

Environment Waikato Technical Report 2006/22

Cooks Beach Coastal Erosion Management Strategy : Part II – Technical Appendices

Prepared by:
Beca Carter Hollings & Ferner Ltd,
in association with Economos Ltd and Covec

For:
Environment Waikato
PO Box 4010
HAMILTON EAST

ISSN: 1172-4005

Document #: 1073151

Appendix Contents

Appendix A - Background to Project and Methodology

Appendix B - Background Information on Cooks Beach

Appendix C - Policy/Planning Framework

Appendix D - Screening of Options

Appendix E - Definition of Options

Appendix F - Economic Analysis

Appendix G - Definition of Indicators

Appendix H - Assessment of Options

Appendix I - Results of Assessments

Appendix J - Action Plan and Lessons Learned

Appendix K - Bibliography

Appendix L - Glossary



Appendix A

Background to Project and Methodology

Table of Contents

1	Background to Project	1
1.1	Background	1
1.2	Outcomes of the Project.....	1
2	Definition of Strategy Boundaries	3
3	Cause of Erosion	4
4	Understanding the Environment and the Desired Environmental Outcomes	4
5	Screening Level Assessment of Options	5
5.1	Workshop of Options.....	5
5.2	Checklist of Possible Options	5
6	Social, Economic and Environmental Qualitative Assessment of Options	6
6.1	Assessment Process	6
6.2	Grading	7
7	Economic/Quantitative Assessment	7
8	Action Plan	7
9	Strategy Project Team	8

1 Background to Project

1.1 Background

This site specific CEMS for Cooks Beach lies within a wider joint Coastal Erosion project EW and TCDC are currently working on. The wider project is considering District-wide issues associated with coastal erosion. The project purpose is twofold, namely to develop a joint agency approach to managing coastal erosion hazards on the Coromandel Peninsula and to develop an associated funding system for the management of coastal erosion issues. The focus of the project lies in a wider Local Government Act (Long-term Council Community Plan) approach, going beyond the Resource Management Act.

Recommendations from the joint Coastal Erosion project will be combined with other natural hazard related recommendations, such as the Coastal Erosion Hazard Lines and planning recommendations from the Peninsula Project and these will form the basis of a review to provisions in the Proposed Thames Coromandel District Plan (TCDP) and possibly the Proposed Waikato Regional Coastal Plan (WRCP). An outcome of the Coastal Erosion project is to identify issues and options for managing the coastal erosion at Cooks Beach then selecting the most technically feasible and affordable mitigation option with stakeholders. The options for managing coastal erosion at this site must be assessed from a sustainable development perspective to identify an outcome that results in the least adverse effects on the environment, society and economy - in other words achieve a quadruple-bottom line outcome.

The coastal environment is under greater pressure as development in marginal areas increases and conflicts arise between the human use system and the coastal system. Cooks Beach is one area where development has occurred in this interface and where long-term strategic management can provide a balance between both systems. Property owners and users of council reserves are pressuring councils to take remedial actions following recent severe storm erosion.

This project is designed to provide information and tools that will facilitate and support the identification of the best approach to managing coastal erosion by EW, TCDC, the Cooks Beach community, the regional and district communities, tangata whenua and other stakeholders.

1.2 Outcomes of the Project

The outcomes of the project identified by the project brief are:

- Identification of options for managing coastal erosion in the context of Sustainable Development;
- Assessment of environmental, social and economic impacts of options;
- Evaluation of impacts in qualitative, quantitative or monetary terms where appropriate;
- Development of generic impact categories/criteria/indicators (social, economic and environmental) to allow for the comparison of options of any project;

- Comparison and prioritisation of preferred options to their contribution of Sustainable Development; and
- Development of a generic matrix for evaluating options to inform decision-making.

Assumptions and Limitations

- The boundaries of the Cooks Beach Erosion Management Strategy are between 165 Captain Cook Road and 105 Captain Cook Road to the west.
- The assessment was based around a 50-year planning horizon to incorporate sustainable development principles and future generations needs.
- No specific design work has been undertaken therefore construction and maintenance costs are estimates for generic structures (e.g. seawall).
- No community or stakeholder consultation has been undertaken in strategy development therefore a selection of options has been provided rather than one recommended option.
- A number of economic assumptions have been made. For further details see Appendix F.
- For the purposes of this project no fieldwork was undertaken and so analysis was based on existing technical information provided by EW and TCDC as well as project team knowledge and experience.

2 Definition of Strategy Boundaries

The boundaries of the Cooks Beach Erosion Management Strategy were defined by Environment Waikato (EW) and Thames Coromandel District Council (TCDC) as:

“The area between 165 Captain Cook Road (Lot 15 in Figure One) and 105 Captain Cook Road (Lot 51, Figure One) to the west where the TCDC reserve extends approximately 20 metres between the property boundary and the coastal marine area”.

This section of Cooks Beach is suffering from significant coastal erosion hazard due to the level of residential development close to the foreshore. Although it is recognised that a management strategy would usually address the beach as a whole system, the undeveloped and hence less at risk sections of Cooks Beach are likely to suit management options recommended for the undeveloped mid section of Buffalo Beach (see the Buffalo Beach Coastal Erosion Management Strategy¹) and have not been included as part of this strategy.

Figure 1: Cooks Beach Strategy area as defined by Environment Waikato and Thames Coromandel District Council (source: Environment Waikato GIS)



¹ Buffalo Beach Coastal Erosion Management Strategy, 2004. Environment Waikato Contract 9215918 prepared by Beca, Eco Nomos Ltd and Covec.

3 Cause of Erosion

Understanding the cause of coastal erosion and whether, in fact, there is a coastal hazard risk at all is essential in determining the appropriate management response. For this reason, background research was undertaken based on existing studies, reports and other documents that investigate the coastal processes, the history of erosion at the site and hypothesise on the cause of the erosion (refer to Appendix K for a bibliography of all referenced material). The following parameters were researched in the assessment of the cause of the erosion:

- Coastal geomorphology;
- Sediment transport;
- Wind, wave and currents;
- Predicted changes in sea level (both short and long-term); and
- Vegetation cover.

As well as data on natural parameters, information was collated on human modifications and/or activities (past and present) that may have altered processes and therefore contributed to, or exacerbated, a coastal hazard problem (for example - removal of natural buffers to a coastal hazard such as vegetation or sand dunes).

Based on the review of existing information and utilising the knowledge and experience of the both the project team and Council staff, the likely cause of erosion and level of coastal hazard was determined. A detailed discussion on the cause of erosion for Cooks Beach is provided in Appendix B.

4 Understanding the Environment and the Desired Environmental Outcomes

The next step in identifying an appropriate strategy for managing coastal erosion at Cooks Beach was to gain an understanding of the local and wider environment, as well as the desired environmental outcomes for that environment. Defining the existing environment sets constraints and opportunities for managing the erosion and formed the first step in the assessment of the actual or potential effects of the options for the management of hazards.

To facilitate the desired outcomes for Cooks Beach, a draft strategy vision and objectives were developed. Consultation with the community and stakeholders is a key part of developing a vision and objectives for any strategic planning such as this, but consultation was not undertaken as part of this project. The draft vision and objectives have therefore been developed based on community consultation undertaken as part of both the EW and TCDC Long Term Council Community Plan (LTCCP) processes plus the experience gained from past strategic studies undertaken by the project team. EW and TCDC will be undertaking consultation on the Cooks Beach CEMS prior to adopting the report. It is anticipated that the draft vision and objectives will be further refined in conjunction with

the community and stakeholders. This consultation is a recommended action point of this strategy (see Action Plan Appendix J).

It is important to recognise also that the success of the CEMS will rely not only on council support but also on a strong sense of ownership and commitment from the community on the direction and philosophy of this document and the long-term vision for this coastal environment.

5 Screening Level Assessment of Options

The option(s) selected for the CEMS need to be capable of managing the risk from the identified cause of the coastal erosion, have acceptable environmental effects and have reasonable and practicable costs associated with it thus achieving quadruple bottom line outcomes. The following section details the process behind the initial screening level assessment of options to select the appropriate options that would then undergo a rigorous environmental, economic and social impact assessment.

5.1 Workshop of Options

The first step in developing a management strategy is to identify the range of options that might be used to manage the identified cause of erosion. A workshop was held with relevant regional and district council staff, coastal engineering specialists, environmental economists, coastal scientists and coastal planning experts. The workshop was initially to brainstorm a wide range of available options and discuss any constraints or potential opportunities that should be included for further investigation.

5.2 Checklist of Possible Options

The background research and workshop produced a range of options available for managing coastal erosion at Cooks Beach, some of which are not technically or practically feasible. To refine the number of options that were to undergo a full quadruple-bottom line assessment a checklist of possible options and combination of options was completed for Cooks Beach. These options were then screened to determine whether they are technically or practically viable. Those options identified as viable were then carried through to the next stage to be assessed more thoroughly for social, economic and environmental impacts.

Factors that resulted in some options being impractical included:

- 1) design issues (e.g. an incompatibility between the structure being considered and the site conditions);
- 2) structures which will present unacceptable safety issues (such as adverse navigational effects); and/or
- 3) options that would have unrealistic costs making them unfeasible to implement.

Factors such as these are known as 'fatal flaws' and justified the removal of the option from the selection process. Fatal flaws of each option possible for management of coastal erosion

at Cooks Beach were considered at this stage and justifications given as to why those options were discounted (Appendix D).

6 Social, Economic and Environmental Qualitative Assessment of Options

6.1 Assessment Process

Following the screening level selection appropriate management options for Cooks Beach were assessed further using a matrix assessment process (multi-criteria analysis²). This matrix approach to options assessment creates a “visual image” of the results of the extensive qualitative assessment process.

Part of development of the matrix included determining indicators against which each option, either singularly or in combination, would be assessed qualitatively. These were based on three broad areas – environmental, social and economic, to achieve a sustainable response^{3,4}. EW have already undertaken work on indicator development based on the review of sustainability principles proposed in international works such as Earth Share of Washington’s Environmental Policy, the Scottish Environment Protection Agency (SEPA) and the National Planning Policy Guideline No. 10, Planning and Waste Management (NPPG10). International indicators that were appraised by EW include the 2000 Sustainability Environmental Indicators (UK Water) and 2001 Sustainability Indicators for the Construction Industry (CIRIA RP 609).

The list of indicators that EW had developed was used as a starting point for the assessment of potential options for coastal erosion management at Cooks Beach. The indicators were further developed to better reflect the New Zealand situation by including matters of national importance as outlined in legislation (such as the RMA and the NZCPS), to reflect the long term assessment over a 50 year time frame and to achieve consistency with the CEMS vision. The 50-year timeframe is used to select options that will promote sustainable development of Cooks Beach⁵. The full list of indicators used and their definitions is provided in Appendix G.

