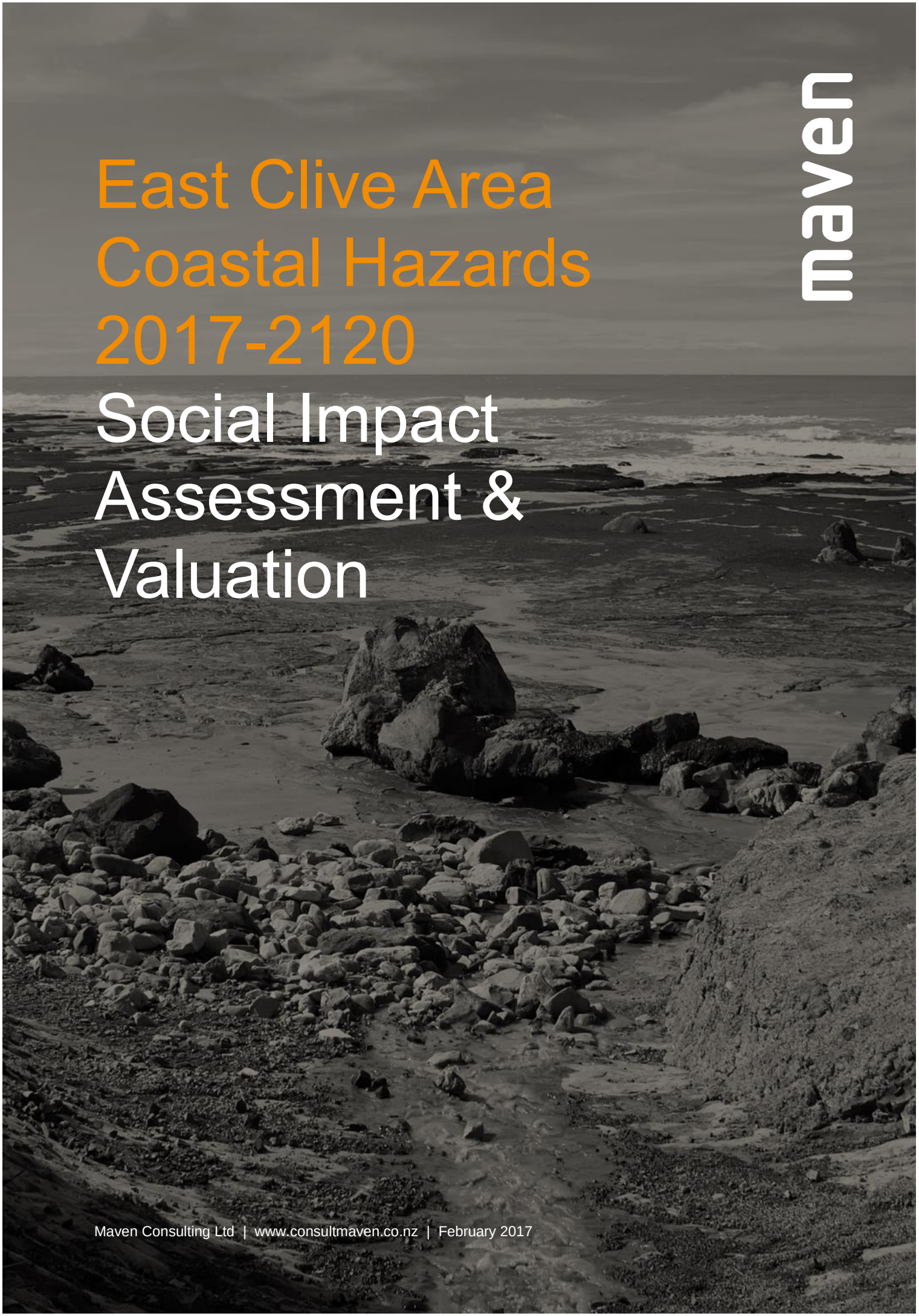

East Clive Area Coastal Hazards 2017-2120

Social Impact Assessment & Valuation

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Maven Consulting Ltd | www.consultmaven.co.nz | February 2017

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HASTINGS DISTRICT COUNCIL
HAWKE'S BAY REGIONAL COUNCIL
NAPIER CITY COUNCIL
Te Kaunihera o Ahuriri

Joint Councils
Clifton to Tangoio Coastal Hazard Strategy

C/- Hawke's Bay Regional Council
159 Dalton Street
Napier 4110
Attention: Michael Adye, Chairperson: Joint Committee

IMPORTANT NOTICE

While every effort has been made to ensure the information in this report is accurate, Maven has relied significantly on information provided and views expressed by others. As such, Maven does not accept any responsibility or liability for error of fact, omission, interpretation or opinion that may be present, nor for the consequences of any decisions based on this information.

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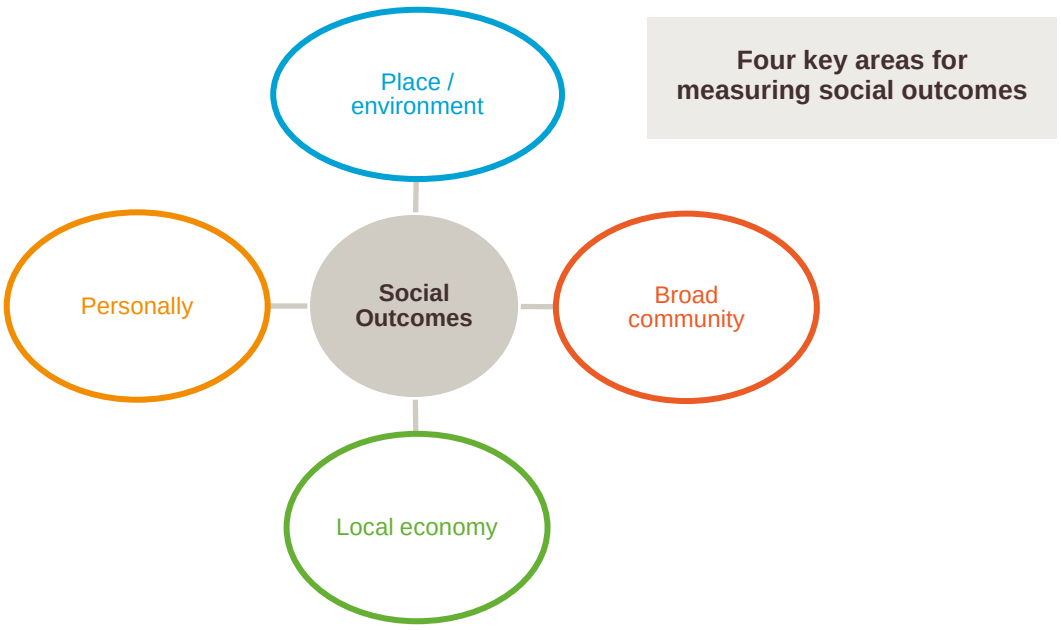
1.0 Part One – Synopsis

This study considers the social impacts and outcomes from coastal hazards that may affect the East Clive / Clive area between now and 2120. The assessment is based on projections of increasing erosion or storm surge inundation through sea-level rise, as discussed and projected in maps prepared by Tonkin and Taylor in its May 2016 report - Clifton to Tangoio Coastal Hazards Strategy 2120: Coastal Hazard Assessment.

Although this report intended to monetise social outcomes arising from East Clive / Clive area coastal hazards, (using the same methodology applied by Maven in the Cape Coast Social Impact study) it has not been possible to achieve this particular objective. This is because erosion and inundation map projections, together with interviews with residents, tend to suggest the likelihood of coastal hazard social impacts and outcomes for the area are much longer term eventualities – perhaps three or five decades away. It is not possible for residents and community stakeholders to accurately visualise and describe social outcomes for the four areas of focus below, when they are so far into the future. Moreover, converting something that might occur in, say, fifty years' time to a net present value for financial measurement purposes does not deliver a meaningful result.



Nevertheless, it is considered that this East Clive / Clive social impact study still provides an important input as one of the range of criteria the Southern Cell Evaluation Panel will need to consider when deciding upon adaptation responses for the area. The study has achieved a clearer understanding of social issues and impacts, and also provided meaningful engagement for community stakeholders.

Cultural impacts for tangata whenua that arise from coastal hazards are not addressed in this report. They will be considered separately by the evaluation panel as part of determining an overall appropriate adaptation response.

To develop the social impact story for the East Clive community, interviews were conducted with a small number of local residents and stakeholders during February 2017. The small sample reflects the fact that the area only has around 220 residents and 80 dwellings. A range of background reports and data was also gathered to assist the overall analysis.

