REPORT

Tonkin+Taylor

Tangoio Stopbank Concept Design

Prepared for
Hawke's Bay Regional Council
Prepared by
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1 Introduction

Hawke's Bay Regional Council (HBRC) has engaged Tonkin & Taylor Ltd (T+T) to undertake a high-level review of potential flood mitigation options for the land categorised as 2A in Tangoio, including the Tangoio Beach settlement subdivision, which is part of the Hastings district. The Tangoio valley catchment was severely affected by Cyclone Gabrielle and experienced extensive flooding from the Te Ngaru Stream.

A substantial portion of Tangoio (including the valley floor) currently falls under Category 3 (Figure 1.1). We understand that others are assessing the appropriateness of the Category 3 decisions.

This report concentrates on the category 2A land, comprising the Tangoio beach subdivision. Within this category 2A, there is a need for further assessment to determine whether the site can be appropriately mitigated from a 1% AEP level flood event.

During the course of workshopping with HBRC staff, a short list of engineering options and the fundamental issues associated with each option were presented, with three potential pathways proposed as outlined below. The thee identified options comprise:

- Construct a community stopbank scheme, with associated infrastructure; or
- Complete property specific mitigation (i.e., raise site levels or floor levels above the 1% AEP flood level).
- Move the properties to Category 3, if the above options are not feasible, or cannot be co-funded or consented.

This report discusses the background, risks, and opportunities for Option 1.

Figure 1.1: HBRC land categorisation map for Tangoio, beach development shown in 2A area (blue shading)

1.1 Aim and purpose

The aim of the proposed scheme protection requirement is to provide flood protection to a 1% AEP level of service to enable the relevant land to be recategorized (to a Category 1).

HBRC will ultimately review the case for which we understand will need to include:

- A technically feasible solution that can be consented, summarised by the findings of this report.
- A Treasury approved business case to secure funding.
- Acquisition of necessary land or relevant easements (or agreement in principle).

It is understood that recategorization may not necessarily require physical works completion. In the interim, we understand any matters pertaining to building consents will be managed by Hastings District Council (HDC) and insurance matters by private insurers.

This report provides a high-level review of the background to the flood event, a brief review of the catchment and initial assessment of options selected to consider as part of flood mitigation. Further work will be needed to support a resource consent and detailed design submission. It is important to note that community consultation will be required, as well as input from Hastings District Council (HDC) in developing a final scheme proposal for the area.

This work has been undertaken in accordance with our proposal dated 27 June 2023[1], the scope of works has included the following (broadly consistent with the HBRC scope):

1. Understand current Land categorisation maps and baseline data.
2. Attend Community Briefings and capture potential options discussed (listen and observe only).
3. Taking account of Land Categorisation information, community briefing outputs work with HBRC to compile a list of options for Community and property specific enhancements that would enable properties in Category 2A 2C and 2P to be updated to a Category 1, or Category 3.
4. Shortlist feasible options.
5. Identify preferred solutions and provide concept designs with indicative budget and timeline.

2 Background

2.1 Catchment extent and topography

The Tangoio development is situated within the Te Ngaru Catchment (Figure 2.1) and encompasses low-lying flood plains between steep hill country. The catchment comprises of hills immediately west of the development site, channelling runoff across Beach Road onto the Tangoio development. Runoff from the valley appears to discharge into the roadside drain on Beach Road at the northern end of the subject site, which then flows in a southeasterly direction before entering a culvert crossing the road and ultimately discharging into the open drain within the development site.[2] (refer to Figure 2.2, Section 2.3 for further information).

[1] Tonkin & Taylor Ltd, Letter of Engagement, HBRC Land Categorisation-Proposal for technical support for mitigation options assessment, 27 June 2023, T+T ref: 1017353.2301

[2] Te Ngaru Catchment Flood Hazard Study, September 2005 AM 05/16, HBRC Plan Number 3794

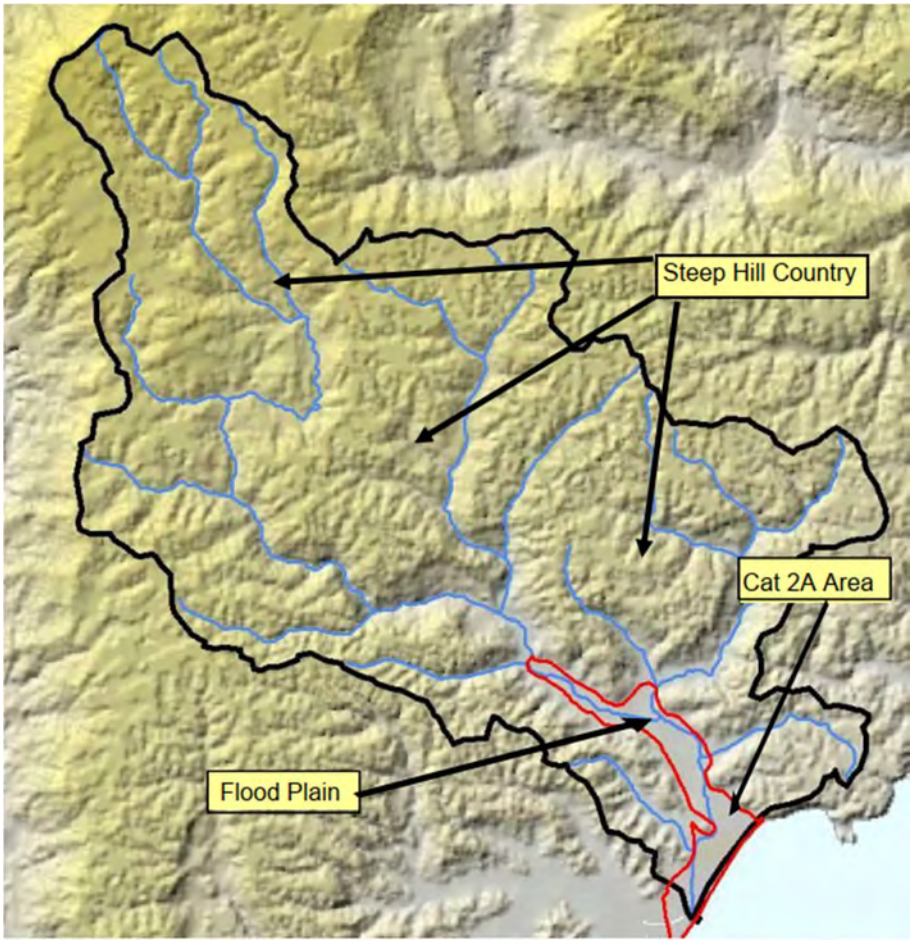

Figure 2.1: Te Ngaru Catchment with Category 2A area marked

2.2 Catchment history

Over the past century, the Tangoio area has experienced a total of 14 flooding events, with six of them causing recorded substantial damage.[3]

- April 1938 Gisborne and Hawke's Bay Flooding, 610 mm measured at Tutira (20 km north of Tangoio but still within Te Ngaru catchment) over 3 days, 324 mm in 1 day (A man was drowned in his home at Tangoio).
- July 1956 North Island Flooding, 215 mm in 24 hours with 280 mm over a 3-day period.
- June 1963 Hawke's Bay Flooding (the Tangoio catchment area received 406.4 mm of rain in 24 hours.
- June 1968 Flooding, 170 mm overnight and 199.6 mm for 24 hours at another recorder. (Several families evacuated, silt, and debris were deposited).
- March 1988 North Island Ex-Tropical Cyclone Bola, over a 6-day period 805 mm, with 613 mm in 3 days (Te Ngaru Stream had a major flood, with considerable overflows down the valley, major silt deposits were left, and stream bank damage occurred).
- September 1988 North Island Storm, 210 mm in 1 day (State Highway 2 section was scoured out hampering access to Tangoio settlement).

[3] Niwa, Historic Weather Event Catalogue Tangoio

In 1963, the District Commissioner of Works deemed this valley "unsafe for living due to flood risks"[4]. Furthermore, a 2008 report[5] commissioned by the HBRC as part of an assessment of the Tangoio beach settlement, asserted that practical mitigation measures were unfeasible due them being difficult to adequately implement and manage into the future. Based on historical flood data and comprehensive study, settling in the floodplain was strongly discouraged by due to its potential risks to life, infrastructure, and property.

During larger floods, the valley floors accumulate silt, elevating their level. Hillside erosion surpasses fluvial erosion, resulting in stream aggradation. Investigations[5] into shallow mass movements in Tangoio's valley slopes show that historical storms can cause the landscape to erode years into the future, increasing sediment build up, an example like the 1938 rain event caused erosion at a rate of 2.3 mm/year over 50 years. Smaller floods gradually deposit silt, reducing available freeboard. In river management, actively addressing sediment buildup on berms and in the active channel can be a costly challenge.

2.3 Te Ngaru Flood Control Scheme

The Te Ngarue Flood Control Scheme[6] was established in 1999 by HBRC with the goal of reducing the potential for flooding and damage caused by the Te Ngarue Stream to properties and roads in the lower reaches of the valley. This scheme encompasses the Te Ngarue Stream from its mouth to three kilometres upstream.

The area in which the scheme operates includes rural grazing, intensive cropping, and an increasing demand for residential development around the existing Beach Road coastal area.

The scheme includes maintenance of the streams and drainage channels, which are considered HBRC assets and located on both private property and Crown land. The scheme's management is overseen by the Asset Management Group of the HBRC, with the scheme maintenance carried out through annual contracts. The customer Level of Service (LoS) aspects are stream channels cleared and minor siltation excavated, bank stabilisation, tree blockages, river and stream moth opens and coastal inundation. The technical LoS aspects are stream maintenance, regrowth spraying, river and steam mouth openings, gravel management and flood damage.

The scheme is funded through a combination of targeted works rates and a general funding subsidy of 10%. It has a small scheme rating pool, with limited capital funds for major drain improvements. Through a conversation between HBRC and T+T the scheme is understood to function largely to clear blockages to ensure ongoing function of drainways.

While river and stream mouth openings are not within the scope of the Te Ngarue Scheme, they do have an impact on the scheme as blockages at the river mouth can exacerbate flooding and siltation.

It's important to note that the Te Ngarue Flood Control Scheme is not designed to address coastal inundation. Additionally, three private drains (South, Coastal, West) are separately maintained by HBRC under contracts with the owners, and these are not part of the scheme as shown in Figure 2.2.

[4] Resource Management Act 1991, Proposed Tangoio Beach Development Tangoio, Hawke's Bay

[5] Earth Science Journal 1971, R.J. Eyles's paper titled 'Mass Movement in the Tangoio Conservation Reserve, Northern Hawke's Bay'

[6] Te Ngarue Flood Control Scheme Asset Management Plan 2021

Figure 2.2: Te Ngarue scheme and three private drains

2.4 Tangoio coastal development

2.4.1 Catchment Flood Hazard Study and rezoning

In 2005 the Te Ngaru Catchment Flood Hazard Study (C Goodier Statement of Evidence) was prepared for the HBRC. This report was prepared in order to provide an up-to-date analysis of the hydrology and hydraulics of the catchment and floodplain.

The HBRC statement of evidence used Probable Maximum Precipitation (PMP) to estimate the maximum likely rainfall event that may occur over the catchment. The method involves obtaining a representative 24-hour index PMP value, then adjusting this value for elevation and catchment area. This value is then factored to provide PMP estimates for durations other than 24 hours. For the design 50- and 100-year events 'The Frequency of High Intensity Rainfalls in New Zealand, Technical Publication 19 (TP19)' was used in the model.

HBRC ran the hydrologic model with the rainfall from the 1924, 1938, and 1988 storms, the design 50- and 100-year events (xx duration), as well as the 6, 8, 12-, 24-, 48- and 72-hour PMP rainfalls. The results from the catchments were aggregated to be input to the hydrodynamic model. The PMP events are assumed to cause the Probable Maximum Flood (PMF). Results are shown below in Table 2.1.

Table 2.1: Hydrologic Model Results from various storm events in Te Ngaru Catchment reported by HBRC

Event	Peak Discharge (m^3/s)	Rainfall Volume (million m^3)	Runoff Volume (million m^3)	Peak Water Level (predicted by model)
March 1988	239	25.4	16.8	14.74
TP19 50 year	380	20.5	14.9	15.09
TP19 100 year	427	22.5	16.7	15.21
12 hour PMF	753	26.7	20.3	15.84
24 hour PMF	628	38.1	29.4	15.61
72 hour PMF	448	65.9	52.1	15.28
72 hour PMF with Mouth Closed	448	65.9	52.1	16.33

During a large rainfall event there is considerable risk that the Te Ngarue Stream river mouth will become blocked to a level of 15.0 RL. The more adverse flooding scenario presented above is the 72-hour PMF with river mouth closed resulting in an estimated peak water level of 16.33 RL. The table also highlights that assumptions on tail water level have a significant impact on estimated flood level.

