-related) and longer term (gradual) trends are included in the assessment together with an allowance for potential sea level rise associated with climate change. Provision is also included for a factor of safety on the estimates and an allowance made for slumping of the dune scarp that is often observed after significant storm erosion has occurred. The relationship below was originally used by the (then) Beach Protection Authority (BPA) for determining erosion hazard area widths throughout Queensland and continues to be recognised by DEHP (2013) as a reasonable method of assessing the erosion hazard on sandy coastlines:

$$E = [(N \times R) + C + S] \times (1 + F) + D$$

Equation 1

Where E = erosion prone area width (metres)

N = planning period (years)

R = rate of long term erosion (metres per year)

C = short term erosion from the design storm event (metres)

S = erosion due to sea level rise (metres)

F = factor of safety

D = dune scarp component (metres)

The Fraser Coast Region Plan (FCR3A, Table 1) provides a summary of the calculated erosion prone areas for open coast locations. Consideration of the potential presence of bedrock is included however it is noted that the State plans do not capture local-scale natural and/or manmade features that may limit the landward extent of shoreline erosion.

The permanent inundation due to SLR (component 3) represents the HAT coastline (or elevation contour) in 2100 in the absence of any adaptation response to treat the risk, such as filling land to an elevation above the threshold water level.

The approximate erosion prone area footprint (combining the three erosion components) for the Fraser Coast LGA is shown on the Coastal Hazard Area Plans (refer Section 3.4, Table 3-5). It is noted that the footprint on the Coastal Hazard Area Maps (refer Table 3-5) is for illustrative purposes only and that the definition provided by Fraser Coast Region Local Government Area Plan FCR3A prevails in the instance of discrepancy between the two products.

The erosion prone areas determined by the State define a hazard extent at a single specified planning horizon (the year 2100) and probability (representative 100 year Annual Recurrence Interval or ARI). The erosion prone areas are useful for 'first-pass risk screening' however do not provide sufficient information regarding likelihood and consequence to undertake a more detailed risk assessment in accordance with Australian Standard (AS/NZS ISO 31000:2009), State Planning Policy and other State guideline documents (such as the $QCoast_{2100}$ MS&G). For the Fraser Coast CHAS, this issue has been partially addressed through a recent study described in Section 3.5.2.2.

3.4.2 State Storm Tide Inundation Hazard

DES has prepared default storm tide inundation mapping to assist with land use planning and development assessment decisions in the absence of a detailed, site specific storm tide hazard and risk assessment study.

For all areas outside of south east Queensland, including the Fraser Coast local government area, the default storm tide inundation area is all land up to 2 m above the HAT in 2100 (i.e. including a 0.8 m SLR allowance). The State defined storm tide inundation areas are classified as either:

- Medium Hazard (temporary inundation depth less 1 m); or
- High Hazard (temporary inundation depth greater than 1 m).

The approximate inundation extents and hazard classifications for Fraser Coast are shown on the Coastal Hazard Area Plans (refer Section 3.4, Table 3-5). As described in Section 3.4.3, a site-specific inundation assessment has been completed for the Fraser Coast region and therefore the default storm tide inundation mapping prepared by DES is not likely to be basis for decision making within the local government area.

3.4.3 Ocean Hazards Assessment – Stage 2 (Hardy et al., 2004)

This study provided storm tide and wave statistics for the Hervey Bay and Sunshine Coast regions and was commissioned by the former Queensland Environmental Protection Agency with support from the BOM and the Greenhouse Special Treasury Initiative. The study report is available via the Queensland Government Long Paddock website:

https://www.longpaddock.qld.gov.au/about/publications/pdf/climatechange/vulnerabilitytotropicalcyclones/stage2/FullReportLowRes.pdf

The study produced water level and wave return period curves between 10 and 1000 year Annual ARI. The assessments also included 'Greenhouse Scenarios' with the following key assumptions:

- Combined effect of an increase in tropical cyclone Maximum Potential Intensity (MPI) of 10% and a poleward shift in tracks of 1.3°;
- Increase in frequency of tropical cyclones of 10%; and
- Mean SLR of 0.3 m by 2050.

The SLR allowance was based on recommendations in the now superseded IPCC third assessment report (IPCC, 2001).

It is important to note that the outputs from this study only concern water levels and waves associated with tropical cyclone events. Extra-tropical storms (such as east coast low events) and other meteorological or oceanic causes of extreme water level and wave conditions were not considered. For southeast Queensland locations, non-tropical cyclone events are statistically significant at the lower return periods and often dominate up to and beyond the 500 year ARI.

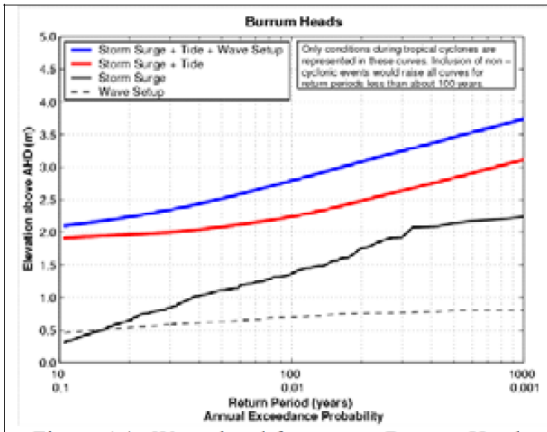


Figure A4. Water level frequency: Burrum Heads
HAT = 1.99 m

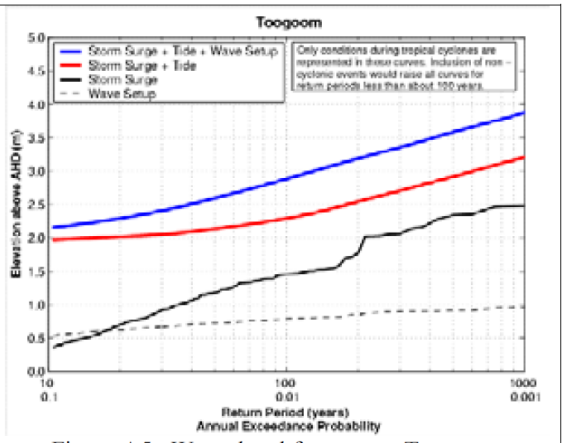


Figure A5. Water level frequency: Toogoom
HAT = 2.12 m

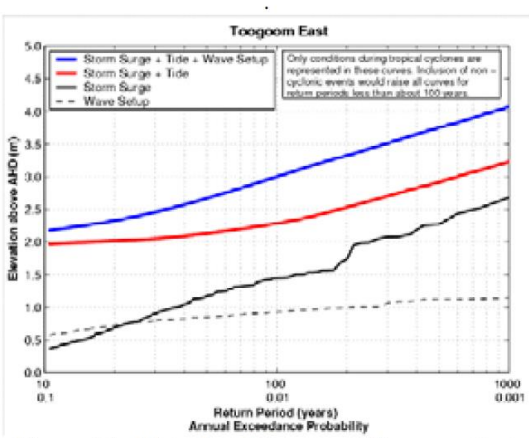


Figure A6. Water level frequency: Toogoom East
HAT =2.12

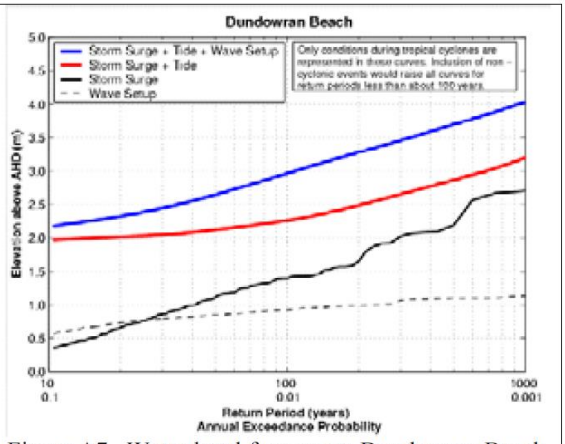


Figure A7. Water level frequency: Dundowran Beach
HAT = 2.12 m

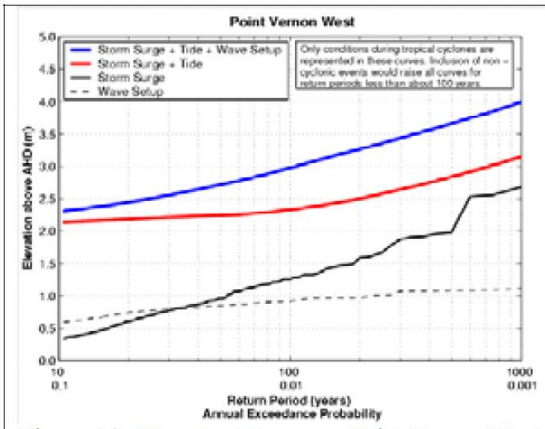


Figure A8. Water level frequency: Point Vernon West
HAT = 2.12 m

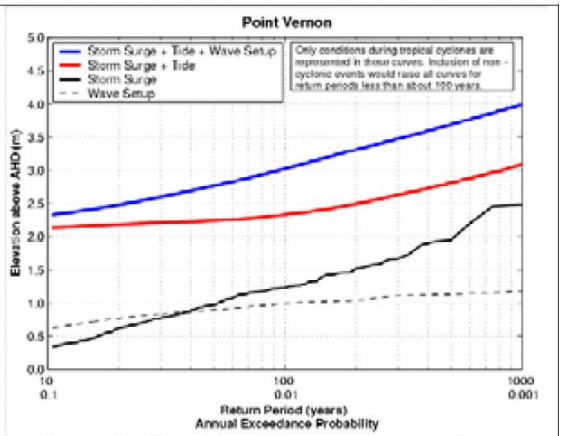


Figure A9. Water level frequency: Point Vernon
HAT = 2.12 m

Figure 3-4 Tropical Cyclone Water Level Return Period Curves (JCU, 2004)

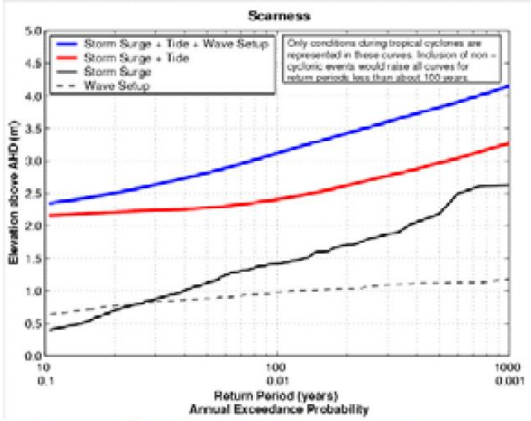


Figure A10. Water level frequency: Scarness
HAT = 2.15 m

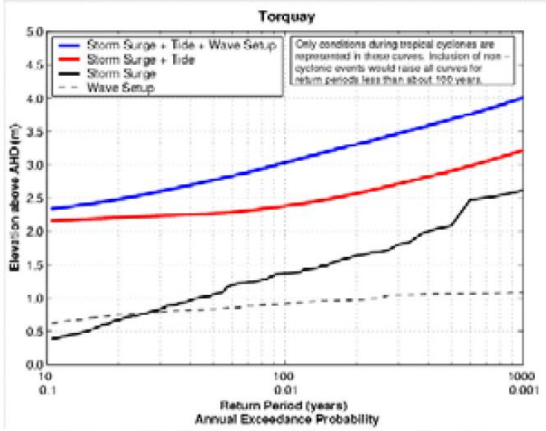


Figure A11. Water level frequency: Torquay
HAT = 2.15 m

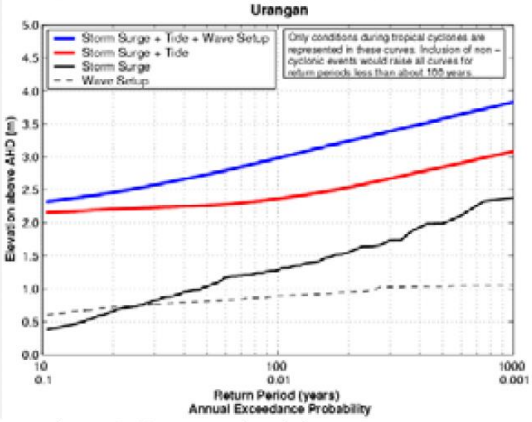


Figure A12. Water level frequency: Urangan
HAT = 2.15 m

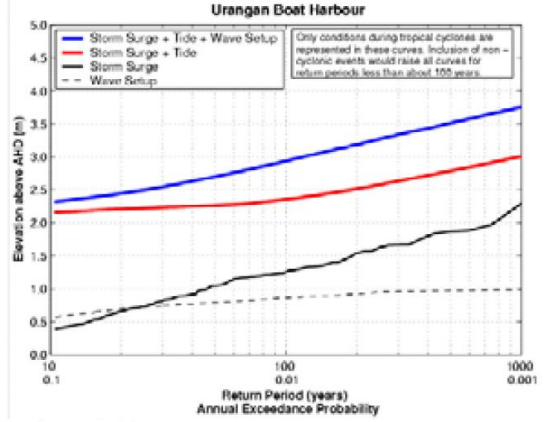


Figure A13. Water level frequency: Urangan Boat Hr.
HAT = 2.15 m

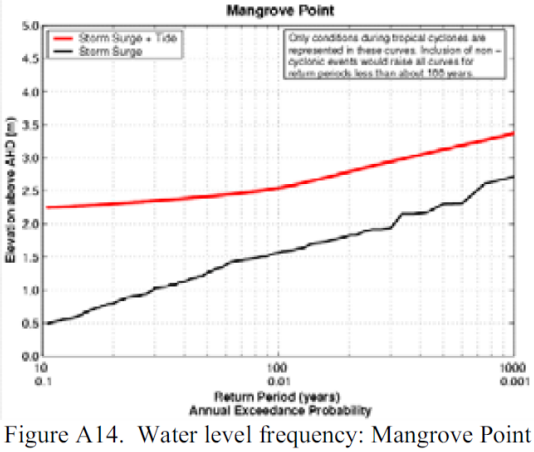


Figure A14. Water level frequency: Mangrove Point
HAT = 2.63 m

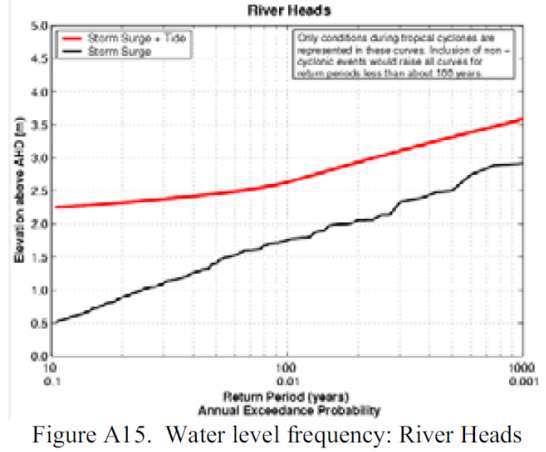


Figure A15. Water level frequency: River Heads
HAT = 2.63 m

Figure 3-5 Tropical Cyclone Water Level Return Period Curves (JCU, 2004)

Table 3-6 Hervey Bay Tropical Cyclone Wave Conditions (Hardy et al., 2004)

				100 years		500 years	
Location (Fig. 19a)	**Long (°)**	**Lat (°)**	**Depth (m)**	H_s (m)	T_p (s)	H_s (m)	T_p (s)
Burnett Heads WR	152.5917	-24.4066	24	9.63	12 – 16	12.01	15 – 18
Hervey Bay WR	152.8500	-25.2500	9	3.28	7 – 13	3.45	7 – 17
H1	152.9432	-25.1057	16	5.61	9 – 11	7.18	11 – 13
H2	152.8494	-25.1228	15	5.68	9 – 11	7.42	11 – 15
H3	152.7514	-25.1377	16	5.50	9 – 11	7.33	11 – 15
H4	152.6646	-25.0741	16	5.92	10 – 15	7.99	12 – 18
H5	152.6320	-24.8200	24	7.07	10 – 14	9.67	15 – 17
H6	152.7812	-24.8371	26	6.27	9 – 15	8.00	11 – 17
H7	152.9411	-24.8520	24	6.40	11 – 15	8.60	14 – 18
Hervey Bay Offshore	153.0756	-24.2451	185	11.3	12 - 18	16.47	15 – 18

3.4.4 NDRP Storm Tide Hazard Interpolation Study (GHD 2014)

The primary objective of this study was to provide a statistically consistent set of ARI water levels for the Queensland open coast by reviewing, collating and normalising 23 separate local government area storm tide studies. Key outputs from the study included a detailed final report and GIS layers of overland water level and depth. The GIS layers have a horizontal resolution of 10 m; however, the alongshore water level statistics have been derived at a significantly lower resolution as part of each separate local government area study (the reported point locations are typically separated by at least hundreds of metres). The study report and GIS layers are publicly available via the Queensland Government data repository:

https://data.qld.gov.au/dataset/ndrp-storm-tide-hazard-interpolation-series

The study included a systematic review and scoring of the 23 separate storm tide hazard studies based on the following key components:

- Tropical cyclone climatology;
- Windfield modelling;
- Hydrodynamic modelling;
- Statistical modelling; and
- Wave setup/runup allowance.