From interviews with residents it is apparent that though, in early post European settlement history, there were several sub-settlements of Clive, people now living in the East Clive area identify themselves as part of the wider region of Clive. For that reason, this study also considers some related coastal hazards and potential social impacts for the wider Clive area.

East Clive, per se, is geographically defined as the area bounded by Stafford St to the north, School Road to the west and the Tukituki River to the south as shown in the map. It has a small population of around 219 people and about 70 dwellings (from the 2013 census). The area is dominated by the nine hectare site of East Clive Wastewater Treatment Plant which processes all of Hastings District's wastewater before it is piped 2.75km to an offshore ocean outfall.

Overall, Clive (including East Clive) has a population of around 1,750 people and 650 dwellings. People interviewed liked the area as a place to live for the following reasons.

- Safe and accessible
- An overall sense of community and belonging and strong pride
- Beautiful lifestyle – a place where one should be – a quality of life like no other
- "Halfway-between" settlement (Napier and Hastings) allowing easy access to main centres for work or recreation
- A place of convenience for living – a hidden gem
- The coast's dynamic nature and "barrier beach" is special
- People love the fishing, whitebaiting, the scenery
- Local schooling is excellent

The East Clive area has a rich pre- and post-European settlement history, having been developed in the late 1800's as the main centre of activity and population in Hawke's Bay. One of its present characteristics is the collection of unconnected streets and large number of small land parcels established during this historical period that remain undeveloped, or which have been consolidated into larger lots and small farms with single dwellings.

The primary reason that Clive never became the main centre of business and population lies in its history, beginning in the late 1800's, of damaging flood events affecting an area which is inherently low-lying. Repeated flooding from high rainfalls and nearby rivers over the past several decades has resulted in a succession of flood control schemes for the area which include the diversion of the Ngaruroro River from its original path, the establishment of Clive River as backwater catchment, river stopbanks that now join a sea exclusion wall, and the development of the Muddy Creek drainage scheme.

Despite this level of flood protection, recent planning documents such as the 2016 Heretaunga Plains Urban Development Strategy have deemed the area as unsuitable for further residential growth citing the fact that sea level rise as a result of climatic changes may impact on groundwater levels in the area.

East Clive has been the historical site for waste water discharge for all of Hastings District since the 1930's. The Waste Water Treatment Plant (WWTP) was significantly upgraded in 2009 through an innovative system of biological trickling filters, and a 2.75km long outfall pipeline to the sea. The site appears vulnerable to inundation from coastal storm surges, but not for several decades. However, the outfall structure (on the seaward side of the exclusion wall) may be more vulnerable in the shorter term. Some residents in East Clive consider that the WWTP is a form of "insurance" for protection against future coastal hazards because they believe HDC would not allow it to be compromised or placed at any such risk of failure.

On the seaward side of the exclusion wall, the coastal area is dominated by the Waitangi Regional Park, a major development project under the management of HBRC which was approved in 2015. The project will include an upgrade of a number of key open spaces around the estuaries of the four key rivers – Tutaekuri, Ngaruroro, Clive and Tukituki. It comprises a 5km section of the coastal environment between Awatoto and Haumoana including the Muddy Creek wetland (near East Clive).

The park is considered by officials to have significant ecological importance. HBRC notes that the "estuaries include a mosaic of open waters, inter tidal flats, salt marsh and fresh water swamp resulting in a diversity of flora and fauna communities".

Coastal hazard maps suggest that, even under "Present" scenarios, the Waitangi Park area would not be significantly affected by erosion (based on 66% probability in a 1:10 AEP storm event). However much of the area will be subject to inundation from storm surge and sea level rise under Present scenarios and in a 1:100 AEP flood event.

Officials consider that there may be some investment required for restoration of the park after such a flood event, but that the recreational and ecological values inherent in the project would not be lost.

The main tourism feature in the area is the cycle and walkway trail that mainly runs along the crest of the stopbank protection system. Counts of cycle trails in the area suggest around 20,000

cyclists per annum use this section of the trail. When it was built in 2007 HBRC chose (for residential privacy reasons) to divert the pathway to 1.5 metres below the top of the stopbank for 635 metres distance in East Clive and for 200 metres distance in the Ferry Road area. These two lower sections would probably be inundated in any storm surge under present scenarios, but the adverse effect would likely be only temporary.

Similarly, the Evers Swindell Reserve on the banks of the Clive River is inundated during high flows in the Ngaruroro River and is inundated from time to time when the Ngaruroro River mouth is blocked or partially blocked as a result of low flows in the river and sea swells which build up the beach. This is considered unlikely to have any permanent adverse effect on the amenity.

Another important community landmark with a rich history is the Hohepa Home which is a disability service provider located on the northern side of the Clive River. Hohepa is closely linked to the Clive community and village through social events and errands. A small number of Clive residents also work at the site. Although Hohepa faces some unique people evacuation challenges when natural impacts occur (especially tsunami), reports prepared for Hohepa by Opus, and discussions with Hohepa management suggest that the complex is not at any risk of coastal erosion or storm surge flooding because it is reasonably well protected by stopbanks that surround the site between the Clive and Ngaruroro rivers.

The interview process yielded few issues of social concern (other than perhaps crime). One point that may drive this lack of concern is that, unlike the Cape Coast which is a close-knit and geographically distinct community, Clive is more dispersed and people are not so involved in neighbourhood or community activities and associations where social concerns might be discussed. Social networking is thus less effective than the Cape Coast community.

As with the Cape Coast community, there was a degree of antipathy towards local authorities. However, given that coastal erosion or sea-borne inundation are not seen as immediate threats by residents interviewed, criticism of local councils was more directed towards a general perception of historical inertia. Countering this, there was support expressed for the current evaluation and adaptation response process involving the southern cell evaluation panel.

Interviews suggested people living in East Clive have a strong perception that flood protection works and schemes provide excellent security against inundation from surrounding waterways and the sea. This sense of security is probably reinforced by the fact that there has not been any significant flood event in the area for the past few decades which would possibly enliven the issue again.

Some respondents suggested that most people in Clive would be completely unaware of any coastal hazard risk and that they draw comfort from flood protection schemes which will hold back any major event. One suggested that "95% of the people living in the area" were not interested in coastal hazards because either:

- They were only likely to become a problem long after they were gone; or
- They just didn't know about it.

Maps of projected flooding and coastal erosion in the East Clive area are attached as Appendix Two. As a general observation, by 2120 most of the Clive area is projected to be inundated by a storm surge from the sea given a 1:100 AEP storm event combined with projected sea level rise

over these decades. However the map projections also suggest that inundation from a similar size event up to and beyond 2065 should not lead to any breach of the existing stop bank structures and sea exclusion wall.

In East Clive, the position is similar in relation to flooding (i.e. stop banks provide protection) but there is a 66% probability that coastal erosion could begin to encroach on land and streets in the southernmost area nearest to the shoreline under the present scenario, given a 1:10 storm event.

The map projections therefore suggest that the lack of concern over coastal hazards expressed by residents is reasonably justified, at least under the Present scenarios.

Monetising the social outcomes of coastal hazards presents several unique challenges. These (inter alia) include that:

- The evaluation is best undertaken over short timeframes (say five years) when stakeholders can realistically visualise and express tangible outcomes, whereas coastal erosion and flooding will impact on a community over several decades.
- Estimates of coastal hazard effects are almost always based on percentage probabilities of the events occurring.

These two issues are particularly relevant to this East Clive study in that, at least among those people interviewed, residents do not see any significant near-term threat from coastal erosion and sea-borne flooding and any social outcomes from such a threat do not therefore arise. Nor, understandably, could they visualise (or even be concerned about) social outcomes that might arise in 50 – 100 years' time.

It is therefore not possible to derive a cost of negative wellbeing for residents in the area that is meaningful for the cell evaluation panel.

Since Maven's assessment is that residents in the East Clive area do not currently feel particularly threatened by coastal erosion or sea-borne flooding, it seems likely that any adaptation response for this area that may be proposed by the Southern Cell Evaluation Panel will be more in the nature of a public benefit for the purposes of protecting community, regional and tourism assets and infrastructure. This may include the cycle trail, Waitangi Park, and Muddy Creek reserve, which as noted above, are likely to be inundated by near-term coastal flooding, but able to be restored once such floods recede.

2.0 Part Two - Purpose of study

Hawke's Bay Regional Council (HBRC), Napier City Council (NCC) and Hastings District Council (HDC) – (together referred to as the Joint Councils) – are developing a co-ordinated Coastal Hazard Response Strategy for the Tangoio to Clifton coastline. This coastline is and will continue to be affected by coastal erosion and increased inundation risk from flooding[1] arising from sea level rises and climate change projected between now and 2120.