As part of the planning process for the proposed Plan Change at Tangoio Beach, MWH along with Barnett and MacMurray Limited were commissioned by the original developer in 2007[7] to review available technical evidence and reports and assess the infrastructure technical feasibility of the proposed plan change and associated potential development of the area. They didn't contest the methodology of HBRC's findings, except for the fact that it deals with the catchment as a whole rather than the specific area of the proposed Tangoio development.

It was proposed by MHW that flood mitigation would be achieved by a combination of construction of the access road to a 1% AEP level plus 500 mm freeboard and setting any floor levels within the development area at the 1% AEP flood level plus an agreed freeboard. A value for 1% AEP flood level was not stated but was assumed to be from the Te Ngaru Catchment Flood Hazard Study by HBRC.

The Hastings District Plan[8] states the minimum required surface level is 15.2 RL (5.2m above mean sea level) for the 1% AEP flood (HBRC, 2005) and the minimum FFL (Floor Finish Level) of RL 15.7 m (including 500 mm freeboard). The 2005 1% AEP estimate doesn't consider climate change, sea level rise, valley floor aggradation, or settlement of the area.

For the purposes of this report acknowledging the uncertainties around sediment, rainfall and tailwater condition, we have adopted a conservative design level refer to Section 3 'Basis of Assessment and Initial Optioneering'.

2.4.2 Coastal settlement development

In 2017 Development Nous was engaged by the landowner, David Colville of Tawanui Developments Ltd, to redevelop Tangoio Beach located 22 km north of Napier. In early 2018 Development Nous submitted a resource consent application for a 37-lot coastal settlement along existing Beach Road (Figure 2.3). It was zoned as a Coastal Settlement Zone as per the Hastings District Plan and provided

[7] MHW Tangoio Beach District Plan Change, Engineering Evidence review and Feasibility Report, June 2007, HBRC
[8] Hastings District Plan SECTION 8.0 RESIDENTIAL ZONES

for residential living in a distinctive coastal environment at densities lower than other residential zones.[9]

The settlement construction was completed in 2022, twenty-five of the lots ranging between 800 to 1000 m² have been sold to date with two of them having completed houses, and one partially completed.

The intention of the Tangoio Coastal Settlement Zone is to replicate the small scale of the holiday community that was previously located in Tangoio. Based on the Heretaunga Plains Urban Development Strategy, no further growth is permitted for Tangoio outside of the existing Coastal Settlement Rural Zone boundary.

The legal description for the properties in the development are:

- Beach Road: Lot 1-6 DP 559565, Lot 28-36 DP 548943, Lot 37 DP 571087 (designated as the subdivision balance area)
- Tati Way: Lot 7-20 DP 571087
- Te Karu Lane: Lot 20-27 DP 571087

Figure 2.3: Location of Tangoio Coastal Settlement

In terms of roading flood hazard considerations, the New Zealand Standard for Land Development and Subdivision Engineering (NZS4404: 2004) recommends that roads remain passable to light vehicles during the 2% annual exceedance probability (AEP) event and 1% AEP event for 4WD vehicles.

The developer has advised that the subdivision road network was constructed to NZS40404:2004 requirements based on flood levels estimated by HBRC, 2005. We have assumed the portion of Beach Road outside the development, which provides the only access to the Settlement from the northwest, was designed without any specific consideration for a flood level.

[9] District Plan - Hastings District Plan (Partially Operative with the Exception of Section 16.1 & Appendix 50) (hdc.govt.nz)

2.4.3 Property ownership

Land ownership within the subdivision has been summarised from LINZ titles (refer to Figure 2.4). It is worth noting that some of the properties owned by Tangoio Developments Limited may be under contract with private owners, but the title has not been transferred yet. Tangoio Developments Limited holds ownership of the balance block of land (Lot 37 at Figure 2.4 below), which measures 22,700 m^2, and eleven smaller subdivided freehold properties that remained unsold before Cyclone Gabrielle. Out of the total of 37 properties, twenty-five have been sold to private owners, but only two of these properties have completed construction. The majority of the sites remain vacant at present, or with intent to develop.

Other existing properties north of Beach Road that predated the subdivision are assessed as Category 1 by HBRC, meaning no flood mitigation is proposed.

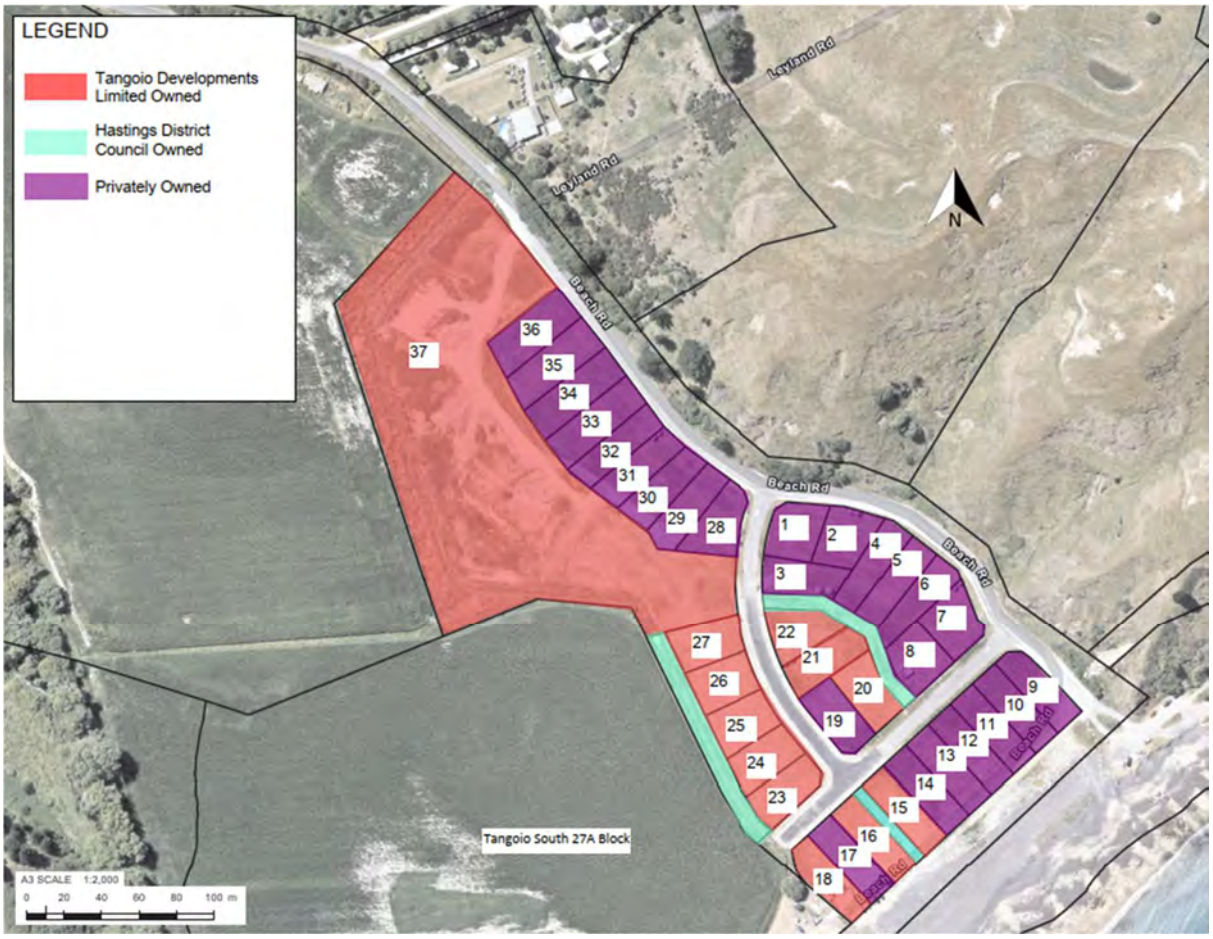

Figure 2.4: Ownership of Tangoio development lots

2.4.4 Development topography

The contour information provided by Nous Development can be found in Appendix B and is summarised below.

Beach Road starts at 16 RL at the development entrance and increases to 18 RL to the southeast. Te Karu Lane connects to Beach Road at approximately 16.5 RL, which decreases to 15 RL as it meets Tati Way. Tati Way sits at around 15 RL, except where it meets Beach Road at 16 RL.

2.5 Observations during Cyclone Gabrielle

During the recent Cyclone Gabrielle event in February 2023, the Tangoio development and its surrounding community experienced flooding caused by Te Ngaru Stream in the lower Tangoio valley. In the Tangoio Marae situated 2 km further inland from the development, floodwaters, as reported by Newshub, surged to 2 m high.

Based on information provided by Development Nous, Lot 9 (situated on the beachfront) and Lots 32 and 33 (on Beach Road) had floodwaters reaching a level of 15.8 RL. Based on the observed effects on these three homes, an assumption has been made that floodwater reached a level of 15.8m RL. Refer to Figure 2.5, Figure 2.6, and Figure 2.7 for Cyclone Gabrielle damage.

Figure 2.5: Aftermath of Cyclone Gabrielle on Tangoio development, oriented north, source Dan Tait- 139 Beach Road

Figure 2.6: Aftermath of Cyclone Gabrielle on Tangoio development, oriented southwest, source Dan Tait- 139 Beach Road

Figure 2.7: Silt buildup excavated from Beach Road orientated west, Source David Colville

3 Basis of assessment and initial optioneering

In order to initiate the land categorisation work several key components must be addressed. This includes the development of a feasible and effective scheme, securing access/easements to the relevant land parcels, and securing the necessary funding.

The overarching objective is to provide protection in accordance with the 1% Annual Exceedance Probability (AEP) standard (based on updated flood frequency taking account of Cyclone Gabrielle). It's important to note, however, that the estimated 1% flood level may undergo changes in response to current updates in flood frequency data from NIWA, which are yet to be reviewed. It is important that the appropriate flood level is reviewed as part of the next project stage.

The following options were considered during a workshop held in August 2023 with HBRC to discuss flood protection measures in Table 3.1: Optioneering Summary.

Table 3.1: Optioneering Summary

Option No	Option	Description	Risks	Opportunities	Relative Costs
1	Stopbanks along the western edge of the subdivision area	• Construct a stopbank on the land parcel outside. • General dimensions of 1V:3H side slopes and 4m crest width for ease of maintenance and mowing. • Localised realignment of drainage works needed. • Fill from local borrow area, TBC.	• Land acquisition required. • HBRC report that required land block is Iwi land. TBC by HBRC • Impounding of water within the subdivision in larger events, would require stormwater discharge to coast or similar arrangement (pump station etc). • Does not mitigate against future coastal erosion/sea level rise risks. • It is not clear how overdesign events are managed, egress out of the subdivision is limited. • Potential small reduction in flood storage area in lower catchment (effects would need to be assessed). • Uncertainty of flood levels in catchment due to siltation and lack of comprehensive model. • Requires works to properties around Beach Road to integrate. Beach Rd side catchment to be reviewed further.	• Moderate to high costs, largely earthworks. Cost dependant on borrow material source/proximity. • Relatively straight forward construction. • Development of the balance lots of subdivision could potentially continue, subject to review of internal site stormwater and flood hazard.	Moderate. Ongoing OPEX costs. Grass mowing, culvert, and stormwater maintenance.
2a	Raise ground levels on western side of subdivision	• Rise ground levels within imported engineered fill on the western side (balance lot) of the subdivision and adjacent lots to	• Uncertainty of flood levels in catchment due to siltation and lack of comprehensive model. • Does not mitigate against future coastal erosion/sea level rise risks.	• Potential use for residential development or recreation area. • Broad fill area with landscaped (flatter) batters.	Higher cost than 1 due to increased earthworks volume. Limited OPEX costs.

Option No	Option	Description	Risks	Opportunities	Relative Costs
		provide protection to lower (eastern) lots. • Locally raise road levels where necessary to ensure sufficient freeboard above flood levels. • Localised realignment of drainage works needed.	• It is not clear how overdesign events are managed, egress out of the subdivision is limited. • Potential small reduction in flood storage area in lower catchment (effects would need to be assessed). • Land acquisition is required from developer and seaward lots. • May require works to local roads to integrate stopbank to high ground.	• Moderate to high costs, largely earthworks. Cost dependant on borrow material source/proximity. • Relatively straight forward construction. • Development of the eastern lots of subdivision could potentially continue, subject to review of internal site stormwater and flood hazard.	
2b	Construct a stopbank along the higher ground on the western side of the subdivision	• As per 2A but narrower stopbank along western balance lot. • Tie in works at local roads at either end of alignment. • Local drainage works to ensure discharge away from subdivision in large events.	• Uncertainty of flood levels in catchment due to siltation and lack of comprehensive model. • Does not mitigate against future coastal erosion/sea level rise risks. • It is not clear how overdesign events are managed, egress out of the subdivision is limited. • Potential small reduction in flood storage area in lower catchment (effects would need to be assessed). • Land acquisition is required from developer and seaward lots. • May require works to local roads to integrate stopbank to high ground. • May require local drainage works to convey stormwater out of subdivision in larger events.	• Relatively straight forward construction. • Development of the eastern lots of subdivision could potentially continue, subject to review of internal site stormwater and flood hazard.	Comparable costs with Option 1. Ongoing OPEX costs. Grass mowing, culvert, and stormwater maintenance.

