Pōrangahau Flood Mitigation Ecological Impact Assessment

Prepared for

Hawke's Bay Regional Council

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PATTLE DELAMORE PARTNERS LTD
Level 2, 109 Fanshawe Street,
Auckland Central 1010
PO Box 9528, Auckland 1149, New Zealand

Tel +64 9 **523 6900**
Web www.pdp.co.nz

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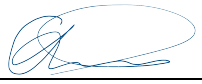
DOCUMENT CONTRIBUTORS

Prepared by				
SIGNATURE				
	Chloe Waugh	Amber Simmonds	Cate Ryan	Nicki Papworth

Reviewed by	Approved by
SIGNATURE		
	Emma Willmore	Jarred Arthur

Limitations:

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Executive Summary

Ecological assessments were conducted in terrestrial and freshwater habitats to support the Hawkes Bay Regional Council (HBRC) consent application for the development of flood management structures along the Pōrangahau River, Pōrangahau. This application will be made under the Order in Council (OiC) for cyclone recovery. Final construction designs and methodologies have yet to be completed. However, the current proposed flood management designs have been used to determine the ecological impacts associated with these works.

The Pōrangahau flood mitigation area is located adjacent to the township of Pōrangahau and adjacent to Pōrangahau River. The surrounding area is predominantly used for pastoral farming. This land use presents a risk to native aquatic ecosystems by reducing riparian vegetation, elevating nutrient inputs and increasing sediment inputs. Downstream, Pōrangahau Estuary is a crucial feeding and roosting area for migratory birds and the only known regional breeding site for Caspian terns. The river is designated as a Significant Conservation Area under regional plans and supports various native fish species.

Terrestrial Ecological Values and Potential Effects

Terrestrial vegetation assessments of the flood mitigation site recorded the presence of 10 distinct vegetation types; poplar and crack willow treeland, poplar, crack willow and blue periwinkle vineland, mixed broadleaved forest, macrocarpa treeland, rank exotic grassland, exotic grassland, Juncus rushland, crack willow wetland, creeping bent stream margin and rautahi sedgeland. Two invasive weed species were found on site including blackberry and Chilean needle grass which must be cleared before works commence and spreading prevented.

The area hosts several sensitive bird species categorised as 'At Risk – Declining', including royal spoonbills that were observed during fieldwork. Whilst there is no evidence that lizards are present within the area, there is suitable habitat suggesting a moderate risk to lizards of the proposed activities.

Potential bat roosts were found in several locations across the site, suggesting that the area could be used by native bats. Bats are considered threatened and are an ecologically significant species, highlighting the need for mitigation measures to be undertaken to reduce the impact of construction works on these species.

Overall, the level of effect on terrestrial ecology associated with the proposed construction activities is assessed as **very low** to **high** (including effects associated with birds, bats and lizards) if no mitigation measures are implemented. If no bats are present, then the maximum level of effect would be **moderate.**

Freshwater Ecological Values and Potential Effects

Freshwater assessments were undertaken along the Pōrangahau River including a rapid habitat assessment and water quality assessment. eDNA samples were not taken during fieldwork as recent data was available through the Wilderlab NZ database for the Pōrangahau River near the site. This information was used to assess the ecological values and baseline condition of the Pōrangahau River.

The riparian margin along the Pōrangahau River was assessed as having marginal to suboptimal habitat quality. The area is dominated by exotic grass and willow species contributing to its poor quality. Erosion was observed at several locations along the riverbank and the presence of fine sediments instream limited the availability of macroinvertebrate habitats suitable for EPT taxa. The river is tidal at the site therefore it is unlikely that EPT taxa are typically present.

Native fish are found in the river close to the site, indicating that the area provides habitats for these species as well as being a migratory pathway. The site has the potential to provide inānga spawning habitat along the banks and in adjacent wetlands. Kakahi freshwater mussels (*Echyridella menziesii*) were identified at the site and are an important taonga species.

In addition, the placement of the access ramp and stopbank will require realignment of a small unnamed intermittent stream. While this will result in direct modification of the existing channel, the stream can be restored to an equivalent or improved condition through appropriate design, planting, and habitat enhancement.

Overall, the freshwater ecological value of Pōrangahau River adjacent to the site is assessed as **moderate**. Extensive agricultural modification, abundant exotic weed species and high sediment input contribute to its lower ecological value. Despite this, the river does have ecological values providing a pathway for native fish species, and foraging and roosting habitats for indigenous birds. The level of effect associated with construction works is assessed as **moderate** to **high** without mitigation measures.

Recommended Mitigation Measures – Terrestrial

The works footprint has been realigned to avoid potential bat habitat and as much wetland extent as possible.

Recommended mitigation measures to further reduce potential effects on terrestrial environments include the following:

- Development and implementation of a restoration planting plan.
  - A restoration plan should be prepared to mitigate the loss of bird and lizard habitat. It should determine the most suitable areas for restoration and the appropriate species composition to support improvements for both bird and lizard habitat and ability to replace riparian shading over time. There is opportunity for planting along the river margins.

  - The plan should include a total of 0.22 ha of wetland to be enhanced/planted or created to replace wetland lost. The paddock with the creeping bent wetland south of Keppel Street appears suitable for wetland enhancement and is approx. 0.72 ha.

- Management of in-situ substrates and earthworks equipment to minimise the risk of spreading pest plants offsite or to new locations on site.
- Staged vegetation clearance and installation of eco-piles will create offsite habitats for lizards, and minimise noise and habitat disruption.
- Bat roost inspections of any trees scheduled to be removed with bat roost features prior to felling.

Construction should occur outside the bird nesting season, where practical. If not, nest checks should be conducted with a 20 m boundary established around active nests until chicks have fledged. If the recommended mitigation measures are implemented, the residual effects on terrestrial vegetation and habitats are assessed as **low, with some resulting in a positive net gain,** especially given the construction footprint is likely to be overestimated. The only exception is bats, where the effect remains **moderate** due to the removal of one potential roost tree. The alignment has already been adjusted to avoid other bat trees, leaving just a single tree requiring felling.

Recommended Mitigation Measures – Freshwater

Recommended mitigation measures to reduce impacts to the Pōrangahau River include:

- The planting of indigenous species following the completion of the works to mitigate the effects of vegetation clearance;
- A robust ESCP will be implemented under the Environmental Management Plan. Routine inspection and maintenance for onsite sediment controls will be outlined in the ESCP, and as such, we consider that the effects will be managed as effectively as possible.
- Management of in-situ substrates and earthworks equipment to minimise the risk of spreading pest plants offsite or to new locations on site.
- Timing construction to avoid peak migration and spawning of indigenous fish.
- Realignment and reinstating the intermittent stream post-works with a culvert to maintain hydrological connection to stormwater source of water and some planting to improve the margins and ecological value of the new stream alignment.

If these recommended mitigation measures are implemented, the residual level of effect has been assessed as **very low** to **low** with the potential for **net gains** from the restoration of riparian margins.

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1.0 Introduction

Pattle Delamore Partners Limited (PDP) was engaged by Hawke's Bay Regional Council (HBRC) to assist with Land Categorisation Engineering Solutions (South Zone) in Pōrangahau, following the devastating impacts of Cyclone Gabrielle in February 2023.

Currently, the preferred flood management option for Pōrangahau consists of stopbanks, sheet piled flood walls and a diversion bund adjacent to Pōrangahau River (Appendix A). An assessment of the existing ecological values and potential impacts resulting from the proposed flood management works is required to inform the project design and construction methodology, and provide suitable mitigation measures to manage potential impacts.

1.1 Background

The Hawke's Bay Order in Council (the Order in Council) was established following Cyclone Gabrielle (February 2023) to accelerate emergency flood response and recovery efforts, particularly in areas severely impacted by the storm, such as Pōrangahau. Pōrangahau was almost completely flooded, with many homes damaged and residents facing significant challenges in the aftermath. In recognition of urgent needs, the Order in Council helps speed up flood protection and recovery works in areas like Pōrangahau by reducing the time and complexity of resource consenting under the Resource Management Act. This includes waiving or streamlining certain environmental assessments and public consultation processes to ensure critical flood mitigation and infrastructure repair can proceed without delay. It reduces the time and detail typically required for Environmental Impact Assessments (EIAs) and Ecological Impact Assessments (EcIAs).

While the expedited consenting process facilitates urgent response, HBRC and other agencies must still address environmental risks and manage long-term ecological impacts as part of the recovery efforts. Essentially, the Order in Council prioritizes urgent safety and infrastructure needs while balancing environmental oversight to support both short-term recovery and long-term sustainability.

Pōrangahau is being rehabilitated through a targeted flood mitigation approach. After considering a wide range of potential remedial options, non-viable choices were gradually eliminated. This process led to the selection of a preferred solution, which includes the construction of stopbanks, a sheet-piled wall, and a diversion bund to effectively reduce the risk of flooding and support the long-term resilience of Pōrangahau.

HBRC has requested that an ecological investigation is undertaken to determine existing ecological values and assess the potential effects of the preferred option, in line with the Order in Council standardised conditions.

1.2 Proposed Works

The proposed flood management works have progressed to the preliminary design stage. Consequently, details regarding enabling works, construction methods, erosion and sediment control, and project timelines have yet to be finalized. As a result, the ecological investigation can only evaluate the information available at the time of assessment.