This work has now advanced to a point where adaptation strategies need to be settled upon and implemented, commencing 2018, for higher priority areas. These areas include part of the coastline that borders the East Clive area.

Decisions on adaptation strategies for the coastline south of the Port of Napier will be made by a Southern Cell Evaluation Panel that includes community representatives as well as other stakeholders. The panel will consider and weight a range of criteria to determine an optimal adaptation response for geographically based coastal units (sometimes referred to as cells) as defined by Tonkin and Taylor[2], along the coastline.

One important input to the panel's decision making is the social impact that erosion and flooding hazards impose on affected coastal communities.

Social impact on coastal communities influences adaptation strategies in two ways. Firstly, if the impact was especially high, then it might encourage decision makers more towards defensive strategies to defend the shoreline and coastal areas rather than less costly mitigation expenditure. Secondly, social impact of coastal hazards can influence the extent to which the costs of adaptation should be shared between private and public beneficiaries. For example, if coastal erosion resulted in the destruction of an important social amenity for a wider community such as the district or region, then some (or all) of the cost of defending, replacing or relocating that amenity might fairly be apportioned to that wider community rather than the coastal residents in the immediate vicinity.

During their work on the Coastal Hazards study, Joint Councils have received feedback from various stakeholders that an understanding (and measurement) of social impact is a critical factor that has perhaps been neglected, or received only passing acknowledgement in the past.

This study (and future ones focussing on other coastal cells) aims to redress that perception. Its purpose is to provide:

- A clearer understanding of social issues and impacts
- Meaningful engagement with community stakeholders
- Analysis of social outcomes that would occur if there were no human intervention to address coastal hazards (the "status quo" scenario)
- Where possible, an estimated monetary value on those outcomes using contemporary social impact measurement methodologies
- A key input to multi-criteria analysis by the evaluation panels for better decision making.

1 The work also includes evaluation of increased flooding from tsunami risk but this coastal hazard risk does not form part of the multi criteria analysis that will be undertaken by the evaluation panels discussed in this report.
[2] Clifton to Tangoio Coastal Hazards Strategy 2120: Coastal Hazard Assessment. Tonkin & Taylor, May 2016

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Monetisation of social outcomes is only possible if such outcomes can be realistically visualised and expressed by stakeholders. Therefore, they are more likely to be foreseeable and measurable, say, within the next five to ten years. On the other hand, coastal hazards are, by nature, likely to impact over several decades depending on the area of coastline affected. This longer-dated impact is an issue for the East Clive social assessment which is discussed later in this report.

3.0 Methodology

The main input for this report comes from a series of interviews with a relatively small sample[3] of East Clive residents together with background research on the area and discussion with local authority officials.

These interviews were conducted 7th – 9th February 2017. Some interviewees were directly approached by Maven because they are active community spokespeople or previous submitters who were thought likely to hold strong and informed views and perspectives on the social impact of coastal hazards. Four additional interviewees requested a meeting with Maven as a result of a series of public meetings held to discuss the evaluation panel process described above, during which people were invited to contribute to the social impact study. Two of these ultimately chose not to participate.

Interviews were conducted on a semi-structured basis and broadly followed the discussion topics that are attached to this report as Appendix One.

The interviews focussed on the positive features and values of living in the East Clive area, the wider social issues that challenge the community, and, especially, how people perceived the risk of coastal hazards to the community. It became apparent that East Clive describes a geographical area rather than a distinct community of interest. Residents in this area prefer to see themselves as residents of Clive rather than the smaller area unit of East Clive.

The focus of the interview process was to gain a view from respondents of how things might change in the East Clive (or wider Clive) community, in the short, medium and long terms, with ongoing erosion and flooding hazards in the area and no human intervention to mitigate that risk – a "status quo" scenario developed in the Cape Coast report recently completed by Maven.

Maven utilised a series of maps for sections of the shoreline and surrounding areas showing the potential extent of coastal erosion and inundation over the next 100 years[4]. These were used, as appropriate, during meetings to assist discussions and are attached as Appendix Two.

Aside from the interview process Maven researched a number of past reports and background information to support the conclusions in this study.

The available time to complete the study did not permit a quantitative survey of the whole community to better contextualise coastal hazards amongst other social issues in the Cape Coast area. However, as discussed later, it appears that coastal hazards are not a particularly visible or topical issue for residents in the area at the time of this study. Rather, coastal hazards are merged under the more general heading of flood protection for the Clive area given that it is surrounded by a number of waterways, is low lying, and has a long history of flooding, stopbank construction, river diversions and improved drainage schemes.

[3] Less than 10 people indicated an interest or were willing to participate. To put this sample in perspective, the total population of the East Clive area that is threatened by near-term coastal hazards was just under 220 in the 2013 census.
[4] See Coastal Hazards page - http://www.hbemergency.govt.nz/hazards/portal

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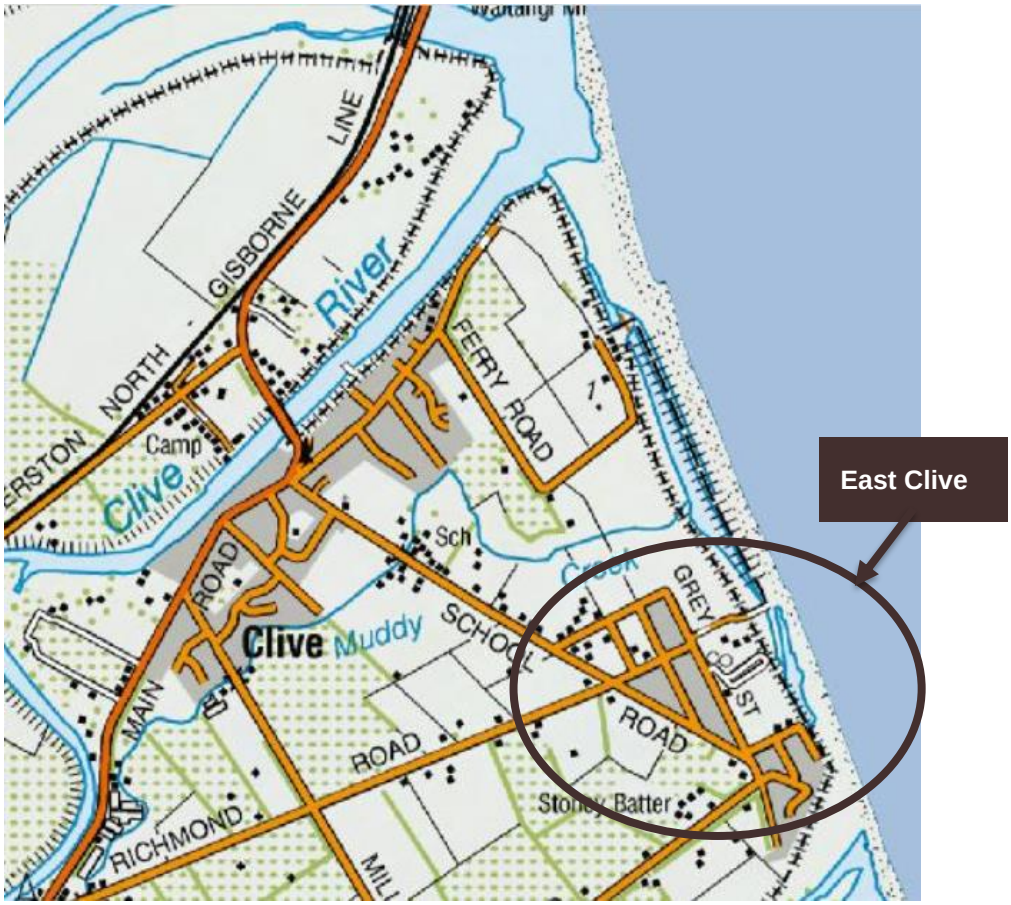
4.0 Background – East Clive / Clive

4.1 East Clive is a part of Clive

From interviews with residents it is apparent that though, historically, there were several sub-settlements of Clive , people now living in the East Clive area identify themselves with the wider community of Clive as the place in which they choose to live. For that reason, this study also considers some related coastal hazards and potential social impacts for the wider Clive area.

4.2 Description of area

East Clive, per se, is geographically defined as the area bounded by Stafford St to the north, School Road to the west and the Tukituki River to the south as shown in the below map. It has a small population of around 219 people and about 70 dwellings. The area is dominated by the nine hectare site of East Clive Wastewater Treatment Plant which processes all of Hastings District's wastewater before it is piped 2.75km to an offshore ocean outfall. This plant is discussed in more detail in Section 6.