Option No	Option	Description	Risks	Opportunities	Relative Costs
3	Property specific mitigation	• Individual property owners responsible for lifting ground and/or floor levels to suitable level above 1% AEP flood level. • It is not clear exactly what level will be required to develop to, further catchment modelling and updated flood frequency analysis needed to assess FFL's. • No changes proposed to road network of balance of subdivision area.	• Existing properties may need to be raised, it is unclear on the current status of these site with respect to damage, insurance or consent status. • Properties could be subject to Section 72 notification on the title (Building on land subject to natural hazards). Legal advice required to confirm this. • Insurance availability and affordability is unclear. • Ongoing maintenance of subdivision is still required by HDC (roads, stormwater etc). • Additional costs for potential development of sites. • Potential effects on ability to resell sections is not well understood. • Costs to raise sections or dwellings is not clear. • Does not mitigate against future coastal erosion/sea level rise risks.	• Low up-front cost to ratepayer. • Limited works required on public roads or assets. • Construction is limited to small scale residential lots. • It is unclear if the balance undeveloped subdivision lot will be consented and constructed, if it wasn't, this would limit further development in flood prone catchment. • Potential ability to jack and lift sites onto timber piles? • There is no reticulation of the service networks so servicing can be revised as needed on a site-by-site basis.	Low costs to ratepayer, individual properties to undertake works and accrue benefits.
4	Moving Area to Category 3	• Move the Cat 2A to Category 3, implying that the sites are not suitable for residential development as there is a significant risk to life.	**Unclear if there is public support to remain at the site.** • It is not clear if all affected property owners would be eligible or be accepting of a potential buyout. Further consultation is required. • It is not clear where the local community can relocate to. There is a	• Removes risk to property and life from flood hazard by reducing further development. • Reduced maintenance costs to keep servicing to site live (power, comms, roading etc).	Significant costs to buy out properties (3-5 sites). Unclear on position for developer and lots not yet constructed in buy out policy.

Option No	Option	Description	Risks	Opportunities	Relative Costs
		• It is not clear if the site meets this threshold with respect to risk to life from flooding. Further review by HBRC and PDP may be required. • Sites are retained by HDC/HBRC and converted to recreational areas or similar.	general lack of suitable development sites in the area.	• Opportunity to use area as recreation and reserve. • Potential to strike a balance between Options 3 and 4, depending on individual site risks?	
5	River works and rivermouth amendment	• Excavate wider channel profile and outfall to coast downstream of site. Potentially provide secondary overflow for extreme flows over raised barrier beach. • Provide for mouth maintenance with dredged channel and training walls, if required, subject to further review.	• Environmental impacts of excavation, dredging and coastal works. • Very high physical works costs. • Significant maintenance requirements, i.e., maintenance dredging, coastal works, edge protection. • Would require considerable design and assessment of environmental effects. • Ongoing requirements to maintain the mouth and channel. Training wall or similar may be required. • Modelling needed to confirm benefits. • May not be a sustainable long-term option, due to SLR and coastal effects.	• Could potentially improve conveyance to coast. Needs further review. • Spoil from excavation could be used to fill areas for stopbanking etc. • Silt in valley flood can be excavated and reused elsewhere. • Improved local drainage.	Very high cost. Very high maintenance/OPEX costs.

During the course of the workshop, the following was generally noted:

- Option 1 was not preferred by HBRC due to concerns about the ability to acquire the land.
- Option 2A and B were considered feasible, subject to land acquisition and final design. HBRCs preference was to review option 2B, for a narrower stopbank, rather than raising the whole area for recreation or housing.
- Option 3 was considered feasible, but it was unclear on the impacts to properties in terms of insurance, notices on title and general saleability of sites. Given the category 2P option requires property level intervention it is likely that the design for this would be undertaken on a site-by-site basis and therefore is not discussed further in this report.
- HBRC were unclear if Option 4 would meet the threshold of flooding being “risk to life”, the condition to move the land into Category 3. Further review would be required to confirm this.
- All agreed option 5 was not feasible due to cost and environmental impacts.

HBRC requested to consider Options 2B and 3 as part of a short-listing exercise.

T+T and HBRC agreed to proceed with a concept stopbank crest level ranging from RL 16.5 to 17m based on the worst case of 72 hours PMF with block river mouth of 16.33 RL with an additional allowance of freeboard. T+T and HBRC acknowledged the uncertainties in the flood frequency analyses, climate change effects, the catchment behaviour (siltation and aggradation) and a lack of well-established stream gauging. The stopbank crest levels are proposed to gently taper down to the east, meeting the barrier beach level at about 16.5 RL.

4 Concept design of 2C solution (Option 2a)

This section outlines considerations as part of the development of the concept engineering solution.

4.1 Concept design assumptions

Based on our observations of current stopbanks in Hawke's Bay following Cyclone Gabrielle, scour was common on slopes steeper than about 2.5H:1V. A number of these scours led to full scale breaches once the headward erosion developed. To mitigate future overtopping scour, flatter batter slopes are recommended.

The following assumptions have been made to support the concept development of Option 2.

- Based on initial advice from HBRC it has been assumed that ETC Gabrielle was in excess of the 1 % event and that adequate performance of the Tangoio area without improvement works will not be achieved by a revised 1 % event derived from current information.
- Stopbank batter to be 3H:1V (Figure 4.1).
- Stopbank crest to be 4 m wide to provide adequate maintenance access for mowing etc.
- A provision for keying in the stopbank to the surrounding ground levels.
- The stopbank alignment is proposed to be within the Tangoio Development Limited and Hastings District Council land.
- Access to Tangoio South 27A Block is to be provided.
- The northern end of the stopbank to tie in with Beach Road, the southern end of the stopbank to tie into the beach high ground. Tie in details to be confirmed in the detailed design stage but will generally require some regrading of Beach Road.
- We have assumed that some sections of roads will need to be elevated in order for stopbank to be constructed. the stopbank alignment and elevation will be confirmed in the detailed design stage.
- Based on discussions with HBRC the stopbank crest level has been set at RL 17 m for this assessment (including 700 mm freeboard to allow for uncertainty, catchment siltation and climate change). The crest level is based on the HBRC Statement of Evidence, May 2008, which indicates a peak flood level of RL 16.33 m when the river mouth is blocked at RL 15 m. While RL 17 m is significantly in excess of the current HBRC 1 % AEP flood level estimate, RL 17 m been adopted for the purpose of this assessment because of uncertainty with the current level given a range of changed circumstances since the flood level estimates presented at Table 2.1 were prepared. Confirmation of the appropriate crest level (based on rainfall, tailwater and as-built ground levels) is required if the scheme is to be progressed further.
- A stormwater management system will be required within the development to mitigate water impoundment from local subdivision runoff caused by the stopbank. We have proposed a small pump station, swale, and culvert to remove impounded catchment floodwaters trapped by the stopbank, and discharge to the coast.

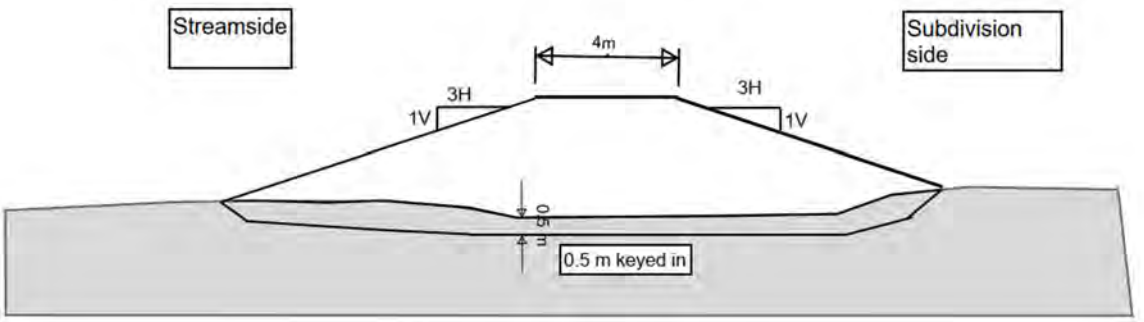

Figure 4.1: Typical stopbank alignment

4.2 Digital elevation model

A 1 m x 1 m gridded digital elevation model (DEM) was derived from a LiDAR dataset sourced from Land Information New Zealand (LINZ). LiDAR was captured between 11 and 15 November 2020. The vertical datum for the DEM is NZVD2016. LINZ indicate this is a bare earth terrain with all buildings and above ground features removed. However, some discrepancies could be expected around thick vegetation and similar areas. The DEM model below (Figure 4.2) shows the Te Ngarue (formerly known as Te Ngaru) Stream to the west from the Tangoio Development boundary. Refer to Appendix B contour plans for further information.

Figure 4.2: DEM model of Tangoio development

4.3 Overland flow paths

Analysis of the ground elevations of the site shows the land within the development boundary is generally flat and is gently sloping towards the open drain to the west and then towards the beach (Figure 4.3). The hill catchment northeast of the development falls towards Beach Road; at the road's high point, the flow splits in two directions, northwest draining towards the open drain and southeast draining towards the sea. As part of the detailed design the impact of a new stopbank on the lower Te Ngaru Stream catchments should be assessed and allowance for effective drainage should be provided. Further review is needed on the potential ponding behind a new stopbank. It is noted that based on Hastings District Plans, the subdivision holds consent for stormwater discharge via soakage, suggesting an absence of stormwater infrastructure. Refer to Figure 4.4 for the indicative overland flow paths. It should be noted though the DEM is from 2020, since than land development has taken place. Further surveying should be done at a detailed design level.

Figure 4.3: Te Ngaru catchment surrounding category 2A (Tangoio development)

Figure 4.4: Flow paths through the development, using DEM model and Global Mapper

4.4 Stopbank design overview

The stopbank proposed alignment generally follows parallel to the open drain alignment, starting from the north at 149 Beach Road to the south, where it ties in with the beach high ground. The open drain is located within the Tangoio Development Limited owned land, and it aligns with the land's western boundary. The total length of the stopbank is approximately 520 m, with an approximate fill volume of 17,000 m^3. The stopbank side slopes are proposed to be at 3H:1V and 4 m wide crest. The proposed crest level is at 17 RL and lowers to about 16.5 RL as it reaches the beach. Final crest levels would need to be confirmed during detailed design and would be subject to an updated flood model. For the purposes of this report acknowledging the uncertainties around sediment, rainfall and tailwater condition, we have adopted a conservative design level refer to Section 3 'Basis of Assessment and Initial Optioneering'.

The stopbank fill material could potentially be sourced from the borrow area located on private property on Beach Road, further liaison with the property owner will be required. Additionally, fill material testing will be required to confirm the suitability of the borrow area(s).

It is proposed that a section of the road adjacent to 149 Beach Road and at the start of the stopbank, is to be elevated to allow access to the development. at the southern end of the stopbank, a section of Tati Way is to be elevated to provide access to Tangoio South 27A Block.

As the stopbank will block overland flowpaths from discharging to the open drain, it is proposed to provide a swale within the development following the stopbank toe alignment. The site topography at the southern end of the stopbank shows the beach levels significantly higher than the northern extent of the development, which will prevent a positive discharge to the sea. It is proposed that swale will discharge into the sea via a pumping station located behind the beach crest. The swale outlet and pumping station details will be confirmed during the detailed design stage. Refer to Figure 4.5 for details. A defined ponding area may be required and should be confirmed during the detailed design in conjunction with pump sizing. Culvert discharge to the existing drain was not preferred to mitigate the risk of penetration and to prevent water ponding behind the stopbank when river levels are high and discharge via outlets are not possible.