The Hervey Bay Storm Tide Study (Lawson and Treloar, 2002) and Storm Tide Risk Study – Great Sandy Strait Coastal Townships (GHD, 2011) were included in the review (these and other 'local government scale' studies are discussed further below). The summary of review score results shown in Figure 3-6 indicates that both studies ranked relatively low, and did not include consideration of non-cyclonic storm tide.

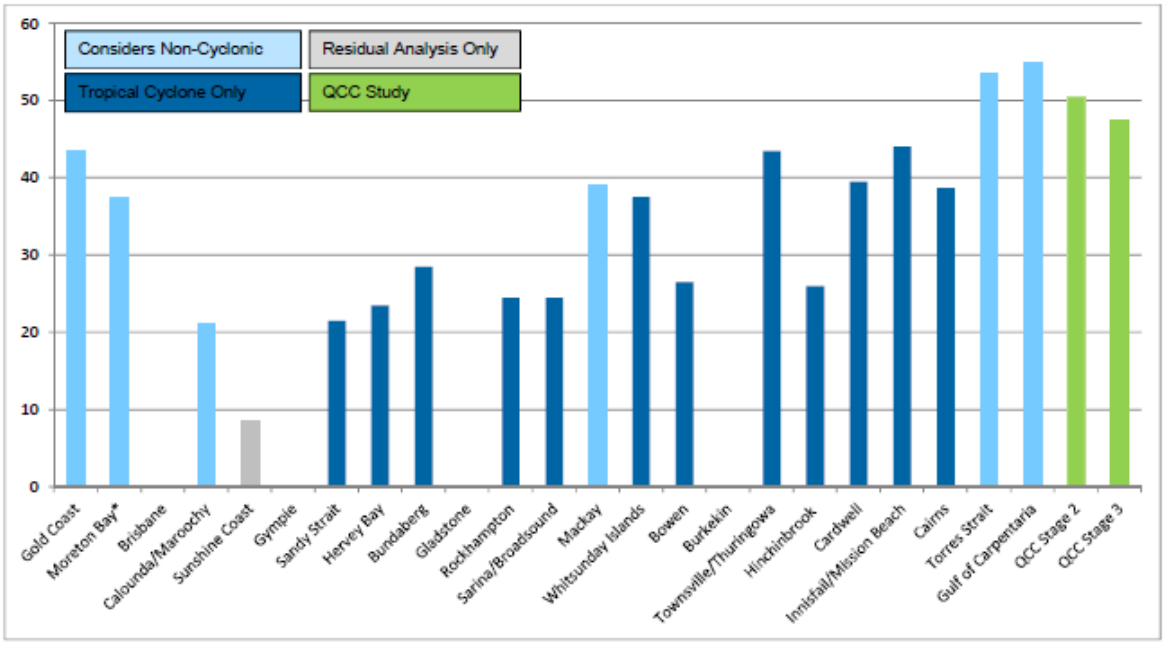


Figure 3-6 Storm Tide Study Review Scores (GHD, 2014)

3.5 Local Government Area and Council Studies

Key local government hazard assessment studies are considered in the following Sections. There are several other previously completed shoreline and foreshore management studies that describe the design of coastal protection options but have not dealt specifically with the coastal hazard definition. Some of these studies may be considered at a later stage of the CHAS process when coastal hazard adaptation options are considered.

The CHAS development process is not intended to interfere with or delay shoreline management activities that address contemporary needs. Once endorsed and implemented, the CHAS is expected to guide the coastal hazard risk management options that are preferred by Council and the community.

3.5.1 Fraser Coast Strom Tide Hazard Assessments & Mapping

The most recent storm tide hazard assessment for Fraser Coast communities (GHD 2011a; 2011b) has built on the statistical basis for regional storm tide established as part of the *Queensland Climate Change Ocean Hazards Assessment Study Ocean Hazard Assessment Stage 2* (Hardy et al. 2004) and summarised above in Section 3.4.3.

3.5.1.1 Storm Tide Risk Study – Great Sandy Strait Coastal Townships (GHD 2011a)

The study adopted open coast water levels reported by Hardy et al. (2004) as the statistical basis for the numerical modelling of tide and surge propagation throughout the Great Sandy Strait and assessment of the inundation hazard area. Communities at Maaroom, Tinnanbar, Poona, Tuan and Boonooroo were included in the original assessment. Additional work was undertaken to provide storm tide statistics for the tidal extent of the Mary River (including Maryborough) and the east Coast of Fraser Island.

Due to the piecemeal approach to these assessments and inconsistencies in the reporting of outcomes it is difficult to provide a concise summary of storm tide levels for the Great Sand Strait communities. Summaries for a selection of Mary River and Fraser Island east coast locations are provided in Table 3-7.

Table 3-7 Great Sandy Strait, Mary River and Fraser Island East Coast Tropical Cyclone Storm Tide Level (mAHD)

Location	2004 100 year ARI	2050 100 year ARI	2100 100 year ARI
Maryborough upstream (site 106)	2.68	2.97	3.66
Maryborough downstream (site 103)	2.18	2.83	3.47
Fraser Island Eurong (site 1)	2.69	2.79	3.15
Fraser Island Happy Valley (site 7)	2.67	2.75	3.05

For the Great Sandy Strait communities, the inundation modelling outcomes were used as the basis for a vulnerability assessment, focusing on the number of properties (cadastral parcels) and critical infrastructure identified within the inundation hazard area. Due to the flooding of access roads and inundation of residential areas, communities at Maaroom, Boonooroo and Tuan were reported as highly vulnerable.

3.5.1.2 Hervey Bay Storm Tide Reassessment (GHD 2011b)

Tropical cyclone generated extreme water level statistics for the 2004, 2050 and 2100 climates were derived for the 'Hervey Bay' communities. The results for the 100 year ARI across the range of climate scenarios are summarised in Table 3-8.

The reassessment was based on extrapolation of the Hardy et al. (2004) results to the 10,000 year ARI and also to the 2100 climate scenario (including 0.8 m SLR). The authors note that the reassessment was not based on additional modelling nor did it include consideration of non-cyclonic events that are expected to dominate the water level statistics up to at least the 100 year ARI.

Table 3-8 Hervey Bay Tropical Cyclone Storm Tide Levels (mAHD)

Location	2004 100 year ARI	2050 100 year ARI	2100 100 year ARI
Burrum Heads	2.79	3.29	3.79
Burrum River	2.24	2.82	3.32
Dundowran Beach	2.96	3.54	4.04
Mangrove Point	2.54	2.91	3.41
Point Vernon West	2.98	3.55	4.05
Point Vernon	3.02	3.56	4.06
River Heads	2.62	3.08	3.58
Scarness	3.11	3.68	4.18
Toogoom East	3.00	3.57	4.07
Toogoom	2.88	3.59	4.09
Torquay	3.03	3.59	4.09
Urangan Boat Harbour	2.93	3.46	3.96
Urangan	2.98	3.50	4.00

3.5.1.3 Fraser Coast Planning Scheme – Storm Tide Hazard Mapping

The storm tide hazard mapping adopted for the Fraser Coast Planning Scheme 2014 can be viewed via the Coastal Protection Public Mapping resource:

https://mapping.frasercoast.qld.gov.au/maps/?project=Planning&module=Coastal%20Protection

It is understood this mapping was developed using the outcomes from the Storm Tide Risk Study – Great Sandy Strait Coastal Townships (GHD 2011a) and Hervey Bay Storm Tide Reassessment (GHD 2011b). The storm tide hazard mapping represents the medium (inundation depth < 1 m) and high hazard (inundation depth > 1 m) in 2100 and incorporates 0.8 m of SLR.

3.5.2 Fraser Coast Erosion Hazard Assessments & Mapping

The most recent erosion prone area assessment for Fraser Coast communities (Cardno 2011; 2012) has built on the statutory erosion prone area mapping developed by the state. The basis for this work is briefly described below.

3.5.2.1 Hervey Bay Beaches (Beach Protection Authority 1989)

This study was the first to examine and interpret coastal processes occurring throughout the Fraser Coast region. At the time, beach erosion was a key issue due to development that had occurred within the zone of natural beach movements.

The study included a substantial data collection program to describe coastal processes and shoreline trends. It was noted that the study area was not easily related to other areas studied by the Beach Protection Authority (BPA) due to the sheltering provided by Fraser Island and complex morphology of the Great Sand Strait. This study also provides a detailed summary of the coastal geology throughout the region and remains a key reference for this content alone.

The study included an assessment of the erosion prone area, following the 'calculated erosion distance' formula described in Section 3.4.1. Many assumptions applied at the time are still included in the present erosion prone area definition; however, some assumptions are now outdated (for example, the sea level rise forecasts) and have since been addressed through subsequent work by the State Government. Similarly, the management options promoted at the time have since been either implemented or reviewed in response to more recent trends, development and present-day conditions (e.g. Cardno 2011; 2012).

3.5.2.2 Fraser Coast Shoreline Erosion Management Plan: Gap Analysis (Cardno 2011) and Option Assessment (Cardno 2012)

The Fraser Coast Shoreline Erosion Management Plan (Cardno 2011; 2012) produced erosion prone area width (EPAW) mapping for the 2030, 2050, 2070 and 2100 planning horizons. Calculation of the EPAW followed the approach described in the *Queensland Coastal Hazard Guidelines* (DERM 2011) which has since been replaced by the *Coastal Hazards Technical Guide* (DEHP 2013). The EPAW mapping is readily available to the Fraser Coast CHAS and is considered suitable for identifying assets within the hazard area. This study focused on 'open coast' areas with development. There are several other 'tidally dominated' locations that are also within the statutory erosion prone area that may consideration as part of the CHAS. This is discussed further in Section 4.2.2.

The Fraser Coast Shoreline Erosion Management Plan (Cardno 2011; 2012) also developed a risk assessment framework that aligns with requirements of the $QCoast_{2100}$ MS&G. The risk assessment was underpinned by extensive stakeholder consultation and considered the following broad classes of assets and values:

- Environmental values.
- Critical infrastructure.
- Social values – cultural heritage, visual amenity, public health and safety, recreational access.
- Commercial values.

This previous work sets a robust foundation for the Fraser Coast CHAS and will likely guide the approach to coastal hazard risk assessment adopted for the project. This is discussed further in Section 5.4.

3.6 Assessment of Previous Work & Key Directions

The previous work described in this Chapter sets a robust foundation for the Fraser Coast CHAS. There are several other previously completed shoreline and foreshore management studies that have also been reviewed but are not listed in Table 3-9. These studies will be considered further at a later stage of the CHAS process when adaptation options are being developed. It is noted that the CHAS is not intended to delay routine shoreline management activities that address contemporary needs; however, the CHAS may ultimately guide the management options that are preferred by Council and the community.

Table 3-9 Assessment of previous work relevant to the Fraser Coast CHAS

Study	Indicative phases of CHAS (as per MS&G)	Commenced or Completed?	Study, assessment and/or data available?	Study, assessment, and/or data compliant with MS&G?	Additional Comments
Intergovernmental Panel on Climate Change	Phase 3: baseline data (sea level rise)	Completed	Yes (report only)	Yes	Key international reference for projected increases to global mean sea level based on the CMIP5 project and RCP scenarios.
Climate Change in Australia (DOE, CSIRO, BOM)	Phase 3: baseline data (sea level rise)	Completed	Yes	Yes	Summary of regional projected increase to global sea level rise across Australia, building on the CMIP5 project using model downscaling techniques. Reports SLR projections for 2030 and 2090 across the range of RCPs used by the IPCC.
CoastAdapt (NCCARF)	Phase 3: baseline data (shoreline type)	Completed	Yes	No Yes: preliminary assessment only	Coastal Risk Australia illustrates the inundation hazard associated with sea level rise. This tool is not suitable for detailed risk assessment. Smartline provides consistent map of coastal landforms for the entire Australian coast, representing geomorphic features located up to 500 m landward of the high water mark. Useful for understanding the range of shoreline types within the study area.
State-Declared Erosion Prone Area	Phase 3: erosion prone area hazard assessment	Completed	Yes	Yes: preliminary risk screening only	Default erosion prone area approximately equivalent to the 100 year ARI in 2100. No hazard or risk classification available.
State Storm Tide Inundation Hazard	Phase 3: storm tide hazard assessment	Completed	Yes	Yes: preliminary risk screening only	Default storm tide inundation hazard area approximately equivalent to the 100 year ARI in 2100. Hazard classified has either ‘medium’ (depth < 1 m) or ‘high’ (depth > 1 m).
Ocean Hazards Assessment – Stage 2 (Hardy et al. 2004)	Phase 3: storm tide hazard assessment	Completed	Yes (report only)	No: only provides offshore conditions	Statistically robust study regarding tropical cyclone generated storm tide only (non-cyclonic events not considered). Report provides offshore water level and wave conditions. Future climate assumptions are now superseded by IPCC, national and State guidelines.

Study	Indicative phases of CHAS (as per MS&G)	Commenced or Completed?	Study, assessment and/or data available?	Study, assessment, and/or data compliant with MS&G?	Additional Comments
NDRP Storm Tide Hazard Interpolation Study (GHD 2014)	Phase 3: storm tide hazard assessment	Completed	Yes	No: only provides current climate conditions	Provides a useful review of completed Queensland storm tide studies at local government scale. The Hervey Bay Storm Tide Study (Lawson and Treloar, 2002) and Storm Tide Risk Study – Great Sandy Strait Coastal Townships (GHD, 2011) were included in the review. Both studies received a low score as part of the review.
Storm Tide Risk Study – Great Sandy Strait Coastal Townships (GHD 2011a)	Phase 3: storm tide inundation hazard assessment	Completed	Yes	Yes: partially compliant, additional planning horizons may be needed	Includes current and future climate (2004, 2050 and 2100) storm tide inundation likelihoods (100, 200, 500, 1000 and 10000 year ARI). Did not consider non-cyclonic storm tide which may be statistically significant up to approximately the 100 year ARI. Only considers inundation depth (not velocity).
Hervey Bay Storm Tide Reassessment (GHD 2011b)	Phase 3: storm tide hazard assessment	Completed	Yes	Yes: partially compliant, additional planning horizons may be needed	Extrapolation of storm tide levels from Ocean Hazards Assessment – Stage 2 (Hardy et al., 2004) for current and future climate (2004, 2050 and 2100) storm tide likelihoods (100, 500, 1000 and 10000 year ARI). Non-cyclonic conditions were not considered.
Hervey Bay Beaches (Beach Protection Authority 1989)	Phase 3: erosion hazard assessment	Completed	Yes	Yes: partially compliant, some assumptions outdated	Provides a useful summary of coastal geology and coastal processes throughout the region.
Fraser Coast Shoreline Erosion Management Plan (SEMP) (Cardno 2011; 2012)	Phase 3, 4 & 5: coastal erosion hazard & risk assessment	Completed	Yes	Yes: additional consideration of erosion prone area adjacent to tidal waterways needed	Provides erosion prone area hazard mapping for present-day, 2030, 2050, 2070 and 2100. Identifies assets in the erosion hazard area. Applies a risk assessment framework that meets the requirements of the $QCoast_{2100}$ MS&G.

4 Coastal Communities, Assets & Values at Risk

4.1 Preliminary Risk Screening

National and State-level assessment and mapping are generally suitable for first-pass risk screening, and in some instances second-pass risk assessment, and can assist in identifying knowledge gaps and prioritise and frame necessary finer scale assessments. The following section describes the results of first-pass risk screening for the Fraser Coast CHAS using the State-declared Erosion Prone Area and default Storm Tide Hazard Area plans discussed in Sections 3.4.1 and 3.4.2. In addition, a summary of the at-risk infrastructure identified as part of the Fraser Coast Shoreline Erosion Management Plan (Cardno 2012) is also included.