The Clive area is located between Napier and Hastings on State Highway 2, mainly south of the Clive River spreading eastwards to the coast. The area is primarily comprised of low-density

residential development and rural lifestyle blocks supporting a small commercial centre. There is a Year 1-6 primary school and recreational facilities. As well as a small commercial area, a local medical centre and a few churches serve the area. A community constable served the Clive (and Cape Coast) district until August 2015 when the station was closed in favour of centralised policing from Hastings.

The residential area of Clive was described in the 2013 Hastings District Plan as a mix of both long established, and newly built residential properties.

The Plan noted that…….

> "the older area of Clive is centred around the main road (State Highway 2) and the river. The newer residential developments are located off Ferry Road and have been developed over the last ten years. There has been a new, albeit small, residential development on Farndon Road.
>
> The land surrounding the main residential area in Clive, is productive in nature although part of this area to the east is influenced by one of the early subdivision patterns. This area is referred to as East Clive and it is characterised by lifestyle sized lots, although the land does not have a zoning that reflects the smaller site sizes".

Additionally, the Plan observes that ……

> "the characteristics of the [area] are its open flat landscape and the river upon which much of the recreational values of the area are based. The flat landscape does make the area susceptible to flooding and this places limits on the ability of the residential area to grow. The residential environment is […] not large. Streets in Clive are cul-de-sacs or short connector streets creating a strong sense of community.
>
> There are two distinct residential components in the settlement. The first is the original area around the State Highway and extending back down Mill Road and Tucker Lane. Those properties that are located on the state highway and extend back to the riverbank are large and linear and many have been further subdivided if their size has allowed it. The [second] most recent residential development has occurred off Ferry Road, both along the edge of the riverbank and also in three cul-de-sac developments.
>
> There is little potential for any further development as a flood hazard affects the land beyond these current developments. This new development has lot sizes that are smaller than most of the residential lots in the earlier settled parts of Clive".

This view of limited development potential is echoed in the Heretaunga Plains Urban Development Strategy document (HPUDS) scheduled for completion in 2016. This confirms that the area is inappropriate for further residential growth. The reason advanced in HPUDS is that sea level rise as a result of climatic changes may impact on groundwater levels in the area.

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4.3 Demographics

The following data taken from the 2013 census provides some perspective on the size and demographics of the Clive area. As has already been noted, East Clive comprises a much smaller sub-set of this data – around 220 people and about 72 dwellings.

Metric	Total Clive area
Residential population	1,764 people (2.4% of Hastings total population).
No of dwellings	654
One family households	76% of all households (compared with 68% for whole of Hastings
One-person households	126 – average household size is 2.6 people
Owner-occupied dwellings	79.9% of dwellings (compared with 66.4% in Hastings District as a whole)
Median weekly rental	$280
Business locations	173 (compared with 8,862 in Hastings District) = 1.9%

4.4 Why residents choose to live in the area

Despite the limited prospect of future development growth, the area is considered by interviewees to have special character due primarily to its location near Clive River and the coast, and the compact and rural nature of the residential area.

Some individual reflections about the area provided by interviewees include:

- Safe and accessible
- An overall sense of community and belonging and strong pride
- Beautiful lifestyle – a place where one should be – a quality of life like no other
- "Halfway-between" settlement (Napier and Hastings) allowing easy access to main centres for work or recreation
- A place of convenience for living – a hidden gem
- The coast's dynamic nature and "barrier beach" is special
- People love the fishing, whitebaiting, the scenery
- Local schooling is excellent

5.0 History of the area

5.1 General overview

A useful synopsis of the history of the Clive area is provided in the HDC 2006-2015 Ten Year Plan document from which much of the following material has been extracted. Some additional material was provided by Hawke's Bay Heritage Trails group.

- The area was originally known as Waipureku and included the Ahuriri lagoon which was a vital resource during the occupation by Ngati Awa, Ngati Whatumamoa and Nga Tara. By the mid sixteenth century Rangitane also occupied the area. Most of these earlier occupants were partly displaced by Ngati Kahungungu under Taraia.
- By the early 19th century the region between the Ngaruroro and Tutaekuri Rivers was held by Te Whatuiapiti. By the mid nineteenth century, Waipureku was home to the rangatira, Kurupo te Moananui and his people.
- The first European settler in the Waipureku area was William Colenso who built the Ahuriri mission in 1844.
- The town was given the name Clive after Major-General Robert Clive, First Baron of Plassey (1725-1774). The town founder was a local run-holder Joseph Rhodes who purchased land on the south bank of the river in 1855.
- During this period and later decades Clive was the main centre of Hawke's Bay. There was more land around the Ngaruroro river mouth than near the government founded town of Napier and a wharf on the Clive River at Farndon offered an export outlet. The development of Napier's port and Clive's vulnerability to floods eventually limited its growth.
- The Clive economy was improved by the advent of the railway line built along the coastal route through Farndon in the early 1870's.
- In the 1850's and 1860's there were two hotels, several stores, a bakery, post office, public school, police station, a blacksmith, a ferry service over the Tukituki River, and a race course.
- As early as 1855 settlers formed a company and established a punt ferry service at the end of Ferry Road. The punt was replaced by the Ngaruroro Bridge in 1867 subsequently renamed the Farndon Bridge, and now called the Clive Bridge.
- In 1879 Clive became a town district and by 1887 it was a thriving community between Napier and Hastings centred in the East Clive area. There were three rendering plants, a flour mill, breweries, agriculture and a sawmill in the wider catchment.
- Roading infrastructure was improved in the early 1920's and Clive townsfolk formed a progressive association to promote town developments including a war memorial.

One of the features of the East Clive area is the large number of smaller land parcels that have either never been built on, or have been consolidated into larger lots and small farms with single dwellings. The number is understood to be an artefact of history when East Clive was expected to be the main centre of activity and population in Hawke's Bay. Several streets that

are named after politicians or royalty of the era remain unconnected, reflecting a residential subdivision plan for the area that never eventuated.

5.2 A history of flood protection schemes for the Clive area

Among those residents interviewed there is a theme of confidence in robust protection and security from inundation evidenced by their general awareness of Clive's flood history and schemes that have been developed over time to improve flood protection. For that reason it is considered useful to provide the evaluation panel with a brief history based on Maven's parallel research.

Waipureku (the original place name for Clive) means "meeting of the waters" and reflects the fact that the Tukituki and Ngaruroro Rivers once flowed together into a single outlet near the current overflow channels. The name also reflects the fact that most of the area's early development centred on East Clive.

Ongoing efforts to improve flood protection for Clive date as far back as 1897 when massive rainfall caused the Tutaekuri River to merge with the Ngaruroro and surge through the Clive township and surrounding land with resultant loss of life[5]. Authorities then decided to straighten the Ngaruroro between Clive and Fernhill and add stopbanks and borrowed $10,000 on a 25 year loan for this purpose. The scheme was derailed by the 1931 earthquake and river location and flooding remained a dominating issue across the district for decades. Eventually, in 1969 the last four kilometres of the river were diverted to the sea north of the township and the old river bed became a backwater now known as the Clive River, draining a smaller catchment.

A persistent heavy swell coinciding with high tides in August 1974 caused significant coastal inundation at East Clive in August 1974. This resulted in the gravel barrier being overtopped and the low-lying land behind being inundated with two hundred homes affected by floods. This event led to the construction of a new sea exclusion bank on the landward side of the gravel crest ridge. The sea exclusion bank joins continuously with the stopbanks on the Ngaruroro and Tukituki Rivers. Two groyne structures (one in 1988 and the second in 1993) were also constructed as part of this project to help maintain the integrity of the gravel barrier ridge.

In 2006 the Regional Council improved stop bank protection along the Clive River using gabion structures in recognition of the river's propensity to back up from the sea during flooding conditions and the need to provide greater protection.

As shown in Figure 1., the areas that are adjacent to river stopbanks (mostly residential and commercial) are considered to be at lower risk of flooding, but the central areas between the two major rivers (mostly rural) are deemed to be flood risk areas. Mitigation of this risk is partially achieved by the Muddy Creek flood protection scheme progressively added to since the 1950's which allows stormwater drains to flow into the creek and eventually out to a wetland between the sea exclusion wall and the beach crest ridge at East Clive. The Muddy Creek scheme is also serviced by pump stations which drain stormwater from the Clive and

[5] The loss of life occurred when people drowned after launching boats to try and rescue others trapped by floodwaters.

East Clive areas when water levels in the Muddy Creek lagoon are high due to river flood levels.

Figure 1 Flood hazard map showing river and sea stopbank protection (dotted lines) and inland areas susceptible to flooding (shaded purple).

As can be seen from the above brief synopsis, there has been an extensive history of flooding in the area, and, over time, progressive construction of river diversions, protection schemes and (now) a continuous series of stopbanks that surround the river waterways and sea.