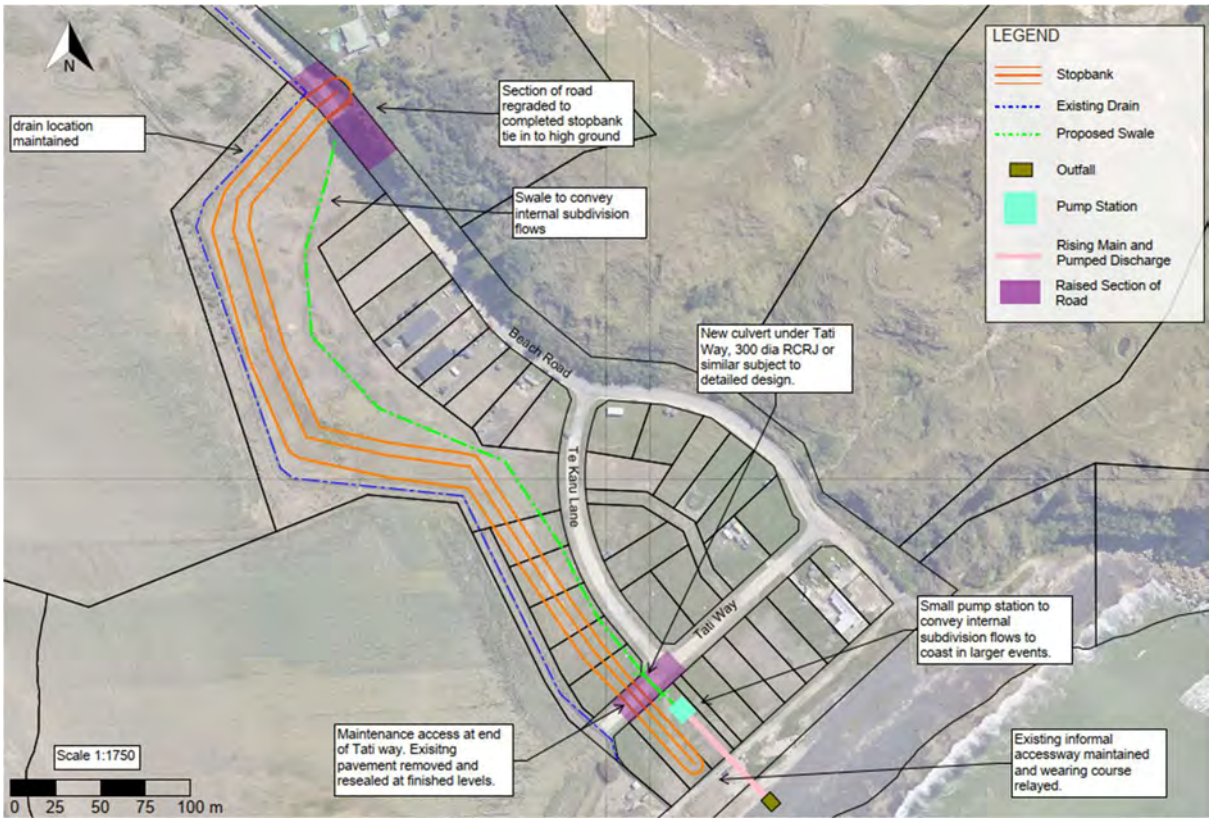

Figure 4.5: Concept Stopbank alignment

The stopbank alignment predominantly follows the drain and Tangoio Development Limited western property boundary. The northern part of the stopbank is located within Lot 37, originally designated as a balance area. The southern part of the stopbank passes through Lots 23-27 and Lot 17-18 towards the beach front. Out of all these lots, only Lot 17 is privately owned. HBRC will need to undertake negotiations with the property owners to acquire access to the land to implement this solution.

4.4.1 Proposed stormwater management

The existing ground elevation within the development boundary shows a higher elevation at the beach crest making a positive stormwater discharge not feasible. A proposed stormwater management strategy comprises a 500 m long swale within the development that follows the stopbank toe alignment that discharges into the sea via a pumping station located at the beach crest. The swale outlet and pumping station details will be confirmed during the detailed design stage. It is noted that the development holds consent for stormwater discharge via soakage, but it assumed that the soakage capacity would be overwhelmed in extreme flood events, particularly if antecedent rainfall is significant. The locations of specific devices are shown in Figure 4.6 below.

The stopbank does not offer protection against stormwater runoff originating from the north-eastern hills. Further assessment and development of the stormwater management system will be required to ensure its effectiveness as the land is developed further.

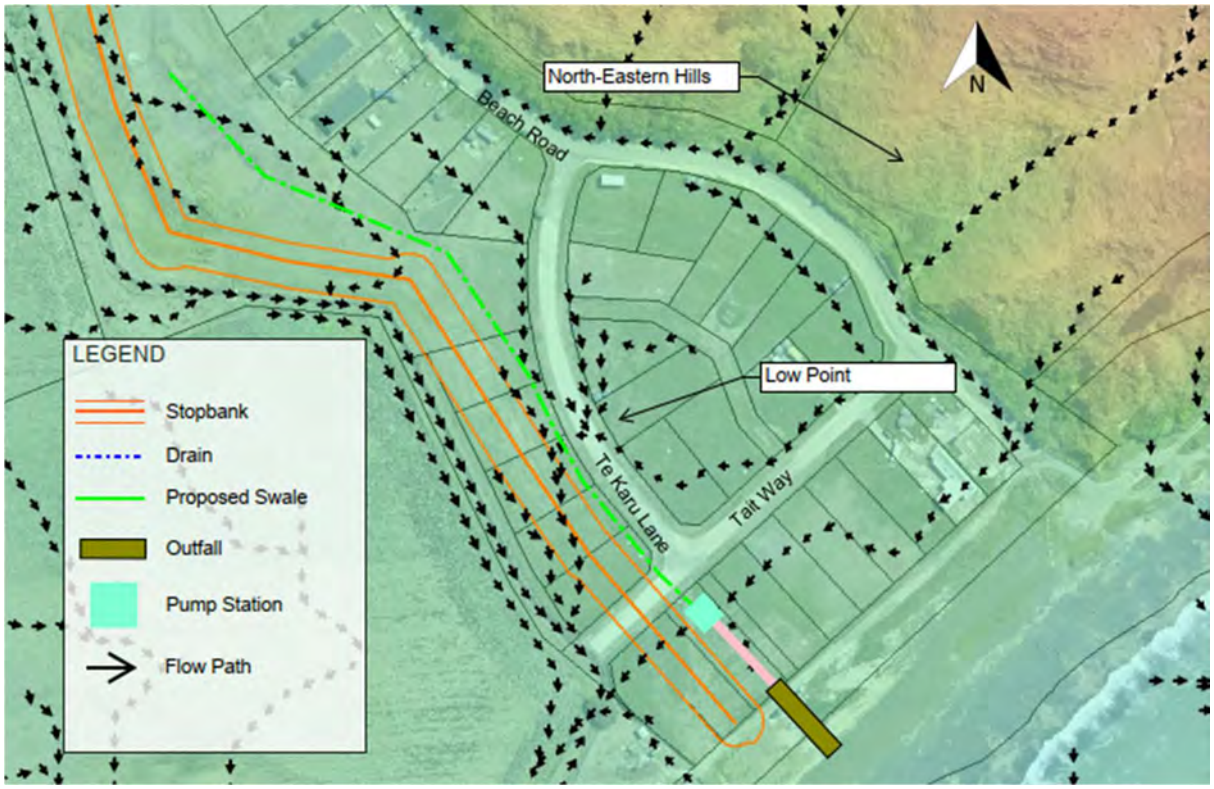

Figure 4.6: Flow paths that are blocked by concept stopbank design

4.5 Roading implications

The existing road consists of an approximately 5.5 m wide crowned chipseal carriageway with no kerb or channel and standard rural table drains each side with culverts at suitable locations, to deal with surface runoff.

The proposed stopbank will cross Beach Road at the edge of the existing subdivision, as indicated in Figure 4.5. The stopbank crest will rise between 1.4 m and 1.7 m above the existing road level, over a width of approximately 13 m from toe-to-toe. This will require that the road be ramped either side of the stopbank to maintain vehicle access.

In order to keep the ramp accessible for most vehicle types as well as active modes, we propose to grade the ramps at 8% (or 1:12.5). This will give an approximate overall ramp length of 40 m from toe-to-toe and provide an easily traversable path. The side slopes will ideally need to be at 1V:5H or shallower to provide a safe slope for wayward vehicles and minimise the risk of rollover crashes. This will require approximately 400 m^3 of additional fill, including base course materials (likely GAP65 and AP40). A cross-section for the raised Beach Road segment can be found in Appendix A.

To protect the ramps from runoff scour it will be necessary to line the roadside drains with riprap or similar to slow any concentrated surface runoff. The ramp is not expected to have a significant impact on the surrounding terrain and its footprint should be able to be kept within the existing road reserve.

4.6 Residual Risk/Hazards still present

The purpose of the stopbank is to protect the subdivision community against river flooding from the Te Ngarue Valley; however, it is important to acknowledge that despite this protective measure, there remain inherent risks and hazards that pose a potential threat to the Tangoio development.

- The land surrounding the Tangoio development is classified as Category 3, which means that to evacuate the subdivision, the community must cross a low bridge within the Category 3 land. However, there are egress routes into the surrounding hillsides. But vehicle access out of the subdivision remains very limited. Especially for emergency services vehicles.
- The subdivision falls within a coastal hazard zone, as defined by the Hawkes Bay Hazards Portal (https://gis.hbrc.govt.nz/hazards/).
- There are very limited options to manage overdesign events (although acknowledging that current basis of design is very conservative). There is a small pump station proposed to manage stormwater ponding but this would be quickly overwhelmed in an overdesign event.

4.7 Potential resource consent requirements

A preliminary analysis of the statutory planning provisions that could be relevant to the concept design is provided in Appendix C. Further detailed statutory analysis of the proposed activities will be required once the final design is confirmed and as part of the resource consent and Assessment of Effects on the Environment (AEE) report preparation process.

In summary, resource consent is likely required from HBRC and HDC for the following activities:

4.7.1 Hawke's Bay Regional Council

Regional Resource Management Plan:

- Diversion of floodwater associated with stopbank construction - discretionary activity under rule 69/59.

Regional Coastal Environment Plan:

- Diversion of floodwater associated with stopbank construction - discretionary activity under rule 39.
- Construction of stormwater outfall (network utility structure) within Coastal Hazard Zone 1 and 2 – restricted discretionary activity.
- Stormwater outfall in the CMA – discretionary activity under rule 117.

  Note: whether the outfall is below mean high-water springs and therefore within the CMA needs to be confirmed.
- Diversion and discharge of stormwater to the CMA – controlled activity under rule 164.

  Note: whether the discharge point is below mean high-water springs and therefore within the CMA needs to be confirmed.

We are not aware of any natural wetlands within the immediate vicinity of the works. Therefore, resource consent under the National Environmental Standards for Freshwater (NESF) is unlikely to be required for works in, or within close proximity, to a natural wetland. However, the presence or not of natural wetlands should be confirmed by the project ecologist.

4.7.2 Hastings District Council

District Plan:

- Earthworks - restricted discretionary activity under rule EM6.

Resource Management (National Environmental Standards for Assessing and Managing Contaminants in Soil to Project Human Health) Regulations 2011:

- Disturbance of *in situ* contaminated soils – regulation 9-11 of the

Note: further information is required on the contamination status of the site.

4.7.3 Other approvals

No known archaeological sites have been identified within the vicinity of the works site. As such, we are not aware of any site features that require an Archaeological Authority to be obtained from Heritage New Zealand Pouhere Taonga prior to earthworks commencing. However, we would recommend that accidental discovery protocols are implemented during the earthworks.

There are no overlays or notations in the District Plan that indicate that the site is ecologically sensitive. Furthermore, the site is a grassed area that has recently been developed into a residential subdivision. As such, it is unlikely the proposed works will disturb species that are protected under the Wildlife Act 1953 (e.g., lizards and bats) and that a Wildlife Act Authority is required. Notwithstanding this, the presence, or lack of, protected species and subsequent Wildlife Act Authority requirements should be confirmed with the project ecologist.

5 Cost estimate

Preliminary cost estimates have been prepared based on the sketches and plan extents outlined above.

Earthworks rates have been summarised based on recent tender submissions and local experience in recent construction contracts.

The cost estimate (exclusive of GST) includes:

Stopbank:

- Provisional estimate for vegetation clearance.
- Stripping of surficial material and topsoil.
- Undercut removal.
- Bulk fill, placed and compacted, assumed to be imported to site. assume from local borrow pit in adjacent farmland.
- Topsoiling on completion.
- Re-grassing bank face.

Stormwater Management:

- Swales Installation
- Pump station
- Rising main
- Concrete outlet structure

Road works (Beach Road and Tati Way)

- Removing existing chipseal (assume 50mm thick)
- Trim and compact road to subgrade level
- Chip seal- two coats grade 3/5
- 200mm AP40 base course
- 200mm AP65 sub-base
- Clean Fill
- Surveying
- Erosion & sediment control & reinstatement

Other

- Preliminary and General (P&G) Costs (assumed at 20% of the construction total).
- Contingency of -5/40% to account for significant uncertainties in the project alignment and sourcing of fill material, contingency including P&G.