4.2 Summary of Fraser Coast Communities, Assets & Values

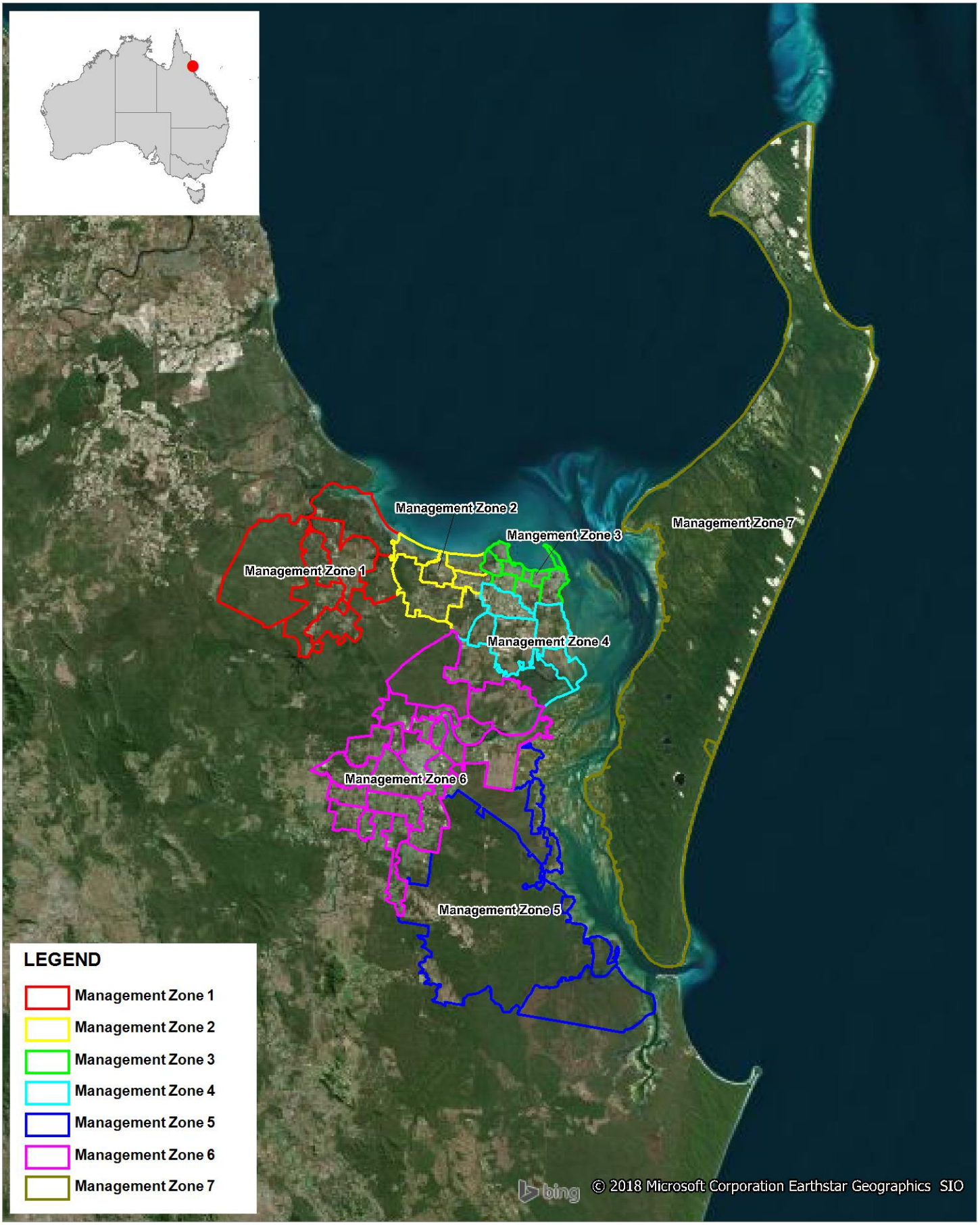
Maps showing the localities and suburbs with assets contained within the State defined coastal hazard areas are provided in Figure 4-1 to Figure 4-8. The localities and suburbs have been grouped into 'Management Zones' to assist with the description of typical land-uses, assets and values potentially impacted by present-day or future coastal hazards. The summary descriptions are provided in Table 4-1.

4.2.1 Planning Zone Assessment

Planning Zone mapping from the Fraser Coast Planning Scheme is available online:

https://mapping.frasercoast.qld.gov.au/maps/?project=Planning&module=Planning%20Zones

An overlay analysis of the Planning Zones and State defined coastal hazard areas has been completed. The results are illustrated in Figure 4-9, Figure 4-10 and Figure 4-11. It is noted that this analysis does not identify locations where the erosion prone area and storm tide hazard area overlap. This may lead to an over estimate of the percentage of impacted zone in some instances.



Title:

Fraser Coast CHAS Management Zones

Figure: 4-1

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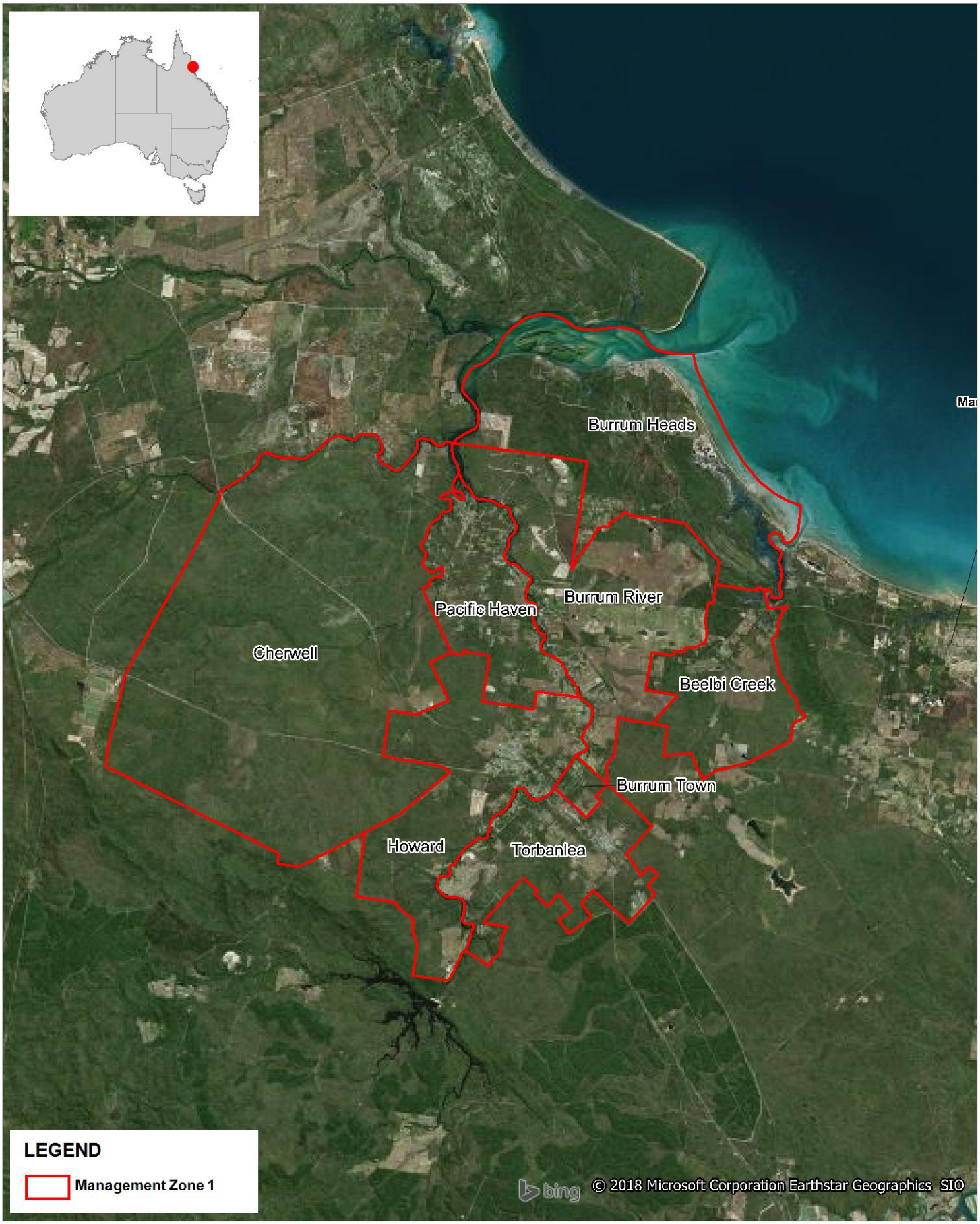

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Fraser Coast CHAS Management Zone 1

Figure: 4-2

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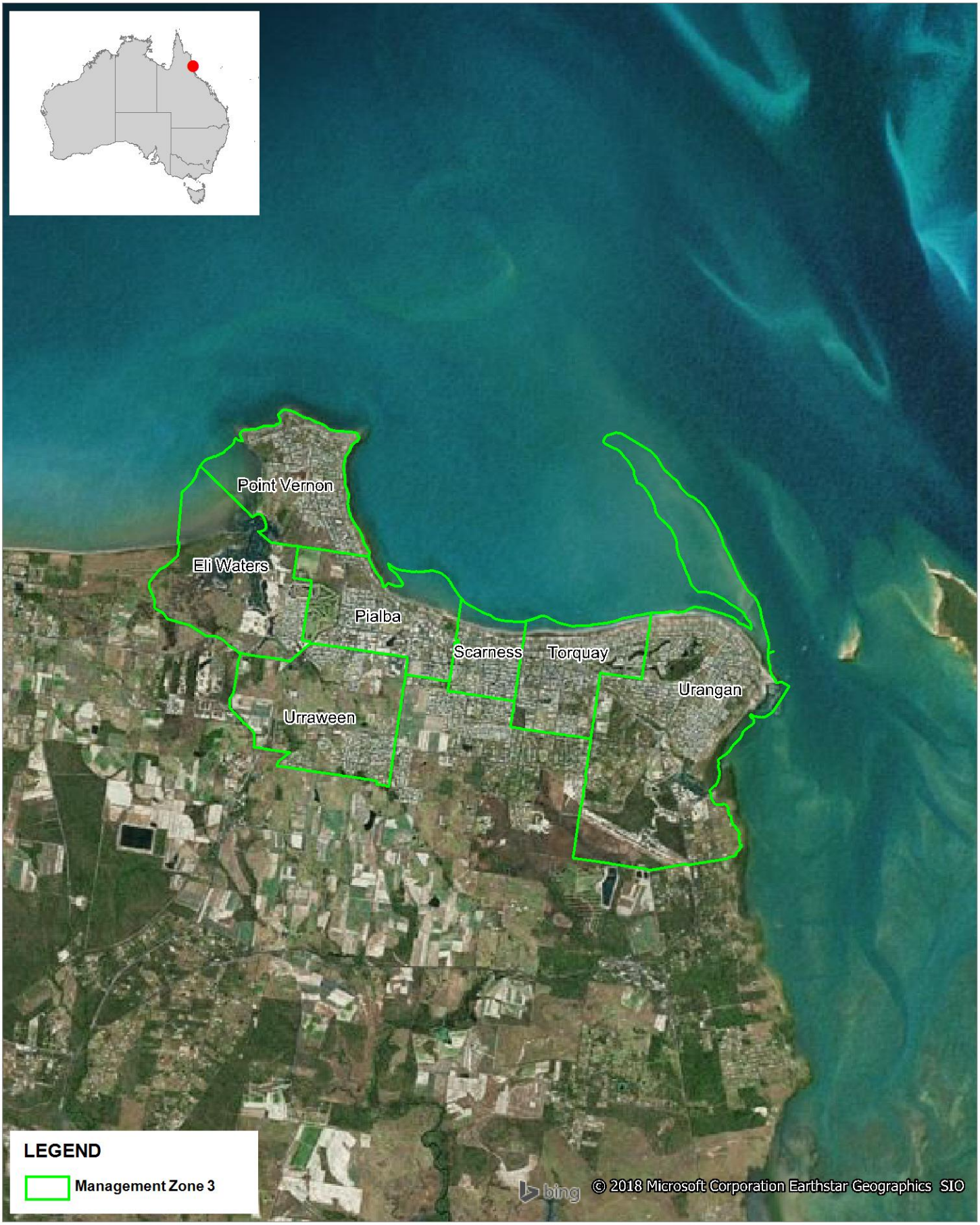

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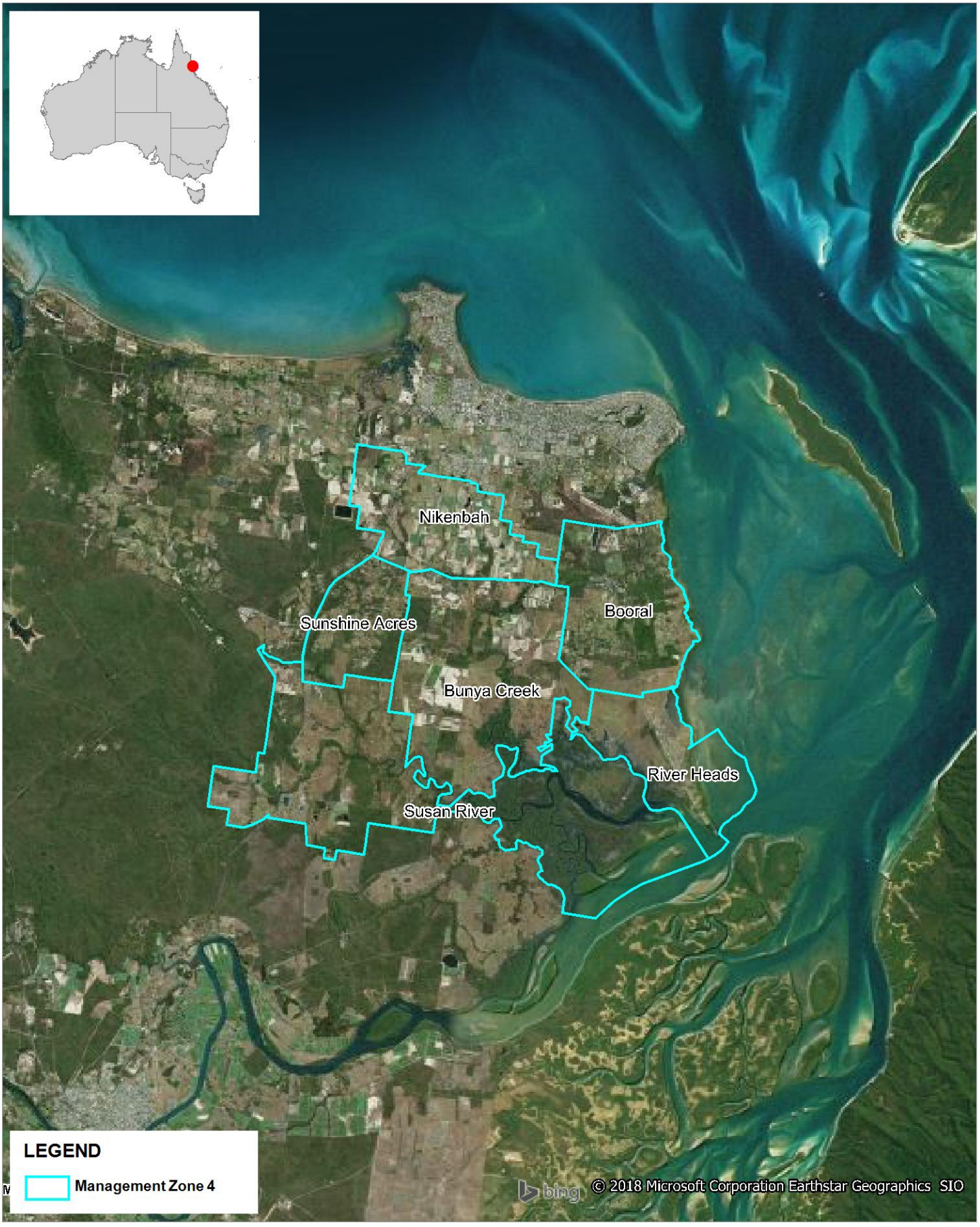

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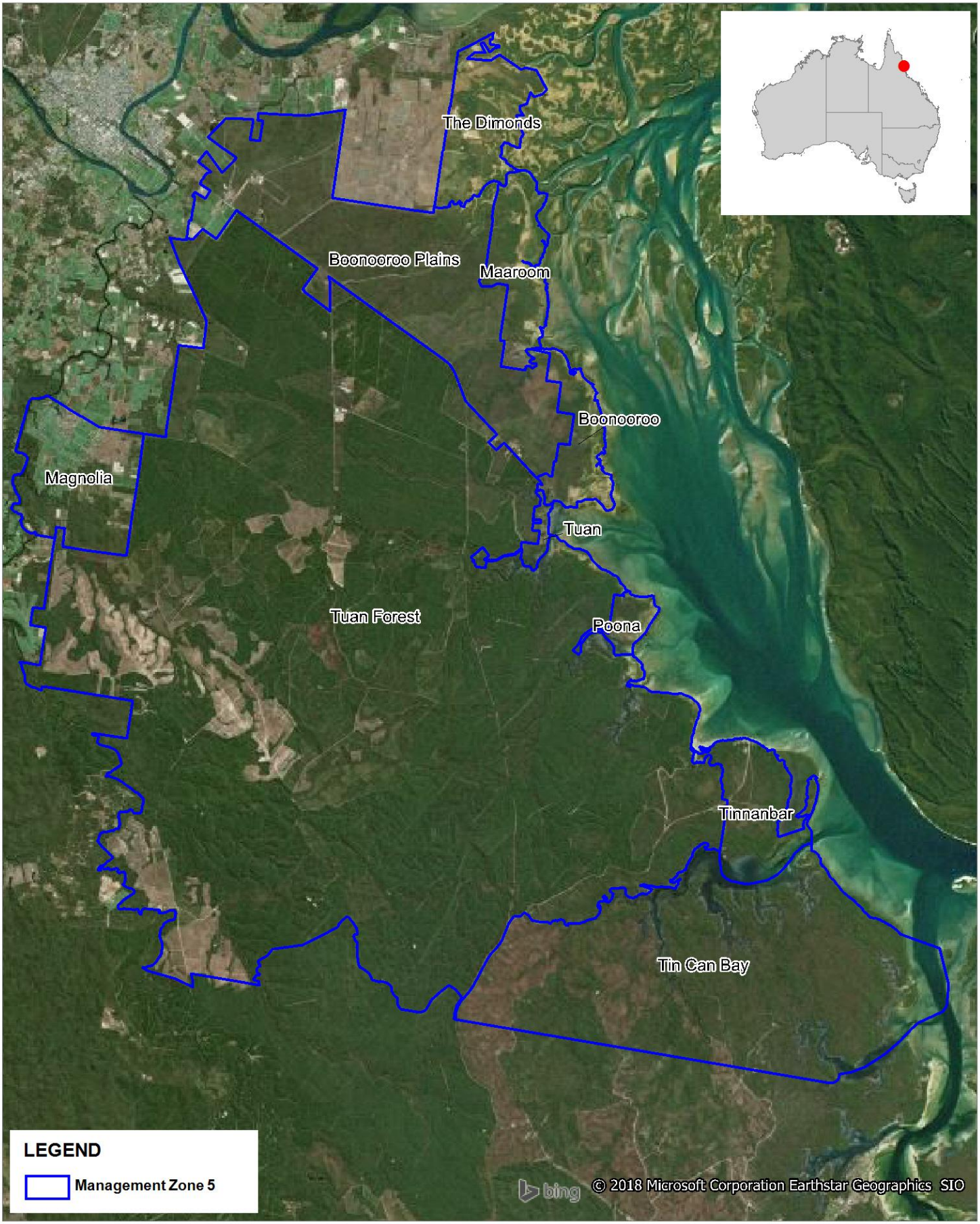