The grading process used (see below for more details) to assess potential options for the Cooks Beach CEMS allowed the potential impacts of each option to be visually presented in a matrix format, also enabling the relatively easy comparison between options.

² See Glossary in Appendix L for definition of multi-criteria analysis

³ Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

⁴ WCRP

⁵ Environment Waikato Contract 921518 Coastal Erosion Management Strategies for Cooks and Buffalo Beaches, 2004.

6.2 Grading

The impacts for each option assessed against the indicators were graded as to the level of negative and/or positive impact the option could have. A red or green bar was used depending on whether the option is expected to have a negative (red) and/or positive (green) effect in the long term. In addition to assessing whether there is a potential positive and/or negative impact caused by each option, the degree of impact was also assessed as being High, Medium or Low. The length of the bar in the matrix represents the level of impact (high impact is a longer bar, low impact a shorter bar). Some impact categories are considered to be not relevant to some options and where this occurs a 0 (zero) grading was applied to indicate the option has no impact (and no coloured bar appears in the matrix for that indicator).

The options were assessed against each indicator qualitatively using available data, current coastal science, engineering knowledge and literature. Justifications for the gradings are given in the assessment tables included in Appendix H. Each option has been assessed against the indicators based on whether or not it will have a positive or negative impact on the environment, society and the economy as well as the level at which it is likely to achieve the strategy vision over a 50-year time frame.

The matrix produces a 'picture' of the most preferred option(s) to achieve sustainable development and quadruple bottom line outcomes.

7 Economic/Quantitative Assessment

The economic analysis provides a quantitative evaluation of each of the options for management of Cooks Beach in terms of the overall impacts on society, including beachfront dwellers and the wider community. The economic analysis used in this strategy takes two approaches:

- It uses cost-benefit analysis (CBA) techniques to measure the overall well-being (or welfare) impacts of the different options for coastal management;
- It uses macro-economic techniques to measure impacts on the size of the local economy.

The details of the economic assessment are provided in Appendix F.

8 Action Plan

Once the preferred coastal erosion management options for Cooks Beach were identified using the economic evaluation and the qualitative matrix evaluation of options, an Action Plan was developed to identify the next key steps for the strategy development. A key part of the Action Plan for the CEMS is the extensive consultation to be undertaken by EW and TCDC as part of the wider regional erosion management strategy. It is anticipated that consultation will enable the two authorities to build on the recommendations of this report and refine the direction and shared vision for Cooks Beach with the community and other stakeholders.

9 Strategy Project Team

The Study Team for the Cooks Beach Coastal Erosion Management Strategy included:

- Lamorna Cooper, CEMS Project Manager & Hazards Analyst, Environment Waikato
- Annabelle Giorgetti, Environmental Economist, Environment Waikato
- Peter Wishart, Forward Planning Manager, Thames Coromandel District Council
- Lucy Brake, CEMS Project Manager, Senior Planner – Coastal, Beca
- Cushla Loomb, Environmental Planner/Coastal Scientist, Beca
- Richard Frankland, Senior Civil Engineer, Beca
- Stephen Priestley, CEMS Project Director, Technical Director-Ports & Coastal, Beca
- Jim Dahm, Coastal Scientist, Eco Nomos Ltd
- Tim Denne, Environmental Economist, Covec Ltd
- Corrina Chai, Environmental Economist, Eco Nomos Ltd

We would also like to thank all those people who attended the Opportunities and Constraints workshop, and others that assisted in the preparation of this strategy document.

Summary - Methodology

The preferred strategy for Cooks Beach has been determined by considering the economic, social and environmental issues to achieve quadruple bottom line outcomes for the long-term sustainable development of this beach. The following approach has been used:

1. The background to the coastal erosion problem was researched, including investigations into whether there is a coastal hazard at Cooks Beach, and a draft strategy 'vision' developed.
2. A list of potential options was produced for the Cooks Beach strategy area based on available literature sources, the knowledge and experience of the project team as well as the constraints and opportunities workshop.
3. The potential options were assessed at a screening level for any 'fatal flaws' that made some options technically unfeasible. Justifications were given as to why these options were not considered viable options for further assessment.
4. The options that passed the screening were then qualitatively assessed (using multi criteria analysis) against carefully selected environmental, social and economic impact categories reflecting sustainable development principles and assigned an impact grade depending on their level of effects.
5. Each option was quantitatively assessed using cost-benefit analysis (CBA) techniques to measure the overall well-being (or welfare) impacts of the different options for coastal management and macro-economic techniques to measure impacts on the size of the local economy.
6. A number of preferred coastal erosion management options were identified using the matrix and the results of the economic analysis. These options are considered to be the most likely to achieve the strategy vision and progress the CEMS to the next stage.
7. A number of actions were identified to assist EW and TCDC to further refine the strategy vision and options and progress the CEMS to the next stage.
8. The final Cooks Beach CEMS was then externally peer reviewed.



Appendix B

**Background
Information on
Cooks Beach**

Table of Contents

1	Environmental Characteristics.....	1
1.1	Description and Coastal Processes.....	1
1.2	Coastal Erosion	2
1.3	Erosion Hazard – Is there an Issue?.....	4
1.4	Property Owner Response and Seawall Issues	5
1.5	Response of Management Agencies.....	6
2	Social Aspects	7
2.1	Population and Ratepayers.....	7
2.2	Main Visitor Attractions	8
2.3	Beach and Beach Use	8
3	Economic Aspects	9
3.1	Tourism in Coromandel and Role of Beaches	9
3.2	Property Values and Influence of Erosion Hazard	10
4	Historic Heritage.....	11

1 Environmental Characteristics

1.1 Description and Coastal Processes

Cooks Beach is a relatively sheltered, crescent-shaped, approximately 3km long, located along the southern shoreline of Mercury Bay. The beach faces the NNE and is oriented almost parallel to the long axis of Mercury Bay.

A small intertidal harbour, Purangi Estuary, is located at the eastern end of the beach. A large and predominantly intertidal bar formed at the entrance of this estuary, scientifically known as an ebb tide delta, lies adjacent to the easternmost 500m of the beach (Figure 1).

Figure 1: Cooks Beach showing Purangi Estuary to the east. Note the ebb tidal delta.



The beach has formed over the last 6500 years; largely from sands moved onshore from the adjacent continental shelf (Dahm and Munro, 2002). Shoreline advance over this period has formed a coastal dune plain, varying in width from 200m (western end) to 675m (eastern end). However, net seaward advance has progressively slowed over the last 2000-3000 years and has now effectively ceased (Dahm and Munro, 2002). In simple terms, the beach effectively has all the sand it is likely to get.

The beach is composed of fine sands and has typical beach face slopes of 1V:20H. The sediments are contained between the headlands at the eastern and western end and there appears to be little to no sand exchange with adjacent beaches - with the beaches to the immediate west (Lonely Bay and Maramaratotara) having much coarser beach sands.

**Cooks Beach
effectively has
all the sand it is
likely to get**

The seaward edge of the beach system lies about 150m offshore from the toe of the dune, at depths about 7m below normal berm level and about 4m below lowest low tide. Further seaward, there is a major change in offshore gradient (the seabed essentially flattening off into Mercury Bay) and the sediments are finer. The marked sediment and morphological break tends to suggest there is little transfer of sediment or loss to areas further offshore and this depth represents the common limit of offshore exchange.

The prevailing wave conditions on the northeastern coast of New Zealand are northeasterly waves, with common heights of 0.5-1.5m and periods of 5-7s. The deep-water significant wave height is estimated at 1-1.4m, though storm waves associated with subtropical disturbances and local storms can generate deep-water waves of 5-7m and higher. Cooks Beach is sheltered from easterly waves by the large headland at the eastern end of the beach (though waves do refract around this headland onto the beach) and from north and NNE east wave directions by the Kuaotunu Peninsula. However, the beach is moderately exposed to waves from the NE – with most severe coastal erosion tending to be associated with waves from this direction.

Tides at the beach are semidiurnal with a mean spring range of about 1.6m. Water levels can also be elevated above predicted astronomical tides by storm surge effects – with a storm surge of approximately 0.8m recorded in Mercury Bay during the northeast storm event of July 1978.

1.2 Coastal Erosion

Cooks Beach is a popular holiday destination and the coastal dune plain behind the beach has been progressively subdivided and developed since the 1950's. Early subdivision occurred at the western end of the beach and is located well landward of the beach behind a large frontal dune. However, subdivision of the eastern end of the beach, undertaken in the 1960's and early 1970's, is located much closer to the sea. The frontal dune was also levelled in some places at the time of subdivision. This area, particularly the easternmost 1km of the beach, has experienced ongoing problems with coastal erosion.

Over the last 50-60 years, the eastern end of Cooks Beach has experienced at least two periods of severe beach and dune erosion – the first from about 1967/68 to 1978, and the second since the mid 1990's.

In the first period of erosion, the dune line was cut back by up to 35m in places (though more typically 20-25m) over the 10-12 year period (Dahm and Munro, 2002). The most severe erosion was experienced in the storm of July 1978, when several properties were impacted and the sea threatened eight dwellings.

In the period from 1979 to the mid 1990's, there was a general trend for beach recovery – beach profile data indicating that the seaward toe of dune prograded seaward by approximately 20m at the northern end of the affected area (Environment Waikato beach profile site ccs 31).

Since the mid 1990's, there has been another general trend for shoreline erosion, the dune at the northern end of the affected area being cut back to within 1-2 metres of the 1978 erosion line.

The available evidence suggests the erosion is primarily related to dynamic shoreline fluctuations¹ rather than permanent shoreline retreat. The dynamic shoreline fluctuations appear to be related both to climate cycles and to the influence of the adjacent ebb tide delta (Dahm and Munro, 2002). The periods of erosion and accretion coincide with the general pattern evident at many other eastern Coromandel and Bay of Plenty sites (i.e. a general trend for erosion in the 1960's and 1970's; for beach and dune recovery in the 1980's and early 1990's; and for erosion since about mid 1990's). These general patterns appear to reflect periods of increased and decreased storminess related to climate cycles (e.g. ENSO, IPO) (e.g. de Lange, 2000).