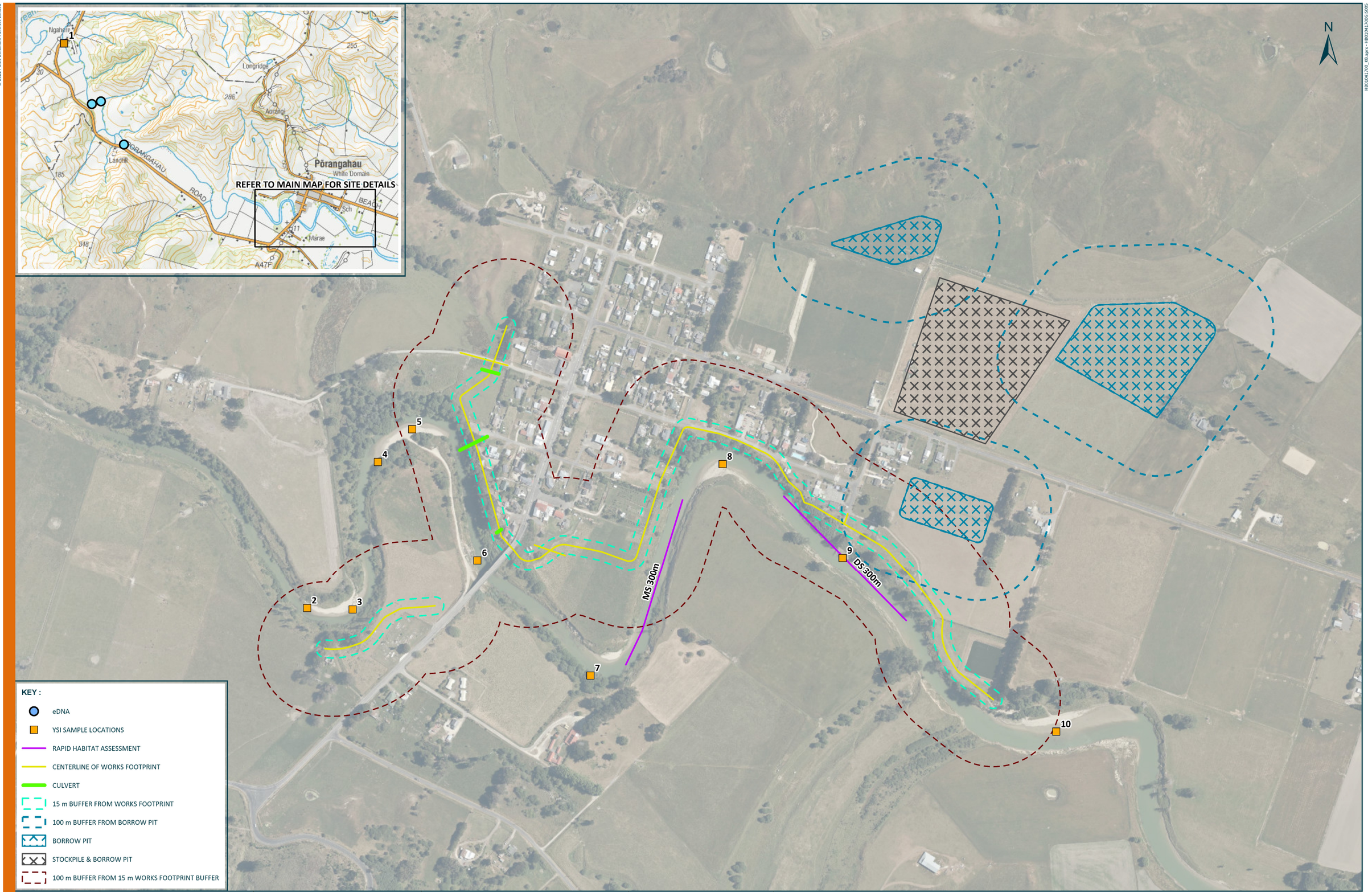
At this stage, the proposed flood management work includes the following three components:

- An earthen, compacted fill, stopbank (2.5 - 4m high). This will be constructed in three sections:
  - From the most downstream end to the school,
  - From Keppel Road to the bridge on Abercrombie Street; and,
  - Away from the river near the west end of Franklin Street to tie into the natural spur to the north.
- A flood wall (2.5 m high with a 3 m wide foundation). This will be constructed in two sections; from the school to Keppel Street and from the bridge to the western end of Franklin Street.
- A 2 m high bund around the urupā/cemetery.
- Three formed access ramps over the stopbank.

The construction will also include the following:

- Three borrow pit areas and a stockpile area between 2 and 5 ha in size. The borrow pit size is dictated by the availability of targeted material for construction of the stopbank. The current proposed locations are indicated on Figure 1.
- Several potential laydown areas to temporarily stockpile construction materials, to receive overburden from the borrow pit, or to hold unsuitable material excavated from the stopbank alignment, as shown on Figure 1.
- Two stormwater culverts will be constructed under the stopbank near Keppel Street and Franklin Street. There is a culvert under the flood wall near Abercromby Street.

The footprint of works are indicated on Figure 1 and detailed designs are included as Appendix A.



KEY :

- eDNA
- YSI SAMPLE LOCATIONS
- RAPID HABITAT ASSESSMENT
- CENTERLINE OF WORKS FOOTPRINT
- CULVERT
- 15 m BUFFER FROM WORKS FOOTPRINT
- 100 m BUFFER FROM BORROW PIT
- BORROW PIT
- STOCKPILE & BORROW PIT
- 100 m BUFFER FROM 15 m WORKS FOOTPRINT BUFFER

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METRES

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2. CADASTRAL/TOPOGRAPHICAL INFORMATION AND INSET DERIVED FROM LINZ DATA.
3. FEATURES AND SAMPLE LOCATIONS DETERMINED BY PDP SITE VISIT NOV 2024.

CLIENT

HAWKE'S BAY REGIONAL COUNCIL

FIGURE

FIGURE 1: PROPOSED PŌRANGAHAU STOPBANKS PLAN AND ECOLOGICAL ASSESSMENT SITES

PROJECT

PŌRANGAHAU STOP BANKS

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1.3 Assessment Scope

The ecological investigation was carried out in accordance with the general ecological principles and scope as agreed with HBRC for all Land Categorisation Engineering Solutions. These principles and scope are given below:

1.3.1 Ecological Principles

- Provide advice to the design team to ensure the ecological principles are considered in developing the project design and construction methodology.

1.3.2 Ecological Scoping Survey

- Scoping of potential ecological values to meet the Order in Council standardised conditions and identify potential Wildlife Act requirements.
- Input from Mana Whenua and the Department of Conservation (DoC) recommended before finalising.
- Scoping should identify all ecological values relevant to applying the ecological principles, including the following:
  - All naturally uncommon ecosystems.
  - All at-risk or threatened species.
  - All taonga species that may be significantly adversely affected during or as a result of construction.
  - Significant natural inland wetland values.
  - Any pest plants or animals that might spread or become established (for example, Chilean needle grass, privet, and yellow bristle grass), having regard to the HBRC Pest Management Plan.
  - Any fish, bird nesting areas, bat habitats, or habitats of species protected under the Wildlife Act 1953.

1.3.3 Ecological Assessment of Effects and Mitigation Report

- Identification of the adverse effects the construction works have on the ecological values identified by the ecological scoping survey.
- Design of mitigation and offsetting measures based on design envelope.
- Indicative costs for any compensation for effects that cannot be addressed within the project, to form basis for contribution to an Ecological Enhancement Fund.
- Should apply the effects management hierarchy to the management of all direct or indirect adverse effects on those ecological values, taking the ecological principles into account.
- Note: this will form the basis of the resource consent and also, if required, the Wildlife Act authority.

2.0 Methodology

2.1 Desktop Assessments

PDP undertook an initial desktop review of publicly available information relating to the current ecological values of the project site, Pōrangahau River, and surrounding area. This included the following information sources, which have been used in text throughout sections 3.0 – 5.0:

- HBRC maps;
- Recent and historical aerial and satellite imagery (including Retrolens);
- The NZ Freshwater Fish Database (NZFFD) to identify recorded fish assemblages within the Pōrangahau River catchment and infer likely species presence at the site;
- Flora, herpetofauna and avifauna databases to identify threatened plant, reptile, bird, and invertebrate records in the vicinity of the project area; and,
- Wilderlab's discover eDNA database (2024) within Pōrangahau River.

2.2 Field Assessments

Ecological investigations were undertaken between the 18th to 20th of November by PDP ecologists to ground-truth desktop information and obtain further data on ecological communities within the stopbank footprint. The stopbank footprint was informed by the current preliminary designs with a 15 m buffer around the structures as the zone of influence (Figure 1). A further 100 m buffer was also considered for effects on wetlands. The assessments included wetland, terrestrial, and aquatic habitat surveys, and water quality monitoring.

The water quality monitoring sites, rapid habitat assessment locations and eDNA locations from the Wilderlab database are also provided in Figure 1.

2.2.1 Vegetation/wetland Assessment

Vegetation across the stopbank footprint was assessed and mapped with its associated composition, structure and integrity recorded. Avifauna was observed and recorded while on-site, and habitat suitability for fauna (for bats and lizards) was assessed.

Areas suspected of containing wetlands were identified on aerial imagery and assessed in the field in accordance with standard Wetland Delineation Protocols for New Zealand (MfE, 2021).

Opportunistic, non-destructive manual habitat searches were carried out for ground-dwelling reptile species and potential spawning locations for īnanga within the project area. Observed in-stream fauna such as fish were recorded.

2.2.2 River Rapid Habitat Assessment (RHA)

A rapid habitat assessment was conducted of three representative reaches of Pōrangahau River, in accordance with the Rapid Habitat Assessment Protocol (RHA) developed by Cawthron (Clapcott, 2015) (Figure 1). The RHA provides an indication of the condition of the physical habitat and its ability to support stream biota by scoring ten habitat parameters between 1 ('poor') and 10 ('excellent'). The scores are then summed for an overall total habitat score.

2.2.3 Macroinvertebrate Assessments

A kicknet sampled was collected in wadeable portions of the river adjacent to each RHA assessment reach. Samples were inspected streamside before being returned to the river.

2.2.4 Water Quality

Field measurements of physicochemical water quality parameters (temperature, pH, electrical conductivity [EC], dissolved oxygen [DO] and turbidity) were taken during the ecological survey. This was conducted using a calibrated handheld water quality meter (YSI Pro DSS) at 10 sites located on Pōrangahau River (from upstream to downstream of the project area), to characterise existing water quality conditions. Sites are illustrated in Figure 1.

2.2.5 eDNA and TICI Scores

Environmental DNA (eDNA) sampling results were found on the Wilderlab database upstream of the project area at three locations to provide further context of river health and freshwater ecological communities. Wilderlab provides TICI (Taxonomic Index of Community Integrity) scores which are derived from eDNA data. TICI scores can be used to assess the health of aquatic ecosystems by evaluating the presence and abundance of specific macroinvertebrate taxa. TICI serves as an indicator of water quality and habitat condition, with higher TICI scores reflecting the presence of pollution-sensitive species and, therefore, better water quality and healthier habitats (Wilderlab, 2024; Wilkinson *et al.*, 2024). Conversely, lower TICI scores suggest that the community is dominated by pollution-tolerant species, indicating poorer water quality and habitat degradation.

2.3 Impact Assessment

The Environment Institute of Australia and New Zealand (EIANZ's) Guidelines for undertaking Ecological Impact Assessments (Roper-Lindsay *et al.,* 2018) were used to assess the impacts of the proposed works within the constraints of the Order in Council. The EIANZ methods are in line with the scope described in section 1.3. The guidelines provide criteria to assess ecological values using the factors 'representativeness', 'rarity/distinctiveness', 'diversity and pattern', and 'ecological context.' Based on the designated values for each factor, the

ecological aspects of the site are then assessed using the attributes matrix in Appendix 10 of the EIANZ guidelines. Chapter 6 of the EIANZ guidelines provides criteria for determining the magnitude of effects.

The level of effect is be determined by combining the value of the ecological feature/attribute with the score or rating for the magnitude of effect to create criteria for describing the level of effects. Cells with low or very low levels of effect represent a low risk to ecological values rather than low ecological values. A 'moderate' level of effect requires careful assessment and analysis of the individual case. These effects could be mitigated through avoidance, design, or appropriate mitigation actions.

The report evaluates ecological effects at the project scale but also considers wider local and regional as relevant to each ecological component.