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6.0 East Clive Waste Water Treatment Plant (WWTP)

As discussed in Section 4.2, the East Clive landscape is dominated by the WWTP. The East Clive location for Hastings sewerage outfall can be traced back to the 1930's when sewerage discharge was first established (mainly into the Ngauroro River) before a short outfall was established near the present site at East Clive. It expanded in the 1960's when Havelock North Borough, Whakatu and Clive all connected to the system.

In 1980 a third inland sewer was laid along with a 2,750m long offshore ocean outfall. The outfall is currently driven by a 2,800L/sec pump. Since 1990, the plant has undergone a number of changes to ensure milliscreening of wastewater before ocean discharge, culminating in the 2009 commissioning of two large tanks called the Biological Trickling Filters (BTF's) for the treatment of domestic and non-separable industrial wastewater. In June 2011, sealed covers were installed on top of the BTF tanks to assist in odour management.

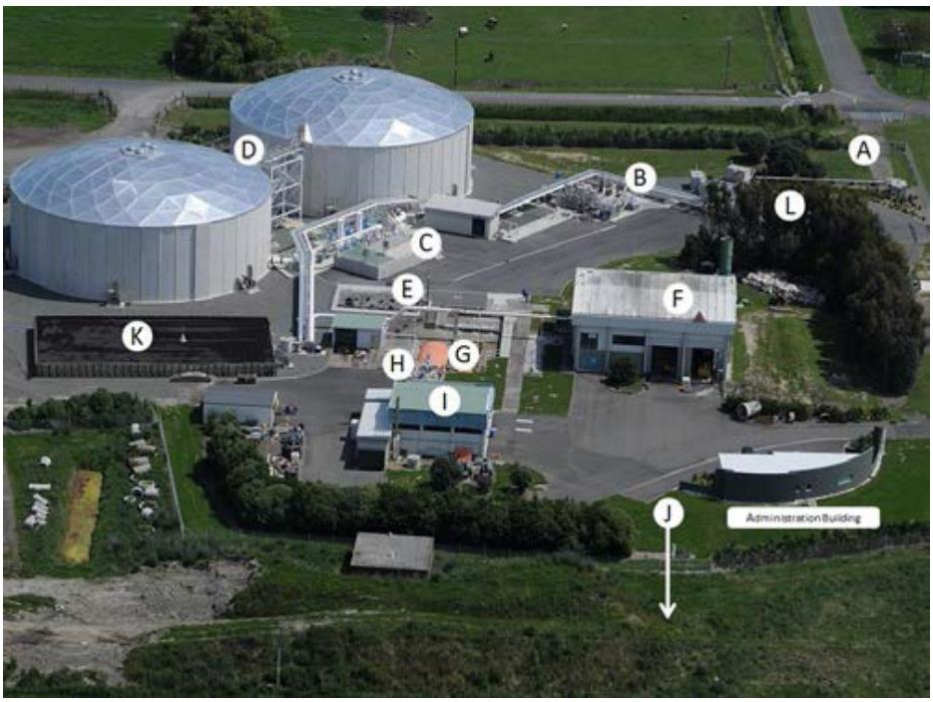


Figure 2 Overview of WWTP showing BTF tanks. "J" marks the point where the 2.75km long ocean outfall begins.

Source: Hastings Wastewater Resource Consents Project: Assessment of Effects on the Environment and Resource Consent Applications – Prepared by MWH – April 2013

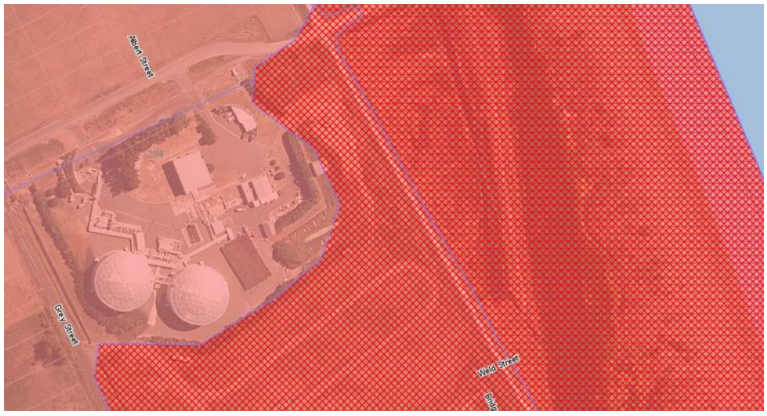
The significance of the WWTP for coastal hazards and social impact purposes is two-fold.

Firstly, coastal hazard maps prepared by Tonkin and Taylor[6] suggest the plant itself may be vulnerable to inundation from sea level rise and storm surges, though it is noted that such an event might only occur, (if at all), several decades into the future when the bunds surrounding the WWTP might eventually be overtopped.

[6] Coastal Hazards 2015-2025 Study (Tonkin and Taylor 2016) and associated mapping.

Figure 3 - Projected inundation from storm surge and sea level rise - 1%AEP - 2065

Figure 4 Projected inundation from storm surge and sea level rise - 1% AEP - 2120



A 2014 HBRC paper[7] suggested that WWTP outfall structures in the vicinity of the gravel barrier ridge are also at risk and observed that "inundation of this area could impact significantly on the operation of the Hastings sewerage treatment Plant".

Secondly, some residents interviewed during the survey regarded the WWTP as, in effect, an "insurance policy" for their coastal hazard protection since the Hastings District Council would be compelled to take any and all steps necessary to protect the plant from compromise or complete failure through sea-borne inundation given the resultant serious consequences for the Hastings District wastewater scheme.

[7] Extracted from Briefing paper to HBRC Environment and Services Committee – April 2014

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7.0 Parks and Reserves

There are two recreational reserves in the area. The first and by far the most significant is known as the Waitangi Regional Park which embraces the area from the Tukituki River mouth in the south to the combined Ngaruruoro and Tutaekuri River mouths in the north. A second reserve, the Evers-Swindell Reserve, is discussed in the next section.

East Clive Wetland (also known as Muddy Creek Reserve)

Although this area is included in the Waitangi Regional Park, given its importance to the East Clive community it is discussed separately here. This area is accessible at the end of Richmond Road past the WWTP across the seaward side of the exclusion wall. Alternatively it is also accessed via the cycle trail and walkway from Awatoto to the Black Bridge which passes along the top of the exclusion wall. As noted earlier, it is a small lagoon which acts as the outlet for Muddy Creek. The wetland is notable for its birdlife, which is said to include a community of threatened bittern species.

However there were varying opinions among some East Clive residents interviewed as to its ecological value.

Some thought the lagoon had become increasingly polluted by geese and that the number of species of birds frequenting the area had declined in recent years. One resident thought that a possible cause was the cessation of duck shooting in the lagoon area in 2013.

Waitangi Regional Park

Approved by the HBRC in late 2015, the Waitangi Regional Park development project will include and upgrade a number of key open spaces around the estuaries of the four key rivers – Tutaekuri, Ngaruroro Clive and Tukituki. It comprises a 5km section of the coastal environment between Awatoto and Haumoana including the Muddy Creek wetland described above.

HBRC considers that the park has significant ecological importance noting that the "estuaries include a mosaic of open waters, inter tidal flats, salt marsh and fresh water swamp resulting in a diversity of flora and fauna communities"[8].

The Park is significant for Maori, has important post-European history (William Colenso), is popular for recreational activity including whitebaiting and fishing, and is the site for a large part of a recreational cycleway as well as walking. An informal equestrian track exists. Jet boating, sailing, and rowing are also common activities within the Clive estuary. The development plan in Figure 5 shows the extent of the project from Awatoto south through east Clive to the Tukituki River and the ambitious range of biodiversity, public interest and recreational opportunities planned.

[8] Hawke's Bay Regional Parks Network - Waitangi Regional Park - Individual Park Plan 2015-2024 – Boffa Miskell - August 2014

Figure 5: Map (draft) showing planned development of Waitangi park - Source: HBRC Regional Parks Individual Development Plan - March 2014

Coastal hazard maps[9] suggest that, even under "Present" scenarios, the Waitangi Park area would not be significantly affected by erosion (based on 66% probability in a 1:10 AEP storm event). However much of the area will be subject to inundation from storm surge and sea level rise under Present scenarios and a 1:100 AEP.