The erosion is primarily related to dynamic shoreline fluctuations rather than permanent shoreline retreat

The affected shoreline lies adjacent to the ebb tide delta and there are strong dynamic links between the ebb tide delta and the beach. For instance, the pattern of net sediment circulation over the ebb tide delta involves sediments being moved seawards by ebb tidal flows and then recirculated landwards towards the beach and entrance by wave action and the influence of flood tidal flows. The strong dynamic relationship between ebb tide deltas and adjacent shorelines has been widely recognised and erosion adjacent to such features is frequently more significant than along adjacent shorelines (Hayes, 1975; Dahm, 1983; Fitzgerald, 1988) and this effect has also been documented at eastern Coromandel sites (Gibb and Aburn, 1986; Dahm and Munro, 2002). Dahm and Munro (2002) note various lines of evidence indicating the influence of the entrance and ebb tide delta on shoreline fluctuations at Cooks Beach.

There is also evidence of a slow trend for net westward drift in recent decades and possibly some transfer of sand from eastern to western ends of the beach. For instance, the central and western areas of the beach experienced a general trend for accretion over the period since 1944 (Dahm and Munro, 2002). At the eastern end of the beach, adjacent to the ebb tide delta, there is a strong net movement towards the entrance (eastward) along the beach, associated with the net sediment transport pattern over the ebb tide delta. Therefore, some small net loss of sediment in the area of these opposing drift directions may also have contributed to the erosion, although it is unlikely that this is a long-term trend.

The major stormwater outlet at Iti Lane in the centre of the affected area also aggravates erosion in this area during storm events with a combination of storm waves and high outflows. However, while the discharge from this outlet locally aggravates erosion, it is not a primary cause of shoreline erosion along the entire length of the affected area. The existing seawalls also give rise to end effects erosion in places.

Overall, there is a finite volume of sands in the Cooks Beach with little to no net input of new sand into the beach system. The sands appear to be largely contained within the beach system with no significant exchange with adjacent beaches and no significant losses to areas beyond the offshore limits of the beach. The present erosion appears to be primarily associated with internal sediment transfers within the total beach system – particularly with offshore transfers to subtidal parts of the beach system during storm conditions and,

¹ See Glossary in Appendix L for definition of dynamic shoreline fluctuations

to a lesser extent, with the sediment dynamics of the ebb tide delta, a slow net transfer of sands to the west over the last decades and localized factors such as the stormwater outlet and end effects off the present wall.

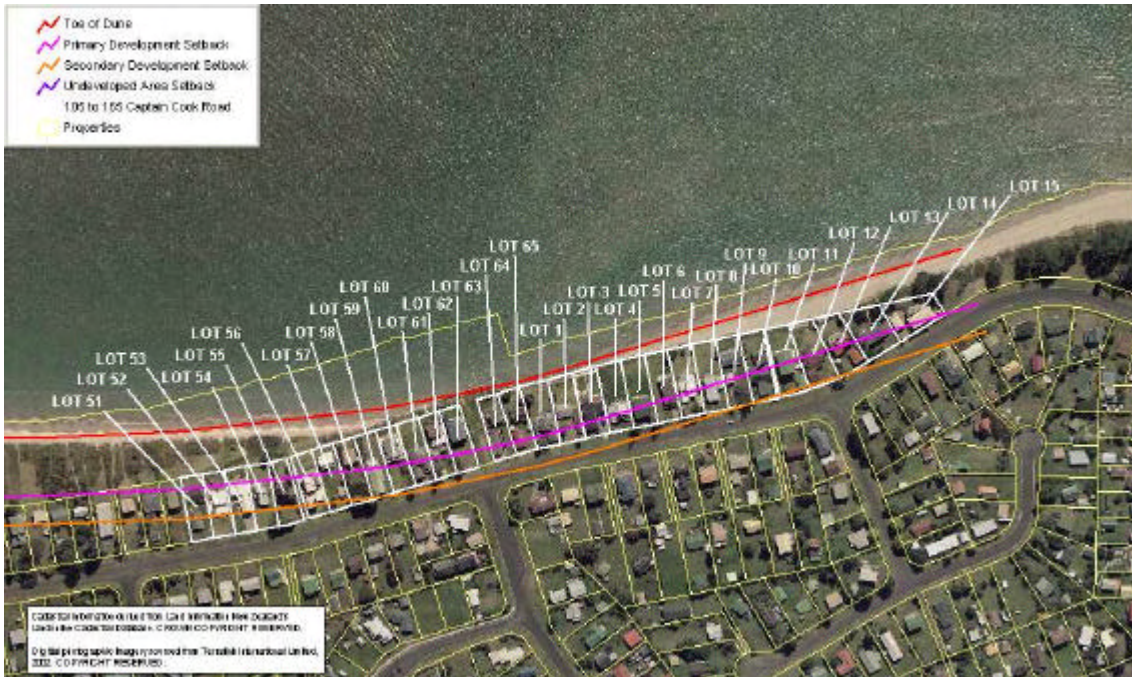
1.3 Erosion Hazard – Is there an Issue?

Analysis of historical shoreline changes and beach profile data suggests that, in the absence of shoreline protection measures, the worst likely storm erosion could potentially cut 25-30m into many sections, though 5-15m is more likely for most properties. The hazard lines recently defined by Environment Waikato provide a reasonable, though precautionary estimate of the area that could be impacted.

Analysis of historical shoreline changes and beach profile data suggests that, in the absence of shoreline protection measures, the worst likely storm erosion could potentially cut 25-30m into many sections

- At present there are 35 properties and 27 dwellings that could potentially be impacted in the absence of shoreline protection works. These properties have a combined capital value of about \$20 million, though the market value of the properties is probably closer to \$30 million or more.
- In the longer-term future, erosion may be further aggravated by projected sea level rise and changing weather patterns, particularly in the period beyond 2050 AD. Present best estimates suggest potential for complete loss of most properties in the study area by 2100. At present, there are 57 properties and 49 dwellings within the area potentially impacted. These properties have a combined capital valuation of \$33 million, though the present market value is probably closer to \$50 million.
- There are existing building setbacks in place for Cooks Beach as shown on Figure 2.

Figure 2: Cooks Beach building setbacks



1.4 Property Owner Response and Seawall Issues

To date, the major response of property owners to the erosion has been the placement of various seawalls in an attempt to hold the shoreline seaward of their properties. There are a variety of issues around these structures, including:

- None of the structures have been designed or certified by an appropriately experienced coastal engineer and most are unlikely to provide appropriate long-term protection. Historically, several structures have been destroyed or severely damaged by past storm events.
- In some places, the structures have given rise to “end effects” erosion on adjacent properties. These effects also appear to have been a significant factor in damage to various houses and property in the July 1978 storm.
- The structures commonly reduce the width of high tide dry beach adjacent to the properties, adversely impacting on natural character, visual amenity and recreational values. Access along the beach is frequently precluded at higher stages of the tide, particularly in the vicinity of Iti Lane where a high tide dry beach rarely ever occurs. These effects increase in severity with shoreline erosion.
- It appears that most existing structures have not been legally established or consented – apart from one rock wall granted short-term consent (as an interim measure to protect the property from end effects erosion related to adjacent unauthorized structures).
- Many existing seawalls appear to be wholly or partially located on reserve and TCDC as landowner has not granted permission for these structures. A policy paper presently being considered by TCDC advocates that permission not be granted for such works

on Council owned foreshore. In the past, Council has also requested that the works be removed.

- There are potential liability issues for management agencies and property owners in regard to these structures.

Figure 3: Cooks Beach property currently protected by a rock wall.



Past discussions with property owners have also indicated that the majority favour management options that hold the shoreline seaward of their properties.

However, in the past, at least one present owner has relocated his dwelling further landward in response to erosion.

1.5 Response of Management Agencies

In response to the erosion problems at Cooks Beach and other sites, TCDC introduced 30m and 60m hazard setbacks at all developed beaches along the Coromandel east coast in the early 1980's - among the earliest hazard setbacks adopted either in New Zealand or internationally (as shown on Figure 2).

The 30m setback defines the area potentially at high risk from coastal erosion. New building is excluded in this area, including the replacement of existing dwellings. The 30m

TCDC introduced 30m and 60m hazard setbacks at all developed beaches along the Coromandel east coast in the early 1980's

setback has generally been firmly implemented for new houses at Cooks Beach and elsewhere. Typically, the only exceptions granted have been on the basis of property-specific hazard assessments and recommendations by suitably qualified coastal specialists. However, there are apparently complications in relation to existing use rights if the new dwelling is similar in scale to the existing. Most existing houses within the 30m setback area were consented before the provision was introduced – though there was one occasion in the late 1990’s when extensive renovation of a dwelling occurred well within the 30m setback, giving rise to serious concerns from an adjacent owner who had relocated his dwelling further landward some years earlier. However, overall, there is little question that the application of the 30m setback has generally been effective and that a greater number of dwellings would be exposed to severe risk if this setback had not been in place over the last two decades.

The 30-60m setback identifies a lower risk area, unlikely to be impacted unless erosion is aggravated by sea level rise or other changes. New dwellings are usually consented within this area, conditional on relocatability and a damage waiver indemnifying Council. A Section 36 notice is also normally imposed.

Environment Waikato has recently proposed modified setback lines for Cooks and other developed beaches on the Coromandel. The Primary Development Setback (PDS) is similar to the existing 30m setback, but fixed in position.

Environment Waikato and TCDC have also made several attempts to assist owners identify an appropriate long-term management option.

2 Social Aspects

This section outlines the social characteristics of the community, including population, visitor numbers and main attractions, as well as beach use and users.

2.1 Population and Ratepayers

Cooks Beach is primarily a holiday resort, with 79% of the 845 ratepayers being absentee owners (Lesley McCormick, Area Manager, TCDC Whitianga, pers. comm., July 2004). These numbers include properties in the surrounding rural area where the proportion of absentee owners may be less. For instance, of the 729 properties in the immediate beach area, approximately 89% appear to be absentees (determined from owner address information supplied by Environment Waikato – Cooks Beach and Whitianga addresses being adopted as locals and all others as absentees).

Cooks Beach is primarily a holiday resort, with 79% of the 845 ratepayers being absentee owners

The majority of the absentee owners are from the Auckland (55%) and Waikato (34%) regions (calculated from owner address information supplied by Environment Waikato). These proportions are very similar to the Coromandel as a whole – where ratepayers from the Auckland region make up about 52% of absentees and those from the Waikato about 35% (data from table supplied by Peter Wishart, Forward Planning Manager, TCDC, June 2004).

The settlement has a permanent population of nearly 180 (Lesley McCormick, Area Manager, TCDC Whitianga, pers. comm., July 2004). However, during summer the population expands significantly. For instance, in the summer of 2003/04 there were about 5,934 people in this area (including Flaxmill Bay and Ferry Landing), with an average of 6.1 people per property (TCDC 2004).