A summary of the EIANZ assessment criteria tables are included as Appendix B for reference.

3.0 Ecological Context

The township of Pōrangahau is located along the Pōrangahau River, 8 km inland from the Pōrangahau Estuary, a coastal feature of high ecological value. The project area lies within the Eastern Hawke's Bay Ecological District (ED) (McEwan, 1987), which is described as featuring low, rounded hills and river terraces draining to Hawke's Bay via the Tukituki, Pōrangahau, and Akitio Rivers. Coastal landscapes include rocky headlands and rolling hills separating bays with sandy dunes on wave-cut platforms.

At Pōrangahau, the climate, influenced by the coast and inland hills, results in higher rainfall than other parts of Central Hawke's Bay. Rainfall ranges from about 1,200 mm annually in lower areas to over 2,200 mm in the eastern hill country (McEwan, 1987). However, the catchment often experiences extended summer dry spells. The Pōrangahau River catchment's soft sedimentary geology makes its bed and banks highly erodible. Limited riparian vegetation contributes to erosion, with fine sediment deposits degrading aquatic habitats.

The catchment spans 850 km² and is classified as a 6th-order Warm Dry Low Elevation river under the River Environment Classification (MfE, 2010). Predominantly used for pastoral farming, this land use increases pressures like reduced riparian vegetation, elevated nutrient inputs and sedimentation. Eight km downstream, the Pōrangahau Estuary is a crucial feeding and roosting area for migratory birds (HBRC, 1999) and the only known regional breeding site for Caspian terns (Davis, 1987). Designated as a Significant Conservation Area under regional plans (HBRC, 1999; HBRC, 2006), the river supports various native fish species despite environmental challenges.

Originally, the Eastern Hawke's Bay ED featured mixed hardwood-totara forests on rolling hills, with tawa and kāmahi notably absent. Tall podocarp forests, including mataī, kahikatea, and tōtara, were typical of the terraces (McEwan, 1987). A limestone area with higher rainfall at approximately 600 m in the Maraetotara Valley supported tawa-dominated forests. Black beech was prevalent in the south, with other beech species sparse elsewhere. The project area, classified as Category 1 under the Threatened Environments Classification (TEC), retains only 10% of its indigenous vegetation cover, with little protection (Cieraad et al., 2015). Pre-human settlement, this section of Pōrangahau River was dominated by Podocarp forest, with Rimu-Mataī-broadleaf mixes nearby (Leathwick et al., 2020). Today, limited riparian vegetation reduces the ability to stabilise banks and filter pollutants, negatively impacting water quality and habitats.

4.0 Terrestrial Assessment Results

4.1 Vegetation and Habitats

Vegetation types were assessed and mapped in the vicinity of the stopbank footprint and wetlands within 100 m of the stopbank footprint between 18th and 19th October. Ten main vegetation types were identified, four of which were classified as wetland.

Vegetation or habitats within the proposed borrow pit and stockpile locations were not formally assessed in the field. These areas are currently used for grazing and are likely dominated by exotic pasture grasses, although aerial imagery indicates there may be periodic wetness in these locations.

Non-wetland vegetation types were assessed as:

- Crack willow - poplar treeland;
- Poplar – crack willow – blue periwinkle vineland;
- Mixed broadleaved forest;
- Macrocarpa treeland;
- Rank exotic grassland; and
- Exotic grassland.

Wetland vegetation types were assessed as:

- *Juncus* rushland;
- Crack willow – poplar wetland;
- Creeping bent stream margin; and
- Rautahi sedgeland.

These are discussed in more detail in the sections below and mapped in Figures 2 and 3. The quantified areas provided in parentheses are the extent of each vegetation type within the construction footprint that will be removed/heavily degraded by construction.

4.1.1 Non Wetland Vegetation

Crack willow - poplar treeland (0.85 ha)

This vegetation type was dominant on both riverbanks over much of the project site. Necklace poplar (*Populus deltoides*) was common, with frequent Lombardy poplar (*Populus nigra*) over locally abundant white poplar (*Populus alba*) and crack willow (*Salix x fragilis*) dominated closer to the river. Dense white poplar saplings were common in the understorey in a mosaic with rank exotic grassland. Stinking iris (*Iris foetidissima*) was common in drier areas and montbretia (*Crocosmia x crocosmiiflora*) frequent in wetter areas.

A small stand of western red cedar (*Thuja plicata*) was present on riverbanks at the end of Franklin Street West and a stand of mature Monterey pine (*Pinus radiata*) occurred in the same stretch of river. Individual macrocarpa (*Hesperocyparis macrocarpa*) trees were occasional throughout. Phoenix palms (*Phoenix canariensis*) were frequent in areas closer to Pōrangahau village, especially adjacent to Keppel Street East. Hawthorn (*Crataegus monogyna*) was locally abundant on the riverbanks behind the cemetery, with occasional German ivy (*Delairea odorata*).

A small area of recent riparian restoration planting occurs among this vegetation type on an oxbow on the true right-hand side of river to the northwest of the Abercromby Street bridge.

Poplar – crack willow – blue periwinkle vineland (0.1 ha)

This vegetation type was located on the true left bank (TLB) of the river on the north and south side of the road bridge on Abercromby Street. Occasional mature necklace and Lombardy poplar occurred over locally common regenerating white poplar saplings and extensive, dominant blue periwinkle (*Vinca major*) vineland. Pink bindweed (*Calystegia sepium*) was locally common. Occasional harakeke (*Phormium tenax*) occurred among a mosaic of herbaceous exotic species including nasturtium (*Tropaeolum majus*), tradescantia (*Tradescantia scandium*) and fennel (*Foeniculum vulgare*). Montbretia was common in wetter areas. Other woody species included frequent elder (*Sambucus nigra*), hawthorn, occasional Phoenix palm, and one lemon tree (*Citrus limon*).

Mixed broadleaved forest (0.08 ha)

Two instances of this type occurred at the end of Franklin Street East, at properties that were not visited due to access restrictions. From aerial imagery it was assessed that white poplar was emergent over tarata (*Pittosporum eugenioides*), tī kōuka (*Cordyline australis*), tōtara (*Podocarpus totara*) and hawthorn, with

occasional phoenix palms. It is likely that weed species such as tradescantia occur in the understorey based on similar, adjacent areas visited.

Adjacent to and south of the school, a small grove of planted indigenous trees and shrubs occur including karaka (*Corynocarpus laevigatus*), ngaio (*Myoporum laetum*), harakeke, taupata (*Coprosma repens*), tarata, lacebark (*Hoheria populnea*), red māpou (*Myrsine australis*), and kōhūhū (*Pittosporum tenuifolium).* Saplings and seedlings from this type were found encroaching into the adjacent crack willow – poplar treeland among an understorey of tradescantia, montbretia, blue periwinkle, pink bindweed and Arum lily (*Zantedeschia aethiopica*).

Macrocarpa treeland (0.36 ha)

A planted, mature macrocarpa shelterbelt nearly 100 m in length occurs on the TLB of the river immediately north of the Abercromby Street bridge. A 175 m long shelterbelt borders the eastern boundary of the wastewater treatment plant (WWTP). A handful of large, tall, mature macrocarpa trees occur in the paddocks adjacent to the cemetery and at the edge of the river terrace, along with locally abundant hawthorn.

Rank exotic grassland (2.33 ha)

This vegetation type occurs throughout the proposed stopbank footprint and likely the borrow pit/stockpile locations and their buffer areas.

Dominant species consisted of common pasture grasses such as Kentucky blue grass (*Poa pratensis*), Yorkshire fog (*Holcus lanatus*), Timothy grass (*Phleum pratense*), false oat grass (*Arrhenatherum elatius*), cocksfoot (*Dactylis glomerata*), Italian rye grass (*Lolium perenne*), barren brome (*Bromus sterilis*), and mouse barley (*Hordeum murinum*), with locally common wild parsnip (*Pastinaca sativa*), occasional Chilean needle grass (*Nasella neesiana*) and exotic herbs associated with pasture. Stinking iris was common in shaded areas.

Closer to streams and river margins, tall fescue (*Lolium arundinaceum*) and creeping bent (*Agrostis stolonifera*) were common and stands of soft rush (*Juncus effusus*) were frequent along with yellow flag (*Iris pseudacorus*) in wetter areas. Horsetail (*Equis arvense*) was locally abundant among this vegetation type on riverbanks.

Individual poplar, crack willow and elder saplings were occasional throughout and locally common in recently disturbed areas, for example on riverbanks at the edge of the Duke Hotel property, along with fennel, blackberry (*Rubus fruticosus agg*.), and elder.

Despite the presence of wetland associated plants, this vegetation type did not pass the Rapid Test for wetland presence (MfE, 2022) and is not classified as a wetland habitat.

Exotic grassland (0.7 ha)

Italian rye grass formed the main component of this vegetation type, along with Yorkshire fog and cocksfoot. Soft rush and other *Juncus* species such as track rush (*Juncus tenuis subsp. tenuis*), jointed rush (*Juncus articulatus*) were present in damper pasture, and yellow flag (*Iris pseudacorus*) occurred in wetter areas closer to riverbanks.

Despite the presence of wetland associated plants, this vegetation type did not pass the Rapid Test for wetland presence and is not classified as a wetland habitat.

4.1.2 Wetland Vegetation

Juncus rushland (0.019 ha)

This vegetation type occurs in an old river oxbow to the north of Keppel Street West. Due to access restrictions the site was not visited but a large area dominated by *Juncus* species was observed from the road. Since the area is within an old oxbow and wetland vegetation was present in adjacent areas, it was assessed that obligate (OBL) and facultative wetland (FACW) *Juncus* species were likely to be dominant, for example soft rush (*Juncus effusus*), wīwī (*Juncus australis*), or Edgar's rush (*Juncus edgariae*).

This vegetation type passed the Rapid Test for wetland presence.

Crack willow – poplar wetland (0 ha)

This vegetation type occurs in an old river oxbow, beyond the true right bank (TRB) of the river, opposite the WWTP. This area is hydrologically connected to the project site by Pōrangahau River. Crack willow was dominant over a mosaic of creeping bent (*Agrostis stolonifera*), bachelor's button (*Cotula coronopifolia*) and water starwort (*Callitriche stagnalis*). Tall fescue and other rank exotic grasses were locally common in the understorey where soils were slightly drier. Stands of tall, mature necklace poplar occurred at the southern and eastern ends of the oxbow, with locally common white poplar also occurring at the southern end.

This vegetation type had overtaken an area of indigenous restoration plantings of wetland species and riparian trees and shrubs at the western end of the oxbow near the river. A channel has previously been created for fish passage in this same area approximately 30 m from the river's edge and was dominated by Mercer grass and bachelor's button. Occasional patches of purua grass (*Bolboschoenus caldwellii*) were observed where the watercourse broadened out.

The eastern end of the oxbow was not visited due to time and access constraints, but obligate wetland species are likely to occur in the oxbow channel and under the crack willow – poplar canopy based on aerial imagery, contour maps and the species assemblage found at adjacent sites.