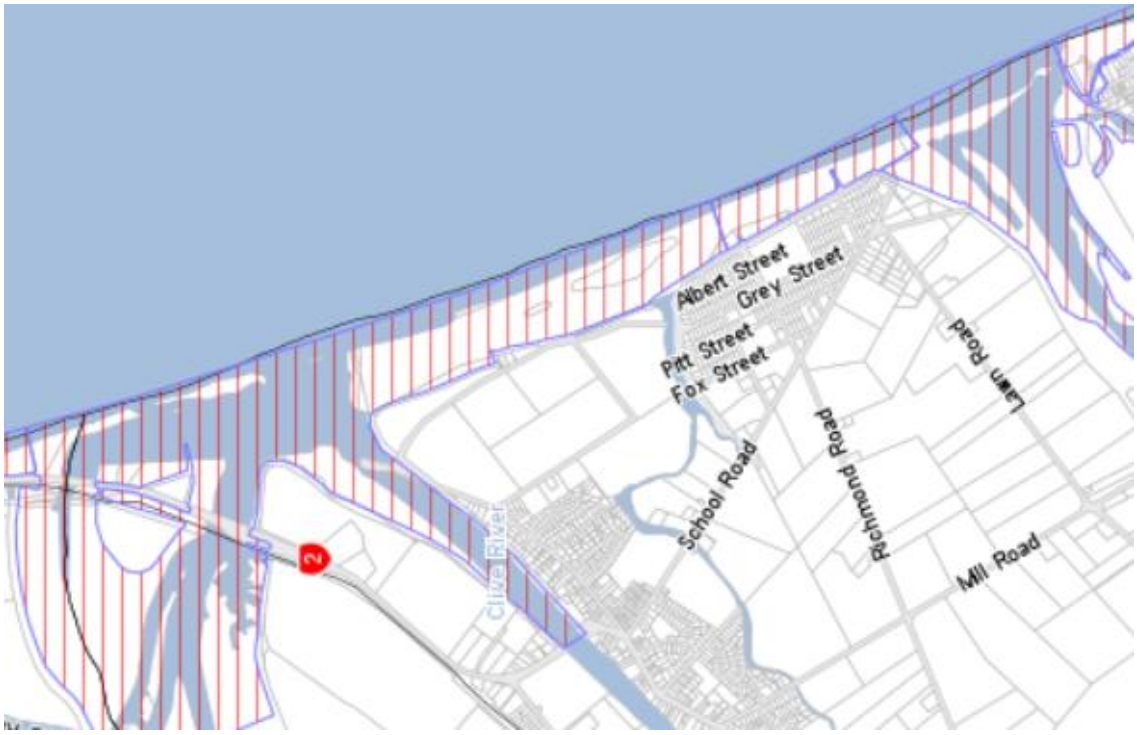

Figure 6: Coastal Hazard Maps - Present Scenario 1:100 AEP Coastal Flood – showing potential inundation of Waitangi Park

Officials from HBRC, which is the project manager and major funder, are aware that the park may be subject to coastal inundation from storm surges from time to time but do not see this as a likely event in the near to medium term future. In any event, they consider that there may be some investment required for restoration of the park after such a flood event, but that the recreational and ecological values inherent in the project would not be lost.

[9] Tonkin & Taylor ibid

8.0 Tourism and heritage sites

Hawke's Bay Heritage Trails Society has provided Maven with an inventory of important heritage sites in the Clive area, from which the following are considered to be potentially affected by coastal hazards.

Cycle and walkway trail

As noted previously, the seawall and Clive River stopbank protection system includes a cycle trail that runs along its crest and which forms part of the extensive network of recreational cycle trails in Hawke's Bay. Counts of cycle trails in the area suggest around 20,000 cyclists per annum use this section of the trail.

When the trail was constructed in 2007 the regional council decided against allowing the pathway to be built along the top of stopbanks in parts of the East Clive and Ferry Road areas to ensure residents retained privacy. The council voted in favour of diverting the pathway to 1.5 metres below the top of the stopbank for 635m in East Clive and for 200m in the Ferry Road area.

In theory, this means that the two lower sections of the trail would become impassable during inundation from sea level surges, though it seems probable that the adverse effect from flooding would be only temporary.

Coastal erosion, at least under "Present" scenarios, does not appear to affect the viability of the trail.

Evers-Swindell Reserve

Formerly the Clive Ski Reserve, this site was renamed in 2013 to commemorate the success of the Hawke's Bay Olympic rowing twins. The site covers one hectare of land on the south-east bank of the Clive River.

The site is a popular freedom camping reserve and public amenity.

"Present" mapping of sea level rise and 1:100AEP storm surges (see Appendix Two) shows that at least part of the site nearest the river would be inundated in such an event. Again, the temporary inundation is not thought likely to have any permanent effect on the amenity.

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Other sites of interest

There are a number of other heritage sites including Ferry Road, Lambert Redoubt, Edinburgh Brewery, Waipureku racecourse that add to the cultural and historical heritage of the Clive area, but none are considered to be at risk of permanent damage by the impact of coastal hazards, at least over the next few decades.

9.0 Hohepa Hawke's Bay

Hohepa Homes is a disability service provider catering for special needs children and adults with an intellectual disability. The facilities at Clive include accommodation for adults and children with on-site schooling and vocational services. There are a wide range of buildings used for residential purposes as well as offices and accessory buildings for vocational activities undertaken at the site.

The site, which was established in 1959, has a rich history having been gifted by the family of prominent Hawke's Bay farmer Sir Lew Harris in collaboration with Marjorie Allen who espoused the Rudolph Steiner philosophy as a way in which to ensure that people with intellectual disability could live in a community where they were able to have "a life fully lived."

Though located on the northern side of the Clive River, Hohepa is closely linked to the Clive community and village through social events and errands. A small number of Clive residents also work at the site.

Hohepa residents (and staff) are uniquely exposed to flood risks through the nature of their activities. Many of the residents are legally entitled to refuse to move in the event of major flood risk or tsunami warning. There is consequential onus on staff and trustees to determine how they personally respond to these situations.

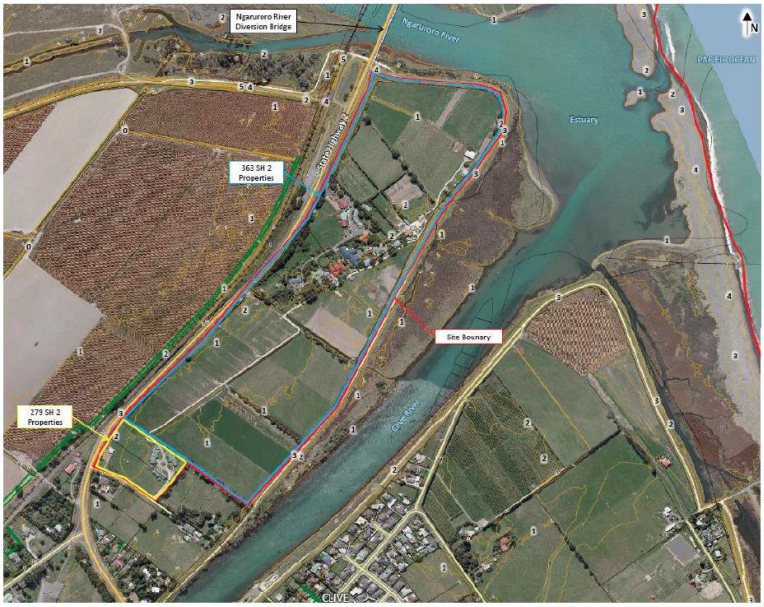

Figure 7 Map of Hohepa Site (Opus Report)

The Hohepa site is irregular in shape, approximately 32 ha in size, and approximately 350 m wide by 1.2km long. Near the Clive and Ngaruroro Rivers, the land rises up by about two metres to the existing stop banks and then slopes down to the water's edge. However, there is no considerable elevation change between the site and the water levels, which are heavily influenced by the ocean tide level.

Hohepa's general manager provided Maven with a copy of a 2015 Opus report[10] prepared for trustees examining the exposure of the site to a range of hazards, including coastal and flood hazards. Opus concluded that the site was susceptible to flooding from tsunami, but not at risk from coastal erosion. Based on the Tonkin and Taylor mapping that is used in this study, the

[10] Natural Hazards Risk Assessment for Hohepa Hawkes Bay – Opus International Consultants Limited – August 2015

stop banks surrounding the Hohepa site appear to protect it from the threat of sea-level rise and 1:100 AEP storm surge (see Figure 8).

Figure 8 Comparison of sea-borne flooding in a 1:100 AEP event – "Present" with 2120 scenario (right) suggests that Hohepa site continues to remain protected by the stop-bank system from coastal inundation

Although tsunami risk is, and continues to pose, a significant management risk, the remaining risks – coastal erosion and sea-borne flooding – are not considered to be a social impact issue for Hohepa Hawke's Bay that requires consideration by the Southern Cell evaluation panel as part of its adaptation responses.