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Fraser Coast CHAS Management Zone 5

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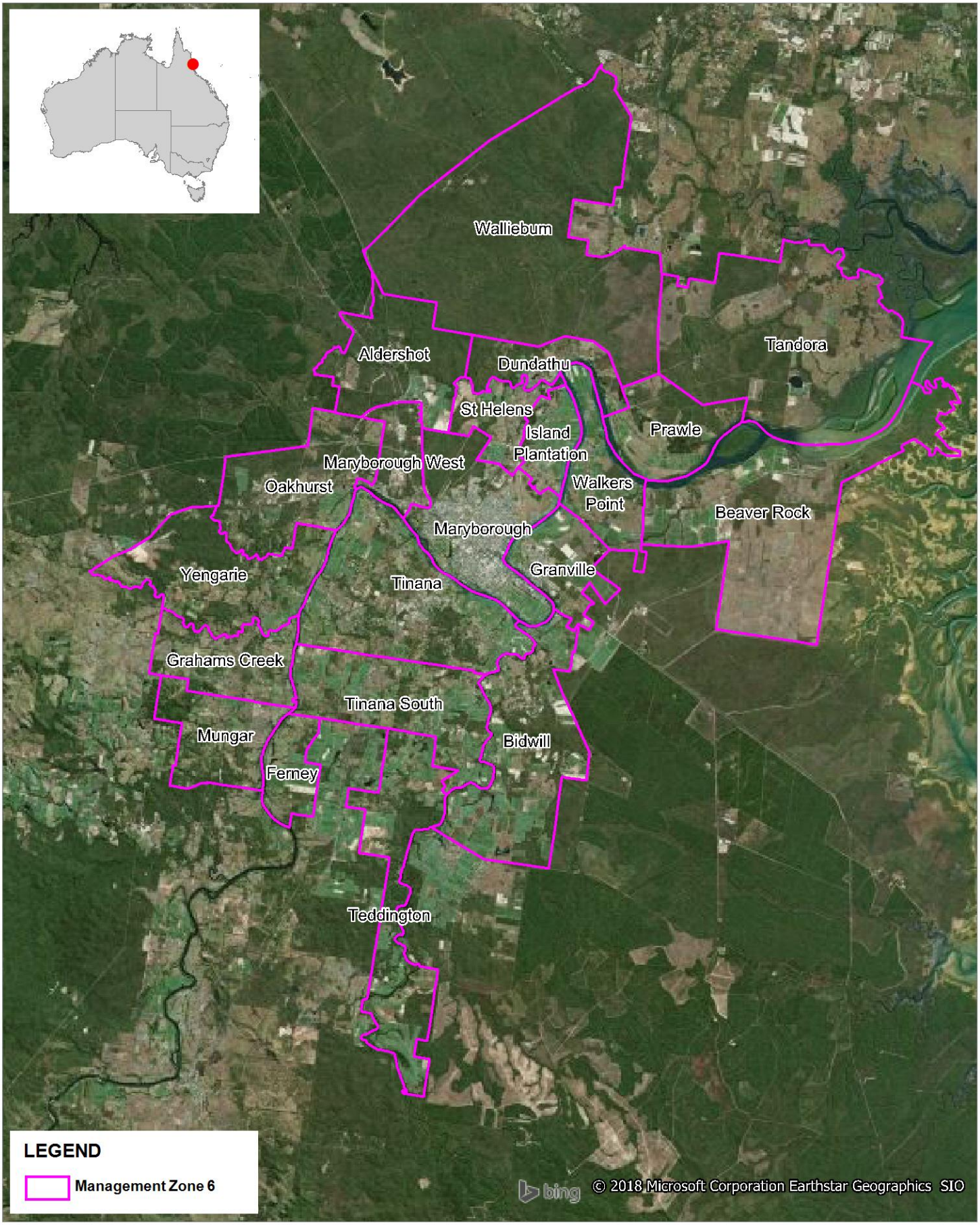

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Fraser Coast CHAS Management Zone 7

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Table 4-1 Summary of Localities within the State Coastal Hazard Areas

Locality	Description
Management Zone 1: Beelbi Creek, Burrum Heads, Burrum River, Burrum Town, Cherwell, Howard, Pacific Haven, Torbanlea	
Beelbi Creek	The Beelbi Creek locality is predominately rural and situated landward of Toogoom (where Beelbi Creek enters the Coral Sea). The locality has allotments within the state erosion and storm tide hazard areas (including the storm tide high hazard area).
Burrum Heads	Burrum Heads is a traditional coastal holiday area that supports a relaxed coastal lifestyle and includes a seaside caravan park and holiday houses, recreational facilities (boat ramp) and small businesses. The locality has a significant number of allotments (~1,000) in the state coastal erosion and/or storm tide hazard area. The Burrum Heads township is located at the mouth of the Burrum River with a rock revetment protecting a 700 m length of the southern shoreline (in three sections) from further loss of land to erosion. A new boat ramp, protected by a 50 m groyne, is located at Lions Park (the upstream extent of the rock revetment).
Burrum River	The Burrum River locality is a rural area bounded by the Burrum Coast National Park to the north and Burrum River to the west. The locality has a relatively small number of freehold allotments (~50) within the state coastal erosion and/or storm tide hazard area.
Burrum Town, Torbanlea & Howard	These settlements are located on the Bruce Highway (and Old Bruce Highway) with Burrum Town and Torbanlea to the south of the Burrum River and Howard to the north. The area is characterised by rural, rural residential and low density residential development with a small retail offering in the Howard main street. The locality has a relatively small number of freehold allotments (~50) within the state coastal erosion and/or storm tide hazard area. There is limited growth anticipated for Burrum Town and Torbanlea under the current planning scheme, however Howard offers some limited growth opportunities dependent on infrastructure provision.
Cherwell	Cherwell is predominately rural and with a relatively small number of allotments adjacent to the Cherwell River (tributary to the Burrum River) within the state erosion and storm tide hazard areas.
Pacific Haven	Pacific Haven is bounded by the Cherwell River (to the west) and the Burrum River (to the east) and is predominantly rural residential. It contains a moderate number of freehold allotments (~200) within the state coastal erosion and/or storm tide hazard area.
Management Zone 2: Walligan, Craignish, Dundowran, Dundowran Beach, Takura, Toogoom	
Walligan	Walligan is predominantly national park (Vernon Conservation Park) with rural residential development. The risk to this locality from coastal hazards is considered low with a relatively small number of allotments near Stockyard Creek and Black Swamp Creek affected by the state storm tide hazard area.
Craignish	Craignish is coastal park residential communities located west of Hervey Bay and accessed via Pialba-Burrum Heads Road. Most of the settlements are located to the north of this road. Craignish includes park residential style development that benefits from extensive sea views due to its high location and hilly topography. Allotments are generally of a large size and development typically includes large detached dwelling houses. A small commercial centre exists on the southern side of Pialba-Burrum Heads Road with a restaurant/café, convenience store and post office.

Locality	Description
Dundowran & Dundowran Beach	Dundowran is accessed from Ansons Road via Pialba-Burrum Heads Road and has a unique character which features park residential style living on predominantly 1-acre allotments that are maintained at a high quality and which include significant vegetation retention. The locality also features a lagoon system (Arkarra lagoons) of which development is located around. There are two beach entry points with public toilet facilities at each and a garden/lagoon cafe. The eastern part of Dundowran (i.e. east of Ansons Road to Eli Waters) is currently undeveloped and features land formerly used for grazing/agricultural purposes though with a significant riparian zone along the foreshore and some significant wetland and vegetated areas.
Takura	Takura is a rural locality with a low risk of exposure to coastal hazards. A relatively small number of allotments are within the state storm tide and/or coastal erosion hazard areas. The affected allotments are adjacent to tributaries of O'Regan Creek.
Toogoom	Like Burrum Heads, Toogoom is a traditional coastal holiday area that supports a relaxed coastal lifestyle and includes seaside holiday accommodation and small commercial facilities. The locality has a significant number of allotments (~900) in the state coastal erosion and/or storm tide hazard area. The Toogoom township is located at the mouth of Beelbi Creek with existing development to the south directly exposed to coastal processes. A rock revetment protects a 300 m length of shoreline from further loss of land to erosion. In other most areas a vegetated dune system, currently 50 to 100 m in width, provides a present-day buffer to erosion. This buffer is expected to narrow in response to sea level rise.
Management Zone 3: Urraween, Pialba, Scarness, Torquay, Urangan, Eli Waters, Point Vernon	
Urraween	Urraween is a predominantly residential area but also includes the Yarralee State School and Stockland Hervey Bay Shopping Centre. Due to distance and topography, the risk to this locality from coastal hazards is considered low with only a single allotment (reserve) affected by the state storm tide hazard area. The public and private hospital and supporting medical functions are located within this precinct but well distanced from the area potentially affected by coastal hazards.
Pialba	The Pialba commercial node is the most significant commercial and shopping area in Hervey Bay city and is the predominant location for business, retail and government agencies. The retail and commercial development is focussed along Torquay Road, Main Street and Boat Harbour Drive, which is set back both by distance and topography from the Hervey Bay foreshore. Key educational and cultural facilities such as the University of Sunshine Coast and the Council-owned art gallery, community and cultural centre and library are located along Old Maryborough Road/Torquay Road. Foreshore development includes the recently established Hervey Bay waterpark, 'Wetside', along with a significant open space area being the Seafront Oval used for several sporting and cultural events. A caravan park is also located on the Pialba foreshore. The southern side of the Esplanade at Pialba rises quite sharply and therefore limits possible usage of this part of the Esplanade. There are also significant open space areas associated with a creek and bat colony that preclude development on this part of the Esplanade. Further west on the Esplanade at Pialba are the Hervey Bay Hotel, the Tingeera apartment development and Sapphire over 55's apartment development which present significant built form in this location.
Scarness	The Esplanade commercial area at Scarness is a picturesque setting with active recreation areas along the Esplanade and the recently redeveloped Enzo's café on the foreshore along with a Council-owned caravan park. On the southern side of the Esplanade are a

Locality	Description
	range of older and more modern buildings (including Eden on the Bay and The Bay apartments). Retail uses include predominantly tourist-related retail, restaurants and cafes. Outside of the coastal hazard zone and at the intersection of Torquay Road and Queens Road are many commercial, community and light industry uses. Police and fire stations are located here.
Torquay	The commercial node of Torquay is centred on the Esplanade and Bideford Street/Freshwater Street commercial area. This contains a mix of office, retail, restaurants and cafes. This precinct also includes Esplanade foreshore development and facilities that supports a beach-front café with water sports, a tennis court facility, a caravan park and a foreshore parkland with various improvements. There are several tourist facilities available including multi-unit/resort style tourist accommodation and backpacker accommodation. Torquay is a popular seaside location and the combination of foreshore parkland and an active Esplanade support this activity. Recent work has been undertaken by the Council to establish greater foreshore protection (including buried rock walls and concrete reinforcement and stairs) to address coastal hazard impacts that have occurred previously and which have resulted in damage to a former boardwalk and other beachfront assets. Inland (south) from the Esplanade, and well outside of the expected coastal hazard zone, Torquay also supports public facilities such as the Council chambers, swimming pool and regional sports fields.
Urangan	The Urangan Boat Harbour is a key precinct at the far eastern end of Urangan and the Hervey Bay urban area. The precinct includes a marina facility along with resort developments (Mantra and Breakfree), restaurants/cafes, speciality retail fronting a boardwalk that is located along the water frontage. The Boat Harbour also includes the Boat Harbour club a large restaurant/function and gaming facility. Opposite the boat harbour are other tourist accommodation areas including the Ramada and Akama developments and other backpacker resorts. The surrounding area also supports unit/tourist development including Best Western Quarterdecks and Whale Cove which are villa style developments. The Pier Park precinct is located on the northern part of Urangan, and is focused around the historical Urangan Pier which is approximately 1 kilometre in length and supports pedestrians and recreational fishers. Opposite the pier are the significant Oceans resort and other multi-storey tourist/residential accommodation, along with a hotel, bars, restaurants, retailers, and embellished parkland foreshore area. The precinct has a slow traffic environment and a high level of amenity. The Pier Park is utilised for several festivals, markets and weekly Park Run. The Urangan Central shopping centre is located outside of the coastal hazard zone, south of the Esplanade at the corner of Boat Harbour Drive and Elizabeth Street. The shopping centre includes a Woolworths, bank facilities, post office, and other specialty retailers.
Eli Waters	Eli Waters forms the entrance to Hervey Bay from Hervey Bay-Maryborough Road and this ‘gateway’ presents as a conglomeration of residential estates. The Eli Waters area contains the Eli Waters Shopping Centre with a full-line supermarket, specialty stores and a significant retail showroom component. The Eli Waters area also includes the residential area, all low density though with some tourist units; and more recently established (and in some cases still developing) residential areas of Mariners Cove, Kingfisher Lakes and Augustus Estate, many of which include lagoons.
Point Vernon	Point Vernon is zoned low density residential and contains predominantly houses, along with some tourist accommodation, which is situated on moderately elevated, rocky headland topography. The coastline at Point Vernon is characterised by a rocky outcrop in the

Locality	Description
	nearshore zone which provides some protection from coastal hazards. Approximately 300 allotments to the west and adjacent to Eli Creek are affected by the state storm tide hazard area. Additional waterfront properties along the east of Point Vernon are within the coastal erosion hazard area.
Management Zone 4: Booral, Bunya Creek, Nikenbah, River Heads, Sunshine Acres, Susan River	
Booral	Booral is situated south of Urangan and accessible via Booral Road. The area consists of primarily rural and rural residential uses.
Bunya Creek	The Bunya Creek locality is predominantly rural. The areas allotments affected by the state coastal hazard areas are adjacent to Bunya Creek which is a tributary to the Susan River.
Nikenbah	The northern extent of Nikenbah is zoned emerging community and shares boundaries with Urraween and Kawungan. The remaining area to the south is predominantly rural. The risk to this locality from coastal hazards is considered low with only two freehold allotments, adjacent to Bunya Creek, affected by the state storm tide hazard area.
River Heads	River Heads is a peninsula-shaped settlement accessed from Booral via River Heads Road which runs centrally through the peninsula and culminates at a headland that is located between the water body of Hervey Bay and the confluence of the Mary and Susan Rivers. This headland also supports a barge facility that provides transport to Fraser Island. Development at River Heads includes predominantly rural residential and low-density development. Of note is the residential estate, Turtle Cove, located on the eastern side of River Heads Road that provides for residential living with views across the Great Sandy Strait and to Fraser Island.
Sunshine Acres	Sunshine Acres is a rural residential area. The risk to this locality from coastal hazards is considered low with a relatively small number of allotments near Stockyard Creek affected by the state storm tide and/or erosion hazard area.
Susan River	The Susan River locality is a rural area that contains several freehold allotments in the state coastal hazard area (including the storm tide high hazard area). The Maryborough-Hervey Bay Road intersects this locality but is at an elevation above the hazard area.
Management Zone 5: Boonooroo, Boonooroo Plains, Maaroom, Magnolia, Poona, The Dimonds, Tin Can Bay, Tinnanbar, Tuan, Tuan Forest	
Maaroom, Boonooroo, Tuan, Poon and Tinnanbar	These communities are located on the mainland along the eastern shoreline of the Great Sandy Strait, directly opposite the southern part of Fraser Island. The Ramsar-listed Great Sandy Strait separates Fraser Island from the mainland. The Poona National Park extends from west of the Boonooroo township north-west along Maryborough-Tuan Forest Road and surrounds Maaroom. The Tuan State Forest is also located within this area. The townships/settlements are embedded within a significant vegetated setting and are connected by the Maryborough-Tuan Forest Road which runs between Maryborough and Tin Can Bay (in the Gympie Regional Council area). The settlements have extensive foreshore areas and beaches/mangroves along with adjoining wetlands and associated vegetation and natural habitats. Overall, they are peaceful communities in an attractive natural coastal setting. The townships are each very small-scale fishing villages, Poona being the largest, with limited residential development, containing a mix of permanent residential and holiday house accommodation. Each settlement supports recreation activities such as boating and fishing.