This vegetation type passed the Rapid Test for wetland presence. However, it should be noted this while this within 100 m of the construction footprint, none of this vegetation type is actually present within the construction footprint itself.

Creeping bent stream margin (0.005 ha)

This vegetation type occupied stream margins within the old oxbow immediately south of Keppel Street west, where the stopbank curves around the Hutcheson property.

Creeping bent dominated stream margins with frequent watercress (*Nasturtium officinale*), water celery (*Helosciadium nodiflorum*), creeping buttercup (*Ranunculus repens*) and water pepper (*Persicaria hydropiper*). Blackberry (*Rubus amplificatus*) occurred on stream banks, grading into tall fescue dominant rank grassland with frequent soft rush.

The stream extends to the north of the property but was not visited due to access restrictions. Based on an assessment of aerial imagery, this area is likely to contain similar vegetation.

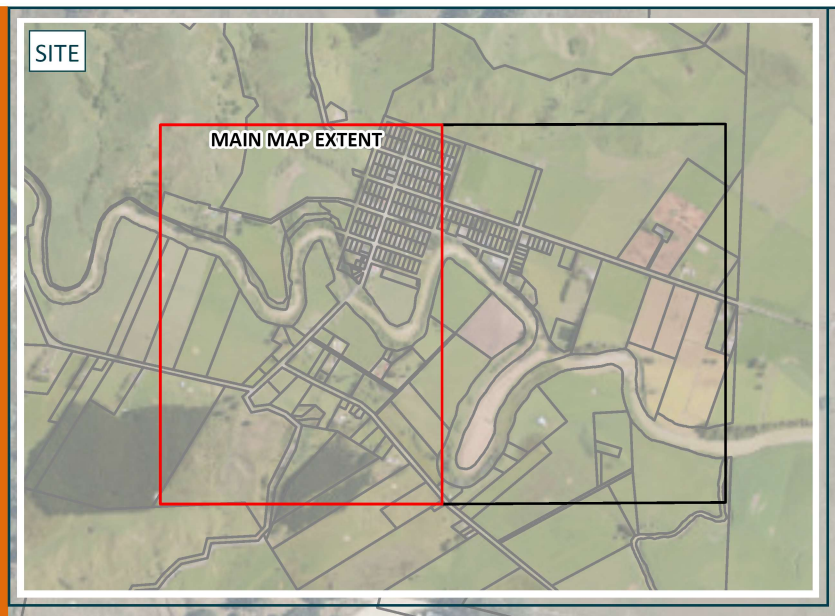
The vegetation of this river margin passes the Rapid Test for wetland presence and is also a riparian habitat.

Rautahi sedgeland (0.05 ha)

This vegetation type was located within the old oxbow immediately south of Keppel Street West, where the stopbank curves around the Hutcheson property. A short, narrow section of rautahi (*Carex geminata*) occurred alongside a culvert and adjacent to areas of locally common soft rush over rank exotic grasses.

Small areas of this vegetation type were also observed on river terraces on the TRB between the school and the WWTP, and potentially occur more widely. Frequent species were soft rush, track rush, toad rush (*Juncus bufonius*) and triglochin (*Triglochin striata*) along with Mercer grass, yellow flag iris and a range of herbs usually associated with rank exotic grassland.

As rautahi and soft rush have a wetland indicator rating of facultative wetland (FACW) and were dominant species (>70%), this area passed the rapid test for wetland presence.



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KEY :

- CULVERT
- 15 m BUFFER FROM WORKS FOOTPRINT
- 100 m BUFFER FROM 15 m WORKS FOOTPRINT BUFFER
- CRACK WILLOW - POPLAR TREELAND
- CRACK WILLOW - POPLAR WETLAND
- EXOTIC GRASSLAND
- JUNCUS RUSHLAND
- MACROCARPA TREELAND
- CREEPING BENT STREAM MARGIN
- MIXED BROADLEAVED FOREST
- POPLAR-CRACK WILLOW- BLUE PERIWINKLE VINELAND
- RANK EXOTIC GRASSLAND
- RAUTAHI SEDGELAND
- NZ PRIMARY PARCEL

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SOURCE:
1. AERIAL IMAGERY (FLOWN 2022) SOURCED FROM THE LINZ DATA SERVICE www.linz.govt.nz/ AND LICENCED FOR RE-USE UNDER THE CREATIVE COMMONS ATTRIBUTION 4.0 INTERNATIONAL LICENCE.
2. CADASTRAL/TOPOGRAPHICAL INFORMATION AND INSET DERIVED FROM LINZ DATA.

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FIGURE
FIGURE 2: VEGETATION AND HABITATS, PŌRANGAHAU

PROJECT
PŌRANGAHAU STOP BANKS

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SOURCE:
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CLIENT
HAWKE'S BAY REGIONAL COUNCIL

FIGURE
FIGURE 3: VEGETATION AND HABITATS, PŌRANGAHAU

PROJECT
PŌRANGAHAU STOP BANKS

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4.1.3 Weeds

PDP ecologists recorded observations of controlled pest plants during the terrestrial assessment (Table 1). Two pest plants were identified on site that are listed in the HBRC Pest Management Plan (PMP) (HBRC, 2018), and three within the National Pest Plant Accord (NPPA) (MPI, 2020).

Table 1: Pest plants observed within the project footprint

Species	Common Name	HBRC Pest Management Plan Status	National Pest Plant Accord
Salix x fragilis	Crack willow	-	✓
Tradescantia fluminensis	Tradescantia	-	✓
Zantedeschia aethiopica	Green arum lily	-	✓
Rubus fruticosus agg	Blackberry	Boundary Control	-
Nassella neesiana	Chilean Needle Grass	Sustained control	-

The status of boundary control means that these plants need to be controlled near boundaries to avoid further spread.

The sustained control status aims to keep pest populations below acceptable thresholds throughout the plan's duration within a property to protect values within that property.

Both of the identified PMP species were found in the vegetation type 'rank exotic grass' which is a dominant vegetation type within the project site. Consideration will need to be given during the construction works to ensure these species are not spread to new areas.

Three identified pest plants are found in the NPPA (tradescantia, green arum lily and crack willow). The NPPA itself is a voluntary agreement that works within New Zealand's broader Biosecurity Act 1993 and other pest management frameworks and controls the sale, propagation and distribution of pest plants. The guidance in the NPPA refers to the regional council for control requirements, however these three species are not listed in the HBRC PMP.

4.2 Avifauna (Birds)

A high-level avifauna survey was conducted by PDP ecologists during the site visit on the 21st of November 2024. Notes were made on avifauna species observed during the walkover.

Table 2 shows indigenous bird observations and records from iNaturalist (research grade observations) and New Zealand Bird Atlas (grids BO82 and BO83; December 2024) of indigenous birds within a 5 km radius of the project site. Data has been restricted to birds likely to use the site and adjacent river for roosting, nesting, breeding and foraging (as per Parrish, 1988).

Pīwakawaka were observed using tree hollows within the proposed stopbank site and 10 m buffer zone.

Table 2: Bird observations and records within 5 km of the project site			
Common Name	**Species**	**Conservation Status[1]**	**Regional Status[2]**
Kāhu, swamp harrier	*Circus approximans*	Not Threatened	Not Threatened
Kakīānau, black swan	*Cygnus atratus*	Not Threatened	Not Threatened
Karoro, southern black-backed gull	*Larus dominicanus*	Not Threatened	Not Threatened
Kāruhiruhi, pied shag	*Phalacrocorax varius*	Recovering	Vagrant
Kawau tūī, little black shag	*Phalacrocorax sulcirostris*	Naturally Uncommon	Data Deficient
Kawaupaka, little pied shag	*Microcarbo melanoleucos*	Relict	Regionally Endangered
Kererū, New Zealand pigeon	*Hemiphaga novaeseelandiae*	Not Threatened	Not Threatened
Korimako, bellbird	*Anthornis melanura*	Not Threatened	Not Threatened
Kōtuku ngutupapa, royal spoonbill	***Platalea regia***	**Naturally Uncommon**	**Regionally Critical**
Kōtare, sacred kingfisher	***Todiramphus sanctus***	**Not Threatened**	**Not Threatened**
Kuruwhengi, Australasian shoveler	*Spatula rhynchotis*	Not Threatened	Not Threatened
Māpunga, black shag	*Phalacrocorax carbo*	Relict	Data Deficient
Matuku moana, white-faced heron	*Egretta novaehollandiae*	Not Threatened	Regionally Vulnerable
Pīhoihoi, New Zealand pipit	*Anthus novaeseelandiae*	Naturally Uncommon	Not Threatened
Pīpīwharauroa, shining cuckoo	*Chrysococcyx lucidus*	Not Threatened	Not Threatened
Pīwakawaka, New Zealand fantail	***Rhipidura fuliginosa***	**Not Threatened**	**Not Threatened**
Poaka, pied stilt	*Himantopus himantopus*	Not Threatened	Regionally Vulnerable
Pūtangitangi, paradise shelduck	*Tadorna variegata*	Not Threatened	Not Threatened
Pūkeko	*Porphyrio melanotus*	Not Threatened	Not Threatened
Riroriro, grey warbler	*Gerygone igata*	Not Threatened	Not Threatened
Spur-winged plover	*Vanellus miles*	Not Threatened	Not Threatened
Tākapu, Australasian gannet	*Morus serrator*	Not Threatened	Not Threatened
Tarāpuka, black-billed gull	*Larus bulleri*	Declining	Regionally Critical
Tarāpunga, red-billed gull	*Chroicocephalus novaehollandiae*	Declining	Regionally Vulnerable
Tauhou, silvereye	*Zosterops lateralis*	Not Threatened	Not Threatened
Tētē-moroiti, grey teal	*Anas gracilis*	Not Threatened	Not Threatened
Tūī	***Prosthemadera novaeseelandiae***	**Not Threatened**	**Not Threatened**
Warou, welcome swallow	***Hirundo neoxena***	**Not Threatened**	**Not Threatened**

Notes:

1. *NZTCS; New Zealand Threat Classification System* (DOC, 2022; Robertson et al., 2021).
2. *A baseline survey of bird values of the Hawke's Bay coastline*(HBRC, 2021).
3. *Bolded denote observed on site by PDP staff during surveys.*

4.3 Herpetofauna (Lizards)

No lizards were observed during site surveys. However, several locations contained suitable native lizard habitats, including rank grass, tradescantia (*Tradescantia fluminensis*) and debris piles (see Photographs 1 & 2).

A desktop search of iNaturalist was conducted within a 5 km and 13 km boundary of the project site, for records of native lizards in the vicinity. Only research-grade quality observations were included in the search. No native lizards were found within a 5 km boundary of the site. One observation of a barking gecko (*Naultinus punctatus*) was found within 13 km. This record was approximately 6.5 km south of the project site and the individual was found dead on a nearby road. A search of the DoC herpetofauna database found no lizard observations within a 5 km or 13 km boundary.