The costs are estimated to be within the range of **$1,820,000 to $2,600,000.** Breakdowns are provided in Appendix D Preliminary construction cost estimate

The costs outlined above should be considered as relative only and we recommend HBRC seek further professional QS guidance prior to detailed design.

Cost estimates exclude items such as:

- Flood management during construction.
- Operating and maintenance costs e.g., any ongoing pumping station costs.
- Consultancy and design fees.
- Construction MSQA and contract management.
- Consenting and associated fees.
- Iwi engagement.
- Track and pathway construction or reinstatement.
- Planting or vegetation works.
- Land acquisition.
- Consultation and legal fees.

6 Next steps

The following works have been identified for the detailed design phase:

- Final flood levels should be confirmed following NIWA flood frequency updates and modelling work, on behalf of HBRC. We understand some catchment modelling has been completed by HBRC and other consultancies for various parts of the catchment including the local marae.
- Assess on-site details and determine the final stopbank alignment and tie in points. Further topographical survey would be beneficial along the alignment to confirm levels in more detail.
- Confirm stopbank design grades and earthworks extents.
- Undertake geotechnical investigations, a combination of machine boreholes, CPT testing and test pits are proposed to assess foundation and borrow site condition, along with a suite of laboratory testing. Consider slope stability under seismic loading and seepage implications/treatment.
- Confirm any on or offsite borrow sources. It is envisaged that a local borrow site would be developed in one of the adjacent hill sites, as was done for the subdivision filling.
- Complete detailed design of stormwater management.
- Confirm the resource consent requirements from HDC and HBRC.
- Confirm details of the proposed rising main and pumping system, including pump details, inlet structure, swale design and confirm maintenance requirements.
- Confirm acquisition of land between HDC and property owners to build stopbank.

7 Conclusion

Hawke's Bay Regional Council has commissioned Tonkin & Taylor Ltd to conduct a review of land categorisation in the Tangoio area, with a specific focus on the category 2A land, comprising of the Tangoio beach subdivision.

Initial workshopping included consideration of property specific mitigations, raising ground level and a stopbank located within and outside the subdivision. A preferred solution proposed is the construction of a stopbank extending around the western side of the subdivision, addressing flooding from out-of-channel flows on the Te Ngarue Stream River. Additionally, a stormwater system that discharges to sea was proposed inside the stopbank alignment to convey overland flow from the northeast hills to mitigate ponding within the subdivision. The project also involves raising a section of Beach Road that the stopbank crosses and raising Tati Way to provide access to adjacent land parcels.

This project, spanning approximately 520 m, is mostly along Tangoio Developments Limited land with a short section of stopbank on Lot 17, The council will be required to liaise with Tangoio Development Limited and Lot 17 to acquire land or establish suitable easements.

Despite the stopbank design, inherent residual risks remain for the Tangoio development. The surrounding Tangoio land's Category 3 classification raises concerns about a lack of secure egress routes during significant weather events (especially for emergency services), along with ongoing risks due of coastal erosion (likely to be exacerbated in future due to sea level rise) and uncertainties regarding the management of overdesign events.

To prepare for the detailed design phase, several key tasks have been identified, including on-site assessments for finalising the design event and related stopbank levels and alignment, sourcing construction materials, conducting geotechnical investigations, creating hydrological and hydraulic models, checking consent requirements and securing landowner agreements.

Initial reviews suggest the construction of this scheme is feasible pending clarification of land acquisition and borrow materials and residual risks as discussed above. Cost estimates have been provided in Appendix D.

8 Applicability

This report has been prepared for the exclusive use of our client Hawke's Bay Regional Council, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

The construction rates utilised for this preliminary cost estimate are based on assumed design concepts, estimated quantities, and a combination of recently submitted tender rates for similar projects within the regional area along with the latest available rates from QV Cost Builder database (formerly Rawlinsons). These rates are based on historic information and data and do not include allowance for any cost escalation since the date of the data other than where/as specifically stated.

Consequently, a significant margin of uncertainty exists on the cost estimate and the contingency we have allowed should be considered as part of the cost rather than a potential add on.

In particular, we have not made any attempt to allow for the potential impact of COVID-19 in this estimate. Also, supply chain disruptions are currently having quickly changing effects on construction costs and schedules. We recommend you seek up-to-date specialist economic advice on what budgetary allowances you should make for escalation, including for any potential changes in construction costs and timing in relation to both COVID-19 and supply-chain issues.

Tonkin & Taylor Ltd
Environmental and Engineering Consultants

Report prepared by:

.....

Amelia Jeffery
Water Resource Engineer

Authorised for Tonkin & Taylor Ltd by:

.....

Tim Morris
Project Director

Reviewed by: Jamie Yule (T+T project manager)

29-Nov-23
\\ttgroup.local\corporate\Wellington\TT Projects\1017353\1017353.2301\WorkingMaterial\3 Tangoio\11 Reporting\PD Review\Tangoio Concept Design Stopbank PD - BIS Review.docx

Appendix A Figures

- Stopbank plan
- Stopbank fill Isopach
- Cross-section of Raised Beach Road
- Cross-sections of stopbank

N

drain location maintained

Beach Road Cross Section

Cross Section 1

Section of road regraded to completed stopbank tie in to high ground

Swale to convey internal subdivision flows

Cross Section 2

Cross Section 3

Cross Section 4

Cross Section 5

Beach Road

Te Karu Lane

Tati Way

New culvert under Tati Way, 300 dia RCRJ or similar subject to detailed design.

Small pump station to convey internal subdivision flows to coast in larger events.

Maintenance access at end of Tati way. Exisitng pavement removed and resealed at finished levels.

Existing informal accessway maintained and wearing course relayed.

LEGEND

- Stopbank
- Existing Drain
- Proposed Swale
- Outfall
- Pump Station
- Rising Main and Pumped Discharge
- Raised Section of Road

Scale 1:1750

0 25 50 75 100 m

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NOTES:

CRS: NZGD 2000 New Zealand Transverse Mercator Credits: Esri Community Maps Contributors, LINZ, Stats NZ, Esri, HERE, Garmin, Foursquare, METI/NASA, USGS, Hastings DC, LINZ, Maxar

PROJECT No.	1017353.2301		
DESIGNED	AMJE	OCT.23	
DRAWN	-WEB-	SEPT.23	
CHECKED			
APPROVED	DATE		

CLIENT Hawkes Bay Regional Council

PROJECT Land Catagorisation-Tangoio

TITLE Proposed stopbank alignment plan

SCALE (A3) 1:1750 FIG No. 1

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NOTES:

CRS: NZGD 2000 New Zealand Transverse Mercator Credits: Esri Community Maps Contributors, LINZ, Stats NZ, Esri, HERE, Garmin, Foursquare, METI/NASA, USGS, Hastings DC, LINZ, Maxar

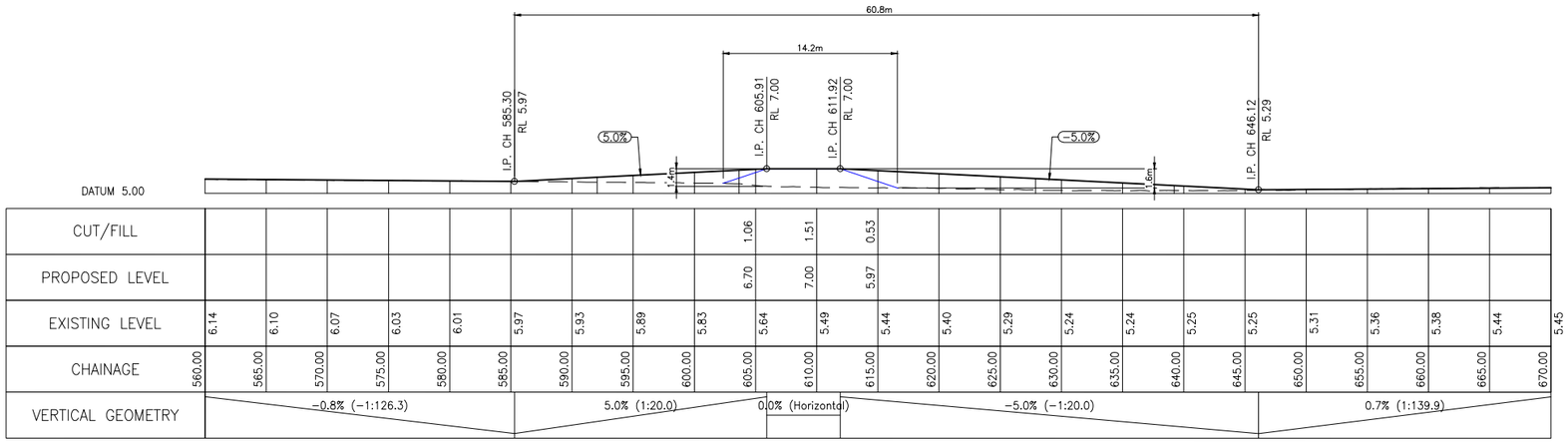
PROJECT No.	1017353.2301	
DESIGNED	ANCL	11/23
DRAWN	ANCL	11/23
CHECKED		
APPROVED	DATE	

CLIENT Hawkes Bay Regional Council

PROJECT Land Catagorisation-Tangoio

TITLE Stopbank Fill Isopach

SCALE (A3) FIG No. 2



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PROPOSED LEVEL									6.70	7.00	5.97														
EXISTING LEVEL	6.14	6.10	6.07	6.03	6.01	5.97	5.93	5.89	5.83	5.64	5.49	5.44	5.40	5.29	5.24	5.24	5.25	5.25	5.31	5.36	5.38	5.44	5.45		
CHAINAGE	560.00	565.00	570.00	575.00	580.00	585.00	590.00	595.00	600.00	605.00	610.00	615.00	620.00	625.00	630.00	635.00	640.00	645.00	650.00	655.00	660.00	665.00	670.00		
VERTICAL GEOMETRY	-0.8% (-1:126.3)						5.0% (1:20.0)				0.0% (Horizontal)	-5.0% (-1:20.0)										0.7% (1:139.9)			

BEACH ROAD

Tonkin+Taylor

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NOTES:

A3 SCALE 1:500

0 5 10 15 20 25 Meters

CRS: NZGD 2000 New Zealand Transverse Mercator
Credits: Esri Community Maps Contributors, LINZ, Stats NZ, Esri, HERE, Garmin, Foursquare, METI/NASA, USGS, Hastings DC, LINZ, Maxar

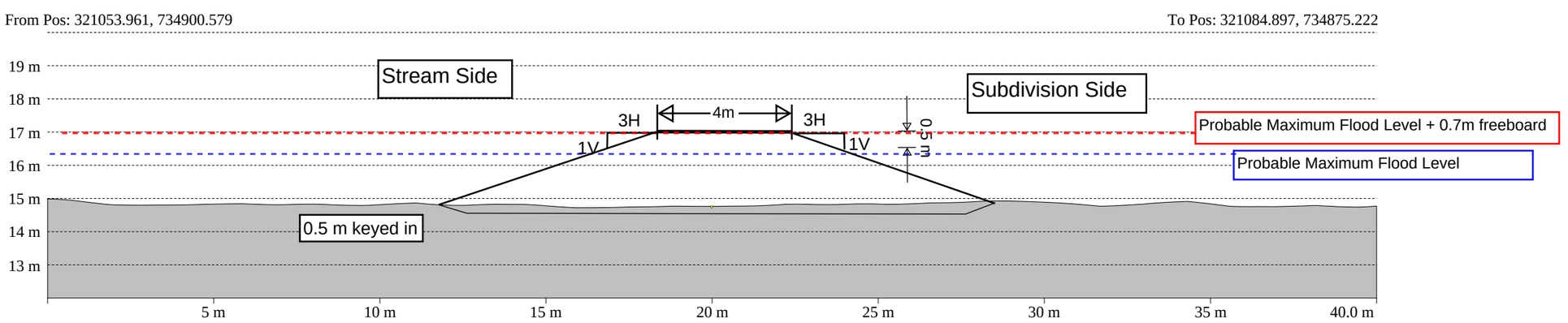
PROJECT No.	1017353.2301		
DESIGNED	ANCL	OCT.23	
DRAWN	-WEB-	SEPT.23	
CHECKED			
APPROVED	DATE		

CLIENT Hawkes Bay Regional Council
PROJECT Land Catagorisation-Tangoio
TITLE Beach Road Cross Section
SCALE (A3) 1:500 FIG No. 3

Cross-section 1

Tonkin+Taylor

Drawn by: AMJE
Date: 28/09/23
Checked by:



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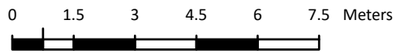


DRAWING NOTES:

1. LEVELS ARE IN TERMS OF HAWKES BAY LOCAL AUTHORITY DATUM(MSL+10m)
2. LIDAR DERIVED DEM FROM LINZ DATA SERVICE. DATA NAME: "Hawke's Bay LiDAR 1m DEM (2020)"
3. FLOOD LEVELS SUPPLIED BY HAWKE'S BAY REGIONAL COUNCIL 2008. FILENAME: "Tangoio_Subdivision_Statement_of_Evidence_Gary_Clode.pdf"

Figure 4

Scale 1:150 in A3

Cross-section 2

Tonkin+Taylor

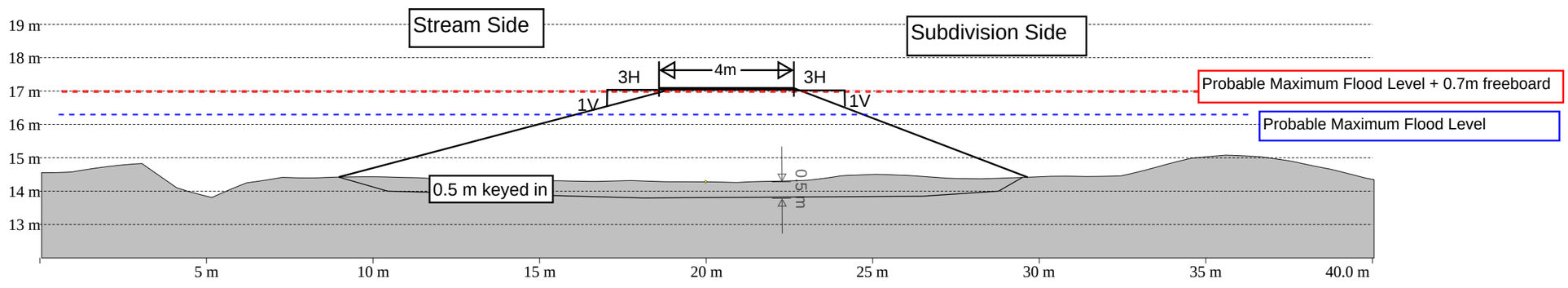
Drawn by: AMJE
Date: 28/09/23
Checked by:

From Pos: 1937689.173, 5638643.873

To Pos: 1937727.672, 5638654.873

From Pos: 321023.631, 734773.172

To Pos: 321061.748, 734785.300



A3 SCALE 1:150

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DRAWING NOTES:

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3. FLOOD LEVELS SUPPLIED BY HAWKE'S BAY REGIONAL COUNCIL 2008. FILENAME: "Tangoio_Subdivision_Statement_of_Evidence_Gary_Clode.pdf"

Figure 5

Scale 1:150 in A3

Cross-section 3

Tonkin+Taylor

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Checked by:

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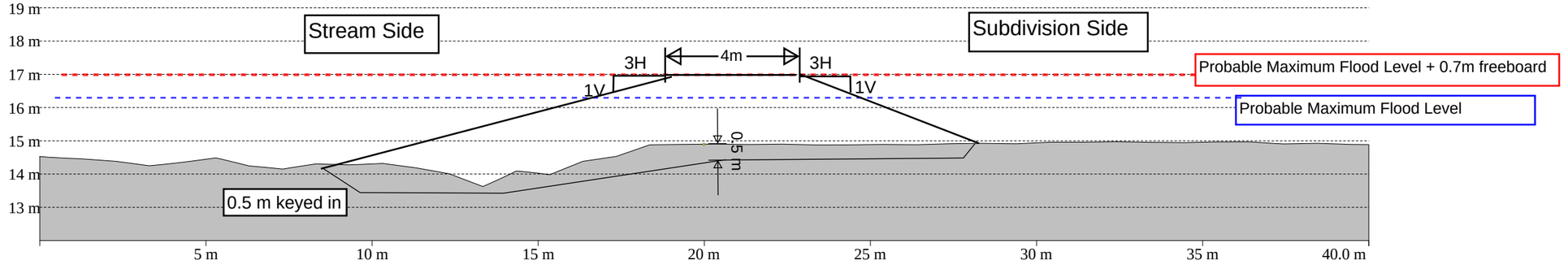
To Pos: 321110.516, 734724.054



A3 SCALE 1:150

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DRAWING NOTES:

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2. LIDAR DERIVED DEM FROM LINZ DATA SERVICE. DATA NAME: "Hawke's Bay LiDAR 1m DEM (2020)"
3. FLOOD LEVELS SUPPLIED BY HAWKE'S BAY REGIONAL COUNCIL 2008. FILENAME: "Tangoio_Subdivision_Statement_of_Evidence_Gary_Clode.pdf"

Figure 6

Scale 1:150 in A3

Cross-section 4

Drawn by: AMJE
Date: 28/09/23
Checked by:

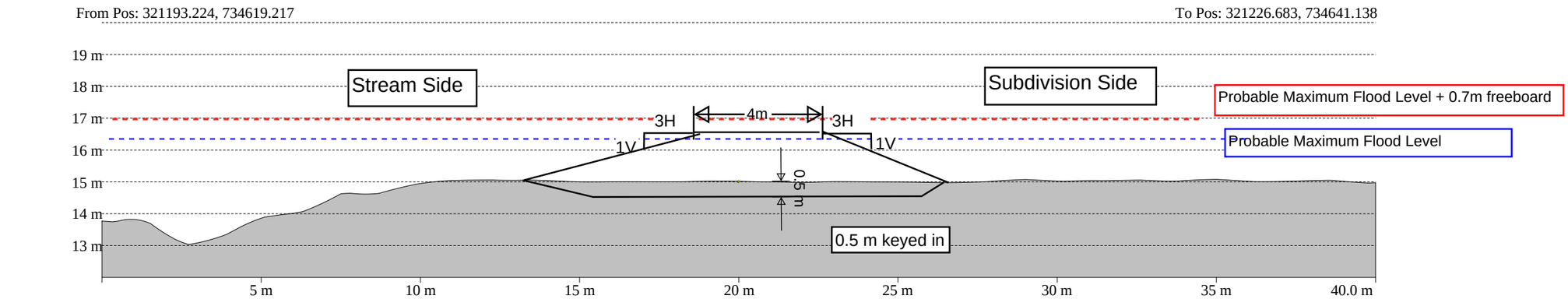

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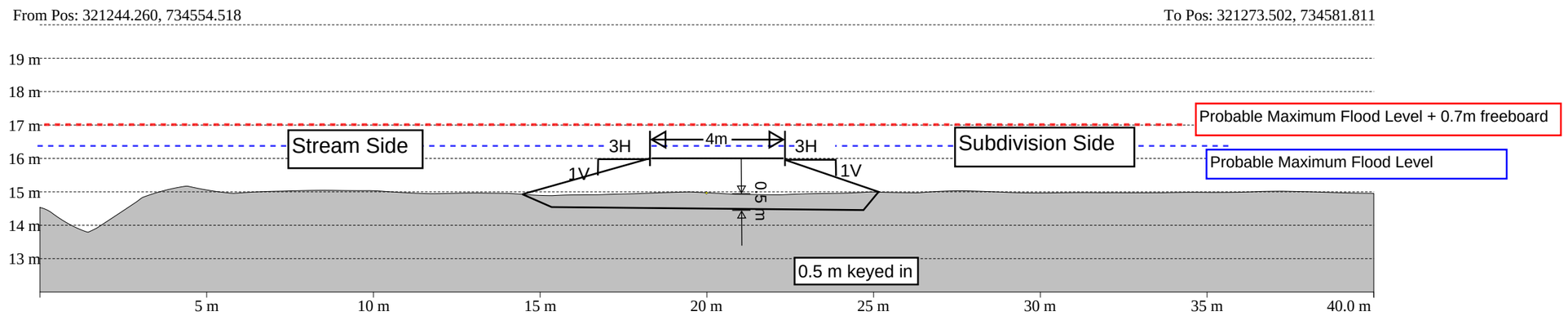
Figure 7

Scale 1:150 in A3

Cross-section 5

Tonkin+Taylor

Drawn by: AMJE
Date: 28/09/23
Checked by:



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2. LIDAR DERIVED DEM FROM LINZ DATA SERVICE. DATA NAME: "Hawke's Bay LiDAR 1m DEM (2020)"
3. FLOOD LEVELS SUPPLIED BY HAWKE'S BAY REGIONAL COUNCIL 2008. FILENAME: "Tangoio_Subdivision_Statement_of_Evidence_Gary_Clode.pdf"

Figure 8

Scale 1:150 in A3

Appendix B Development Nous (Finished Level Contour information)

The co-ordinates are in terms of NZGD2000 Hawke's Bay Circuit.

DATE PLOTTED: 15 December 2022 8:44 am BY: MIKE GRAHAM

NOTES:

1. Coordinates are in terms of NZGD2000 Hawkes Bay Circuit. Origin of coordinates IT 2 DP 548943.
2. Levels are in terms of Hawkes Bay Local Authority Datum. Origin of heights is IT 2 DP 548943. R.L.=14.284m.
3. Asbuilt survey has been completed using GNSS and UAV Photogrammetry.
4. Contours shown at 0.1m interval. Major Contours interval 0.5m.

LEGEND:

BOUNDARY

MAJOR CONTOUR

MINOR CONTOUR

Rev.	Date	Description	Appd.	Issued
1	14/12/2022	ASBUILT SURFACE	KRC	MG

CAD File: H20170157_CONTOURSdwg.dwg

NORTH

0 15 30 45 60 75m

SCALE 1:750 @A1

DEVELOPMENT NOUS
SURVEYING + URBAN DESIGN + ENGINEERING + TOWN PLANNING
ENVIRONMENTAL + LANDSCAPE ARCHITECTURE

Fieldworked	BR, KD, MV, SJ	Date Mar 2021 - July 2022
Drawn	MG	Date 14/12/2022
Checked		Date
Designed		Date
Approved		Date

Client: TAWANUI DEVELOPMENTS LIMITED

Project: TANGOIO BEACH SETTLEMENT
BEACH ROAD TANGOIO

Title: ASBUILT SURFACE
SHEET 1 OF 4

Status: FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Datum	Council Ref.	Scale	Size
HB2000		1:750	A1

Drawing Number: H20170157_CONTOURSdwg-501 Revision: 1

DATE PLOTTED: 15 December 2022 8:46 am BY: MIKE GRAHAM

NOTES:

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2. Levels are in terms of Hawkes Bay Local Authority Datum. Origin of heights is IT 2 DP 548943. R.L.=14.284m.
3. Asbuilt survey has been completed using GNSS and UAV Photogrammetry.
4. Contours shown at 0.1m interval. Major Contours interval 0.5m.

LEGEND:

BOUNDARY

MAJOR CONTOUR

MINOR CONTOUR

Lot 8
807m²

Lot 21
801m²

Lot 19
801m²

Lot 26
804m²

Lot 20
801m²

Lot 25
806m²

Lot 9
809m²

Lot 10
801m²

Lot 11
801m²

Lot 12
801m²

Lot 13
801m²

Lot 24
807m²

Lot 23
801m²

Lot 14
801m²

Lot 15
800m²

Lot 16
825m²

Lot 17
825m²

Lot 18
808m²

Rev.	Date	Description	Appd.	Issued
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NORTH

0 5 10 15 20 25m

SCALE 1:250 @A1

DEVELOPMENT NOUS
SURVEYING • URBAN DESIGN • ENGINEERING • TOWN PLANNING
ENVIRONMENTAL • LANDSCAPE ARCHITECTURE

Fieldworked	BR, KD, MV, SJ	Mar 2021 - July 2022
Drawn	MG	14/12/2022
Checked		
Designed		
Approved		

Client: TAWANUI DEVELOPMENTS LIMITED

Project: TANGOIO BEACH SETTLEMENT
BEACH ROAD TANGOIO

Status: FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Title: ASBUILT CONTOURS
SHEET 2 OF 4

Datum	Council Ref.	Scale	Size
HB2000		1:250	A1

Drawing Number: H20170157_CONTOURSdwg-502 Revision: 1

CAD File: H20170157_CONTOURSdwg.dwg

DATE PLOTTED: 15 December 2022 8:47 am BY: MIKE GRAHAM

NOTES:

1. Coordinates are in terms of NZGD2000 Hawkes Bay Circuit. Origin of coordinates IT 2 DP 548943.
2. Levels are in terms of Hawkes Bay Local Authority Datum. Origin of heights is IT 2 DP 548943. R.L.=14.284m.
3. Asbuilt survey has been completed using GNSS and UAV Photogrammetry.
4. Contours shown at 0.1m interval. Major Contours interval 0.5m.