Locality	Description
	Caravan parks are located at Boonooroo, Poona and Maaroom and Tinnanbar. Poona and Boonoroo have limited small-scale convenience stores.
Management Zone 6: Aldershot, Beaver Rock, Bidwill, Dundathu, Ferney, Grahams Creek, Granville, Island Plantation, Maryborough, Maryborough West, Mungar, Oakhurst, Prawle, St Helens, Tandora, Teddington, Tinana, Tinana South, Walkers Point, Walliebum, Yengarie	
Maryborough, Maryborough West, St Helens, Granville & Tinana	Maryborough is a reinvigorated but still authentic regional centre built on its rich heritage, traditional manufacturing and cane industries and is set on the Mary River that is tidally influenced. The Maryborough CBD and key public facilities are located along the Mary River. Maryborough has several significant heritage sites and a traditional city centre. Maryborough supports a number of regional government offices and various industries. The surrounding suburbs all contain low density housing and associated facilities and services. Growth areas at Granville have been identified within the current planning scheme and there are significant development proposals for redevelopment within this area that are under assessment at present.
Tandora, Beaver Rock, Prawle, Dundathu, Walliebum, Aldershot, Walkers Point, Island Plantation, St Helens	These localities are along the north or south of the lower Mary River (and its tributaries) and are rural areas, with some pockets of rural residential, marine industries, open space and conservation areas. Allotments adjacent to the river are generally within the state storm tide and erosion hazard areas. Regarding the erosion hazard, the allotments are affected by the 'permanent inundation due to sea level rise' or the '40 m buffer on HAT' components of the erosion prone area definition.
Tinana South, Bidwill, Oakhurst, Yengarie, Grahams Creek, Ferney, Mungar, Teddington	Upstream of Maryborough, these localities along the Mary River are predominantly rural. The risk to these localities from coastal hazards is considered low with allotments along the riverbank only affected by the '40 m buffer of HAT' component of the state erosion hazard area.
Management Zone 7: Fraser Island, Eurong	
Fraser Island & Eurong	Fraser Island is a World Heritage Area and is approximately 123 kilometres in length and 22 kilometres at its widest point. Fraser Island has an area of 184,000 hectares and is the largest sand island in the world. The island supports a range of ecosystems including rainforest, sclerophyll forest, numerous freshwater lakes, coastal heathland (including wallum heaths) and sand dunes. Fraser Island is characterised by long uninterrupted white beaches flanked by coloured sand cliffs. The immense sand blows and cliffs of coloured sands are part of the longest and most complete age sequence of coastal dune systems in the world and they are still evolving. Most of the development on the east coast of Fraser Island is located at Eurong, to the immediate north of Eurong, or further north at Happy Valley. Some allotments are within the state erosion hazard area but are generally at an elevation above the storm tide hazard area.

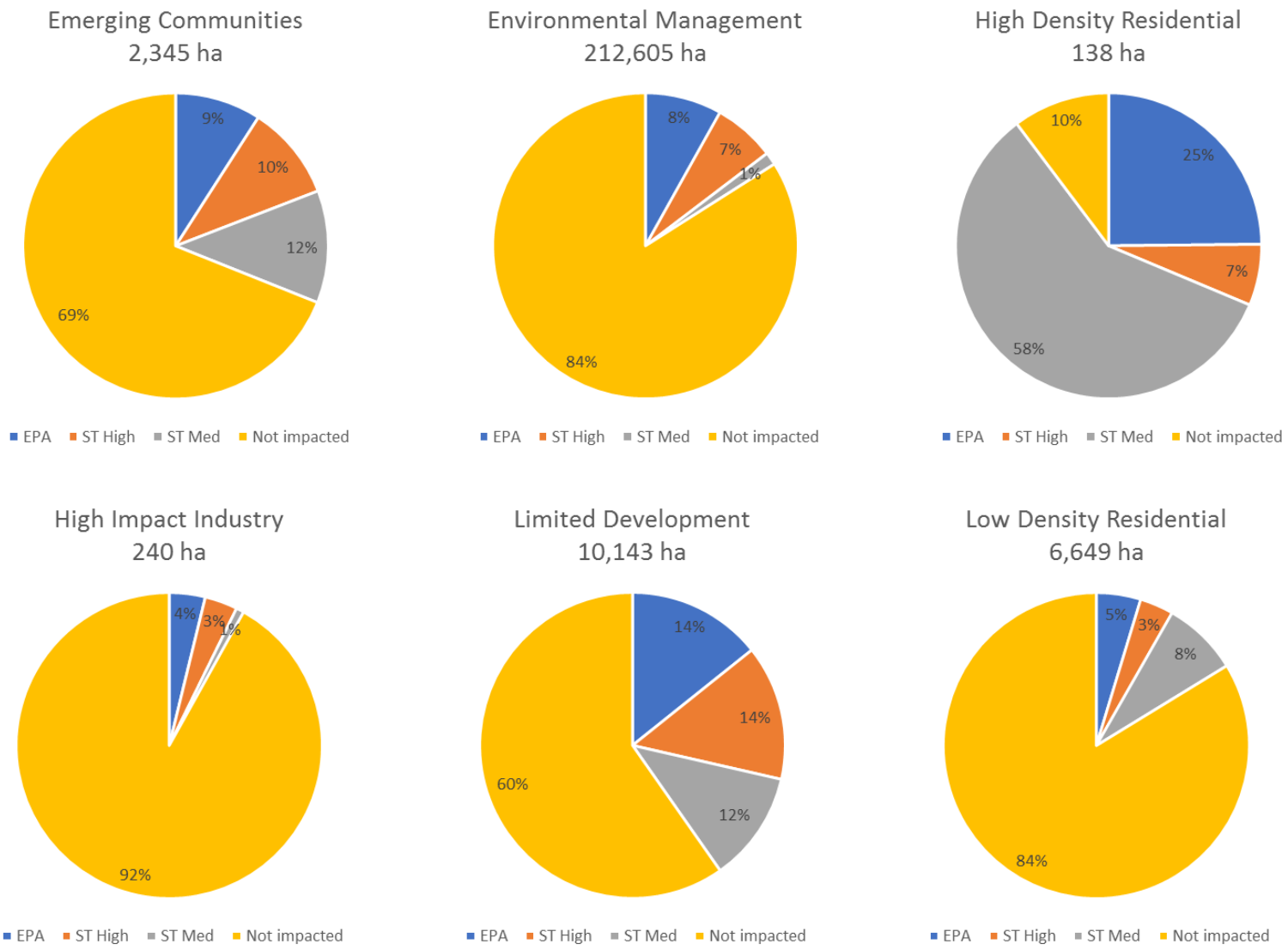


Figure 4-9 Percent of Planning Zone within the State Coastal Hazard Area (Part 1)

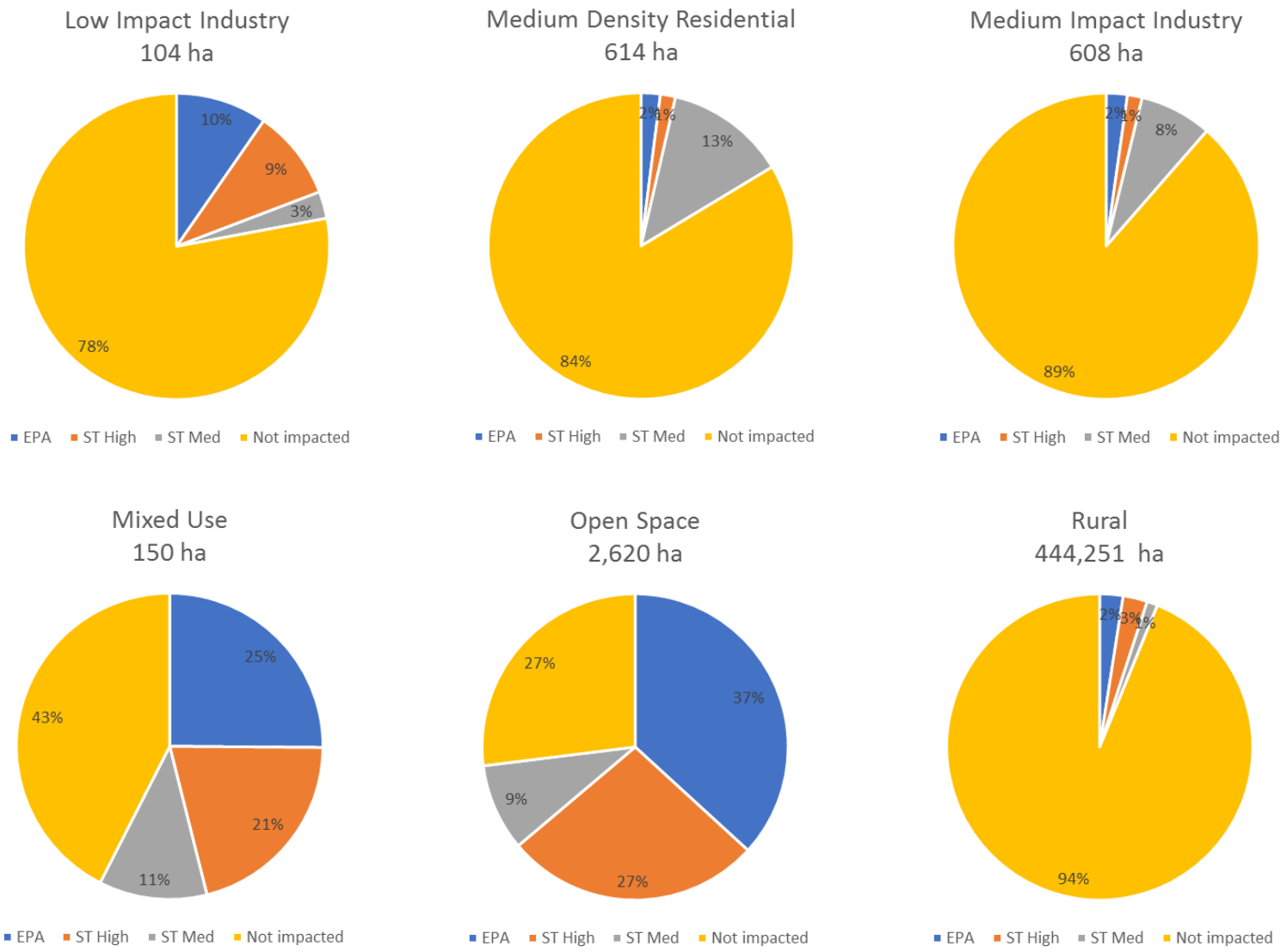


Figure 4-10 Percent of Planning Zone within the State Coastal Hazard Area (Part 2)

Coastal Communities, Assets & Values at Risk

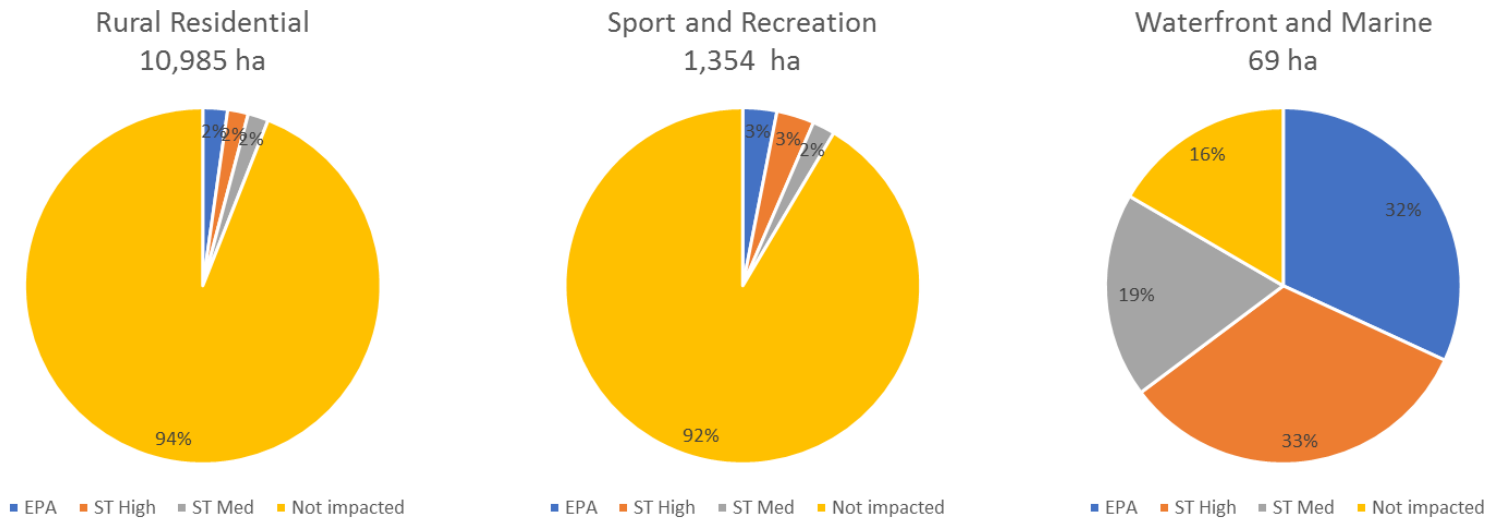


Figure 4-11 Percent of Planning Zone within the State Coastal Hazard Area (Part 3)

4.2.2 Cadastral Parcel Assessment

Cadastral parcels within the State defined hazard areas are summarised in Table 4-2, Table 4-3 and Table 4-4 and illustrated in Figure 4-12, Figure 4-13 and Figure 4-14. The preliminary risk screening identifies the following:

- Total lots within or intersected by the State declared Erosion Prone Area = 5,376.
- Total lots within or intersected by the State Storm Tide Medium Hazard Area = 10,486.
- Total lots within or intersected by the State Storm Tide High Hazard Area = 4,286.

It is noted that this type of assessment will be updated during subsequent CHAS phases using refined mapping and for the additional planning horizons.

With specific reference to the Erosion Prone Area preliminary risk screening results, it is noted that a similar cadastral parcel assessment was undertaken as part of the Shoreline Erosion Management Plan (Cardno 2012) with only 2,946 allotments identified as being within the hazard area (refer Section 4.2.3. Following a cursory review of this issue, this difference is understood to be due to a change to the State erosion hazard definition and mapping, which as discussed in Section 3.4.1 now includes the following elements:

(1) 40 m buffer from the present-day HAT contour (including the tidal extent of rivers and creeks);

(2) Calculated erosion distance shown in Table 1 of the statutory plan; and

(3) Permanent inundation due to SLR in 2100 (defined by present-day HAT plus 0.8 m).

The hazard mapping developed for the Fraser Coast Shoreline Erosion Management Plan (Cardno 2011; 2012) only included elements (2) and (3) above. The current version of the State declared Erosion Prone Area mapping includes all three elements and therefore cadastral parcels adjacent to the tidal extent of the Mary River, Susan River, Burrum River, Cherwell River, Beelbi Creek (and other coastal creeks) are now affected by the statutory coastal erosion hazard area. Inclusion of element (1) in the preliminary risk screening has increased the total number of allotments potentially exposed to the coastal erosion hazard by 2100. It is noted that in most cases these lots are also within the storm tide hazard area.

Table 4-2 Number of Lots within or intersected by the State Declared Erosion Prone Area

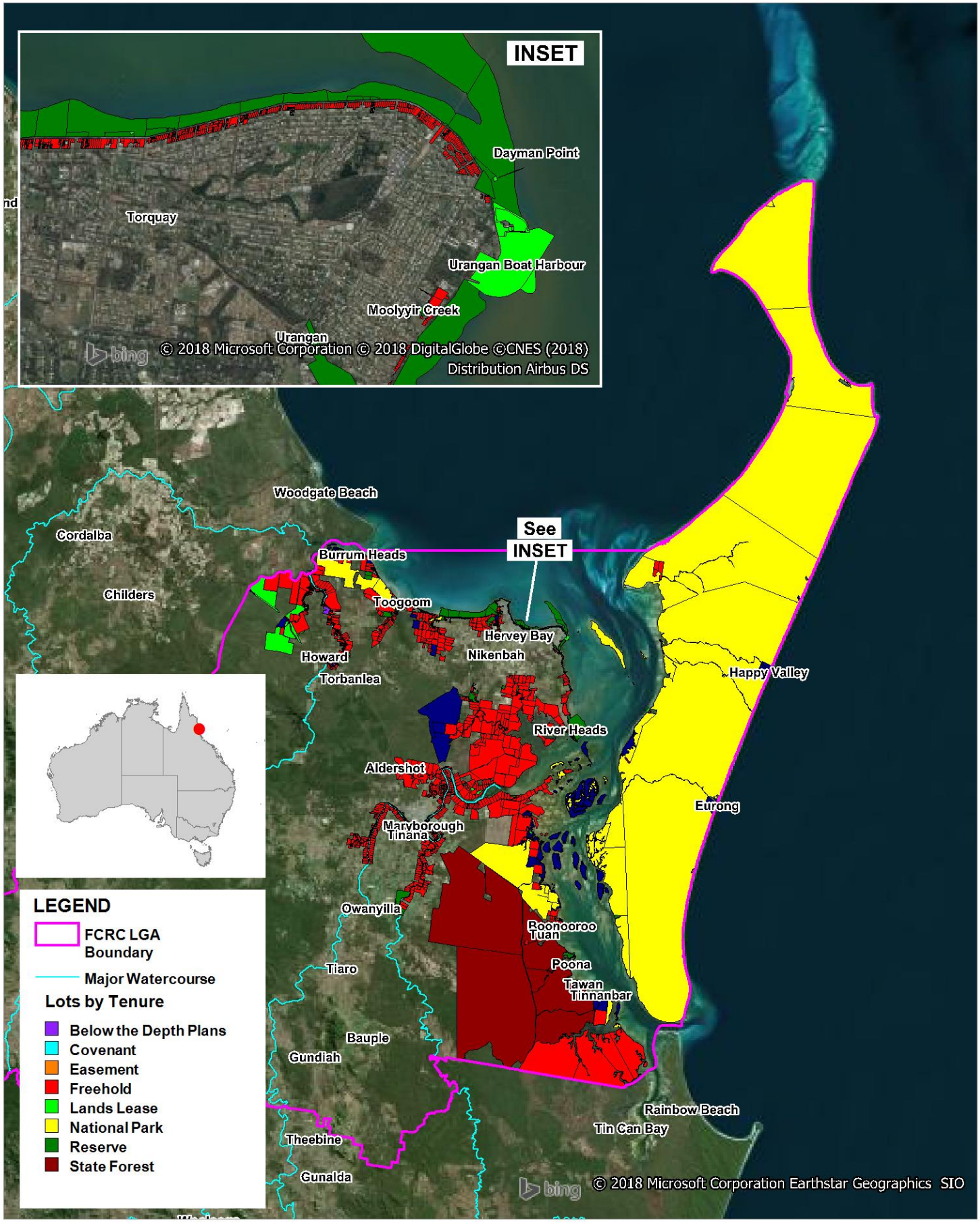
Location	Management Zone	Below the Depth Plans	Covenant	Easement	Freehold	Lands Lease	National Park	Reserve	State Forest	State Land	Total Lots
Beelbi Creek	1			2	36			2			40
Burrum Heads	1		15	39	334	1	3	21		8	421
Burrum River	1			4	45			3		5	57
Burrum Town	1	12		3	33						48
Cherwell	1				11	10				4	25
Howard	1	10		3	36	2		2			53
Pacific Haven	1	4		3	177			3		1	188
Torbanlea	1	1		2	8	1					12
Craignish	2			5	119	1	1	9			135
Dundowran	2				1						1
Dundowran Beach	2			3	108			12			123
Takura	2			3	22					3	28
Toogoom	2		52	8	523			15			598
Eli Waters	3		3	56	115			17		2	193
Point Vernon	3			2	87	1		25		3	118
Pialba	3			25	88			19		1	133
Scarness	3			20	188	1		7			216
Torquay	3			11	240	1		12			264
Urangan	3			13	301	15		20		1	350
Booral	4		2	1	32			5			40
Bunya Creek	4			5	43			3		2	53
River Heads	4			2	85	1		12		14	114
Sunshine Acres	4		7	1	24			3			35