Due to the lack of forest within the area of works, it is unlikely that barking geckos will be present. Despite no recorded sightings of skinks within a 13 km boundary, there is still a chance these could be present given the suitability of the habitat.

Table 3 below provides a summary of all lizard observations within a 13 km boundary of the area footprint.

Table 3: Herpetofauna observed within a 13 km boundary of the project site

Common Name	Species	Conservation Status[1]
Barking gecko	*Naultinus punctatus*	Declining

Notes:

1. *Conservation status was provided by the New Zealand Threat Classification System (NZTCS)*(DOC, 2022).

Photograph 1: Extensive rank grass, trees, and shrubs in full sun

Photograph 2: Several piles of woody debris are present along the proposed Pōrangahau stopbank footprint

4.4 Chiroptera (bats)

Pōrangahau River corridor, including the stopbank footprint, provides potential foraging and roosting habitats for bats/ pekapeka.

A search of bat observation data supplied by DoC found no bats recorded closer than 30 km of the project site. However, extensive surveys have been carried out throughout the Hawke's Bay region since 2020 by The Conservation Company to better understand the presence and roosting locations of long-tailed bats (*Chalinolobus tuberculatus*) across the highly fragmented agricultural landscape. The long-tailed bat has a conservation status of 'Nationally Critical' (O'Donnell et al., 2017).

In southern central Hawke's Bay, the surveys detected long-tailed bats in the following areas:

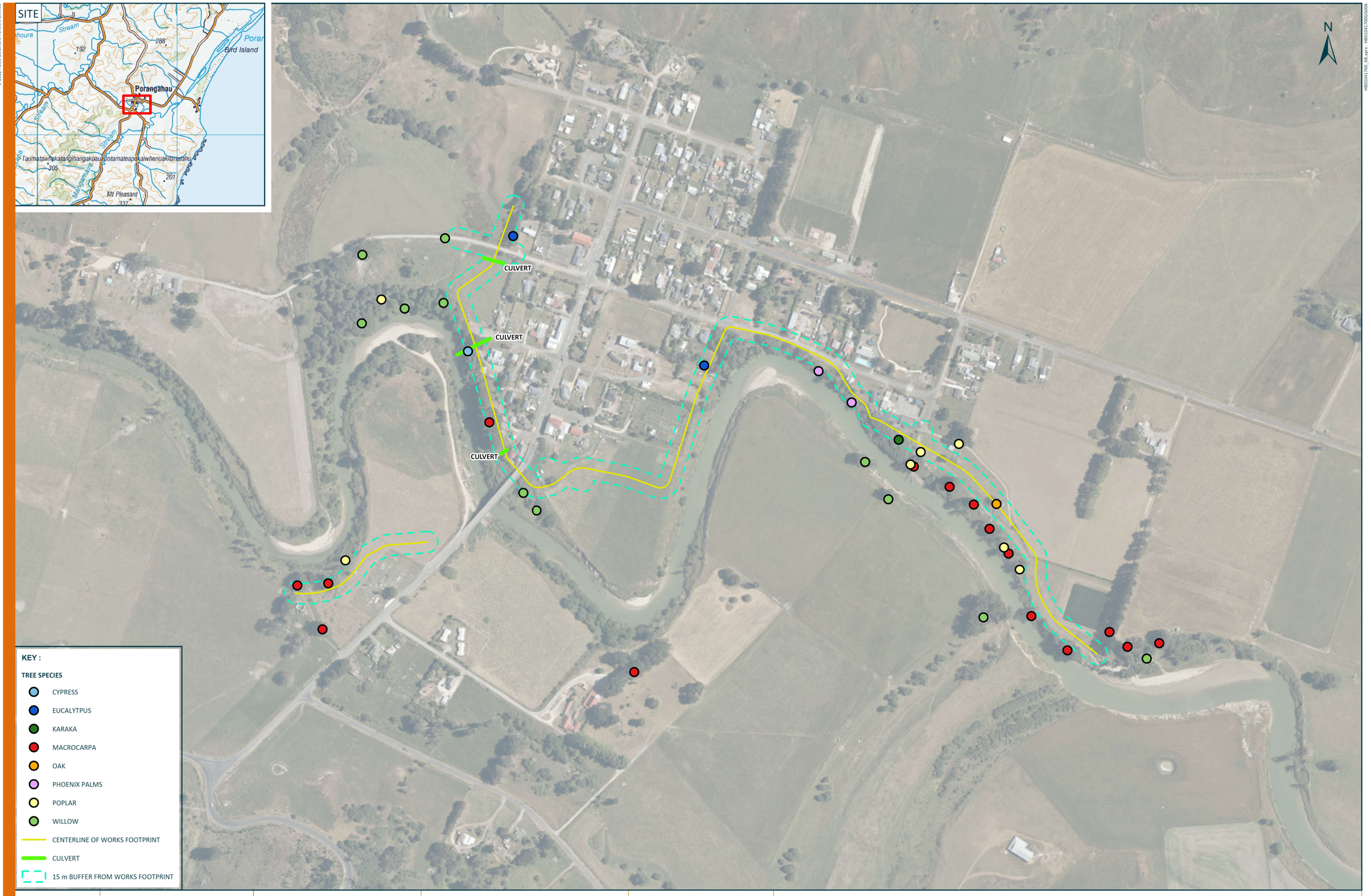
- Wanstead/Lake Station/Flemington, approximately 20km from the project site and on Pōrangahau River in its upper catchment. Data collected indicated the colony was roosting in the immediate area.
- Huatokitoki, around the Matai Moana Scenic Reserve, approximately 14 km from the project site. The authors noted that the nearby Awahiwi covenant area is likely to be a communal roost area.
- Birch Hill, approximately 16 km from the project site. Data indicated a core communal roosting area, with bats travelling out from the Birch Hill covenant into the surrounding farmland, forestry, and indigenous bush to forage.

A review of aerial imagery shows that the project site is connected to these locations by river and stream corridors that host intermittent stands of mature exotic trees and frequent small pockets of habitat in between. A similar scale of habitat fragmentation exists where bats have been detected and suspected of roosting in other areas of the Hawke's Bay region and the initial 2020/2021 survey round found that the foraging range of bat colonies is wide across the fragmented landscape (Griffiths & Moore, 2021).

At the project site, many mature trees with potential bat roosting features (e.g., hollows, broken or twisted boughs, flaking bark, etc) were observed and recorded (Photograph 3, locations shown in Figure 4). Tree species were predominately exotic and included species such as macrocarpa (*Hesperocyparis macrocarpa*), poplar (*Populus nigra*, *P. deltoides, P. alba*), willow (*Salix x fragilis, S. cinerea*), tī kōuka (*Cordyline australis*), and karaka (*Corynocarpus laevigatus*). Several large, dead trees were also observed within the corridor.

Pekapeka have large home ranges (up to 100 km for long-tailed bats) which include multiple roosting locations. The colony will move on a rotation among roosting sites unless they are raising new young. Bats have very specific requirements when they are choosing roosts and show consistent fidelity to existing roosts (DOC, 2024; DOC Bat Recovery Group, 2024). Additionally, males can often be found roosting singly or in small groups.

Photograph 3: Trees with features suitable for pekapeka roosting within the stopbank corridor



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SOURCE:
1. AERIAL IMAGERY (FLOWN 2022) SOURCED FROM THE LINZ DATA SERVICE https://data.linz.govt.nz/ AND LICENCED FOR RE-USE UNDER THE CREATIVE COMMONS ATTRIBUTION 4.0 INTERNATIONAL LICENCE.
2. CADASTRAL/TOPOGRAPHICAL INFORMATION AND INSET DERIVED FROM LINZ DATA.

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FIGURE
FIGURE 4: POTENTIAL BAT ROOST TREES

PROJECT
PŌRANGAHAU STOP BANKS

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5.0 Aquatic Assessment Results

5.1 Pōrangahau River Rapid Habitat Assessments

RHAs were conducted at three representative reaches of Pōrangahau River, located adjacent to the proposed works (Figure 1). Each 300 m long assessment reach contained slightly different riparian vegetation. Results of the RHAs are included in Table 4 and representative photographs are provided for each reach (Photographs 4 to 11).

5.1.1 Reach 1 (US 300 m)

In the upstream reach, the riparian zone was dominated by rank grass and crack willow. On the TLB, mature, over-hanging crack willow were observed, while younger willow dominated the TRB. The channel was approximately 15 m wide with a stream bed consisted of gravels overlain by deposited fine sediment. High amounts of woody debris were present in the reach, as shown in photograph 5. This reach is tidally influenced based on field observations and water quality results.

Photograph 4: Reach 1 looking downstream at high tide

Photograph 5: Reach 1 looking downstream at low tide

Photograph 6: Reach 1 looking upstream at high tide

Photograph 7: Reach 1 looking upstream at low tide

5.1.2 Reach 2 (MS 300 m)

Reach 2 was approximately 30 m wide and characterised by minimal riparian vegetation, and high bank erosion (Photographs 8 - 9). The TLB had a 30 m wide, fenced riparian margin. Vegetation consisted of shoulder height rank grass and the occasional crack willow. Undercut banks were also present at the water's edge. The TRB was steep, with low rank grass, bare earth, and scattered willow and poplar.

Photograph 8: Reach 2 looking downstream from the TRB

Photograph 9: Reach 2 looking upstream from the TLB

5.1.3 Reach 3 (DS 300 m)

The downstream reach was approximately 30 m wide and characterised on the TRB by minimal riparian vegetation and high bank erosion. The TLB was characterised by mature willow, poplar and macrocarpa, with minor pockets of bank erosion. Both banks lacked fencing, however stock access to the majority of the TLB was prevented by large piles of woody debris and vegetation. The stream bed comprised gravel and cobbles overlain by deposited sediment. Woody debris was abundant in the stream, as shown in photographs 10 - 11 below.

Photograph 10: Reach 3 looking upstream from the TLB

Photograph 11: Reach 3 looking downstream from the TLB

5.1.4 Summary

The assessment reach with the highest RHA score was Reach 1, the most upstream section of Pōrangahau River. This was primarily due to the lower occurrence of bank erosion, greater abundance of fish cover and higher quality riparian condition. The poorest score was Reach 2 due to increased bank erosion, low fish cover diversity/abundance and lower quality riparian condition.

Overall, total RHA scores categorised habitat at Reaches 2 and 3 to be of 'marginal' condition and Reach 1 habitat condition as 'suboptimal' (Table 4).