There is no information on visitor numbers to Cooks Beach over a total year. However, visitor information for the Coromandel as a whole indicates a marked seasonality, with visitor numbers peaking in December and January and a trough from May to October (Tourism Coromandel, 2004). This marked seasonal variation may be further exaggerated at Cooks Beach, given the overwhelming dominance of absentee ratepayers in this community and the relatively limited motel accommodation in this area. At Cooks Beach, peak visitor numbers probably occur over summer, with lesser peaks during holiday periods such as Easter, Queen's Birthday, Labour weekend and school holidays.

The permanent population in the Coromandel as a whole is projected to increase by 20% between 2001 and 2021 (Tourism Coromandel, 2004), though the increase at Cooks Beach may be less, given the strong dominance of absentee ratepayers.

2.2 Main Visitor Attractions

The relatively sheltered, crescent shaped white sandy beach that stretches the full length of the town is probably the central attraction at this destination.

Other local attractions include Shakespeare Point and the cove of Lonely Bay at the western end of the beach, and Purangi Estuary at the eastern end. The beach is also only a short distance from Ferry Landing, with various interesting walking tracks, elevated views and a regular ferry service to Whitianga. The Hahei Marine Reserve and Hotwater Beach, very popular visitor destinations, are also relatively short drives (10-15 minutes) from Cooks Beach.

Visitor accommodation is limited but includes a motor camp. Many absentee owners also rent their homes out for holiday visitors. There are also motels nearby at Flaxmill Bay and Homestead Bay.

2.3 Beach and Beach Use

General observations suggest that the major activities at this beach include walking, beachcombing and relaxing all year round and, in summer, swimming and sunbathing. Boating activities are popular during summer and there are several moorings off the beach.

There is good public access to the beach over the full length, with wide public reserves, parking and beach views in the central area.

The entrance to Purangi Estuary, adjacent to the affected erosion area, has an attractive picnic area popular with families. The estuary also contains a boat ramp that is widely used, despite a shallow entrance bar, because of the sheltered nature of the beach. Fishing from the beach also occurs.

The western end of the beach has a high dune, which screens development from the foreshore. Native coastal trees and shrubs have also extensively re-established in this area, providing high natural character.

3 Economic Aspects

This section briefly discusses available information relevant to the economic aspects of the beach and the erosion hazard.

3.1 Tourism in Coromandel and Role of Beaches

Tourism is an important industry in the Coromandel. According to recent research, the Coromandel attracted 1.1 million visitors in 2002; who collectively spent \$244 million. It is also envisaged that visitor numbers will increase by a further 16.9% by 2009 (Tourism Coromandel, 2004).

While a breakdown of visitor numbers and origin is not available for Cooks Beach, figures for the Coromandel as a whole indicate that international visitors make up 21%, with the remaining 79% of domestic origin. Of the domestic visitor nights, 60.5% are people from Auckland region and 21% from the Waikato (Tourism Coromandel, 2004).

In terms of spending by visitors, figures for the Coromandel as a whole indicate that international visitors average \$109/head/day and domestic visitors \$59/head/day. Domestic visitors are projected to grow at an average of 1.4% per year and international visitors at 5.3% per year – with international visitor spending projected to grow to \$138/day and domestic visitor to \$61/day by 2009 (Tourism Coromandel, 2004).

“It is envisaged that visitor numbers will increase by a further 16.9% by 2009”

Information on the role and importance of beaches to Coromandel tourism is limited. However, overseas work has generally concluded that beaches are of particularly significant economic importance in coastal areas, like the Coromandel, where tourism is important. The limited available information suggests this is probably also the case for the Coromandel. For instance, research by Tourism Coromandel has found that unspoiled recreational beaches and a clean, spectacular coastline are one of the eight special experiences essential to the character and appeal of the Coromandel region to visitors (Tourism Coromandel, 2004). Similarly, the presence of numerous beaches is identified as the key to the attraction of domestic visitors who make up 79% of visitors to the Coromandel (Tourism Coromandel, 2004).

The importance of Cooks Beach as a visitor destination is unknown, though it was ranked among the top 10 beaches visited by respondents to a recent beach survey in the Waikato Region (Environment Waikato, 2003). The peak visitor numbers noted above also suggest the beach may have significant economic importance – though average visitor spending is probably below the figures noted above since most of the visitors are staying in local homes rather than visitor accommodation. Further work would be required to assess the present

economic importance of Cooks Beach as a visitor destination. Similarly, in regard to substitutability of this beach; i.e. whether degradation of this beach would reduce visitor and other economic returns to the Coromandel or simply divert these returns to other Coromandel sites.

3.2 Property Values and Influence of Erosion Hazard

The extensive development of the coastal dune plain backing Cooks Beach and the ongoing development in this and surrounding areas indicates that the beach has significant economic importance - this attraction probably being the main reason for the existence of Cooks Beach as a holiday settlement.

Property values also provide some indication of the value of the site - most properties having values in excess of \$200,000.

Beachfront property values at Cooks Beach are high, as with most Coromandel beach settlements - with market values in excess of \$800,000 and typically in excess of \$1.1 million.

However, there is evidence that the erosion and related issues are impacting adversely on beachfront property values at Cooks Beach. At the time of the most recent valuation, the average capital value of beachfront houses in the erosion-affected area at the eastern end (117 to 165 Captain Cook Road) was approximately \$840,000. This contrasts markedly with similar properties immediately adjacent to the west (83 to 115 Captain Cook Road), which have an average capital value of about \$1,124,000 - approximately \$285,000 higher than the properties in the erosion affected area (based on CV data supplied by Environment Waikato in June 2004).

Beachfront property values at Cooks Beach are high- with market values in excess of \$800,000 and typically in excess of \$1.1 million.

This is also consistent with recent observations that properties in the erosion-affected area have sold relatively slowly compared to other beachfront properties on the Coromandel - unless owners were prepared to accept values far less than is typical for beachfront properties.

It is not clear whether the decreased property values reflect the erosion hazard, the uncertainty associated with lack of an effective long-term solution, and/or the adverse effects of existing structures on beach values. However, a recent overseas study indicates that beachfront property values were unaffected by protection works that adversely impacted on beach values - though the values of properties further landward were reduced against what they would otherwise have been (Kriesel, W. and Friedman, R. 2003). Therefore, it is probable that it is the erosion hazard and/or associated uncertainties that are primarily responsible for the reduced property values.

The expenditure on property protection works to date is unknown with many constructed by the owners themselves and extensive repairs and/or replacements undertaken over time. The total expenditure over the last 20-30 years may therefore be reasonably high.

4 Historic Heritage

Cooks Beach has been relatively well assessed by field archaeologists in the past and there is therefore a good level of information available on historic heritage. There are two main sites with high historic heritage values at Cooks Beach, the area of Council reserve adjacent to the Purangi Estuary and the inland dunes (Warren Gumbley, pers. comm.). These two areas are shown on Figure 4. However, archaeological information held by Environment Waikato does show a recorded midden and flaking area inland from the study area (circled in Figure 5), although this is sufficiently landward to not be affected by the CEMS.

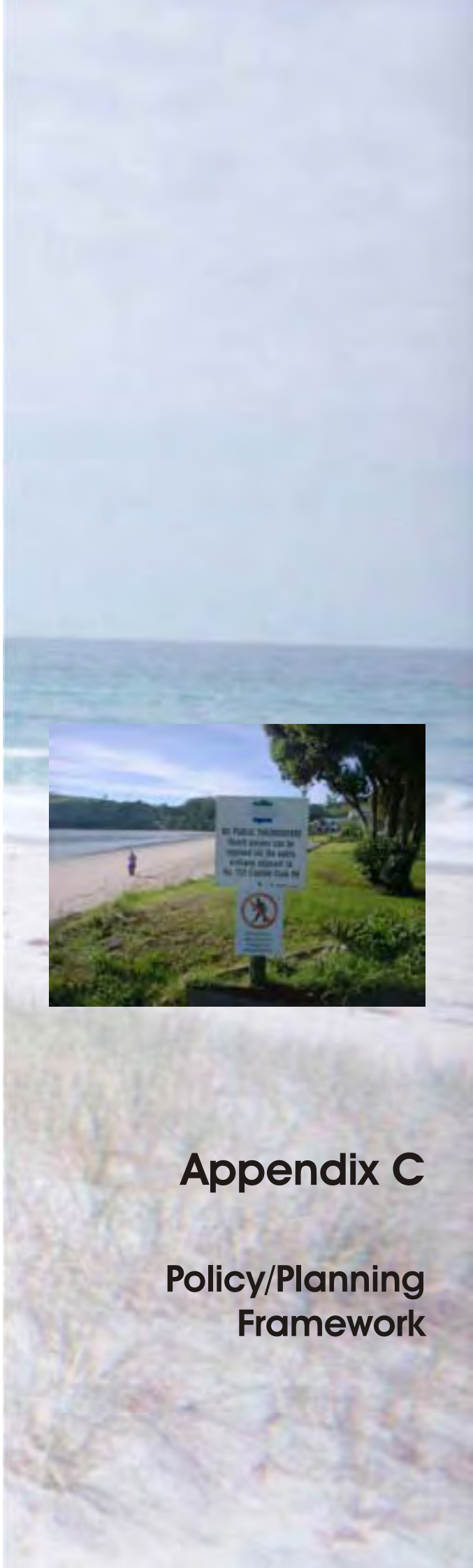
Overall it is considered that the frontal dunes of Cooks Beach are so dynamic that there are unlikely to be any remaining intact archaeological sites (Warren Gumbley, Regional Field Archaeologist, New Zealand Historic Places Trust, pers. comm. July 2004).

Figure 4: Two main areas where archaeological sites have been discovered at Cooks Beach



Figure 5: Archaeological sites for Whitianga and Cooks Beach held in EW register.





Appendix C

Policy/Planning Framework

Table of Contents

1	Introduction	1
2	Statutory Framework.....	1
2.1	Resource Management Act 1991.....	1
2.2	Hauraki Gulf Marine Park Act 2000	4
2.3	New Zealand Coastal Policy Statement	5
2.4	Waikato Regional Policy Statement	6
2.5	Waikato Proposed Regional Coastal Plan.....	9
2.6	Thames Coromandel Proposed District Plan	13
2.7	Draft Thames Coromandel District Council Landowners Policy	14
2.8	Local Government Act 2002	14
2.9	Civil Defence Emergency Management Act 2002	15
2.10	Building Act 1991	16
2.11	Soil Conservation and Rivers Control Act 1941	16
2.12	Reserves Act 1977	16
3	Non Statutory Documents	17
3.1	Coastal Erosion Risk Mitigation Strategy for the Waikato Region.....	17

1 Introduction

Once finalised through community consultation the Coastal Erosion Management Strategy (CEMS) for Cooks Beach will provide overarching direction to both the district and regional council when managing the coastal erosion hazard at Cooks Beach. The focus of the CEMS as a non-statutory document is to go beyond the Resource Management Act 1991 with a wider Local Government Act 2002 approach but that is intended to tie in with existing management documents (including the District Plan, Annual Plans and financial plans). It is therefore important to recognise the influence that national, regional and district strategic and policy documents provide to the CEMS.