10.0 Social Issues and Impacts

This section explores the social and community issues affecting Clive and the perception of coastal hazards and risks to the community.

10.1 Main social and community issues

Based on Maven's interviews (albeit with a small number of residents) it was difficult to discern any real areas of social concern or issues affecting the community.

Once concern expressed was crime in the area - mainly burglaries which are in turn, thought to be drug-related (i.e. proceeds of crime used to fund purchase of methamphetamines, etc.).

An issue raised by one resident was the need for open drainage channels to be kept clear. In a similar vein, one resident mentioned (at least in his view) the self-defeating process of cutting weed build-up along Clive River edges and depositing cuttings at the river mouth.

The WTTP was mentioned on a few occasions as an environmental issue. One interviewee expressed the view that the…."*sewerage plant deposits leftovers / solids on the beach which is unacceptable*".

However, no-one mentioned odour problems which appear to have been historically controversial until sealed covers were installed on the two large bio-filter tanks in 2011.

Some interviewees noted that public transport was "not huge" but that people generally have two or three cars so that it is "not a problem to go places".

The conclusion from this interview process was that there were few issues of social concern. One point that may drive this lack of concern is that, unlike the Cape Coast which is a close-knit geographically distinct community, Clive is more dispersed and people are not so involved in community activities and associations where social issues are discussed. Social networking is thus less pervasive than the Cape Coast community.

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10.2 What is the community perception of local authorities?

As with the Cape Coast survey there was a common theme of antipathy towards local authorities in relation to their stance on coastal hazards and adaptation responses.

Some thoughts and opinions expressed by respondents are set out in the following table.

- **"Councils take people's rights to defend themselves away."**
- **"Do things with your own hands rather than wait for bureaucrats to kick into action"**
- **"Council doesn't want to take responsibility for coastal protection. In other countries they put up great coastal protection measures."**
- **"A stand of self-sown boxthorn hedge was protecting the shore from flooding and erosion many years ago until the Council saw fit to remove them as a noxious weed".**
- **"The experts [advising Councils] who have been involved in the analysis to date ….. contrary to their assurances, they have not had their "hands in the water"**
- **"What council is doing now is pretty good" (in reference to the cell evaluation panel process)**

10.3 Community perspectives on coastal erosion and flooding

As noted earlier, there is a lengthy history of flooding in the Clive / East Clive area mainly because of past major rainfall events and river-borne flooding. This history has led to significant flood protection works which, in present-day terms, is seen by people living in the area to provide an excellent scheme of flood protection from surrounding water.

This sense of security is probably reinforced by the fact that there has not been any significant flood event in the area for the past few decades. The stopbank and sea exclusion system has not therefore really been tested by a major storm or overtopping such as to enliven Clive people to flooding issues again.

Some respondents suggested that most people in Clive would be completely unaware of any coastal hazard risk and that they draw comfort from flood protection schemes which will hold back any major event (*"as long as the pumping system works and is not affected by power outages"*).

They speak of the…..

> *"terrific work of the catchment board…protection has been put in place".*
>
> *"People don't worry about flooding these days".*

Another respondent expressed the view that "95% of the people living in the area" were not interested in coastal hazards because either:

- They were only likely to become a problem long after they were gone; or
- They just didn't know about it.

A contrary view about coastal erosion risk was only raised by people who were equally familiar with the Cape Coast area and were aware of the houses threatened in that neighbouring

location. In these cases the Awatoto Quarry was raised (again) as a major contributor to the problem which should be stopped forthwith. Another resident queried why the Council was not doing more with groynes.

> *"Why can't they do more groynes? The groynes in place are working really well. They are happy to protect the sewerage plant with groynes but not people's houses",* and……..
>
> *"All it would take is diggers to lift the beach profile. We're all freaked out by bureaucracy. People want action. We're going round and round in circles"*

Another view was that

"*the [erosion and flooding] problem would be dealt with easily if there was some serious planting on the landward side of the ridge and the crest was permitted to get another three or four feet higher*".

Maps of projected flooding and coastal erosion in the East Clive area are attached as Appendix Two. These are taken from the Coastal Hazards 2015-2025 Study (Tonkin and Taylor 2016) which is the source of maps on the HB Coast website[11]. For areas other than East Clive, previous sections of this report have identified the extent to which coastal flooding is likely to impact on these areas. (Coastal erosion in these cases is not considered to be a threat at least for the period to 2120).

As a general observation, by 2120 most of the Clive area is projected to be inundated by a storm surge from the sea given a 1:100 AEP storm event combined with projected sea level rise over these decades (see Figure 9 below).

[11] See Coastal Hazards page - http://www.hbemergency.govt.nz/hazards/portal

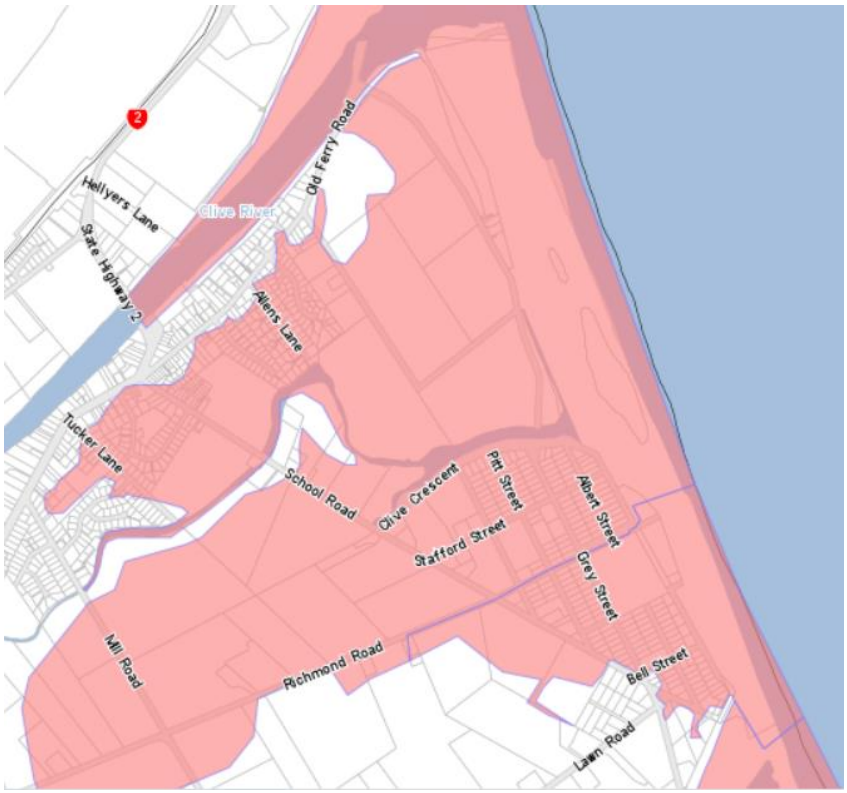


Figure 9 Projected inundation from 1:100 storm surge event – Year 2120

However, the map projections also suggest that inundation from a similar size event up to and beyond 2065 should not lead to any breach of the existing stop bank structures and sea exclusion wall.

In East Clive, the position is similar in relation to flooding (i.e. stop banks provide protection) but there is a 66% probability that coastal erosion will begin to encroach on land and streets in the southern area nearest to the shoreline under the present scenario, given a 1:10 storm event.

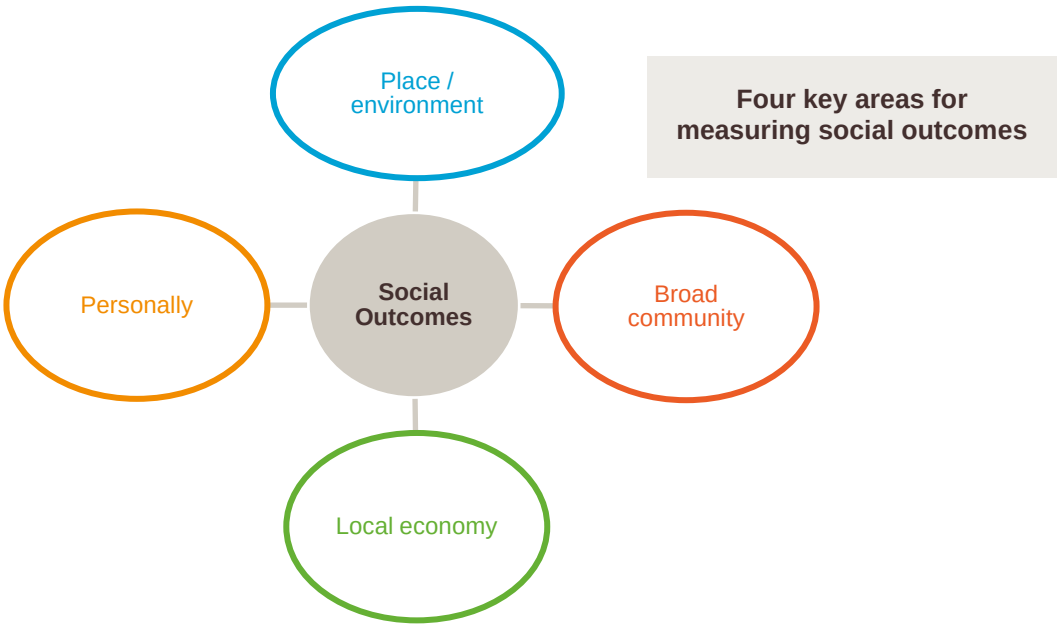
The map projections therefore suggest that the lack of concern expressed by residents is somewhat justified at least in the Present scenarios. Beyond fifty years, inundation risk is projected to increase, but it is not within the scope of people to either visualise that risk or contemplate outcomes that might arise.