Table 4: Rapid Habitat Assessment results of Pōrangahau River[1]

Habitat Parameter	Condition Score		
	Reach 1	Reach 2	Reach 3
Deposited sediment	1	1	1
Invertebrate habitat diversity	6	5	7
Invertebrate habitat abundance	1	1	1
Fish cover diversity	8	6	8
Fish cover abundance	8	3	6
Hydraulic heterogeneity	2	1	1
Bank Erosion	5	2	4
Bank vegetation	6	2	4
Riparian width	10	5	6
Riparian shade	4	3	2
Total	**51**	**29**	**40**

Notes:

1. *All categories are scored out of 10, the total score is out of 100. Values above 75 indicate 'optimal' stream habitat; 50-75 indicates 'suboptimal' stream habitat; 25-50% indicates 'marginal' stream habitat and <25 indicates 'poor' stream habitat.*

5.2 Unnamed intermittent stream

A small unnamed intermittent stream flows from the township through rautahi sedgeland wetland south of Keppel Street, before continuing along margins dominated by creeping bent (Agrostis stolonifera). The channel is primarily stormwater-fed, with inputs from the township providing the majority of baseflow, and it passes through pastoral land before converging with the Pōrangahau River. At the time of the site visit, the stream was not flowing, with shallow pooling (up to 5 cm) in its deepest sections. The streambed supported dense vegetation growth, with little evidence of high-velocity bed turnover or scouring that would be expected from regular baseflows or frequent high-flow events. No formal assessments were undertaken for this stream.

Photograph 12: Intermittent stream flows through the Rauntahi sedgeland (top) and joins the creeping bent stream margin (bottom).

5.3 Benthic Macroinvertebrates

While macroinvertebrate samples have not been processed in the laboratory (as agreed by the standardised scope provided by HBRC), field observations identified freshwater shrimp (*Paratya curvirostris*), kōura (*Paranephrops planifrons*) and damselfly larvae (Photograph 12). Kākahi, freshwater mussels, were also observed.

Photograph 13: Field observations of shrimp and damselfly larva

eDNA results (collected 6.8 km upstream) are displayed in Appendix C. Two pollution-sensitive taxa were identified within the Pōrangahau River network; *Ephemeroptera* (mayflies) and *Tricoptera* (caddisflies), which are generally indicators of good water quality and stream health. Additionally, a variety of chironomids (true flies), aquatic worms, and freshwater snails (*Potamopyrgus*) were found. These taxa are more tolerant of degraded conditions.

These findings suggest there may be diverse benthic macroinvertebrate communities in the wider catchment however limited EPT taxa indicates a degraded system. As Pōrangahau River is tidally influenced near the works footprint, it is likely many of the macroinvertebrate assemblages found upstream may not reside in this location. In particularly sensitive freshwater *Ephemeroptera, Plecoptera* and *Trichoptera* (EPT) taxa are not tolerant to the saline conditions found in this location.

Data collected closer to the site of works would provide more detailed information on the macroinvertebrate community and allow for a better understanding of the local habitat conditions and potential stressors in this specific area.

Wilderlab, the eDNA testing laboratory, provides Taxon-Independent Community Index (TICI) scores (Table 5) which relate back to macroinvertebrate presence and there is some evidence that this aligns with the traditional macroinvertebrate community indices (MCI) (Wilkinson *et al.*, 2024).

5.3.1 Taxon-Independent Community Index (TICI)

Further upstream of the project site, three sampling events were identified on Wilderlab's Explore eDNA tool which yielded TICI scores of "poor," while one returned a "very poor" score.

A *"poor"* TICI score indicates reduced presence of sensitive species and increased dominance of tolerant species, often pointing to issues like nutrient enrichment or sedimentation. A *"very poor"* TICI score suggests severe habitat stress, with macroinvertebrate communities heavily influenced by long-term or significant pollution. Overall, results suggest some impairment of the ecological communities in Pōrangahau River.

Table 5: eDNA TICI scores for upstream of work site, from 2022 to 2024[1]

Coordinates	-40.291302, 176.576235	-40.29141500, 176.5758900	-40.29668135, 176.5807316
Sampled	May, 2022	April, 2023	April, 2024
TICI Score [2]	84.92	82.87	75.01
Average rating	Poor	Poor	Very poor

Notes:

1. *Data from https://www.wilderlab.co.nz/explore (12/12/2024)*
2. *TICI (Taxon-Independent Community Index) scores as per https://www.wilderlab.co.nz/tici*

5.4 Fish

No targeted fish sampling occurred, but incidental observations were made during the field assessments. Within the assessment reaches, small shoaling fish were observed jumping out of the water. Based on their behaviour and size, these were likely to be smelt (*Retropinna retropinna)*. Incidental observations of īnanga were also made. While collecting macroinvertebrate kicknet samples, post-glass eels and juvenile bullies were also caught (Photograph 13).

Photograph 14: Observations of juvenile eels and bullies

NZFFD records show that seven indigenous freshwater fish species have been recorded in Pōrangahau River. Details of these species and their New Zealand Threat Classification conservation statuses (DOC, 2022; Dunn et al., 2017) are outlined in Table 6 below.

Table 6: NZFFD records; mouth to 10 km upstream of Pōrangahau River

Common Name	Scientific Name	NZTCS Status [1]
Toitoi, common bully	*Gobiomorphus cotidianus*	Not Threatened
Paraki, common smelt	*Retropinna retropinna*	Not Threatened
Giant bully	*Gobiomorphus gobioides*	At Risk
Īnanga	*Galaxias maculatus*	At Risk
Ōrea, longfin eel	*Anguilla dieffenbachii*	At Risk
Tuna, shortfin eel	*Anguilla australis*	Not Threatened
Aua, yelloweye mullet	*Aldrichetta forsteri*	Not Threatened

Fish data from Wilderlab's Explore eDNA tool was available 5 km upstream of the project site (Table 7). This data included eDNA signatures of thirteen native species, one exotic and one non-resident native (has migrated to New Zealand on its own accord) (Table 7). Full eDNA results are displayed in Appendix C.

Table 7: Wilderlab fish results

Common Name	Scientific Name	NZTCS Status[1]
Banded kōkopu	*Galaxias fasciatus*	Not Threatened
Brown trout	*Salmo trutta*	Introduced and naturalised
Toitoi, common bully	*Gobiomorphus cotidianus*	Not Threatened
Paraki, common smelt	*Retropinna retropinna*	Not Threatened
Common triplefin	*Forsterygion lapillum*	Not Threatened
Titikura, Crans' bully	*Gobiomorphus basalis*	Not Threatened
Dinah's bully	*Gobiomorphus dinae*	Unknown[2]
Giant bully	*Gobiomorphus gobioides*	At Risk - Naturally Uncommon
Kanae, grey mullet	*Mugil cephalus*	Not Threatened
Īnanga	*Galaxias maculatus*	At Risk - Declining
Ōrea, longfin eel	*Anguilla dieffenbachii*	At Risk - Declining
Redfin bully	*Gobiomorphus huttoni*	Not Threatened
Tuna, shortfin eel	*Anguilla australis*	Not Threatened
Australian longfin eel	*Anguilla reinhardtii*	Non-resident native
Pātiki, yellowbelly flounder	*Rhombosolea leporina*	Unknown

Notes:

1. *NZTCS; New Zealand Threat Classification System (Dunn et al. 2017)*
2. *Recently described and therefore has not yet been given a threat status.*

5.4.1 Spawning Habitat

The Fish Spawning Indicator (FSI) map layers were interrogated to see if there were any areas near the project site predicted to be fish spawning habitat. The FSI shows where and when fish that are sensitive to disturbance may spawn using modelled fish habitat ranges. Redfin fin bullies were modelled to have spawning habitat a few kilometres further up the catchment.

Inanga spawn on the peak monthly high tide, in the tidally inundated riparian margins. This means the eggs remain above the water line until they hatch. PDP ecologists conducted a high-level search for suitable inanga spawning habitat while on site. Optimal inanga spawning habitat is formed when there is lush riparian vegetative growth (ground cover), high sun exposure, tidally influenced water level fluctuation, fresh to brackish water, and a moderate bank slope (7-25°). It was considered that the works area had the potential to support inanga spawning upstream of Site 4 (shown on Figure 1). This was because there was evidence of tidal water level fluctuation, sun exposed banks, and suitable vegetation (largely grass, although some *Juncus*). Further, electrical conductivity of the water was low enough that riparian vegetation growth was unlikely to be restricted by salinity (Table 8). Downstream of Site 4, salinity was likely too high for suitable spawning conditions to develop.

However, downstream of the project site (and thus Site 4), is an old river oxbow which has been dug out and planted with native riparian vegetation (pers comm). Locals have reported seeing īnanga swimming up the channel during high tide. Because the bed is set higher than the bed of the Pōrangahau River more buoyant fresh water could flow into the channel while the heavier saline-brackish water flows along the deepest part of the channel. Such conditions might be conducive to inanga spawning. The observed riparian vegetation supports this possibility and appears indicative of vegetation that is regularly inundated with fresh and/or brackish water (Photograph 14). However, it is uncertain whether vegetation growth is lush enough to provide the dense, humid microclimate required for successful spawning. Likely causes of unsuitable conditions could be lack of sun exposure, sandy soils, brackish water that is too saline, grazing or other control of vegetation or vegetation that is inundated by water for too long.

Photograph 15. Looking downstream at the old river oxbow, showing lush riparian grass growth. Yellow arrow indicates where grass growth may be lush enough to support īnanga spawning.

Below are photos of vegetation taken in the old oxbow opposite the WWTP (Photographs 15 and 16) between water quality sample sites 9 and 10 (Figure 1), 1 hour prior to high tide. The exact location is shown by the pin on the google earth images below (Figure 5). Crab holes observed in this location indicate that it is tidally influenced (Photograph 16).

Photograph 16: Vegetation present within the old oxbow

Photograph 17: Example of crab holes at this location, demonstrating that it is tidally influenced

This meander was dug out by locals when undertaking native riparian planting sometime between 2013 and 2015 (see google earth historical imagery of downstream mouth of meander (Figure 5). Locals have also claimed to see īnanga swimming up the channel once high tide reaches it.

Figure 5: Aerial photograph showing old river oxbow and location of īnanga spawning habitat

5.5 Surface Water Quality

Surface water quality results have been compared to the Australia and New Zealand Guidelines - Default Guideline Values (ANZG, 2018) and the proposed National Objectives Framework (NOF, 2013) for temperature. Comparison to these guidelines (ANZG) is to understand how water quality results compare to reference stream of the same stream type. Exceedance of these thresholds indicates that ecosystem health may be impaired within the catchment. Results are presented in Table 8 below.

There was an increase in temperature in upstream reaches compared to downstream reaches. This likely reflects measurements being taken in an upstream direction over the course of the day as water temperatures gradually increased and/or the upstream movement of cooler saline water on the incoming tide. Site 1 had the highest value of 22.2°C which is at a level that could provide some thermal stress on occasion with sensitive insects and fish affected (NOF, 2013).

The DO guideline was exceeded at the two most upstream sites. However, based on the nearby downstream oxygen levels it is expected that this is due to naturally high oxygen levels (e.g., through diffusion or physical mixing) rather than being induced by high primary productivity.

Conductivity at site 1 is assumed to be indicative of the state of river water. The marked increase in conductivity in sites 2-9 are assumed to represent the variable ingress of sea water.