The following sections outline the planning framework for the management of coastal erosion hazards in the Cooks Beach area and the statutory framework currently used to administer coastal hazards. It also discusses non-statutory documents that have been prepared in association with coastal erosion hazards management of relevance to this site.

2 Statutory Framework

2.1 Resource Management Act 1991

The Resource Management Act 1991 (RMA) provides a framework for integrated and sustainable management of natural and physical resources. Avoidance or mitigation of coastal hazards must be undertaken in a manner that achieves the purpose and principles of the RMA, and must be consistent with the provisions of the relevant statutory documents which derive from it. Part II, IV, V, VI, X, XII, the fourth schedule and relevant case law derived from the RMA are discussed further below.

2.1.1 Part II - Purpose

Section 5 of the RMA states that its purpose is to promote the sustainable management of natural and physical resources. The term “*sustainable management*” is defined to mean:

“...managing the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural wellbeing and for their health and safety while:

- (a) Sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and*
- (b) Safeguarding the life-supporting capacity of air, water, soil and ecosystems; and*
- (c) Avoiding, remedying or mitigating any adverse effects of activities on the environment.”*

Sections 6, 7 and 8 set out matters that must be considered in carrying out functions and duties under the RMA. Section 8 requires that the principles of the Treaty of Waitangi be taken into account.

2.1.2 Part IV

Part IV of the RMA , relates to functions, powers and duties of central and local government. It includes Section 30 which sets out the functions of regional councils including:

- “(c) The control of the use of land for the purpose of-
 - (iv) the avoidance or mitigation of natural hazards’
- (d) In respect of any coastal marine area in the region, the control (in conjunction with the Minister of Conservation) of -
 - (v) Any actual or potential effects of the use, development, or protection of land, including the avoidance or mitigation of natural hazards.....”

Section 31 sets out the functions of territorial authorities which includes:

- “(b) The control of any actual or potential effects of the use, development, or protection of land, including for the purpose of the avoidance or mitigation of natural hazards....”

Section 32 states that before a proposed plan, proposed policy statement, change, or variation is publicly notified an evaluation must be carried out by the local authority that must examine the extent to which each objective is the most appropriate way to achieve the purpose of the RMA and whether, having regard to their efficiency and effectiveness, the policies, rules, or other methods are the most appropriate for achieving the objectives (including an assessment of the benefits and costs of policies, rules or other methods). Therefore, this strategy document provides an assessment of coastal management options that is consistent with an analysis required by Section 32. Section 32 of the RMA will also be relevant if options which require a plan change, such as rezone beachfront land to open space, are pursued.

Section 35 of the Act requires every local authority to gather, monitor and keep “records of natural hazards to the extent that the local authority considers appropriate for the effective discharge of its functions”.

2.1.3 Part V

Part V of the RMA sets out the requirements for policy statement and plans. Under Sections 62, 65, 68, 75 and 76, regional policy statements, regional coastal plans and district plans shall include policies, methods and rules to manage the effects of natural hazards, and the effects of land use on natural hazards where this is considered a “significant resource management issue”.

2.1.4 Part VI

Section 106(1) within Part VI of the Act states that a consent authority may refuse to grant a subdivision consent if it considers that either-

- “(a) Any land in respect of which a consent is sought, or any structure on that land, is or is likely to be subject to material damage by erosion, falling debris, subsidence, slippage, or inundation from any source; or
- (b) Any subsequent use that is likely to be made of the land is likely to accelerate, worsen, or result in material damage to that land, other land, or structure, by erosion, falling debris, subsidence, slippage, or inundation from any source, or
- (c) Sufficient provision has not been made for legal and physical access to each allotment to be created by the subdivision.”

Conditions under 106(1) must be for the purposes of avoiding, remedying, or mitigating the effects referred to in 106(1) and of a type that can be imposed under Section 108 of the RMA (conditions of resource consents).

2.1.5 Part X

Part X of the Act relates to Subdivision and Reclamations and includes Section 220 which provides for a condition of subdivision consent to be imposed to protect land against hazards.

2.1.6 Part XII

Part XII of the Act includes a provision relating to emergency works to take preventative or remedial action to avoid or mitigate any sudden event causing or likely to cause loss of life, injury or serious damage to property. The important tests for application of this section are the demonstration of both immediacy and urgency.

2.1.7 Fourth Schedule

The Fourth Schedule to the Act requires that Assessments of Environmental Effects to accompany resource consent applications should consider risks to the neighbourhood, wider community or the environment through natural hazards.

2.1.8 Common Law Property Rights

Recent case law (*Falkner vs. Gisborne District Council*) has established that common law property rights relating to the use of land, and the right to protect property from the sea, are subject to the purpose and principles of the RMA. The effect of this is that any coastal erosion management works must obtain all necessary statutory approvals as applicable, and must be consistent with the fundamental purpose of the RMA (to promote sustainable management of natural and physical resource), the principles of the RMA including matters of national importance, principles, objectives and policies in other plans.

Summary

Avoidance or mitigation of coastal hazards must be undertaken in a manner that achieves the purpose and principles of the RMA.

2.2 Hauraki Gulf Marine Park Act 2000

The eastern coast of the Coromandel Peninsula is included in the area defined as the Hauraki Gulf Marine Park and therefore the Hauraki Gulf Marine Park Act 2000 (HGMPA) is relevant to the site.

Section 7 of the HGMPA recognises the national significance of the Hauraki Gulf and the importance of sustaining the life supporting capacity of the environment of the Hauraki Gulf (including its islands and catchments).

Section 8 of the HGMPA outlines the objectives of the management of the Hauraki Gulf, its islands and catchments as follows:

- “(a) the protection and, where appropriate, the enhancement of the life-supporting capacity of the environment of the Hauraki Gulf, its islands, and catchments:*
- (b) the protection and, where appropriate, the enhancement of the natural, historic, and physical resources of the Hauraki Gulf, its islands, and catchments:*
- (c) the protection and, where appropriate, the enhancement of those natural, historic, and physical resources (including kaimoana) of the Hauraki Gulf, its islands, and catchments with which tangata whenua have an historic, traditional, cultural, and spiritual relationship:*
- (d) the protection of the cultural and historic associations of people and communities in and around the Hauraki Gulf with its natural, historic, and physical resources:*
- (e) the maintenance and, where appropriate, the enhancement of the contribution of the natural, historic, and physical resources of the Hauraki Gulf, its islands, and catchments to the social and economic well-being of the people and communities of the Hauraki Gulf and New Zealand:*
- (f) the maintenance and, where appropriate, the enhancement of the natural, historic, and physical resources of the Hauraki Gulf, its islands, and catchments, which contribute to the recreation and enjoyment of the Hauraki Gulf for the people and communities of the Hauraki Gulf and New Zealand.”*

Section 9 of the HGMPA states that Regional Councils and territorial authorities must ensure that any part of a regional policy statement, regional plan, or district plan that applies to the Hauraki Gulf, its islands, and catchments does not conflict with Sections 7 and 8 of the HGMPA, which are deemed by Section 1 of the HGMPA to constitute a New Zealand Coastal Policy Statement.

Summary

The Hauraki Gulf is nationally significant and therefore consideration must be given to the HGMPA in the management of Cooks Beach. Sections 7 and 8 of the HGMPA constitute a New Zealand Coastal Policy Statement.

2.3 New Zealand Coastal Policy Statement

The purpose of the New Zealand Coastal Policy Statement 1994 (NZCPS) is set out in Section 56 of the Resource Management Act which states: *“the purpose of a New Zealand Coastal policy statement is to state policies in order to achieve the purpose of this Act in relation to the coastal environment of New Zealand.”*

The NZCPS includes the following principles of particular relevance to the management of coastal hazards:

- ‘7. The coastal environment is particularly susceptible to the effects of natural hazards.’*
- ‘12. The ability to manage activities in the coastal environment sustainably is hindered by the lack of understanding about coastal processes and the effects of activities. Therefore, an approach which is precautionary but responsive to increased knowledge is required for coastal management.’*

Relevant policies include:

- 1.1.2 It is a national priority for the preservation of the natural character of the coastal environment to protect areas of significant indigenous vegetation and significant habitats of indigenous fauna in that environment by:
 - (c) protecting ecosystems which are unique to the coastal environment and vulnerable to modification including estuaries, coastal wetlands, mangroves and dunes and their margins...**
- 1.1.5 It is a national priority to restore and rehabilitate the natural character of the coastal environment where appropriate.*
- 3.2.1 Policy statements and plans should define what form of subdivision, use and development would be appropriate in the coastal environment, and where it would be appropriate.*
- 3.2.2 Adverse effects of subdivision, use or development in the coastal environment should as far as practicable be avoided. Where complete avoidance is not practicable, the adverse effects should be mitigated and provision made for remedying those effects, to the extent practicable.*
- 3.3.1 Because there is a relative lack of understanding about coastal processes and the effects of activities on coastal processes, a precautionary principle should be adopted towards proposed activities, particularly those whose effects are as yet unknown or little understood...*
- 3.4.1 Local authority policy statements and plans should identify areas in the coastal environment where natural hazards exist.*
- 3.4.2 Policy statements and plans should recognise the possibility of a rise in sea level, and should identify areas which would, as a consequence be subject to erosion and/or*

inundation. Natural systems which are a natural defence to erosion and/or inundation should be identified and their integrity protected.

- 3.4.3 *The ability of natural features such as beaches, sand dunes, mangroves, wetlands and barrier islands, to protect subdivisions, use or development should be recognised and maintained, and where appropriate, steps should be required to enhance that ability.*
- 3.4.4 *In relation to future subdivision, use and development, policy statements and plans should recognise that some natural features may migrate inland as a result of dynamic coastal processes (including sea level rise).*
- 3.4.5 *New subdivision, use and development should be so located and designed that the need for hazard protection works is avoided.*
- 3.4.6 *Where existing subdivision, use or development is threatened by a coastal hazard, coastal protection works should be permitted only where they are the best practicable option for the future. The abandonment or relocation of existing structures should be considered among the options. Where coastal protection works are the best practicable option, they should be located and designed so as to avoid adverse environmental effects to the extent practicable.*
- 3.5.3 *In order to recognise and provide for the enhancement of public access to and along the coastal marine areas as matter of national importance, policy statements and plans should make provision for the creation of esplanade reserves, esplanade strips or access strips where they do not already exist, except where there is a specific reason making public access undesirable.”*

Summary

The NZCPS emphasises the use of the best practicable option for coastal hazard management where there is existing subdivision use or development. The NZCPS promotes the use of natural protection measures (such as maintaining dune buffers) in coastal hazard management and the adoption of the precautionary principle where the effects of activities in the coastal marine area are unknown.