LEGEND:

BOUNDARY

MAJOR CONTOUR

MINOR CONTOUR

Rev.	Date	Description	Appd.	Issued
1	14/12/2022	ASBUILT SURFACE	KRC	MG

NORTH

0 5 10 15 20 25m

SCALE 1:250 @A1

DEVELOPMENT NOUS
SURVEYING • URBAN DESIGN • ENGINEERING • TOWN PLANNING
ENVIRONMENTAL • LANDSCAPE ARCHITECTURE

Fieldworked	BR, KD, MV, SJ	Mar 2021 - July 2022
Drawn	MG	14/12/2022
Checked		
Designed		
Approved		

Client: TAWANUI DEVELOPMENTS LIMITED

Project: TANGOIO BEACH SETTLEMENT
BEACH ROAD TANGOIO

Status: FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Title: ASBUILT SURFACE
SHEET 3 OF 4

Datum	Council Ref.	Scale	Size
HB2000		1:250	A1

Drawing Number: H20170157_CONTOURSdwg-503 Revision: 1

CAD File: H20170157_CONTOURSdwg.dwg

DATE PLOTTED: 15 December 2022 8:47 am BY: MIKE GRAHAM

NOTES:

1. Coordinates are in terms of NZGD2000 Hawkes Bay Circuit. Origin of coordinates IT 2 DP 548943.
2. Levels are in terms of Hawkes Bay Local Authority Datum. Origin of heights is IT 2 DP 548943. R.L.=14.284m.
3. Asbuilt survey has been completed using GNSS and UAV Photogrammetry.
4. Contours shown at 0.1m interval. Major Contours interval 0.5m.

LEGEND:

- BOUNDARY
- MAJOR CONTOUR
- MINOR CONTOUR

BEECH ROAD

Lot 36
1050m²

Lot 35
1060m²

Lot 34
1051m²

Lot 33
1044m²

Lot 32
816m²

Lot 31
821m²

Lot 30
831m²

Lot 29
828m²

Lot 28
861m²

Rev.	Date	Description	Appd.	Issued
1	14/12/2022	ASBUILT SURFACE	KRC	MG

NORTH

0 5 10 15 20 25m
SCALE 1:250 @A1

DEVELOPMENT NOUS
SURVEYING • URBAN DESIGN • ENGINEERING • TOWN PLANNING
ENVIRONMENTAL • LANDSCAPE ARCHITECTURE

Fieldworked	BR, KD, MV, SJ	Date Mar 2021 - July 2022
Drawn	MG	Date 14/12/2022
Checked		Date
Designed		Date
Approved		Date

Client: TAWANUI DEVELOPMENTS LIMITED
Project: TANGOIO BEACH SETTLEMENT
BEACH ROAD TANGOIO
Title: ASBUILT SURFACE
SHEET 4 OF 4

Status: FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Datum	Council Ref.	Scale	Size
HB2000		1:250	A1

Drawing Number: H20170157_CONTOURSdwg-504
Revision: 1

CAD File: H20170157_CONTOURSdwg.dwg

Appendix C Relevant statutory planning provisions

C1 Introduction

This is a preliminary assessment of the likely resource consent requirements for the flood protection works at Tangoio Beach based on the information currently available.

It should be noted that the following information represents preliminary planning advice only, based on the information available. Additional resource consent requirements or consultation requirements may be identified once the project is progressed.

C2 Proposed works

The proposed works are outlined in detail in the report above. In summary, these include the following:

- The construction of a 520 m stopbank. This requires earthworks and filling of 14,500 m^3; and
- Construction of a swale, pump station, rising main and outfall on the beach to discharge stormwater from within the stopbank area.

C3 Regulatory framework and resource consent requirements

The sections below set out a preliminary analysis of the statutory planning provisions that could be considered relevant to the consenting of the flood protection works above.

Further detailed statutory analysis of the proposed activities will be required as part of the resource consent and Assessment of Effects on the Environment (AEE) preparation process, as more detailed information becomes available.

C3.1 Relevant RMA statutory documents

The following statutory planning documents are relevant to the proposed works:

- Hawke's Bay Regional Council (HBRC) Regional Resource Management Plan (RRMP).
- HBRC Regional Coastal Environment Plan (RCEP).
- Hastings District Council (HDC) District Plan.
- Resource Management (National Environmental Standards for Freshwater) Regulations 2020 (NESF); and
- Resource Management (National Environmental Standards for Assessing and Managing Contaminants in Soil to Project Human Health) Regulations 2011 (NESCS).

The zoning and planning notations that apply to the site are outlined below in Appendix C Table 1.

Appendix C Table 1: Zoning and planning notations

Zoning/planning notation	Description
HBRC Regional Resource Management Plan	
Schedule II Land Cover	The site is identified as 'primary pastoral'. This is the landcover when the plan was prepared in 1995-1996. This overlay is not relevant to the proposed works.

Schedule II Sustainable Land Use Capability	The site is a mix of pastoral farming, horticulture, and protection.
Schedule II Unsustainable Land Use Capability	The northeast margin is identified as pastoral farming with trees.
Schedule X Rule 7	Applies to the majority of the area where the stopbank will be located, with the exception of the properties on the coastal frontage.
Schedule XIV Heretaunga Plains Sub-Region	Applies to the entire site.
Statutory Acknowledgement Area	The Te Ngarue Stream and its tributaries are a statutory acknowledgement area for Maungaharuru-Tangitu. The main branch of the stream is to the west of the site. The Coastal Marine Area (CMA) by the site is also a statutory acknowledgement area for Maungaharuru-Tangitu.
HBRC Regional Coastal Environment Plan	
Coastal Environment Inland Boundary and Coastal Margin	Approximately half of the site is within this area.
Coastal Hazard Zone 1	Tangoio Beach is within this overlay.
Coastal Hazard Zone 2	Part of Tangoio Beach is within this overlay.
Coastal Hazard Zone 3	Part of the subdivision is within this overlay.
Class CR Coastal Water	Applies to the coastal water of Tangoio Beach. No works are proposed within this area.
Vegetation clearance management area	Applies to the northeastern area of the site. No works are proposed within this area.
Hastings District Plan	
Coastal Settlement Zone	Applies to the southeastern half of the site.
Rural Zone	Applies to the northwestern half of the site.
River Hazard Overlay	Applies to the majority of the site.
Coastal Environment Boundary	Approximately half of the site is within this area.
Coastal Landscape Character Area – Tangoio Beach (CCL2)	Applies to the entire site.

C3.2 Key potential resource consent requirements

A summary of the potential resource consent triggers is set out in Appendix C Table 2 below. In summary:

Hawke's Bay Regional Council

The following activities likely require resource consent under the Regional Resource Management Plan:

- Diversion of floodwater associated with stopbank construction - discretionary activity under rule 69/59.

The following activities may require resource consent under the Regional Coastal Environment Plan:

- Diversion of floodwater associated with stopbank construction - discretionary activity under rule 39.
- Construction of stormwater outfall (network utility structure) within Coastal Hazard Zone 1 and 2 – restricted discretionary activity

- Stormwater outfall in the CMA – discretionary activity under rule 117.

  Note: whether the outfall is below mean high-water springs and therefore within the CMA needs to be confirmed; and

- Diversion and discharge of stormwater to the CMA – controlled activity under rule 164.

  Note: whether the discharge point is below mean high-water springs and therefore within the CMA needs to be confirmed.

Permitted activities:

The following activities can likely be a permitted activity under the Regional Resource Management Plan, subject to compliance with the permitted activity conditions:

- Earthworks on land – permitted activity under rule 7; and
- Diversion and discharge of stormwater associated with stormwater infrastructure (swale, pump station, rising main, outfall) – permitted activity rule 42.

The following activities can likely be a permitted activity under the Resource Coastal Environment Plan, subject to compliance with the permitted activity conditions:

- Earthworks within the coastal margin – permitted activity under rule 7.
- Diversion and discharge of stormwater within the coastal margin associated with stormwater infrastructure (swale, pump station, rising main, outfall) – permitted activity rule 25; and
- Construction of a pump station and rising main, being network utility structures, within Coastal Hazard Zone 3 – permitted activity under rule 94.

Hastings District Council

The following activities likely require resource consent under the District Plan:

- Earthworks - restricted discretionary activity under rule EM6.

The following activities may require resource consent under the NESCS:

- Disturbance of *in situ* contaminated soils – regulation 9-11 of the NESCS.

  Note: further information is required on the contamination status of the site.

Permitted activities:

The following activities can likely be a permitted activity under the District Plan:

- Construction of stopbank, swale and pump station within the River Hazard Overlay – permitted activity under rule 15.1.5 NH1.
- Construction of stopbank, swale and pump station within the Tangoio Coastal Character Landscape area – permitted activity under rule 17.1.5 LS1; and
- Construction Noise – Permitted activity under rule 15.1.5 NS1.

C3.2.1 Regional and District Plan assessment

This table constitutes a preliminary assessment of resource consent requirements. The resource consent requirements will be confirmed at the time of preparing the relevant resource consent applications.

Appendix C Table 2: Key potential resource consent requirements

Activity	Rule	Comment
HBRC Regional Resource Management Plan		
Earthworks on land for the construction of the stopbank and stormwater infrastructure (swale, pump station, rising main, outfall)	*Permitted activity rule 7 – Vegetation clearance and soil disturbance.* Vegetation clearance and soil disturbance activities. a. All cleared vegetation, disturbed soil or debris shall be deposited or contained to reasonably prevent the transportation or deposition of disturbed matter into any water body. b. Vegetation clearance or soil disturbance shall not give rise to any significant change in the colour or clarity of any adjacent water body, after reasonable mixing. c. No vegetation clearance shall occur within 5 metres of any permanently flowing river, or any other river with a bed width in excess of 2 metres, or any other lake or wetland, except that this condition shall not apply to: d. Deposition of soil or soil particles across a property boundary shall not be objectionable or offensive, cause property damage or exceed 10 kg/m2. e. Where the clearance of vegetation or the disturbance of soil increases the risk of soil loss the land shall be: i. re-vegetated as soon as practicable after completion of the activity, but in any event no later than 18 months with species providing equivalent or better land stabilisation; or ii. retained in a manner which inhibits soil loss.	**Permitted activity** Earthworks can likely be permitted under rule 7.
Diversion of stormwater associated with stormwater infrastructure (swale, pump station, rising main, outfall).	*Permitted activity rule 42 – Diversion and discharge of stormwater* The diversion and discharge of stormwater from any constructed open drainage system or piped stormwater drainage system in the Coastal Margin that: 1. Does not convey stormwater from any industrial or trade premises; or <u>Conditions:</u> a) The activity shall not cause any permanent: i) reduction of the ability of the receiving channel to convey flood flows or ii) bed scouring or bank erosion of the receiving channel. b) The discharge shall not cause the production of conspicuous oil or grease films, scums, or foams, or floatable or suspended materials in any receiving water after reasonable mixing.	**Permitted activity** The diversion and discharge of stormwater can likely be a permitted activity

Activity	Rule	Comment
Diversion of floodwater due to stopbank construction	*Permitted activity rule 70 – River control & Drainage Works* Any activity, as described in the Hawke's Bay Regional Council Environmental Code of Practice for River Control and Drainage Works (1999), that is carried out by a local authority exercising its powers, functions and duties under the Soil Conservation and Rivers Control Act 1941, the Land Drainage Act 1908, or the Local Government Act 1974, in relation to flood control and drainage, including: • edge protection works. • planting • river protection maintenance works • irrigation intake maintenance • weed and vegetation control (excluding spraying) • drain maintenance, and drainage outlet maintenance. • drain crossings. • river mouth openings for the purpose of flood mitigation • river management and drainage for the maintenance of surface water quality • channel diversions within a riverbed or drain, ancillary to the above activities. that would otherwise contravene: • section 13 or section 14 of the RMA, or • section 15 of the RMA in relation to the discharge of sediment.	**Discretionary activity** Previous advice from HBRC is that rule 70 applies to works associated with stopbanks that may be outside of the bed of the river (as defined under the RMA). The stopbanks will effectively divert floodwater away from the Tangoio settlement and onto the adjacent land. This is considered to be a major diversion that is not provided for by the permitted activity rule which relates to diversions within the riverbed. Therefore, the activity requires resource consent under rule 69. *We note that if rule 70 is deemed to not apply by HBRC as the works are outside of a riverbed, the diversion of floodwater is unlikely to comply with permitted activity rule 56 and discretionary activity resource consent is required under rule 59.*
	Discretionary activity Rule 69 - River & lakebed activities that are not expressly regulated by other rules	
HBRC Regional Coastal Environment Plan		
Earthworks within the coastal margin	*Permitted activity rule 7* a) All cleared vegetation, disturbed soil or debris shall be deposited or contained to reasonably prevent the transportation or deposition of disturbed matter into the coastal marine area or any water body. b) Vegetation clearance or soil disturbance shall not give rise to any significant change in the colour or clarity of any coastal water or any adjacent water body, after reasonable mixing. […] e) Deposition of soil or soil particles across a property boundary shall not be objectionable or offensive, cause property damage or exceed 10 kg/m2 f) Where the clearance of vegetation or the disturbance of soil increases the risk of soil loss the land shall be:	**Permitted activity** Earthworks can likely be permitted under rule 7.