Coastal Communities, Assets & Values at Risk

Location	Management Zone	Below the Depth Plans	Covenant	Easement	Freehold	Lands Lease	National Park	Reserve	State Forest	State Land	Total Lots
Susan River	4			19	42			2		1	64
Boonooroo	5			9	175	1	4	6		7	202
Boonooroo Plains	5						2				2
Great Sandy Strait	5				16	3	27	3		67	116
Maaroom	5			1	60	1		3		9	74
Magnolia	5			2	3	1		2			8
Poona	5			3	159			9		3	174
The Dimonds	5				12	6		1		13	32
Tin Can Bay	5				5		1				6
Tinnanbar	5				4		1	3		3	11
Tuan	5			5	114			1			120
Tuan Forest	5				2				6		8
Aldershot	6			1	11	3					15
Beaver Rock	6			1	42	4		2		1	50
Bidwill	6			3	44	12					59
Dundathu	6			2	27	1		1		1	32
Grahams Creek	6			2	24	1					27
Granville	6			6	110	5					121
Island Plantation	6			2	89	2					93
Maryborough	6			20	249	33	1	22		6	331
Maryborough West	6			1	56			4			61
Oakhurst	6				9						9
Prawle	6				32	2		2			36
St Helens	6			5	36			1			42

Coastal Communities, Assets & Values at Risk

Location	Management Zone	Below the Depth Plans	Covenant	Easement	Freehold	Lands Lease	National Park	Reserve	State Forest	State Land	Total Lots
Tandora	6				14	1		1			16
Teddington	6				3	2		3			8
Tinana	6			1	101	5	1	4			112
Tinana South	6				25	3					28
Walkers Point	6			2	54	1					57
Walliebum	6							1		4	5
Yengarie	6		8		50	1		4			63
Eurong	7				47	1		2		5	55
Fraser Island	7				27	11	39	2	3	12	94
Grand Total	**-**	**27**	**87**	**296**	**4298**	**134**	**80**	**269**	**9**	**176**	**5376**



Title:

Lots within the State Declared Erosion Prone Area

Figure: **4-9**

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Table 4-3 Number of Lots within or intersected by the State Defined Storm Tide Medium Hazard Area (Inundation Depth < 1 m)

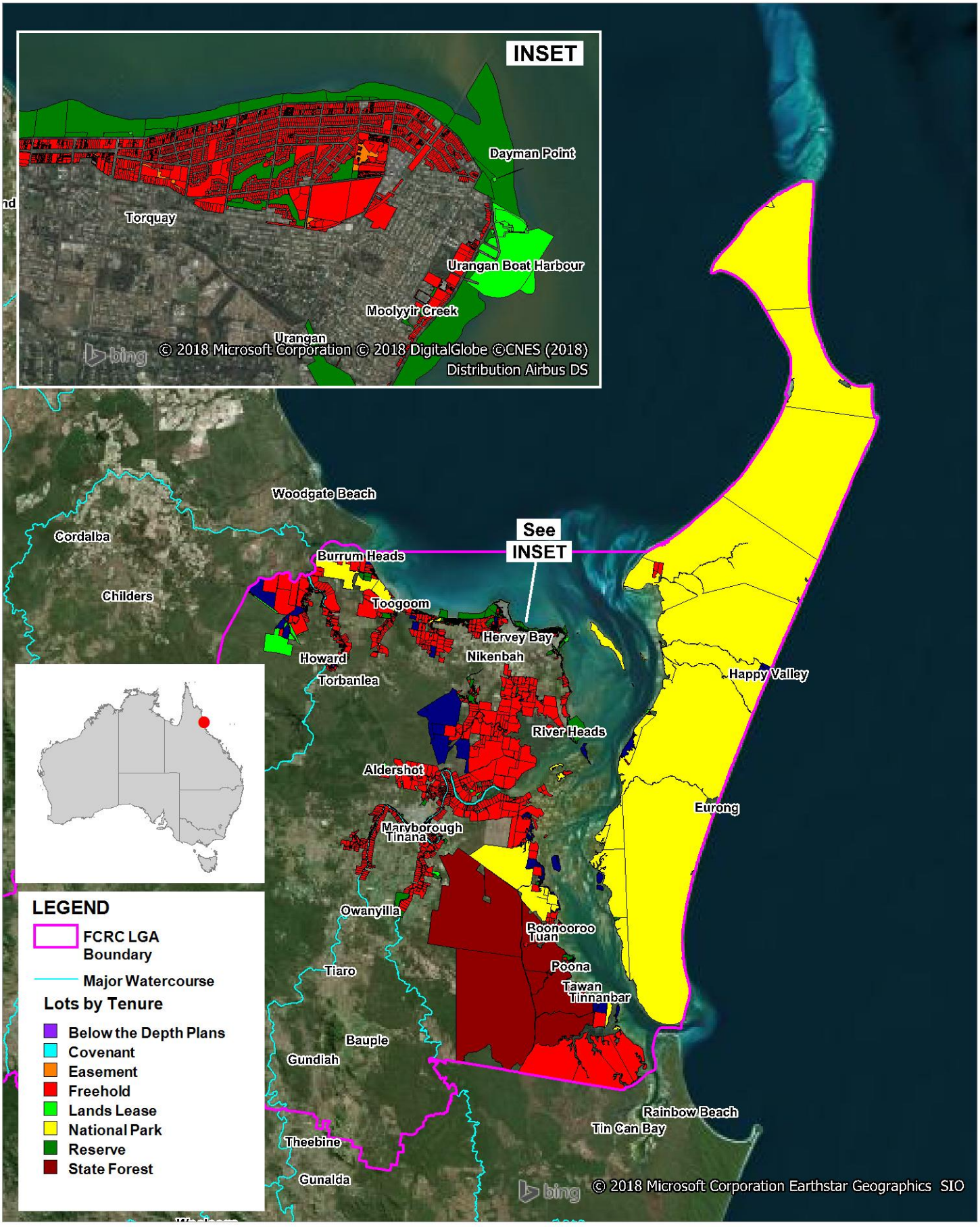
Location	Management Zone	Below the Depth Plans	Covenant	Easement	Freehold	Lands Lease	National Park	Reserve	State Forest	State Land	Total Lots
Aldershot	1				40	2	1	3		2	48
Beaver Rock	1		15	32	999		3	34		3	1086
Beelbi Creek	1			4	46			4		1	55
Bidwill	1	11		2	32						45
Boonooroo	1				12	10				5	27
Boonooroo Plains	1	10		3	37	2		2			54
Booral	1	4		8	188			1		1	202
Bunya Creek	1	1			8	1					10
Burrum Heads	2		13	4	18	1		2			38
Burrum River	2		5	22	228	1	1	11			268
Burrum Town	2			1	26			3			30
Cherwell	2		8	50	534			22			614
Craignish	2			8	27	1				3	39
Dundathu	2		66	35	854			22			977
Dundowran	3							1			1
Dundowran Beach	3		5	78	612			35		2	732
Eli Waters	3			17	310	1		31		1	360
Ferney	3			49	130			19		2	200
Fraser Island	3			34	320			7			361
Grahams Creek	3			51	1254	1		18			1324
Granville	3			62	1481	21		28		1	1593

Coastal Communities, Assets & Values at Risk

Location	Management Zone	Below the Depth Plans	Covenant	Easement	Freehold	Lands Lease	National Park	Reserve	State Forest	State Land	Total Lots
Great Sandy Strait	4		2	1	46			5			54
Howard	4			9	50			3		1	63
Island Plantation	4				2						2
Maaroom	4			2	51	1		8		4	66
Magnolia	4		7	3	43			3			56
Maryborough	4			20	40			1			61
Maryborough West	5			5	243		4	3		3	258
Mungar	5						2				2
Nikenbah	5				4	1	5	1		9	20
Oakhurst	5				61	1		3		9	74
Pacific Haven	5			2	4	1		2			9
Pialba	5			14	221			10		1	246
Point Vernon	5				12					7	19
Poona	5				5		1				6
Prawle	5				2		1	3		4	10
River Heads	5			4	93			1			98
Scarness	5				2				6		8
St Helens	6			5	25	4					34
Sunshine Acres	6			2	43	5		2		1	53
Susan River	6			3	46	14		2			65
Takura	6			2	26					1	29
Tandora	6				6						6
Teddington	6			2	27	1					30

Coastal Communities, Assets & Values at Risk

Location	Management Zone	Below the Depth Plans	Covenant	Easement	Freehold	Lands Lease	National Park	Reserve	State Forest	State Land	Total Lots
The Dimonds	6			6	183	7		1			197
Tin Can Bay	6			3	100	2					105
Tinana	6			27	280	26		16		4	353
Tinana South	6			1	54			4			59
Tinnanbar	6				5	1					6
Toogoom	6			1	9						10
Torbanlea	6				32	2		2			36
Torquay	6			5	43	3		1		3	55
Tuan	6				14	1		1			16
Tuan Forest	6				3			3			6
Urangan	6			2	87	6		4			99
Urraween	6				30	4					34
Walkers Point	6			3	59	2		1			65
Walliebum	6			1				1		5	7
Walligan	6		7		53	1		3			64
Yengarie	7			1	8	3	19	1	2	7	41
Total Lots	-	**26**	**128**	**584**	**9168**	**127**	**37**	**328**	**8**	**80**	**10486**



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Lots within the State Defined Storm Tide Medium Hazard Area

Figure: 4-10

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Scale - Main Map

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Table 4-4 Number of Lots within the State Defined Storm Tide High Hazard Area (Inundation Depth > 1 m)

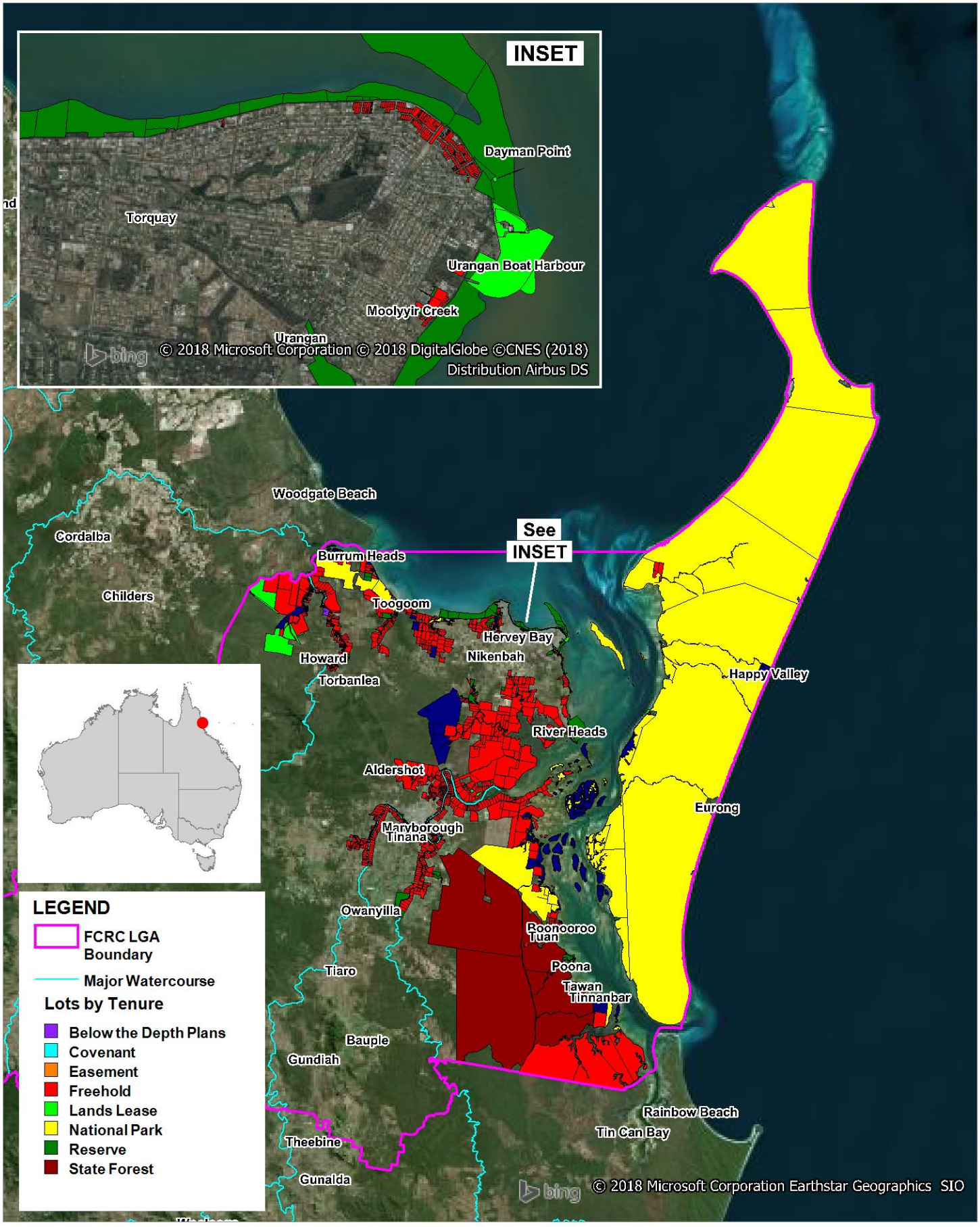
Location	Management Zone	Below the Depth Plans	Covenant	Easement	Freehold	Lands Lease	National Park	Reserve	State Forest	State Land	Total
Aldershot	1				39		1	3			43
Beaver Rock	1			30	256	1	3	25		8	323
Beelbi Creek	1			3	41			4		5	53
Bidwill	1	12		2	33						47
Boonooroo	1				12	10				4	26
Boonooroo Plains	1	9		3	35	2		2			51
Booral	1	4		8	181			2		1	196
Bunya Creek	1			4	25					3	32
Burrum Heads	1	1			8	1					10
Burrum River	2			2	84	1	1	9			97
Burrum Town	2				1						1
Cherwell	2			1	66			12			79
Craignish	2		55	3	149			9			216
Dundathu	2		2		3			1			6
Dundowran	3		4	96	189			23		2	314
Dundowran Beach	3			3	10			24		3	40
Eli Waters	3			9	35			16		1	61
Fraser Island	3			19	116			3			138
Grahams Creek	3				3			6			9
Granville	3			7	270	12		23		1	313
Great Sandy Strait	4		2		30			5			37
Howard	4			7	44			3		2	56
Island Plantation	4				1						1

Coastal Communities, Assets & Values at Risk

Location	Management Zone	Below the Depth Plans	Covenant	Easement	Freehold	Lands Lease	National Park	Reserve	State Forest	State Land	Total
Maaroom	4			1	27	1		8		4	41
Magnolia	4		7	2	36			3			48
Maryborough	4			21	42			2		1	66
Maryborough West	5			9	208	1	4	6		7	235
Nikenbah	5						2				2
Oakhurst	5				16	3	27	3		67	116
Pacific Haven	5			1	50	1		3		10	65
Pialba	5			2	4	1		2			9
Point Vernon	5			3	160			8			171
Poona	5				12	6		1		13	32
Prawle	5				5		1				6
River Heads	5				2		1	3		3	9
Scarness	5			5	131			1			137
St Helens	5				2				6		8
Sunshine Acres	6			3	14	3					20
Susan River	6			1	42	4		2		1	50
Takura	6			3	45	14		2			64
Tandora	6			2	20	1		1		1	25
Teddington	6			2	24	1					27
The Dimonds	6			5	90	5					100
Tin Can Bay	6			5	97	2					104
Tinana	6			20	251	34	1	20		6	332
Tinana South	6			1	50			4			55

Coastal Communities, Assets & Values at Risk

Location	Management Zone	Below the Depth Plans	Covenant	Easement	Freehold	Lands Lease	National Park	Reserve	State Forest	State Land	Total
Tinnanbar	6				9						9
Toogoom	6				32	2		2			36
Torbanlea	6			5	37	2		1			45
Torquay	6				14	1		1			16
Tuan	6				3	2		3			8
Tuan Forest	6			1	75	6	1	3			86
Urangan	6				25	4					29
Walkers Point	6			2	58	2		1			63
Walliebum	6			1				1		4	6
Walligan	6		7		49	1		3			60
Yengarie	7			1	7	3	35	1	2	8	57
Total Lots	-	**26**	**77**	**293**	**3268**	**127**	**77**	**255**	**8**	**155**	**4286**



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Lots within the State Defined Storm Tide High Hazard Area

Figure: 4-11

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Scale - Main Map

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4.2.3 Previous Assessment of Assets & Infrastructure in the Erosion Prone Area Width (Cardno 2012)

Assets and infrastructure at risk from coastal erosion have been previously identified using the EPAW mapping described in Section 3.5.2.2. Key outcomes from this assessment are summarised in Table 4-5, Table 4-6 and Table 4-7. It is reiterated that this work and associated risk assessment sets a robust foundation for the CHAS to build upon.