2.4 Waikato Regional Policy Statement

The operative Waikato Regional Policy Statement (October 2000) (WRPS) sets out the significant resource management issues along with providing policies and methods to achieve integrated management of the Region's natural and physical resources.

This integrated and co-ordinated approach to resource management gives regional policy statements a central role in ensuring that integrated management takes place and that the purpose of the RMA is achieved. The WRPS will provide policy guidance/direction to territorial authorities.

Regional policy statements must not be inconsistent with any national policy statement, a New Zealand coastal policy statement or any water conservation order³. Regional plans and district plans must not be inconsistent with the regional policy statement or other

regional plans or any national policy statement, New Zealand coastal policy statement or water conservation order.

Section 3.5 of the WRPS outlines the significant resource management issues associated with the coast. The following is a summary of significant resource management issues that have been identified from the overview section on coastal management:

- Inappropriate subdivision, use and development within the coastal environment results in loss of natural character.
- Any decline in coastal water quality can reduce its life supporting capacity, and/or result in decreased cultural, recreational and commercial value.
- Failure to consider the interconnected nature of coastal processes and interagency responsibilities may result in unforeseen adverse effects.
- Conflict between the demand for public access to and along the coastal marine area, and the need to restrict access for conservation, safety, security or defence purposes.
- The emission of excessive noise from within the coastal environment can adversely affect amenity and conservation values.

Relevant policies include:

“Policy Two - Recognition of Natural Processes: Ensure that the subdivision, use and/or development of the coastal environment are undertaken in a way, or at a rate which recognises and provides for the unique processes operating in this environment.

Policy Three – Precautionary Approach: Adopt a precautionary approach when managing the coastal environment which recognises the likely occurrence of events in the coastal environment of high potential impact and low probability.

Policy Four – Coastal Hazards: Promote the use of ‘soft-engineering’ or non-engineering solutions to avoid or mitigate the adverse effects of natural hazards in the coastal environment.”

The environmental results anticipated in regard to natural character are 1) significant coastal areas, features and processes protected, 2) no further inappropriate subdivision, use or development and 3) reduced use of hard engineering solutions to coastal erosion and hazards.

Section 3.5.7 outlines the importance of public access in the coastal environment and states an objective is *“Public access to and along the coastal marine area, and to public coastal lands maintained or enhanced except in defined circumstances.”*

The principle reason for adopting this objective is given as *“People's enjoyment of the coast depends on access, both to and along the coast. Appropriate subdivision design and layout and the provision of access roads/walkways would increase the opportunity for public use of coastal areas. In some cases private property rights extend down to the high tide line, making public access unavailable. Access in such cases would need to be negotiated with landowners.”*

Integrated management in relation to public access will be necessary as access to the coast generally occurs on the landward side of mean high water spring. That is, there will be

both territorial authority and regional council input into the provision of public access. For example, the Environment Waikato (EW) will advocate to territorial authorities for the provision of esplanade reserves and walkways in heavily used areas of the coast. These can both provide access to the coast and to public coastal lands, and assist in channelling pedestrian traffic away from more sensitive areas.

Section 3.8 of the RPS is the most important section to the coastal erosion strategies as it outlines Regional issues around Natural Hazards.

The following is a summary of significant resource management issues that have been identified from the overview section on natural hazards:

1. The roles and responsibilities of local authorities and other agencies for the management of natural hazards in the Waikato Region have not been agreed or clearly identified. Until this is done, inefficiencies and/or a duplication of functions may occur.
2. A lack of public awareness of the causes and potential effects of natural hazard events increases the likelihood of adverse effects when these events occur.

The WRPS defines the regional and territorial authority roles (as required by the RMA) when dealing with natural hazards as follows:

“The Waikato Regional Council (Environment Waikato) will:

- *develop specific objectives, policies, rules and/or other methods in regional plans for the avoidance or mitigation of natural hazards in the coastal marine area and in the beds of rivers and lakes*
- *take a lead role in the collection, analysis, storage and communication of natural hazard information to territorial authorities*
- *prioritise risks from natural hazards across the Region for further investigation, in consultation with territorial authorities and the Region’s community*
- *develop, in conjunction with territorial authorities and the wider community, hazard specific mitigation plans for managing the risks associated with natural hazards*
- *implement those aspects of mitigation plans that are relevant to Environment Waikato’s functions*
- *co-ordinate responses to regionally significant natural hazard events with those of territorial authorities, network utility operators, government departments and other relevant agencies*
- *support the development and implementation of environmental education programmes related to specific natural hazards.*

Territorial authorities will:

- *develop specific objectives, policies, rules and/or other methods in district plans that control the use of land (except for in the beds of lakes and rivers and the coastal marine area) for the avoidance or mitigation of natural hazards;*
- *deliver environmental education programmes on local natural hazards to their communities*

- *implement relevant hazard specific mitigation plans through building consents and other regulatory and non-regulatory methods;*
- *provide information on the presence of natural hazards at specific sites through land information memoranda and project information memoranda where such information is known by the territorial authority;*
- *work in partnership with the Waikato Regional Council (Environment Waikato) and their communities to ensure efficient and effective response and recovery to natural hazard events including planning for emergencies."*

The methods indicate that EW will usually be in an integrating role involving aspects such as the provision of expert advice, support and co-ordination. Implementation Method 1 identifies that, only in circumstances where Environment Waikato has specific functions for managing hazards under legislation, Environment Waikato take a more leading role. In contrast, Implementation Method 2 identifies that territorial authorities and the local community will be responsible for implementing many of the strategies and plans for managing natural hazards through methods such as rules and environmental education. This differentiation is appropriate because territorial authorities are best placed to determine the most efficient and effective methods for managing natural hazards in their districts as part of their district plan, strategic plan and annual plan development processes and through methods such as setting floor levels in building consents.

Section 3.8.4 outlines the adverse effects of natural Hazards and has the following relevant policies.

"Policy One - Ensure the occurrence of natural hazard events are prevented or the associated adverse effects are avoided or mitigated.

Policy Two - Ensure new subdivisions and developments are built in a manner designed to avoid or mitigate the adverse effects of natural hazards.

Policy Three - Raise public awareness of the causes and effects of natural hazard events (and the means by which their effects can be avoided or mitigated) and ensure that the community are prepared for civil defence emergencies."

Summary

The WRPS does not preclude development in the regions coastal areas but rather recognises the need to retain the unique natural values that characterise coastal areas. The WRPS outlines the separate functions of both the territorial and regional authority in the management of the coastal environment but advocates an integrated approach.

2.5 Waikato Proposed Regional Coastal Plan

The Proposed Regional Coastal Plan for Waikato (WRCP) was notified in December 1994 and decisions on submissions were released in September 1998. The Environment Court in August 2003 determined the last remaining reference to the WRCP (notwithstanding those

that relate to the marine farming variation), however, the Minister of Conservation has yet to approve the plan so is therefore not deemed to be fully operative. The plan seeks to promote the sustainable management of resources in the coastal marine area of the Waikato region.

The Natural Character section of this plan states the natural character of the coastal environment of the Region is a fragile and finite resource that is vulnerable to irreversible alteration and damage. The section also states that protection of the CMA from inappropriate subdivision, use and development includes restoration and/or enhancement of any natural character values that may have been adversely affected, to avoid adverse cumulative effects.

Structures in the coastal marine area are given discretionary activity status in the WRCP so long as they are not located in an area identified as waahi tapu and the Hydrographic Office of the Royal New Zealand Navy, and the Maritime Safety Authority are given written notice of the details of the structure before it is erected (Rule 16.4.24). The assessment criteria for structures in the CMA are as follows:

- i. the extent to which the activity will adversely affect any conservation value within the ASCV areas as marked on maps in Appendix III and described in Appendix IV of this Plan; and*
- ii. the Decision-Making Criteria and Considerations which are set out in Appendix II of this Plan, and which are relevant to this activity; and*
- iii. the extent to which the structure has a functional need for location in the CMA; and*
- iv. the extent to which the structures will be designed, constructed and maintained to a standard to withstand coastal processes and relative changes in sea level; and*
- v. the extent to which the structure results in cumulative effects; and*
- vi. the extent to which the structure provides for public use and access.*

This Rule recognises that there are a variety of structures which are appropriately located in the CMA. However, it is also recognised that cumulative effects, amenity values and natural character need to be considered on a site by site basis. It is therefore important that the effects of such structures are managed."

Temporary structures for hazard management are given controlled activity status as follows:

"The erection or placement of any structure in the CMA, for a period of time less than three months, for the sole purpose of managing hazard risk is a controlled activity provided it complies with the standards and terms stated in this Rule:

Standards and Terms

- It shall be demonstrated that there is a functional need for the structure to be located in the CMA.*
- The structure shall not restrict public access to the CMA.*
- The structure shall be totally removed from the CMA within three months of the issue of a Resource Consent under this Rule.*

The matters over which the Regional Council reserves control are:

- *location of the structure,*
- *material used,*
- *method of placement,*
- *method of removal”*

Policy 3.1.5 promotes the restoration of natural character in areas where it has been degraded recognising that one mechanism for enhancing areas is to undertake planting.

Section 3.4 of the WRCP recognises the need to take into account the effects of coastal processes and the dynamic nature of the coast when considering use or development in the CMA and adopting a precautionary approach when effects of activities are unknown (as outlined in the NZCPS).

Chapter 5 of the WRCP discusses structures and identifies that structures in the CMA can adversely affect natural character, public access and amenity values, impact on natural processes, and conflict with other uses. Policy 5.1.1 states that existing structures that were not lawfully established will need to be assessed against the objectives of the plan and either authorised or removed.

The Natural Hazards section of this plan is the most relevant to these coastal strategies. It has policies relating to the avoidance or mitigation of coastal hazard risk to people and property and acknowledges that effective management requires an integrated approach to the avoidance or mitigation of hazard risk as most effects are felt above the line of mean high water springs (and therefore in territorial authority managed areas).

Policy 8.1.1 directly refers to the production of site specific management strategies such as the ones for Cooks and Buffalo Beaches and states that these strategies may be guided by the plan but may also result in subsequent changes being made to the Plan. Policy 8.1.3 promotes the protection of natural features that provide a buffer against natural hazards (such as dunes).