The pH guideline was exceeded at all sites, with a maximum pH of 8.34 (Site 1) although it is unknown whether the catchment geology is naturally more alkaline and influencing these values.

The ANZG turbidity guideline was exceeded at all sites except Site 1, likely reflecting the influence of incoming sea water.

Table 8: Surface water quality results for the Pōrangahau River

Site Number		1	2	3	4	5	6	7	8	9	10	ANZG DGVs[2,3]
Site Description		Immediately US Pōrangahau Rd Bridge	US Pōrangahau @ US Control Site Beach	US Pōrangahau @ Control site Beach	US Pōrangahau @ US the US section	US Section adj Franklin St East	50 m US Abercromby St Bridge	North of Marae	MS Section opposite 33 Keppel St	Immediately DS of Pōrangahau School	150m DS WWTP Plant	
Time		15:42	12:57	12:49	10:20	10:16	10:11	10:01	9:45	9:18	8:58	
Tide		Outgoing			High tide - outgoing				High tide - Incoming			
Temperature	°C	22.2	19.6	19.6	19	19	18.9	18.8	18.8	18.7	18.6	-
Dissolved Oxygen	% saturation	**112.2**	**102**	96.5	96.6	98	96.2	94.9	97.1	96.2	97.4	**82 - 100**
Dissolved Oxygen	mg/L	9.76	9.26	8.77	8.72	8.83	8.58	8.37	8.51	8.44	8.6	**-**
Electrical Conductivity	µs/cm	**605**	**2780**	**2965**	**8315**	**8938**	**12064**	**15357**	**17512**	**17710**	**15882**	**86**
pH	pH units	**8.34**	**8.05**	**8.07**	**7.97**	**8.01**	**8.01**	**7.99**	**7.98**	**7.98**	**7.92**	**7.27-7.8**
Turbidity	NTU	1.37	**19.5**	**7.94**	**18.34**	**12.31**	**27.82**	**37.83**	**24.74**	**26.05**	**21.5**	**4.2**

Notes:

1. Sampling *occurred on 20th November 2024 with High Tide at 9:48 am;*
2. Bold *denotes exceedance of the ANZG Default Guideline value;*
3. *ANZG (2018) Default Guideline Values for warm dry low-elevation REC code (https://data.mfe.govt.nz/layer/51845-river-environment-classification-new-zealand-2010/). Values refer to the 80th percentile reference values. pH and dissolved oxygen (% saturation) values refer to the 20th and 80th percentile values - https://www.waterquality.gov.au/anz-guidelines/your-location/new-zealand*

6.0 Summary of Results

Assessed vegetation within the stopbank footprint consists of six terrestrial and four wetland vegetation types. Rank exotic grasses are the most dominant vegetation type, followed by crack willow and poplar treeland along riparian margins. This demonstrates a high presence of exotic species in the assessed area, although the presence of native wetland vegetation indicates higher value ecosystems are also present. Two weed species were identified that are included in the HBRC PMP—blackberry and Chilean needle grass—which must be managed appropriately during site works to avoid their spread to new areas.

Within a 5 km radius of the project site, several sensitive bird species with a 'regionally endangered, critical or vulnerable' conservation status have been recorded (little pied shag, royal spoonbill, white-faced heron, pied stilt, black billed and red billed gulls).

One record of a barking gecko has been identified 6.5 km south of the project site. While there is a low risk of further unidentified barking geckos occurring within the project footprint due to a lack of suitable habitat, the presence of extensive skink habitat suggests that the latter species may be present.

Long-tailed bats are potentially utilising the river corridor, with suitable roosting trees identified within the stopbank footprint. Long-tailed bats are ecologically significant with a 'threatened-nationally critical' conservation status, highlighting the need for their protection during site activities.

A rapid habitat assessment of three representative assessment reaches along Pōrangahau River determined habitat condition to range from 'marginal' at the furthest upstream reach to 'suboptimal' at the middle and downstream reaches. The riparian zone is dominated by exotic grasses, willow and poplar species, contributing to its poor overall quality and lack of integrity. Shading is limited due to the width of the river and lack of a contiguous, dense riparian canopy cover. Several points of erosion were observed along the riverbanks, and the presence of fine deposited sediments on the stream bed has limited the availability of good quality habitat suitable for sensitive EPT macroinvertebrate taxa.

Given that the river is tidal within the assessment area, it is unlikely that EPT taxa would be present as they are not tolerant to saline conditions. eDNA results collected from three sites upstream of the project site between 2022 and 2024 confirm the reduced presence of sensitive species and increased dominance of tolerant species, with reported TCI scores of 'poor' and 'very poor' for macroinvertebrate communities.

Water quality results highlighted the clear tidal influence, with high electrical conductivity readings that fluctuate with tidal changes and salinity. Although the exact point of the salt wedge was not determined.

The presence of diverse native fish species in Pōrangahau River, including 'at risk' species (giant bully, īnanga and long fin eel) indicates the waterway's ecological importance as a habitat and migration pathway. While īnanga spawning habitat has not been confirmed in the vicinity of the project site, dense, tidally inundated vegetation located in the old oxbow on the TRB of Pōrangahau River does appear to provide suitable spawning habitat. Other significant invertebrates, such as *kākahi*/freshwater mussels, have been identified, underscoring the presence of taonga species within the area.

Overall, the aquatic ecological health of the river is considered poor, largely due to the extensively modified agricultural catchment which has resulted in increased sedimentation and reduced riparian cover. Despite these conditions, the river remains an ecologically important connection and migratory pathway for native fauna, particularly bats, fish, and birds.

7.0 Ecological Values

The current physical and ecological characteristics of Pōrangahau River within the project site and the surrounding terrestrial environment were assessed against the matters and attributes outlined in the EIANZ EcIA guidelines (Roper-Lindsay et al., 2018), included as Appendix B and the requirements of the Order in Council. The cultural significance of fauna species is not incorporated in the ecological evaluation.

7.1 Terrestrial Environments

Six terrestrial and four wetland vegetation types were recorded along the stopbank footprint. Table 9 provides the ecological values assigned to each vegetation type, following an assessment of the matters outlined in the guidelines.

Table 9: Ecological values for assessed vegetation types		
Matter	**Rating**	**Justification**
Crack willow - poplar treeland		
Representativeness	Negligible	This vegetation is not representative of the original tall podocarp forest and indigenous understorey that would have once dominated on river terraces in the Eastern Hawkes Bay ED.
Rarity/Distinctiveness	Negligible	
Diversity and Pattern	Low	
Ecological Context	High	Mature poplars and willows provide shelter and cover for native fauna such as birds, bats and insects, and shade for aquatic fauna. Fallen trees provide habitat for herpetofauna and instream woody debris for aquatic fauna.
Overall Value		Moderate
Poplar – crack willow – blue periwinkle vineland		
Representativeness	Negligible	This vegetation does not occur naturally in the ED. Blue periwinkle and other exotic species present in this vegetation type are aggressively invasive.
Rarity/Distinctiveness	Negligible	
Diversity and Pattern	Negligible	
Ecological Context	Negligible	While providing some shelter and foraging habitat for indigenous species, fly tipping was observed in this vegetation type, likely encouraging pest fauna that compete with native species.
Overall Value		Negligible
Mixed broadleaved forest		
Representativeness	Moderate	Vegetation comprises trees and shrubs that could represent the understorey of the original podocarp forest on river terraces, within a Class 1 Threatened Environment.
Rarity/Distinctiveness	Low	While indigenous species were common and regenerating, high amounts of invasive weed species were also observed in these areas.
Diversity and Pattern	Moderate	Indigenous species are relatively diverse, however these areas are small compared to other woody vegetation types, with exotic species encroaching and little connectivity to larger indigenous vegetation.

Table 9: Ecological values for assessed vegetation types		
Matter	**Rating**	**Justification**
Ecological Context	High	Provides shelter and foraging habitat for native fauna.
Overall Value		Moderate
Macrocarpa treeland		
Representativeness	Negligible	This vegetation type comprises one exotic species.
Rarity/Distinctiveness	Negligible	
Diversity and Pattern	Low	The vegetation provides some connectivity between woody habitats in the landscape.
Ecological Context	High	Mature macrocarpa trees have been found to provide habitat for bat and bird species.
Overall Value		Moderate
Rank exotic grassland		
Representativeness	Negligible	While some indigenous species occasionally occur, the vegetation type is predominantly common exotic pasture grasses.
Rarity/Distinctiveness	Negligible	
Diversity and Pattern	Negligible	
Ecological Context	Moderate	Provides some cover and foraging habitat for indigenous fauna and invertebrates.
Overall Value		Very Low
Exotic grassland		
Representativeness	Negligible	While some indigenous species occasionally occur, the vegetation type is predominantly common exotic pasture grasses.
Rarity/Distinctiveness	Negligible	
Diversity and Pattern	Negligible	
Ecological Context	Low	Provides limited cover and foraging habitat for indigenous fauna and invertebrates.
Overall Value		Negligible
Juncus rushland		
Representativeness	Moderate	This vegetation constitutes a relatively large wetland, which is a naturally uncommon ecosystem and occurs within a Category 1 Threatened Environment.
Rarity/Distinctiveness	Moderate	The wetland is likely to contain other indigenous wetland species, although access to the site is required to confirm this.

Table 9: Ecological values for assessed vegetation types		
Matter	**Rating**	**Justification**
Diversity and Pattern	Moderate	Although this appeared to be a low diversity wetland, its large size and position in an old oxbow provides landscape connectivity between tributaries and Pōrangahau River.
Ecological Context	High	This wetland has saline and freshwater influences, providing a large habitat and variety of forage for wet adapted fauna.
Overall Value		Moderate
Crack willow - poplar wetland		
Representativeness	Moderate	This vegetation constitutes a large wetland, which is a naturally uncommon ecosystem, and occurs within a Class 1 Threatened Environment.
Rarity/Distinctiveness	Moderate	Limited indigenous species occur naturally and in restoration plantings, in the understorey and shrub tiers within the western portion of the wetland.
Diversity and Pattern	Moderate	This wetland has diverse flora, dominated by exotics, and its large size and position within an old oxbow provides landscape connectivity between tributaries and Pōrangahau River.
Ecological Context	High	The saline and freshwater influences in the wetland provides variation of habitat and food for wet adapted species, and potential īnanga spawning habitat. Mature poplar and crack willow provide habitat and shelter for indigenous fauna (birds, bats and insects) and shade for aquatic species. Regenerating indigenous wetland species can provide resilience to environmental disturbance (i.e., high flow and flood events) and recover quickly.
Overall Value		Moderate

Table 9: Ecological values for assessed vegetation types		
Matter	**Rating**	**Justification**
Creeping bent stream margin habitat		
Representativeness	Negligible	This vegetation type constitutes a wetland, which is a naturally uncommon ecosystem and is also a stream habitat. However, it is small and largely comprises exotic species and is therefore not representative of wetland and stream habitats in Aotearoa.
Rarity/Distinctiveness	Low	
Diversity and Pattern	Low	
Ecological Context	Low	Provides some cover and forage habitat for indigenous fauna and invertebrates.
Overall Value		Low
Rautahi sedgeland		
Representativeness	Moderate	These three areas constitute wetlands, a naturally uncommon ecosystem. Although they are relatively small, more examples are likely to occur on inaccessible riverbanks. The wetlands occur within a Class 1 Threatened Environment.
Rarity/Distinctiveness	Moderate	While rautahi is not an At Risk or Threatened species, the habitat type is indigenous.
Diversity and Pattern	Moderate	This vegetation type is small, dominated by rautahi. Examples on river ledges to the east of the project site have greater diversity of both native and exotic species.
Ecological Context	Moderate	Provides cover and foraging habitat for indigenous fauna and invertebrates. Rautahi is resilient to environmental disturbance (i.e., high flow and flood events) and recovers quickly.
Overall Value		Moderate

7.2 Aquatic Environments

The ecological value and justification for each rating assigned to the assessed section of the Pōrangahau River and the unnamed stream are presented in Table 10 below.