Activity	Rule	Comment
	i) re-vegetated as soon as practicable after completion of the activity, but in any event no later than 18 months after completion with species providing equivalent or better land stabilisation or ii) retained in a manner which inhibits soil loss.	
Diversion and discharge of stormwater within the coastal margin associated with stormwater infrastructure (swale, pump station, rising main, outfall).	*Permitted activity rule 25 – Diversion and discharge of stormwater* The diversion and discharge of stormwater from any constructed open drainage system or piped stormwater drainage system in the Coastal Margin that: 1. Does not convey stormwater from any industrial or trade premises; or <u>Conditions:</u> a) The activity shall not cause any permanent: i) reduction of the ability of the receiving channel to convey flood flows or ii) bed scouring or bank erosion of the receiving channel. b) The discharge shall not cause the production of conspicuous oil or grease films, scums, or foams, or floatable or suspended materials in any receiving water after reasonable mixing. *Note: we consider stormwater rule 25 to be the relevant rule and not Controlled activity rule 24 relating to the diversion and discharge of drainage water.*	**Permitted activity** The diversion and discharge of stormwater can likely be a permitted activity
Diversion of floodwater due to stopbank construction	*Permitted activity rule 40 – Minor diversions* a) Either: i) the catchment area above the diversion shall not exceed 50 hectares or ii) the diversion shall remain within the bed of the affected water body or iii) the diversion shall divert no more than 10% of the flow of the affected water body, and the diverted water shall be returned to the affected water body no more than 100m downstream of the point at which the water is diverted. b) The diversion shall have not adversely affected any wetland. c) The diversion shall not be from one catchment to another. d) The diversion shall not cause any scouring or erosion of any land or any water course beyond the point of discharge. e) The diversion shall not adversely affect any lawfully established take, which existed at the time that the diversion commenced.	**Discretionary activity** The stopbanks will effectively divert floodwater away from the Tangoio settlement and onto the adjacent land. This is unlikely to meet point (g). Therefore, the activity requires resource consent under rule 39.

Activity	Rule	Comment
	f) The diversion shall not prevent the passage of fish within the water body g) There shall be no adverse flooding effects on any property owned or occupied by another person, as a result of the diversion activity.	
	Discretionary activity rule 39 - Diversions not regulated by, or not complying with other rules	
Construction of a pump station and rising main, being network utility structures, within Coastal Hazard Zone 3	*Permitted activity rule 94 – Network Utility Structures in CHZ3* The maintenance, repair, construction, upgrading, replacement, removal, or demolition of a structure for purposes of a network utility operation in CHZ3.	**Permitted**
Construction of stormwater outfall (network utility structure) within Coastal Hazard Zone 1 and 2	*Restricted discretionary activity rule 97 – Network utility structures in CHZ1 and CHZ2 not within a road reserve* Except as provided for in Rule 89, Rule 98, Rule 99, and Rule 100, any of the following activities in CHZ1 or CHZ2 not within a road reserve: 1. construction of a new structure and any associated earthworks for purposes of a network utility operation […]	**Restricted discretionary**
Stormwater outfall in the CMA *Note: whether the outfall is below mean high water springs and therefore within the CMA needs to be confirmed.*	*Discretionary activity rule 117 - Structures not regulated by, or not complying with, other rules*	**Discretionary activity** If the outfall structure is within the CMA resource consent will be required.
Diversion and discharge of stormwater to the CMA *Note: whether the discharge point is below mean high-water springs and therefore within the CMA needs to be confirmed.*	*Permitted activity rule 163 – Diversion and discharge of stormwater* The diversion and discharge of stormwater from any constructed open drainage system or piped stormwater drainage system that: 1. Does not convey stormwater from any industrial or trade premises; or […] <u>Conditions:</u> a) The activity shall not cause any permanent: i) reduction of the ability of the receiving channel to convey flood flows or ii) bed scouring or bank erosion of the receiving channel. b) The discharge shall not cause the production of conspicuous oil or grease films, scums, or foams, or floatable or suspended materials in any receiving water after reasonable mixing.	**Controlled activity** The discharge of stormwater to the CMA cannot comply with permitted activity rule 163(d). Therefore, controlled activity rule 164 likely applies assuming condition a can be complied with.

Activity	Rule	Comment
	c) The discharge must not cause deterioration of receiving water quality beyond the water quality standards set out in Schedule E. d) The stormwater shall not be diverted or discharged from an area greater than 2 hectares	
	Controlled activity rule 164 – Diversion and discharge of stormwater to the CMA a) The discharge must not cause deterioration of receiving water quality beyond the water quality standards set out in Schedule E.	
Hastings District Plan		
Earthworks on land	*Permitted activity rule 27.1.5 EM4* The removal of river berm silt, gravel or other river control or drainage works carried out by a local or regional authority, exercising its powers, functions and duties under The Soil Conservation and Rivers Controls Act 1941, or The Land Drainage Act 1908 and ancillary activities involved with the relocation of the extracted material.	**Restricted discretionary** The permitted activity volume of earthworks for the rural zone is 2,000 m^3/ha and 50 m3/site for the coastal settlement zone. For the importation of fill these permitted volumes are halved. Fill faces must also be <5 m in the rural zone and <2.5 m in the coastal settlement zone. It is unlikely the proposal can meet these permitted activity conditions. Resource consent is likely required as a restricted discretionary activity under rule EM6.
	Restricted discretionary activity rule 27.1.5 EM6	
Construction of stopbank, swale and pump station	*Permitted activity rule 15.1.5 NH1* Natural Hazard Mitigation Activities including River Control and Drainage Works in the River Hazard Overlay carried out by or on behalf of a Local Authority, Network Utility Operator or a Requiring Authority Exercising its Powers, Functions and Duties Under the Resource Management Act 1991, Soil Conservation and Rivers Control Act 1941, or Land Drainage Act 1908. <u>Permitted activity conditions:</u> (a) Within a River Hazard Overlay, earthworks associated with the installation of underground network utilities shall reinstate the ground level to as close as practicable to its state prior to disturbance.	**Permitted activity** The River Hazard Overlay only covers the site. The permitted activity condition can likely be complied with.
	Permitted activity rule 17.1.5 LS1 Any activity not defined as a Controlled, Restricted Discretionary, Discretionary, Non-complying or Prohibited activity by the landscape area Rules.	**Permitted activity** The proposed activities are not restricted within the Tangoio Coastal Character Landscape area

Activity	Rule	Comment
Construction Noise	*Permitted activity rule 15.1.5 NS1* Any activity that meets the Performance Standards for the relevant Zone and the General and/or Specific Performance Standards and Terms in Sections 25.1.6 and 25.1.7. Permitted activity conditions 25.1.6I (a) Any noise arising from construction, maintenance and demolition work in any Zone shall comply with NZS6803:1999 Acoustics - Construction Noise. […]	**Permitted** Given the lack of dwellings nearby compliance with the noise standards can likely be achieved.

C3.2.2 NESF

The NESF contains regulations relating to natural wetlands, reclamation of rivers and structures in rivers. Public flood control and protection works are considered to be specified infrastructure under the NESF.

We are not aware of any natural wetlands in the vicinity of the works and structures within rivers are not proposed. Therefore, the regulations relating to natural wetlands structures in rivers are unlikely to be relevant to the proposed works. However, the presence or not of natural wetlands should be confirmed by the project ecologist.

C3.2.3 NESCS

The NESCS manages the disturbance of contaminated soil and removal of contaminated soil from sites listed on the Hazardous Activities and Industries Lists (HAIL). The site is identified on the HBRC HAIL register as being a category *E1 - Asbestos products manufacture or disposal including sites with buildings containing asbestos products known to be in a deteriorated condition.*

Therefore, the NESCS likely applies to the site. Given the site has recently undergone a residential subdivision we recommend that a Preliminary Site Investigation (PSI) is undertaken to confirm the nature of the HAIL activity that has occurred onsite, it's location and whether the site was remediated during the subdivision. Following this, it can be confirmed whether a Detailed Site Investigation is required and whether resource consent is likely to be required for the disturbance of *in situ* contaminated soils under regulation 9-11.

C3.3 Other approvals required

C3.3.1 Marine and Coastal Area (Takutai Moana) Act (MACAA) 2011

If the stormwater discharge and stormwater outfall are within the CMA, the MACAA will be relevant to the resource consent application to HBRC. The following parties have applied for customary marine title and/or protected customary rights over the Tangoio area:

- Maungaharuru-Tangitū Hapū;
- Ngāti Pāhauwera; and
- Te Aitanga a Puta, Ngāti Kurupakia Ngai Tauira.

These applications have not yet been recognised and therefore, written approval is not required from these parties. However, as part of the resource consent application process these parties must be notified and their views sought.

C3.3.2 Archaeological authority

A review of the District Plan planning maps and the NZAA 'ArchSite' archaeological database has been undertaken. No known archaeological sites have been identified within the vicinity of the works site. As such, we are not aware of any site features that require an Authority to be obtained from Heritage New Zealand Pouhere Taonga prior to earthworks commencing. However, we would recommend that accidental discovery protocols are implemented during the earthworks.

Notwithstanding this, with all earthworks there is a risk that accidental discoveries may be made. Should there be a discovery, it may delay construction while the site is reviewed by Heritage New Zealand and mana whenua and any necessary Archaeological Authorities are obtained. This delay could be reduced by seeking a general archaeological authority in advance.

C3.3.3 Wildlife Act 1953

There are no overlays or notations in the District Plan that indicate that the site is ecologically sensitive. Furthermore, the site is a grassed area that has recently been developed into a residential subdivision. As such, it is unlikely the proposed works will disturb species that are protected under the Wildlife Act 1953 (e.g., lizards and bats) and that a Wildlife Act Authority is required. Notwithstanding this, the presence, or lack of, protected species and subsequent Wildlife Act Authority requirements should be confirmed with the project ecologist.

Note: The processing time for a permit from the Department of Conservation (DOC) is approximately 6 to 9 months.

Appendix D Preliminary construction cost estimate

High-level construction cost estimate

No.	Item	Unit	Quantity	Rate	Estimate
Stopbank					
1	Vege clearance and tree removal	Prov	1	$60,000	$60,000
2	Strip vegetation and topsoil	m^2	9483	$4	$37,932
3	Undercut for 0.5 m key	m^3	4742	$12	$56,898
4	Fill - Supply, place, compact and shape stopbank, assumed imported to site	m^3	14458	$30	$433,743
5	Topsoiling	m^2	9925	$8	$79,399
6	erosion and sediment control	Prov	1	$50,000	$50,000
7	erosion and sediment control (borrow site)	Prov	1	$30,000	$30,000
8	Re-grassing and finishing	m^2	9925	$4	$39,700
Stormwater Management					
9	Swale Installation	m	500	$220	$110,000
10	Pump station	Prov	1	$500,000	$500,000
11	Rising main	m	12	$500	$6,000
12	Concrete outlet structure	Prov	1	$30,000	$30,000
Beach Road Raising (rural road)					
13	Removing existing chipseal (assume 50mm thick)	m^2	352	$6.50	$2,288.00
14	Trim and compact road to subgrade level	m^2	352	$2.00	$704.00
15	Chip seal- two coats grade 3/5	m^2	352	$16.50	$5,808.00
16	200mm AP40 base course	m^3	70.4	$195.00	$13,728.00
17	200mm AP65 sub-base	m^3	70.4	$90	$6,336.00
18	Clean Fill (approx)	m^3	500	$30	$15,000.00
19	Surveying	Prov	1	$50,000	$50,000
20	Erosion & sediment control & reinstatement	Prov	1	$35,000	$35,000
Tati Way Road Rasing (rural road)					
21	Removing existing chipseal (assume 50mm thick)	m^2	125	$6.50	$812.50
22	Trim and compact road to subgrade level	m^2	125	$2.00	$250.00
23	AP20 running course	m^3	25	$195.00	$4,875.00
24	200mm AP65 layer	m^3	25	$90	$2,250.00
25	Clean Fill (approx)	m^3	250	$30	$7,500.00
26	Erosion & sediment control & reinstatement	Prov	1	$15,000	$15,000.00
27	150mm AP65 on beach front paper road	m^3	105	$68	$7,087.50

Other					
28	P&G Assumed 20% of total cost	Prov			$320,062
29	Sum				$1,920,374
Contingency					
30	Contingency range -5%	Prov			$1,824,356
31	Contingency range +40%				$2,604,524
		Indicative estimated range		**$1,800,000**	**$2,600,000**