Policy 8.1.4 specifically applies to coastal protection structures and aims to ensure that any use of structures to control coastal erosion is necessary and avoids or remedies any adverse effects on other coastal processes and on natural character. This is in recognition of the fact that some structures can aggravate the hazard problems and degrade natural character values.

The environmental results anticipated by the natural hazards section in the WRCP is

1. increased public awareness of coastal hazards and associated risks,
2. adverse effects on people and property avoided or mitigated,
3. dune and wetland habitats protected,
4. amenity and natural character values protected, and
5. reduction in ‘hazard protection’ structures.

Section 9 of the WRCP emphasises that public access within the CMA (i.e. along the foreshore and across the water) should not be unduly restricted. Policy 9.1.2 says that the

Regional Council should identify areas in the coastal environment where public access should be enhanced, and support the development of landward reserves and walkways in those areas.

Methods for implementing the WRCP are given below:

17.7.4 Appropriate Management Options

In managing hazard risks, Environment Waikato will emphasise:

- proactive management of hazard risk by the avoidance of hazard risks,
- the use of district planning controls to restrict new or further development in areas of potential hazard risk,
- the use of measures which will protect and/or enhance natural buffers between coastal development and the sea,
- the avoidance of hazard management options which adversely affect public access and coastal values, in particular shore-line armouring works.

Principal Reasons for Adopting: Community consultation is critical in the management of hazard risk. Managing the interface between the coast and land also requires an integrated management approach with territorial authorities. The above options will most effectively avoid or mitigate hazard risk while protecting public access and coastal values. Soft engineering options such as beach nourishment or set back zones recognise that structures can not only interfere with wave patterns and sand transport, resulting in additional or transferred problems of erosion or accretion, but can also have adverse effects on natural character.

17.7.9 Protection of Natural Features

Environment Waikato will consult with the Department of Conservation and territorial authorities to ensure natural features that provide a buffer against natural hazards are protected and restored. Provision must be made for possible landward migration of features e.g. dunes and wetlands.

Principal Reasons for Adopting: Such 'buffering' features occur above and/or below Mean High Water Springs, therefore requiring co-ordination between organisations. It is important to leave undeveloped areas between land development and the sea to accommodate possible landward migration of dune and wetland systems, should a rise in sea level occur.

17.8.2 Consultation with Territorial Authorities

EW will consult with territorial authorities to ensure that any near shore subdivision, use or development does not restrict public access, unless such a restriction is necessary, and that public access is provided to as much of the foreshore of the coast as possible.

Principal Reasons for Adopting: Because territorial authorities control subdivision and development above Mean High Water Springs, it is through them that EW must advocate the retention of public access. Any restrictions on access to these areas implemented by EW would apply only to the CMA. Situations where restrictions on public access may be necessary are set out in Policy 3.5.1 of the NZCPS.

Summary

The WRCP has a natural character section that promotes the restoration of degraded areas and the enhancement of natural character.

The Natural Hazards section of this plan is the most relevant to these coastal strategies. It has policies relating to the avoidance or mitigation of coastal hazard risk to people and property and acknowledges that effective management requires an integrated approach to the avoidance or mitigation of hazard risk as most effects are felt above the line of mean high water springs (and therefore in territorial authority managed areas).

2.6 Thames Coromandel Proposed District Plan

The Thames Coromandel Proposed District Plan (TCDP) was publicly notified in March 1997 and attracted a large number of submissions, and further submissions. The Proposed Plan was publicly notified in December 1999.

The TCDP recognises that the District's landscape contains substantial areas of significant landscape including the coastal environment, which is of national significance and has been determined to be of outstanding value. In particular, Dunelands and spits are described as outstanding landscape features that are particularly sensitive to development, due both to their dynamic character and lack of visual backdrop.

In accordance with Section 6(a) of the Act the TCDP also recognises that natural character is a matter of national importance and that the coast is highly valued for scenic, ecological and cultural reasons (Principle reason 212.6.1 and 213.6.2).

The natural hazards section of the TCDP states four objectives (222.3):

1. *To avoid the effects of natural hazards as far as practicable.*
2. *To avoid the creation of natural hazards as far as practicable.*
3. *To promote the protection of existing physical resources where practicable and sustainable.*
4. *To avoid the establishment of hard engineering structures as far as practicable, especially within the coastal environment."*

These objectives have supporting policies in the section.

Rule 452.5 of the TCDP states that coastal defence structures are a non-complying activity with a note that this rule applies to both public and private property.

The TCDP has noted that coastal erosion areas setback standards are applied and enforced under the Building Act 1991 as follows:

- No Buildings: Structures shall not be located within 30m inland from the toe of the natural shoreline or seaward vegetated toe of the foredune on the East Coast.
- Relocated Buildings: May be situated between the 30m and 60m hazard lines, East Coast (as measured above), provided that Council may require a greater setback or building to be relocatable in other circumstances if required because of the severity of the erosion risk.

2.7 Draft Thames Coromandel District Council Landowners Policy

The Thames Coromandel District Council (TCDC) is currently considering a draft policy paper that recommends soft engineering options be used for Council foreshore property at risk from coastal erosion.

The policy paper investigated options ranging from do nothing through to permitting works that incorporate a range of coastal hazard mitigation measures encompassing both soft and hard responses. As part of the policy report each option was summarized in terms of its advantages and disadvantages, including the legal implications of options. The report recommended that TCDC permit works that work with natural processes. If adopted, this policy would mean that Council, as landowner, would allow only soft engineering structures as an option to protect coastal reserves and the private land behind.

2.8 Local Government Act 2002

The Local Government Act (LGA) requires stopped roads along the margins of the coast (along Mean High Water Springs) to be vested in Council as esplanade reserves. The Local Government Act 2002 also establishes the means by which Council may collect financial contributions for funding the acquisition, maintenance and development of reserves.

2.8.1 Long Term Council Community Plan (LTCCP)

Section 93 of the Local Government Act 2002 states that a local authority must have, at all times, a long-term council community plan. Section 93 (6) states that the purpose of a long-term council community plan is to –

- “(a) describe the activities of the local authority; and
- (b) describe the community outcomes of the local authority's district or region; and
- (c) provide integrated decision-making and co-ordination of the resources of the local authority; and
- (d) provide a long-term focus for the decisions and activities of the local authority; and
- (e) provide a basis for accountability of the local authority to the community; and

- (f) *provide an opportunity for participation by the public in decision-making processes on activities to be undertaken by the local authority."*

Schedule 10 of the LGA includes things that must be included by a local authority in a LTCCP.

Both EW and TCDC have LTCCP's with a number of outcomes stated in relation to the coastal environment.

In particular a community outcome stated in the TCDC LTCCP is "*Social: a healthy, safe and secure community*". Among the actions required to achieve this is the statement "*protect our communities from natural hazards*".

The EW LTCCP states a desired community outcome of "*The community is actively managing the coast in an integrated way that allows for dynamic natural processes, preserves natural values and provides timely planned solutions to accommodate a variety of coastal uses.*" It is from this desired community outcome that the strategy vision was developed.

2.9 Civil Defence Emergency Management Act 2002

The Civil Defence Emergency Management Act, 2002 (CDEMA) also gives central government, regional and territorial authorities responsibility for civil defence planning, response and recovery. The civil defence responsibilities for these authorities are outlined in national, regional and local civil defence plans, known as Civil Defence Emergency Management Plans (CDEM Plans). CDEM Plans must state and provide for:

1. local authorities that have united to establish the CDEM group,
2. the hazards and risks to be managed by the Group,
3. the civil defence emergency management necessary to manage the hazards and risk,
4. the objectives of the plan and the relationship of each objective to the National Civil Defence Management Strategy,
5. the apportionment between local authorities of liability for the provision of financial and other resources for the activities of the Group, and the basis for that apportionment,
6. the arrangements for declaring a state of emergency in the area of the Group, and
7. the arrangements for co-operation and co-ordination with other groups.

Central government agencies and local authorities are not the only agencies with legal responsibilities for the management of natural hazards; network utility providers, businesses and individuals have the ability to reduce their exposure to risk from natural hazards.

2.10 Building Act 1991

Under Section 36(1) of the Building Act 1991 (BA), territorial authorities are required to refuse to grant building consent for a new building or major alteration unless they are satisfied that adequate provision has or will be made to protect the land or building from natural hazards.

If the building work will not accelerate or worsen the situation affecting the land then Council can grant building consent as long as the title is notated to state that the land is subject to a hazard.

2.11 Soil Conservation and Rivers Control Act 1941

The Soil Conservation and Rivers Control Act 1941 (SCRCA) regulates soil management and river works associated with hazard management. Soil conservation relates to land management practices to reduce erosion and flooding hazards and to maintain the soil resource. EW has responsibilities for administration of the SCRCA in the Waikato.

2.12 Reserves Act 1977

The Reserves Act 1977 (RA) enables the formation of esplanade reserves and esplanade strips (in accordance with the purposes outlined in the RMA) where land adjoins the coast. The key difference between these two provisions being that esplanade strips are not fixed in position but maintain their position relative to the coast (or other body of water), even if the coast moves.

While the RA is based on public use and access, often reserve areas are used to provide buffers of coastal land through managed retreat, or adaptation responses where coastal hazards have been identified. Without explicit reference to buffer functions in a reserve management plan, it is questionable whether reserve areas can be treated in this way by Territorial Authorities because their buffering function may impact upon their specified use for reserve or open space recreation reserve¹.

2.12.1 Cooks Beach Reserves Management Plan

Under Section 41 of the RA, a reserve administering body shall, within five years after the date of its appointment or within five years after the commencement of the RA, whichever is the later, prepare and submit to the Minister for his approval a management plan for the reserve under its control, management, or administration.

The Cooks Beach Reserves Management Plan (CBRMP) was adopted in December 1986. The CBRMP states that along the Cooks Beach beachfront are Esplanade and Recreation reserves and sand dunes that are "*fragile*". Much of these reserves have eroded away over time. The management plan requires that all work undertaken on the sea front reserves is under the direct control of TCDC. It also goes on to state (paragraph 322) that it is Council policy that (with one exception) there are no "*defended*" beaches in the District.

¹ Coastal Hazards and Climate Change: a Guidance Note for Local Government in New Zealand, March 2004. Ministry for the Environment, Wellington.

The CBRMP states two objectives (6 and 7) in particular that related to beachfront reserves in the study area are:

6. *To maintain the stability of these reserves and;*
7. *To maintain the safety and pleasantness of these reserves."*

3 Non Statutory Documents

3.1 Coastal Erosion Risk Mitigation Strategy for the Waikato Region

The Coastal Erosion Risk Mitigation Strategy for the Waikato Region (CERMS) outlines the way risk mitigation will be approached in the Waikato with regard to coastal erosion. The purpose of the CERMS is to promote integrated and sustainable management of coastal erosion hazard.