As discussed in Section 3.4.1 and 4.2.2, an additional element has been added to the State coastal erosion definition (40 m buffer on HAT) and therefore the previous asset identification assessment will need to be reviewed and updated during Phase 4 of the CHAS. In addition, the assessments for the CHAS will also need to consider the assets within the storm tide hazard area.

Table 4-5 Infrastructure within the Erosion Prone Area Width (mainland open coast and Great Sandy Strait)

Infrastructure	2030	2050	2070	2100
Critical Infrastructure				
Roads				
Length Road Centreline (km)	39.46	44.03	57.07	70.21
Length Road Footpath (km)	6.78	11.73	16.05	21.3
Stormwater				
No. Pipe Beach Outlets	45	46	46	48
Length Drainage Pipes (km)	3.99	6.31	8.37	11.78
Drainage SQID (GPTs)	4	4	4	4
Wastewater				
No. Sewer Pumping Stations	6	7	8	15
Length Rising Mains (km)	0.8	1.53	3.68	4.77
Length Gravity Mains (km)	3.064	6.24	9.8	17.06
No. House Connectins	19	21	79	157
Length Sewer Effluent Main (km)	0.67	0.67	0.67	0.83
No. Sewer Treatment Plants	-	-	-	-
No. Sewer Effluent Pumping Stations	-	-	-	-
Other Infrastructure				
No. Buildings	479	666	921	1466
No. Beach Access Points	97	108	110	111

Table 4-6 Number of Cadastral Lots within the Erosion Prone Area Width and Estimated Value (mainland open coast and Great Sandy Strait)

Cadastral Lots	2030	2050	2070	2100
Total	1,131	1,564	2,147	2,946
Estimated Value in 2012	$346.5M	$467.5M	$679.7M	$932.8M

Table 4-7 Foreshore Parks within the Erosion Prone Area Width (mainland open coast and Great Sandy Strait)

Foreshore Parks	2030
Total Area (ha)	433.8
Estimated Value in 2012	$22.3M

5 Future CHAS Phases and Project Plan

5.1 Tailoring of Coastal Hazard Mapping for the CHAS (Phase 3)

To undertake the asset identification and risk assessment stages of the CHAS, it will be necessary to compile existing information and in some cases, develop 'fit for purpose' hazard mapping that aligns with the CHAS planning horizons. A summary of the potential CHAS hazard mapping requirements and information that's readily available to the project is provided in Table 5-1.

Gaps associated with the erosion prone area width mapping have been previously addressed through the Shoreline Erosion Management Plan (Cardno 2011; 2012). However as noted above, this study didn't consider tidally dominated areas within a 40 m buffer of HAT (in accordance with the statutory definition). This will need to be captured as part of the CHAS.

Tropical cyclone storm tide inundation hazard mapping for the 2100 planning horizon is available to the CHAS. As discussed in Section 3.5.1, this mapping is based on *ad hoc* assessments and the CHAS provides an opportunity to provide a consistent, leading practice product for the entire local government area. To align with the available erosion hazard maps (Cardno 2011; 2012) and meet the objectives of the CHAS, it is proposed that storm tide assessments are undertaken for the present-day, 2030, 2050 and 2100 planning horizons. A proposed methodology to address the storm tide hazard knowledge gap is briefly described below in Section 5.1.1.

Table 5-1 Summary of CHAS Coastal Hazard Mapping Approach

Mapping product	Present-day	2030	2050	2100
Erosion Prone Area Width & permanent inundation due to sea level rise	Available for all coastal communities (Cardno 2012)	Available for all coastal communities (Cardno 2012)	Available for all coastal communities (Cardno 2012)	Available for all coastal communities (Cardno 2012)
Storm tide inundation	To be addressed through proposed study	To be addressed through proposed study	To be addressed through proposed study	Mapping based on previous assessments available, to be updated through proposed study

5.1.1 Storm Tide Hazard Assessment

The QCoast$_{2100}$ program provides Council with an opportunity to review and update the storm tide water level statistics and inundation hazard mapping. A proposed methodology has been discussed in detail with the Technical Working Group and is illustrated below in Figure 5-1. This approach considered leading-practice and would exceed the minimum standards set by the QCoast$_{2100}$ MS&G. The outcomes from this work would have application beyond the CHAS and assist with:

- Design water levels and/or floor levels for planning and development assessment;
- Strategic planning for future growth areas;
- Disaster management planning; and

- Informing future coastal drainage and lower catchment flood assessments.

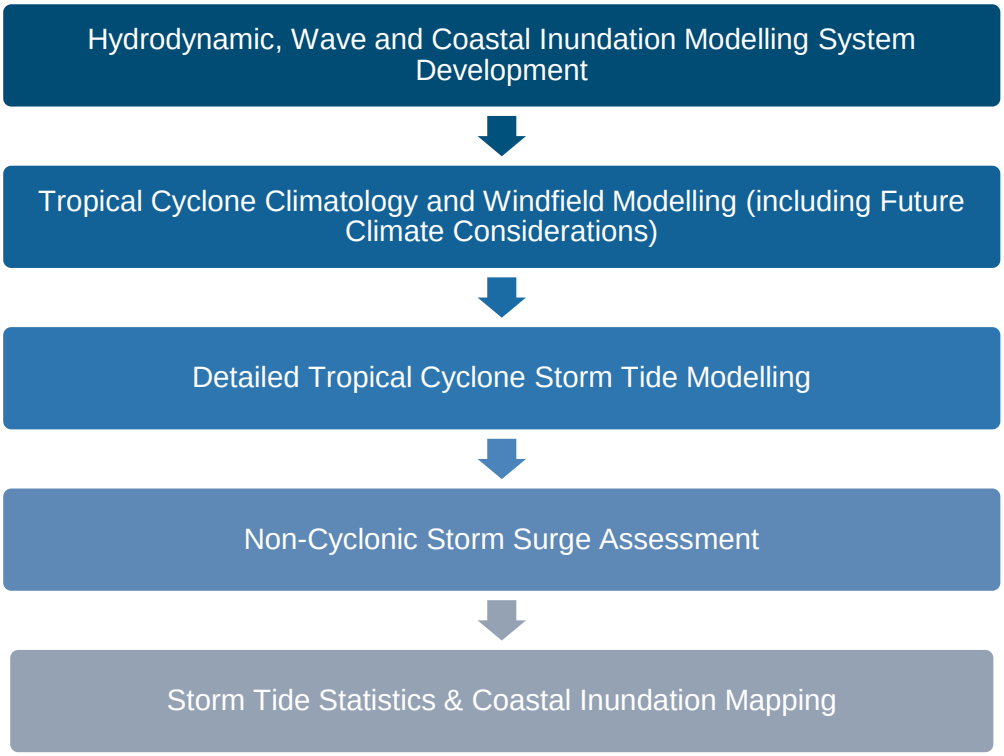

Figure 5-1 Storm Tide Assessment Work Flow

A key element of this methodology is the assessment of non-cyclonic events such as east coast lows, mid-latitude low pressure systems and continental shelf waves that cause storm tide conditions. While these events typically generate smaller storm tides in comparison to tropical cyclones, they are still statistically significant up to at least the 1% AEP. For many coastal communities, the increased frequency of 'nuisance' flooding is likely to be a key driver of adaptation at a local level.

It is also noted that a storm tide hazard assessment could be delivered in collaboration with Gympie Regional Council. A collaborative approach would provide an opportunity to realise substantial cost savings for each individual Council (and therefore direct $QCoast_{2100}$ funding to other Phases of the CHAS development). Due to the regional setting and significant coastal features (such as Fraser Island and the Great Sandy Strait), it is practical for both local government areas to be contained within a single assessment framework. A detailed proposed methodology for a collaborative storm tide assessment has been provided to Fraser Coast and Gympie TWG's for consideration. It is assumed this can be provided to LGAQ and DES upon request.

5.2 Asset Prioritisation (Phase 3)

Phase 4 of the CHAS development will seek to identify and prioritise assets to be included in the risk assessment based on criteria to be determined through consultation with the project Technical Working Group. Following the $QCoast_{2100}$ MS&G, key considerations regarding asset prioritisation may include value, relevance to stakeholders and the community, and interdependences. Council controlled assets are likely to include (but not limited to):

- Roads;
- Stormwater network;
- Parks, foreshore and open space;
- Recreational facilities including boating infrastructure (boat ramps, jetties, pontoons); and
- Public transport facilities (e.g. bus shelters).

The QCoast MS&G encourages the evaluation assets controlled by external stakeholders within the local government area. The extent of external assets to be included in the CHAS is to be confirmed. As a minimum it is expected that this will include major infrastructure owners and land managers.

Council's existing asset database and financial register has been reviewed as part of this scoping study. The database and register capture tangible assets and will partially meet the requirements of the CHAS. In addition to tangible council-controlled assets, the CHAS will also need to define and map various ecological, community and cultural assets. These intangible assets and values will be identified through engagement activities and in some cases, need to be mapped in GIS format to supplement the existing asset database.

5.3 Asset Identification (QCoast$_{2100}$ Phase 4)

Using the refined asset register and database, physical infrastructure, ecological, community and cultural assets within the CHAS coastal hazard areas will be identified. Liaison with the Technical Working Group and external stakeholders will also be undertaken to identify and describe any additional assets expected to be captured by the CHAS. The register would record (where available) the asset type, ownership, location (including elevation), age, maintenance regime and condition.

The QCoast$_{2100}$ MS&G encourages the evaluation assets controlled by external stakeholders within the local government area. The extent of external assets to be included in the CHAS is to be confirmed, however it is expected that this will include major infrastructure and land managers (e.g. Department of Transport and Main Roads and Department of Environment and Science).

5.3.1 Valuing Assets

As briefly discussed in Section 1.4.4, many assets and values important to the Fraser Coast region are not traded in markets, and are therefore more difficult to value because market prices are not available as a guide. This is especially true of many ecological, community and cultural assets (such as beaches and coastal wetlands). To value these assets, 'non-market valuation' techniques will be applied by transferring the values from existing studies that estimate the values of similar assets in similar contexts. Where this is not possible, estimates of reasonable values through stakeholder consultation should be undertaken, including an estimate of the degree of uncertainty involved in this approach.

Studies by Cardno (2012) and Hervey Bay City Council (2007) document some previous assumptions regarding the valuation of intangible assets within the Fraser Coast region. These will need to be closely reviewed, tested with stakeholders and the community, and potentially further tailored for the CHAS.

5.4 Risk Assessment (Phase 5)

The use of a risk-based approach to managing coastal hazards is a requirement of the QCoast$_{2100}$ MS&G, State Planning Policy and accords with current international best practice for natural resource management. The general steps involved in a risk assessment adjusted to suit coastal hazards and adaptation are described in Section 1.2.2 of this report and will applied to the Fraser Coast CHAS.

The risk assessment framework described by Cardno (2012) and applied to assets and values within the erosion prone area width generally aligns with the requirement of the QCoast$_{2100}$ MS&G and State Planning Policy. Adopting a similar framework and terminology for the CHAS will provide consistency when engaging with stakeholders and allow the previous work to be carried forward rather than needlessly repeated. Previously established qualitative measures of likelihood, consequence and risk are summarised below. These descriptions and measures have been slightly modified so they can be readily applied to both coastal erosion and storm tide and therefore adopted as part of the CHAS.

Table 5-2 Qualitative Measures of Likelihood (modified from Cardno 2012)

Level	Descriptor	Recurrence
1	Almost Certain	Could occur several times during the planning period. More likely to occur than not.
2	Likely	May occur about once during the planning period. As likely to occur as not.
3	Possible	May arise during the planning period. Less likely to occur than not.
4	Unlikely	Unlikely to occur during the planning period. Unlikely but not negligible.
5	Rare	Negligible likelihood of occurrence.

Table 5-3 Qualitative Measures of Consequence (modified from Cardno 2012)

Level	Descriptor	Environmental Values	Critical Infrastructure	Social Value – Recreational Access & Amenity	Social Values – Public Health & Safety	Commercial Values
1	Insignificant	No/negligible environmental change or damage.	No damage. No disruption to service.	No decrease in extent of open space. No decline in recreational amenity.	No/negligible social impacts.	No/negligible loss or damage of private assets.
2	Minor	Minor environmental change. Minor environmental degradation or deterioration in environmental values. Good potential for restoration / relocation.	Localised short-term service disruption. No permanent damage. Some minor restoration works required.	Localised short-term loss &/or closure of open space. Some minor restoration works required to recreational facilities.	Person suffers an injury. Short-term disruption to some community members. Some negative reports or complaints.	Minor property damage (e.g. to ancillary structures). Minor restoration works required.
3	Moderate	Isolated but significant instances of environmental change. Isolated but significant instance of environmental degradation. Potential for restoration / relocation. Significant environmental feature subject to minor impacts.	Widespread damage & loss of service. Damage recoverable by maintenance & minor repair. Short term disruption to service. Partial loss of local infrastructure.	Widespread short term or localised permanent loss of public open space. Damage to a range of recreational facilities recoverable by maintenance and minor repair. Loss of some minor recreational facilities.	Person suffers serious injury or several people with minor injuries. Short-term disruption to several community members. Isolated but noticeable decline in social cohesion (conflict over resources). Negative reports or complaints.	Property damage. Damage to property recoverable by maintenance & minor repair.
4	Major	Significant environmental change over a large area. Significant environmental degradation or deterioration in environmental values over a large area. Significant environmental feature subject to significant impacts. Limited potential for restoration, some potential for relocation. Some clean-up & remediation required.	Extensive damage requiring extensive repair. Major disruption of service until infrastructure is repaired. Permanent loss of infrastructure services for a sub-region.	Extensive &/or significant public open space areas are permanently lost. Extensive damage to recreational facilities across several sites requiring extensive repair.	Several serious or irreversible injuries occur. Fatality may occur from an individual event. Temporary disruption to essential activities undertaken by the community. Significant decline in services or quality of life for large sector of the community. Significant public debate about the issue, constrained resources and services. Negative reports in national media; complaints.	Extensive property damage. Long term loss of part of property or access way. Extensive repair to property.

Level	Descriptor	Environmental Values	Critical Infrastructure	Social Value – Recreational Access & Amenity	Social Values – Public Health & Safety	Commercial Values
5	Catastrophic	Irreversible environmental change or damage over a large area. Irreversible impacts on significant environmental feature. No potential for restoration. Potential for relocation very limited. Considerable clean-up & remediation required.	Permanent damage &/or loss of infrastructure service across the region. Service completely stopped until infrastructure is replaced. Retreat of infrastructure support.	Regional public open space areas & associated facilities are permanently lost.	Several serious or irreversible injuries occur. Chance of death from an event. Disruption to a large sector of the community. Public outrage; community divided over the issue. Regional community resources unable to support/inadequate for the population. Negative reports in international media; complaints.	Widespread permanent loss of property.

Table 5-4 Qualitative Measures of Risk Matrix (modified from Cardno 2012)

		Consequence				
	Descriptor	Catastrophic (1)	Major (2)	Moderate (3)	Minor (4)	Insignificant (5)
Likelihood	Almost Certain (1)	1	2	3	4	5
	Likely (2)	2	4	6	8	10
	Possible (3)	3	6	9	12	15
	Unlikely (4)	4	8	12	16	20
	Rare (5)	5	10	15	20	25

Risk Level	Extreme / High	Medium	Low

5.5 Adaptation Options & Assessment (Phase 6 & 7)

It is not always possible (or preferable) to eliminate all risks and actions need to be prioritised in terms of importance to both Council and the community. Typically, this is done through an interactive process of determining whether a risk is Acceptable, Tolerable or Intolerable. Tolerable (low) risks can be flagged for monitoring, with no further actions necessary. Intolerable risks are those that need more resources or are considered urgent.