To some extent this short term perspective of adequate flood protection is reflected in the three-yearly August 2016 property CV (Capital Values) revaluation by Quotable Value. Properties in Bridge, Albert and Bell Street that are most at risk in the Present Scenario (see Appendix Two) have increased in value by 23% over the past three years which is consistent with the CV increase for the whole of Hastings. By contrast, properties in Te Awanga and parts of Haumoana that are imminently threatened by coastal erosion and flooding have increased by only 9% on average in the same three-yearly revaluation.

11.0 Outcomes

The purpose of identifying and measuring social outcomes from the impact of coastal hazards is to address the following broad questions.

- What would people in the East Clive community and the wider Hawke's Bay region experience?
- How would life change for the East Clive community?



11.1 Outcomes affecting people's wellbeing

Having identified such outcomes the evaluation process involves monetizing them to provide the cell evaluation panels with some contextual sense of the financial materiality of these social outcomes and their avoidance. It is useful for adaptation response decision making, and also to guide how future adaptation costs might be shared between public and private benefit.

In the companion report by Maven on Cape Coast Social Impact Assessment and Valuation (February 2017) prepared for the southern cell evaluation panel, it was noted that monetising the social outcomes of coastal hazards presents several unique challenges. These (inter alia) included that:

- The evaluation is best undertaken over short timeframes (say five years) when stakeholders can realistically visualise and express tangible outcomes, whereas coastal erosion and flooding will impact on a community over several decades.
- Estimates of coastal hazard effects are almost always based on percentage probabilities of the events occurring.

These two issues are particularly relevant to this East Clive study in that, at least among those people interviewed, residents do not see any significant near-term threat from coastal erosion and sea-borne flooding and any social outcomes from such a threat do not therefore arise. Nor, understandably, could they visualise (or even be concerned about) outcomes that might arise in 50 – 100 years' time.

It is therefore not possible to derive a cost of negative wellbeing for residents in the area, in net present value terms, which is meaningful for the cell evaluation panel.

11.2 Other social outcomes arising from near-term coastal hazards

Maven's analysis is that the only social amenities and community infrastructure that are likely to be affected near-term (i.e. in the "Present" mapping scenarios contained in Appendix Two) involve assets on the seaward or river embankment side of the stop-bank and sea exclusion walls.

These are:

- Waitangi Park (see Section 7.0)
- Muddy Creek Reserve (which is an integral part of Waitangi Park)
- Evers Swindell Reserve
- East Clive WWTP outfall structure. (see Section 6.0)
- Parts of the cycle / walkway that are below the level of the seawall ridge line. (Section 8.0)

In the case of the recreational reserves, HBRC officials confirm there is a risk of sea-borne inundation but, while there may be some financial cost in restoring any affected infrastructure, the ecological and recreational values of the reserves would not be lost.

Evers-Swindell Reserve may be inundated by sea-borne flooding from storm surge for short periods, but does not appear to be at risk of permanent closure during or after these events.

So far as damage to the WTTP outfall structure is concerned a social impact (which may even extend to the wider Hastings District) may be significant for the period when the structure may be inoperable, but assessing a financial cost of this for social impact purposes is too speculative to be useful to the evaluation panel. Nevertheless, given its serious potential consequences, it may be important for the panel to receive further advice from HDC around risk mitigation for this potential outcome.

11.3 Public and Private Benefit

Since Maven's assessment is that residents in the East Clive area do not currently feel particularly threatened by coastal erosion or sea-borne flooding, it seems likely that any adaptation response for this area that may be proposed will be more in the nature of a public benefit for the purposes of protecting community, regional and tourism assets and infrastructure.

Appendix One

Broad themes used for discussion in East Clive interviews

- How would you describe this area? Is "East Clive" different from the whole of Clive in any unique way?
- What is it like to live here?
- What are the local features that you particularly like?
- What do you not like about the area?
- What, if anything, would you say are the most significant risks facing this area?
- Explore the perceived likelihood and potential impact of each risk if it occurred – effects on the place/environment, effects on the local economy, effects on the broad community, effects on them personally.
- To what degree do you feel that coastal erosion and increased flooding is a threat to this area?
- Show participants the projected coastal erosion and flooding images and description. Explore responses – believability, perceived impacts, degree of concern (as above).

Baseline Question

With ongoing coastal erosion and flooding hazards in this area, and no intervention to mitigate this risk:

- What would you do? What would others in the community do?
  - Short term – 1- 5 years
  - Medium term – 5-20 years
  - Long term – 20 years +
- How would things change in the East Clive community?
- What amenities, values, and interactions would be lost or adversely affected in the short, medium and long term?

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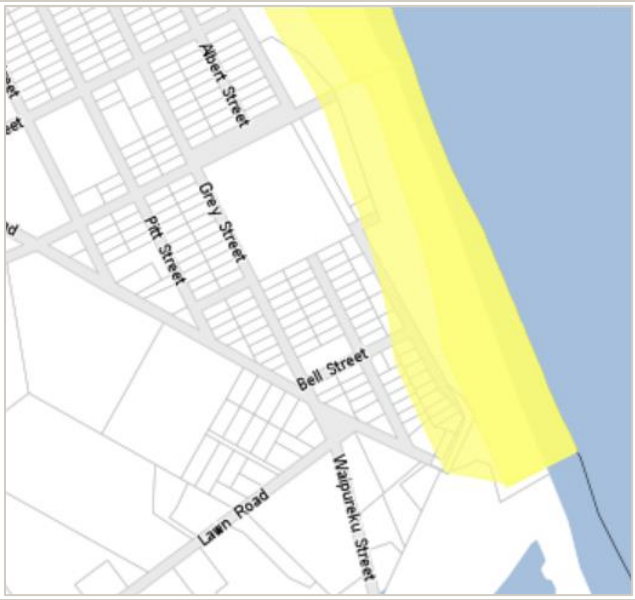
Appendix Two

Sectional maps of East Clive area showing projected coastal erosion and inundation risk under specified AEP events - Present to 2120

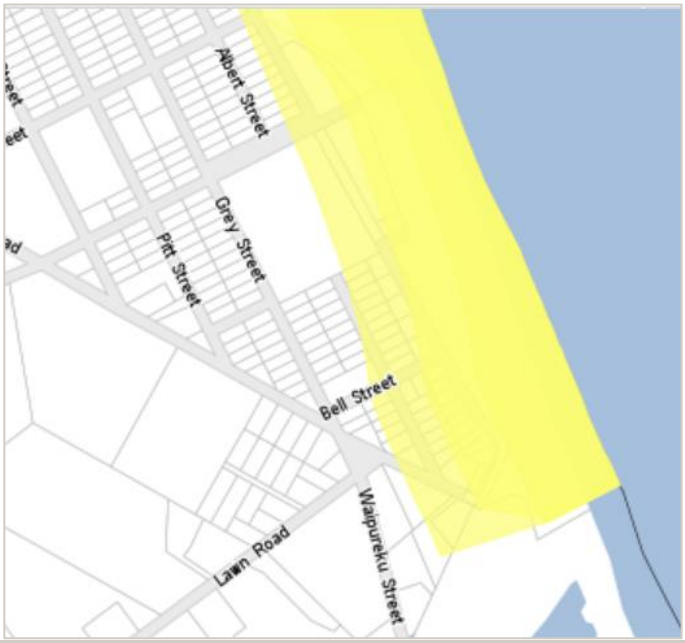
East Clive Coastal Erosion Projections – extent of erosion occurring in a 1:10 storm event – 66% probability

Present

2065



2120



East Clive Coastal Flooding Projections – extent of flooding in 1:100 AEP storm surge exacerbated by sea level rise

Present

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2065

2120