The strategy has four major elements:

1. Central focus – relevant to the management of coastal erosion hazard at all sites in the Region;
2. Site Specific Hazard Management Strategies – relevant to difficult problem sites (e.g., Buffalo and Cooks Beaches).
3. Guidelines for the Use of Coastal Structures – recognising that these devices will continue to be relevant in the management of coastal erosion at some sites in the immediate future; and
4. Ongoing Monitoring and Investigations – to develop and refine the strategy over time.

Summary - Policy/Planning Framework

The focus of the Cooks Beach CEMS as a non-statutory document is to go beyond the RMA with a wider LGA approach but that is intended to tie in with existing management documents (including the TCDP, Annual Plans and financial plans). It is therefore important to recognise the influence that national, regional and district strategic and policy documents provide to the CEMS. The following summarises the statutory environment that needs to be considered in strategy development.

- Avoidance or mitigation of coastal hazards must be undertaken in a manner that achieves the purpose and principles of the RMA. The theme through RMA case law appears to be that although district councils can exercise some judgement about whether to allow a subdivision or development, councils cannot ignore responsibilities for avoiding or mitigating effects of natural hazards in favour of reliance of controls under the Building Act.
- The NZCPS emphasises the use of the best practicable option for coastal hazard management where there is existing subdivision use or development. Overall the NZCPS emphasises the use of natural protection measures and the adoption of the precautionary principle where the effects of activities in the coastal marine area are unknown.
- The WRPS does not preclude development in the regions coastal areas but rather recognises the need to retain the unique natural values that characterise coastal areas. The WRPS outlines the separate functions of both the territorial and regional authority in the management of the coastal environment but advocates an integrated approach.
- The Natural Hazards section of the WRCP has policies relating to the avoidance or mitigation of coastal hazard risk to people and property and acknowledges that effective management requires an integrated approach to the avoidance or mitigation of hazard risk as most effects are felt above the line of mean high water springs.
- The TCDP has identified coastal erosion areas setback standards that are applied and enforced under the Building Act.
- TCDC is currently considering a draft policy paper that recommends soft engineering options be used for Council foreshore property at risk from coastal erosion. If adopted, this policy would mean that Council would allow only soft engineering structures as an option to protect coastal reserves and the private land behind.
- Both EW and TCDC have operative LTCCP's with a number of outcomes stated in relation to the coastal environment.
- The CBRMP states that (with one exception) there are no "defended" beaches on the Coromandel.
- The CERMS provides guidelines for the use of coastal structures as well as ongoing monitoring and investigations.



Appendix D

Screening of Options

1 Initial Screening Assessment

1.1 Introduction

The option(s) selected for the CEMS needs to be capable of managing the risk from the identified cause of the coastal erosion, have acceptable environmental effects and have reasonable and practicable costs associated with it thus achieving triple bottom line outcomes. The background research and workshop produced a range of options available for managing coastal erosion at Cooks Beach, some of which are not technically or practically feasible. To refine the number of options that were to undergo a full triple-bottom line assessment the following checklist of possible options and combination of options was completed for Cooks Beach. These options were then assessed at an initial screening level to determine whether they are technically or practically viable. Those options identified as viable were then carried through to the next stage to be assessed more thoroughly for social, economic and environmental impacts.

Factors that resulted in some options being impractical included:

- design issues (e.g. an incompatibility between the structure being considered and the site conditions);
- structures which will present unacceptable safety issues (such as adverse navigational effects); and/or
- options that would have unrealistic costs making them unfeasible to implement.

Factors such as these are known as ‘fatal flaws’ and justified the removal of the option from the selection process. Fatal flaws of each option possible for management of coastal erosion at Cooks Beach were considered at this stage and justifications given in the table below as to why those options were discounted.

National policy and best practice directs any assessment of options for managing coastal erosion to a clear hierarchy of responses. This hierarchy of responses is considered to be an options feasibility assessment based on the following:

- Tier 1: Non-Structural Options, e.g. do nothing, management (protection) of natural systems and natural defences.
- Tier 2: Soft Structural Options, e.g. beach dewatering.
- Tier 3: Hard Structural Options, e.g.: seawalls, groynes and offshore breakwaters.

This hierarchy of response options directs those assessing options to Tier 1 as the most preferred option and Tier 3 as the least preferred option. (This hierarchy is also defined in the Glossary, Appendix J).

2 Cooks Beach Checklist

Tier	Option	Viable	Reason/Justification option not considered viable – ‘Fatal Flaw’
3	Status quo	√	
1	Living with coastal erosion (removal of any existing structures and let nature take its course)	√	
1	Commercial rezoning of beach front land	X	This option would involve the rezoning of the beachfront land from Coastal to Town Centre Zone (this would require a Variation to the Proposed TCDP). There is considered to be insufficient existing and future demand at Cooks Beach for Town Centre zoning to be a useful or justifiable option. Cooks Beach is generally considered to be a residential beach (e.g. locals and absentee owners) and not a significant destination for visitors to the Coromandel who would require the use of services that would be provided on commercial land (e.g. cafés and motels). The beach is not visible from the road and Flaxmill Bay is probably more important for general visitors than Cooks Beach.
1	Council purchase of private land + relocation + rezoning to open space/reserve	√	
1	Transferable development rights	X	Transferable development rights are where the development rights for land in private ownership are transferred/compensated for with another site. This is unlikely to be useful/practicable at Cooks Beach. The value of beachfront properties are too high to be compensated by development rights elsewhere. This option would be primarily used to protect undeveloped land in private ownership, which is not the situation at this site.
2	Beach and dune replenishment without retaining structures	X	This option involves placing sand (from either a local or non-local source) on the beach and dune without structures and replanting of the dunes with vegetation to assist the dune to rebuild naturally. This would require very large volumes of sand at Cooks Beach (probably close to 500,000 cubic metres), as the entire beach would have to be nourished. Sand placed only in front of properties would disperse alongshore without some form of retaining system. This option has proved to be successful at Mission Bay in Auckland only due to the structure (groyne) placed at the eastern end of the beach. The required volumes of suitable sand would be difficult and expensive to obtain for this site – probably having to be dredged from 8-15m depth along the inner continental shelf, several kilometres from Cooks Beach (if available at all) due to the large amounts required. Therefore, even if suitable sand could be found, the option would be very expensive – probably in excess of \$12 million.

Tier	Option	Viable	Reason/Justification option not considered viable – ‘Fatal Flaw’
2	Beach dewatering	X	Beach dewatering is an erosion management option where a series of pipes are laid beneath the beach and dune to lower the water table by extracting the water in the sand and pumping it to a pumping station. The system is based on the idea that, when the water table under the beach is lower than under the ocean, sand accretion is enhanced. As each wave rushes up the beach, water from the wave easily drains through the dry beach, leaving part of its suspended sand load on the beach. Less water drains back into the ocean taking less sand with it ¹ . This option is most appropriate for beaches where there is excess water in the sand over long periods of time, essentially the beach is ‘water logged’ and thus more susceptible to erosion by the backwash of waves. The aim is to remove the water and stabilise the beach, the excess water can then be redistributed further inland. Not yet a widely accepted and well-tested approach with no test site yet in New Zealand. A number of test sites have been set up in Europe that have shown that lowering of the water table in beaches can have some beneficial effects, mainly enhanced accretion in fair weather rather than erosion protection during storms ² . This option is therefore unlikely to be practical at Cooks Beach due to the large dynamic shoreline fluctuations experienced (i.e. up to 30m of erosion). There is a high risk that the pipework would be exposed by erosion and damaged. The fine sands with poor permeability at Cooks Beach would also require a relatively high density for the pipework underlying the beach.
2	Dune restoration	X	This option involves the restoration of the existing dune through rebuilding the dune with imported sand and replanting with native vegetation, which will hopefully trap more sand and build up the dune over time. The existing seawalls encroach onto the active beach and there is insufficient space in front of these walls to establish a sustainable dune. Past experience has been that a temporary feature can develop in places but is removed during severe erosion events. The hazard at Cooks Beach is related to short-term storm cycles rather than long-term erosion. An option of this type is more suitable to beaches undergoing dynamic fluctuations where there is a reasonable area in front of properties to build up a dune buffer. If structures were removed, the option would essentially be the same as the “Living with Erosion” option that is being evaluated.
3	Seawall	√	
3	Seawall + nourishment without beach perpendicular retaining structure (such as a groyne)	X	This option involves building a new seawall and placing sand (from either a local or non-local source) on the beach and dune without a structure perpendicular to the beach. The nourishment would require very large volumes of sand at Cooks Beach (probably close to 500,000 cubic metres) as the entire beach would have to be nourished. Sand placed only in front of properties would disperse alongshore without some form of retaining

¹ www.unesco.org/csi/pub/source/ero11.htm

² Turner, I L & S P Leatherman (1997): Beach dewatering as a soft engineering solution to coastal erosion: A history and critical review. J Coastal Res, Vol 13, No 4, pp 1050-1063.

Tier	Option	Viability	Reason/Justification option not considered viable – ‘Fatal Flaw’
			system due to the effect of the ebb tide delta on the sediment movement along the beach. This option has proved to be successful at Mission Bay in Auckland only due to the structure (groyne) placed at the eastern end of the beach. The required volumes of suitable sand would be difficult and expensive to obtain for this site – probably having to be dredged from 8-15m depth along the inner continental shelf, several kilometres from Cooks Beach (if available at all) due to the large amounts required. Therefore, even if suitable sand could be found, the option would be very expensive – probably in excess of \$12 million for the nourishment alone.
3	Re-engineer existing seawalls	X	Re-engineering existing seawalls involves undertaking redesign of the seawalls and constructing a new seawall based on what is currently in place. There are a wide variety of existing seawalls at Cooks Beach in varying states of condition and few, if any, are built to proper engineering standards. If it were desired to have a properly engineered seawall at this location, it would be cheaper and more cost effective to build a new structure.
3	Backstop wall + relocation	√	
3	Groyne	X	A groyne is a structure that is normally perpendicular to the beach and is designed to trap sediment that is moving along the shore to build up a beach. Often the beach on the downdrift side of the groyne will end up being starved of sand and will suffer increased erosion as a result of the structure. Groynes are generally made from large rock boulders. A groyne at Cooks Beach would require beach nourishment in order to be a practicable option. It is now standard coastal management practice to nourish the beach on both sides of the groyne on sites like this (where there is not a large amount of sediment movement along the beach). Otherwise, there is potential for severe erosion problems on the downdrift side of structure.
3	Groyne + nourishment	√	
3	Offshore breakwater (either emerging or submerged)	√	