Management options can be designed to reduce the likelihood of the risks (e.g. planning setbacks to reduce the likelihood of shoreline recession impacts) or the consequence of the risk (e.g. emergency management to reduce the consequence of shoreline recession) or both.

Adaptation options for coastal hazard risks can be classified into the following three types:

(1) Avoidance.

(2) Accommodation.

(3) Acceptance.

The above strategies are listed in order of the level of resilience (avoid provides a higher level of resilience than accommodation; and accommodation provides a higher level of resilience than acceptance).

There may be some instances where coastal hazard risks may be accepted or tolerated by the community, particularly for less sensitive land uses, coastal dependent development or where development is nearing the end of its design life. In some instances, it may be more cost effective to accept the risk rather than investing in retrofitting or upgrading an asset to accommodate the risk (build stronger) because the cost to upgrade is significantly greater than the value of the asset.

Statutory planning mechanisms have a key role in helping to implement adaptation options to avoid future risk to life and minimise future asset/property costs and damages. However, statutory controls are generally limited to regulating new development only and have no influence over existing development and current risk. In this context, it is imperative to take a holistic and integrated approach to adaptation and ensure a suite of delivery tools or mechanisms are identified, such as planning response, emergency warning and management, community education, additional/upgraded infrastructure, asset management, natural environment-based responses such as shoreline revegetation, and defence measures (i.e. engineering solutions). This will require thoughtful and carefully considered discussions with community regarding their tolerance for risk and preferred adaptation options to respond to this risk as well as the cost implications of different adaptation measures.

The CHAS will identify and describe high level adaptation options with a focus primarily on intolerable risks. These will be developed to a level of detail sufficient to allow for a multi-criteria analysis (MCA) of options to be performed. The multi-criteria analysis will capture a range of practical considerations such as technical feasibility, community acceptance, government priorities, consistency with statutory requirements, and order of magnitude costs. When performing MCA, scoring criteria will be developed that has a ‘minimum standard’ e.g. no significant impact to Matters of State Environmental Significance. It is important to score options from a variety of perspectives and views, and having a

range of stakeholders involved is valuable. Internal workshops with stakeholders will be undertaken to assist with prioritising adaption options to be shortlisted for cost-benefit analysis (CBA).

The approach to the CBA will be grounded in sound economics and consistent with Queensland Government guidelines. The following principles to compare the benefits and costs of different options include:

- Account for all relevant significant impacts to all people:
  - Look beyond the financial impacts (such as the impacts on private businesses) to also consider non-financial impacts (such as impacts on beaches).
  - Consider both short run and long run impacts.
- Quantify and value the impacts where possible:
  - Where not possible, address qualitatively.
- Account for uncertainty:
  - Explore the performance of different options under a range of future scenarios.
  - Note the level of confidence in assumptions.
  - Test the sensitivity of the results to different plausible assumptions.
- Present the analysis clearly so that decision makers can make an informed judgement and the analysis can be replicated.

5.5.1 Previously Identified Shoreline Erosion Management Options

The Fraser Coast Shoreline Erosion Management Options Assessment (Cardno 2012) identified a total 62 management options. This total was reduced to 38 following a CBA and consideration of technical feasibility and compatibility with the statutory framework.

Initially, the entire length of shoreline was categorised by the preferred management policy, either:

- Planning Controls: Land use planning and development controls were the preferred options for reducing risk from erosion by either preventing or limiting development; or
- Hold the Line: Maintenance of the present-day shoreline position and reduce risk of erosion by implementing soft or hard engineering options.

Standard coastal engineering options for ‘holding the line’ were proposed, including:

- Groynes;
- Sand pushing (or sand scraping);
- Beach Nourishment;
- Sandbagging;
- Dune Management;
- Seawalls; and

- Channel realignment.

The total cost for implementing and maintaining the promoted options was estimated to be $600M over a 20-year period. However, it was recognised that some of the options were in fact mutually exclusive and therefore the actual cost could be substantially lower.

Beach nourishment is often identified as a preferred option to mitigate shoreline erosion since the placed sand also helps to maintain recreational and social values. The feasibility of beach nourishment across the Fraser Coast region, particularly for major works required to mitigate the effects of SLR over longer planning periods, remains uncertain. Challenges with beach nourishment are typically associated with:

- Sand quality and suitability for beach nourishment. Ideally the target sand for extraction has similar characteristics (e.g. particle size and colour) to the placement area.
- The presence of potential acid-forming sediment (Acid Sulfate Soils or ASS) and/or of fine material (silts and clays) within the target area which can generate environmentally impacting turbidity plumes during extraction and placement activities.
- Environmental constraints and values relating to dredging near seagrass beds, fish habitat and/or migratory shorebird roosting areas. In addition, marine megafauna (e.g. turtles, dugongs and whales are protected under both Federal and State legislation. In recognition of the Great Sandy Strait Marine Park, these constraints are particularly relevant to future beach nourishment activities within the Fraser Coast region.
- Operational costs and constraints. Beach nourishment campaigns are often limited by the availability of suitable equipment that can both access the sand and deliver it to the target area. Mobilising specialised dredging equipment is typically expensive and not economically viable for all coastal councils.

The CHAS provides an opportunity to further explore the feasibility of beach nourishment in the context of the constraints listed above. Importantly, sand volume required to ‘hold the line’ over the long term and the potential sand source(s) must be determined. If the challenges outlined above cannot be overcome, then beach nourishment may only be viable for a short period.

5.6 Fraser Coast CHAS Project Plan and Resources

Table 5-5 below provides an overview of the proposed studies to support the CHAS. The purpose of the outline is to broadly identify indicative timing and resourcing estimates as a starting point for further refinement with the TWG.

Commencement of each phase is dependent on securing LGAQ funding and will also vary depending on Council’s appetite for community and stakeholder engagement throughout the process. An indicative project plan is provided in Figure 5-2, outlining the intended project delivery and the interrelationship between the technical outputs and the stakeholder and community engagement strategy.

5.6.1 Strategic Engagement Opportunities

Discussions with Council and the Executive team have identified that in the context of the close engagement undertaken on the SEMP, and the nature of the broader community, there is an identified need and desire to examine a 'deliberative democracy' engagement approach.

Deliberative democracy involves a process where members of the community are provided with the necessary information and support to be informed and understanding of the issues or project content and being able to make a decision that has a direct influence upon the project.

The way this would best occur is through a community panel, and important considerations are:

- Achieving diversity in the group – people from a variety of locations and backgrounds;
- Consideration toward this being a paid role as this requires time and commitment (how this is funded requires consideration);
- Setting clear parameters about their role and decision making;
- Possibility of this requiring an independent review committee to ensure transparency (resourcing needs to be considered); and
- Requires a highly experienced facilitator.

Details of the Stakeholder and Engagement Strategy are provided separately in the Phase 1 report. It is noted here that in the context of project planning and resourcing, a deliberative democracy approach will increase the level of public participation in the CHAS and therefore require additional time and budget to be implemented successfully. The additional time and cost for a deliberative democracy approach is not captured in Table 5-5. However, the following estimates are provided as a guide:

- Council resourcing: a dedicated officer to manage the CHAS project, community reference panel, independent review committee, and assist with coordination of the engagement activities.
- External resourcing: $7,000 to $10,000 per CHAS Phase for an experienced facilitator to coordinate the engagement process and for independent peer review.

Table 5-5 Proposed Studies to Support the CHAS

Item	Indicative phases of CHAS (as per MS&G)	Describe proposed study/assessment/data collection methodology and demonstrate compliance with MS&G	Project Outputs	Duration & Cost Estimate (additional time may be needed for consultation)
Tailoring Coastal Hazard Mapping for the CHAS	Phase 3	• Storm tide assessment, potentially in collaboration with Gympie Regional Council • Preparation for consultation launch, including online stakeholder engagement platform and consultation collateral	Consistent storm tide inundation hazard mapping for CHAS planning horizons	6 months $100,000 (reduced to $60,000-$70,000 if in collaboration with Gympie Regional Council)
Asset Database Refinement		• Intangible assets identified and included in GIS database	Fit for purpose asset register and GIS database	2 months $15,000 (GIS support provided by Council)
Asset Identification & Valuation	Phase 4	• Identifying assets exposed to coastal hazards • Identifying owners of assets • Engaging with internal and external stakeholders • Estimating the value of affected assets • Agreeing to a list of priority assets to be subject of risk assessment • Consultation launch and associated activities	Database of assets and values exposed to coastal hazards. Register would include asset type, ownership, location, age, maintenance regime, condition, present-day value and rate of depreciation.	4 months $80,000
Risk & Vulnerability Assessment	Phase 5	• Apply the Australian standard for risk management AS/NZS ISO 31000:2009: risk identification, risk analysis, risk evaluation and risk treatment • Define likelihood of risk occurrence and consequence of the event based on site specific risk/consequence scales, building on qualitative descriptions developed for the previous Fraser Coast Shoreline Erosion Management Options Assessment	At community and assets level, understanding: • The likelihood and consequence associated with coastal hazards • The tolerable and intolerable levels of risk	3-6 months $120,000 to $170,000

Item	Indicative phases of CHAS (as per MS&G)	Describe proposed study/assessment/data collection methodology and demonstrate compliance with MS&G	Project Outputs	Duration & Cost Estimate (additional time may be needed for consultation)
		• Assess the risk based on community expectations and/or tolerance	• Risk treatment options to reduce the risk to tolerable levels • Triggers for implementing adaptation options	
Options Development & Assessment	Phase 6 & 7	• Identify potential options to treat risks identified in Phase 5 • Informing the options identification process through community and stakeholder consultation • Further investigation of beach nourishment opportunities and constraints • Undertake MCA and CBA to inform adaption option ranking	Development of adaptation options for coastal hazard risks, broadly classified to either: • Avoidance • Accommodation • Acceptance MCA and CBA to inform the selection of preferred adaptation options	6 months $150,000-$170,000
Final CHAS report	Phase 8	• Summary of the findings of previous phases in a single document • Prioritise, stage and sequence actions over time and focus on treating priority risks. • Indicative budget for capital investment to deliver priority adaptation actions • Adaptation actions embedded across core governance functions and implemented using a range of tools including: – Risk management framework – Long term financial planning and annual budgets – asset management and planning – Disaster management and planning – Corporate and operational planning – land use and infrastructure planning	Information in formats suitable for internal and external consultation purposes Descriptions of how Council will provide an integrated and coordinated response to coastal hazard adaptation Explain how the CHAS is to be effectively implemented, reviewed and monitored	2 to 3 months $60,000-$80,000

Item	Indicative phases of CHAS (as per MS&G)	Describe proposed study/assessment/data collection methodology and demonstrate compliance with MS&G	Project Outputs	Duration & Cost Estimate (additional time may be needed for consultation)
		– Organisational development and workforce planning – Community and stakeholder engagement policy and plans		

Future CHAS Phases and Project Plan

Project Phases

Phase 1 & 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8

Technical Outputs

Phase 1 & 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
• Communication and Engagement Strategy • Coastal Hazard Scoping Study	• Erosion prone area mapping • Storm tide inundation area mapping	• Asset database refinement • Key asset identification and mapping	• Risk assessment of key assets • Risk matrix and risk mapping	• Identification of adaptation options • Develop preliminary screening criteria/ method	• Finalise evaluation criteria • Socio-economic appraisal of short- listed options	• CHAS Document • Implementation Plan • Change Management Plan

Engagement Program

Stakeholder Groups Engaged

Phase 1 & 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
Internal Council Stakeholders (Key Groups) Internal Council Stakeholders (Whole of Council) External Government Stakeholders	Internal Council Stakeholders (Key Groups) Internal Council Stakeholders (Whole of Council)	Special Focus Group (Community) Special Focus Group (Local Business and Industry) Regional Groups and Industry Bodies Special Focus Group (Environmental Groups) Broad Fraser Coast Community	Internal Council Stakeholders (Key Groups) Internal Council Stakeholders (Whole of Council) External Asset Owners Special Focus Group (Community) Special Focus Group (Local Business and Industry)	Internal Council Stakeholders (Key Groups) Special Focus Group (Community) Special Focus Group (Local Business and Industry) Special Focus Group (Environmental Groups) Broad Fraser Coast Community	Internal Council Stakeholders (Key Groups) Special Focus Group (Community) Special Focus Group (Local Business and Industry)	Internal Council Stakeholders (Key Groups) Internal Council Stakeholders (Whole of Council) External Government Stakeholders / External Asset Owners Broad Fraser Coast Community

Summary of Activities

Phase 1 & 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
Internal workshops/briefings/ meetings	Internal workshops/briefings/ meetings	Broad engagement, including website, media engagement, social media posts, project bulletin, survey, etc. Direct mail to households / businesses in study areas Pop up events and meet the planner sessions Small group workshops Community reference group workshops and community champions program Update engagement strategy	Internal workshops/briefings/ meetings Update website with input received Update engagement strategy	Internal workshops/briefings/ meetings Broad engagement, including website, media engagement, social media posts, project bulletin, etc Direct mail Public lecture Meet the planner sessions Small group workshops Community reference group meeting Update engagement strategy	Internal workshops/briefings/ meetings Update website with input received Project bulletin Community reference group meeting Update engagement strategy	Internal workshops/briefings/ meetings Public exhibition of draft strategy. Broad engagement, including website, media engagement, project bulletin etc. and options to submit submissions *Other methods to be determined* Record and respond to submissions Publish final CHAS

Key Council Business Touchpoints

- **Internal Launch & apply for QCoast funding Phases 3-8**
- **Project Launch & Phase 3 & 4 Community Engagement**
- **Phase 6 Community Engagement**
- **28-day public exhibition period**

Figure 5-2 Fraser Coast CHAS Project Plan Overview

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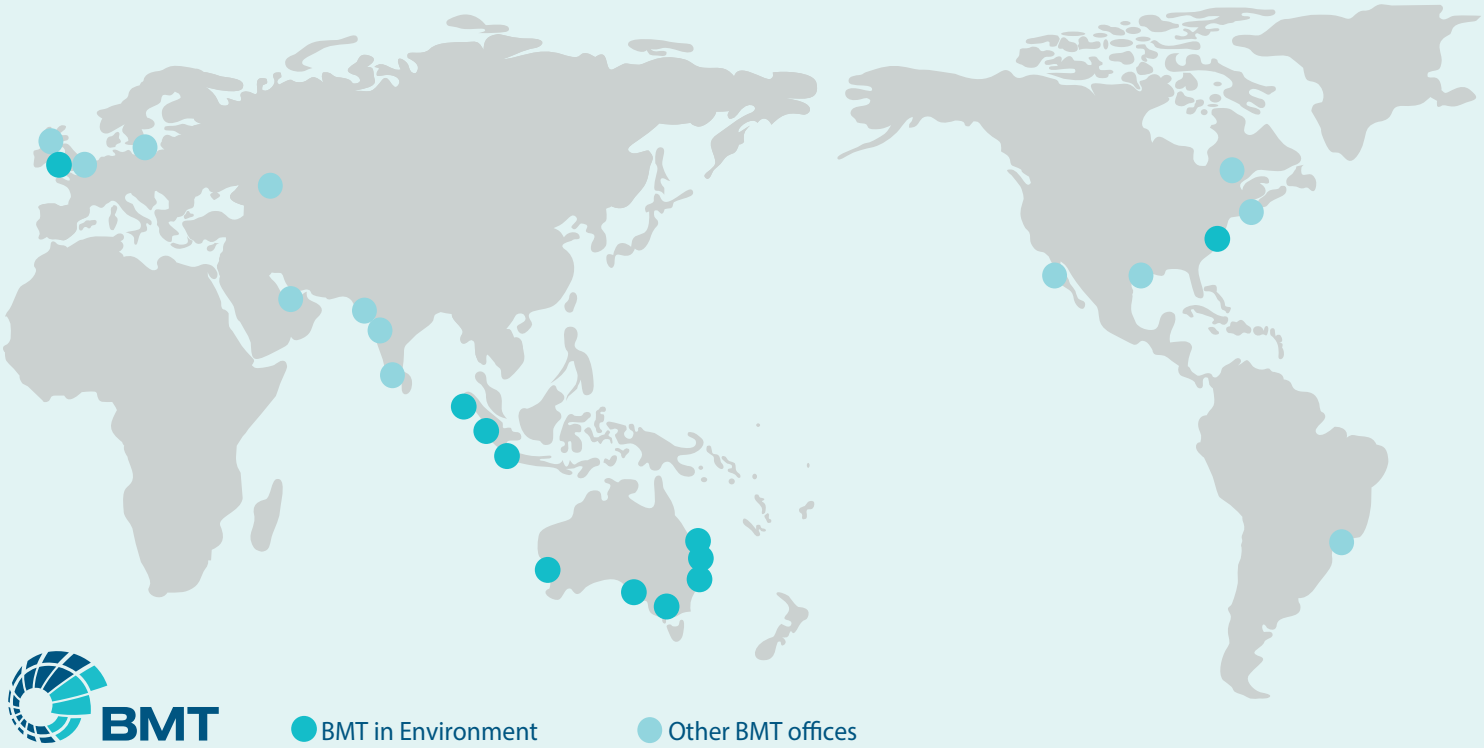
BMT has a proven record in addressing today's engineering and environmental issues.

Our dedication to developing innovative approaches and solutions enhances our ability to meet our client's most challenging needs.



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