Table 10: Ecological values for assessed aquatic features - Pōrangahau River

Matter	Rating	Justification
Pōrangahau River		
Representativeness	Low	Results from the aquatic assessments within the project site indicate that aquatic habitats have been degraded by modification and agricultural land use, leading to increased sedimentation and poor quality riparian vegetation. This has resulted in homogenous hydraulic features and limited habitat for benthic species.
Rarity/Distinctiveness	High	Pōrangahau River is an impacted waterway however the project site is within close proximity to the salt wedge and potential īnanga habitat has been identified. A high diversity of native fish (including 'at risk – declining' species) utilise the wider project site.
Diversity and Pattern	Moderate	Limited diversity of habitat is available for macroinvertebrate communities, as reflected in low RHA scores, however there is some habitat complexity and a diverse community of native fish has been identified.
Ecological Context	Moderate	The project corridor is located in the lower reaches of the Pōrangahau catchment within a high order river before it discharges to the estuary and is therefore the main conduit of water to the coast.
	Overall Value	**Moderate**

Table 10: Ecological values for assessed aquatic features - Pōrangahau River		
Matter	**Rating**	**Justification**
Unnamed Stream		
Representativeness	Low	The stream is highly modified, primarily conveying township stormwater and passing through pastoral land. The margins are dominated by exotic grass.
Rarity/Distinctiveness	Low - Moderate	While the stream itself is modified and stormwater-fed, it does support a short margin of rautahi sedgeland wetland. Wetland habitat is increasingly uncommon in the wider landscape and provides some distinctiveness compared to surrounding pastoral land use.
Diversity and Pattern	Low	Aquatic diversity is expected to be limited to hardy macroinvertebrate taxa tolerant of fluctuating flow and stormwater contaminants. Habitat structure is simple, with no significant instream or riparian complexity beyond the small wetland margin.
Ecological Context	Low	The stream provides a minor hydrological connection between township stormwater and the Pōrangahau River, but offers little in terms of ecological connectivity or buffering. The sedgeland wetland component provides some localised habitat value, but overall contribution to broader ecological networks is limited.
	Overall Value	**Low**

8.0 Ecological Impact Assessment

This section assesses the nature and level of actual or potential effects for the proposed flood management works. Positive and adverse effects, short and long-term effects, cumulative effects and residual effects are considered, and this assessment informs the nature and scale of impact management required under the Order in Council.

The assessment has been completed following the criteria for describing the magnitude and level of effects, outlined in the EIANZ EcIA guidelines (Roper-Lindsay et al., 2018), included as Appendix B.

8.1 Terrestrial Effects

Potential effects on the values of terrestrial habitats in and around the Stopbank footprint were identified and assessed as follows:

- Loss of terrestrial vegetation diversity.
- Vegetation removal and material stockpiling resulting in loss of faunal habitat;
- Vegetation removal and material stockpiling resulting in potential harm to native fauna;
- Disturbance to native fauna as a result of noise and vibration from machinery and construction;
- Spread of pest and weed plant species due to earthworks; and,
- Destruction or hydrological alteration of natural inland wetlands.

8.1.1 Vegetation removal and material stockpiling resulting in loss of fauna habitat

Vegetation will need to be permanently removed to construct the stopbanks and flood walls. This may result in the loss of habitat for fauna, such as lizards, bats, and birds. The construction footprint is based on the width required for the stopbanks, with additional allowances for machinery to operate around the structures. In contrast, the floodwall requires a much smaller footprint. It is expected that stopbank widths are conservatively estimated across the project site. Therefore, this assessment likely overestimates the extent of vegetation clearance to occur, and consequently the actual area affected will be smaller than those quantified in this report (Section 4.1).

8.1.1.1 Loss of indigenous bird habitat

A number of birds will be utilising the existing vegetation, including the identified Crack willow – Poplar Treeland, Macrocarpa Treeland, Mixed Broadleaf Forest and Poplar Crack willow – Blue Periwinkle Vineland vegetation types set to be removed. The removal of these trees could harm nesting birds and will be

removing roosting and nesting habitat. Pukeko typically utilise the low growing vegetation types such as the exotic grassland, juncus rushland, rautahi sedgeland close to water including the creeping bent stream margin. However, birds are highly mobile species and it is anticipated that most individuals will disperse during the works to more favourable habitat.

The value of vegetation utilised by birds in the area ranges from **negligible** to **moderate**. The magnitude of effect associated with habitat loss for avifauna is assessed as **moderate,** as such the level of effect could range from **very low** to **moderate** without mitigation.

Suggested mitigation therefore would be to conduct restoration planting plan to replace habitat that has been lost. Details would be provided in the plan, but could include enhancing vegetation along the river margins past the site of work as there are several kilometres of river margin which are dominated by exotic grassland with negligible to low ecological value in its present state. A well-designed restoration plan could provide higher quality, contiguous native habitat for birds compared to that which has been lost.

With appropriate levels of restorative planting to mitigate impacts, the residual level of effect would be **very low,** and has potential to provide a **net gain**.

8.1.1.2 Loss of indigenous lizard habitat

The rank exotic grassland and woody debris piles found at the site create suitable habitats for indigenous lizards. Removal of these habitats may cause indirect harm to indigenous lizards through the destruction of refugia and foraging sites, and a reduction in available habitat to lizards post-construction completion (Hecnar & M'Closkey, 1998).

The value of vegetation utilised by lizards is assessed as **low,** and magnitude of effect from habitat loss if lizards are present is assessed as **high.** As such the corresponding level effect would be **low** without mitigation.

Suggested mitigation would be to conduct restoration planting as suggested above for bird habitat and design the restoration to support higher quality lizard habitat than is currently found. A restoration planting plan with design considerations that ensure suitable on-site conditions for lizards, i.e., incorporating features such as wood/rock piles and planting favourable species like *Coprosma propinqua* while avoiding areas prone to frequent inundation.

With the inclusion of a restoration plan, which incorporates lizard habitat improvements, the residual effect would be reduced to **very low** or could provide a **net gain**.

8.1.1.3 Loss of indigenous bat habitat

To establish the flood mitigation infrastructure, large trees with potential bat roosting habitat will need to be cleared. These include predominately mature

exotic species such as macrocarpa, poplar, willow, cabbage tree and karaka, and several large dead trees.

The specialised features of roosts make them rare and almost irreplaceable in any landscape or habitat type except over very long-time frames. Felling communal roost trees will have an ongoing significant negative effect as bats may then be forced to use roosts that are less thermally efficient (DoC's Bat Recovery Group, 2024). Bats will then require more energy to survive, resulting in reductions in survival and lower reproductive success, and ultimately a higher risk of local extinction.

The value of vegetation utilised by bats is assessed as **moderate.** The magnitude of effect from tree removal will potentially be either **low** in the absence of evidence of bats or **moderate** if bats are present or there is evidence they use these trees. There are currently no known effective ways to mitigate for the loss of bat habitat as mature trees take many years to replace. The project has aligned the works to avoid as many potential bat roost trees as possible, reducing the number requiring removal. It is expected that one tree that meets this criteria will need to be felled. It is critical to ensure that bats are not present in the trees when works commence. If bats are present, the level of effect would be **moderate**. If bats are not present, as confirmed by inspection, the level of effect would be **low**. Monitoring for bat activity prior to works commencing would confirm the presence of bats and the utilisation of mature trees identified in the stopbank footprint.

8.1.2 Vegetation removal resulting in direct harm or mortality to indigenous fauna

8.1.2.1 Direct harm or mortality to indigenous birds

As discussed, terrestrial birds will be utilising Crack willow – Poplar Treeland, Macrocarpa Treeland, Mixed Broadleaf Forest and Poplar Crack willow – blue periwinkle vineland vegetation types. The removal of this habitat could directly harm nesting birds. Whilst birds are mobile they are particularly vulnerable during nesting season.

Without mitigation, the magnitude of effect is assessed as **very high** due to the harm or mortality of individuals, and the overall level of effect would be **high**.

To avoid harm to indigenous birds during the proposed works, preparation and construction should be undertaken outside of the bird breeding season. Site preparation such as scrub removal will reduce the number of birds nesting within the footprint and therefore reduce the overall risk. Scaring tactics will also be used in the lead up to works to reduce the number of birds nesting in the area. In the first instance, nesting deterrence actions described above will be employed. Nest searches prior to vegetation clearance and construction will further reduce the risk after the above mitigation measures are employed. Any active nests found during searches should have a 20 m exclusion boundary

established around them until chicks have fledged. Nest searches will involve searching potential nests for chicks and surveying the area for birds displaying nesting behaviour.

Implementation of the recommended mitigation measures will reduce the residual level of effect to **very low.**

8.1.2.2 Direct harm or mortality to indigenous lizards

Rank exotic grassland and woody debris piles found at the site create suitable habitat for indigenous reptiles (skinks). Construction works may cause direct harm or mortality to these species via physical disturbance. Additionally, physiological stress caused by increased anthropogenic disturbances may result in increased energy expenditure and reduced foraging effort by affected individuals (e.g., Pérez-Tris et al., 2004). These effects are likely to negatively affect lizard fecundity and survival and cause a decrease in an individual's overall health.

The magnitude of this effect will be **very high** due to the harm or mortality of individuals, and the overall level of effect would be **moderate**.

To minimise harm to herpetofauna, staged vegetation clearance in combination with eco-piles should be implemented across the site. Staged vegetation clearance involves the staged removal of vegetation to allow any native lizards potentially in the area to disperse to more favourable habitat, and maintaining grassed areas to a low height (100 mm length). Trees, shrubs and other woody materials should be cut and piled offsite to create eco-piles. Eco-piles are made using rocks, wood and other natural materials to create refugia and foraging habitats for indigenous lizards. Lizards are likely to relocate to these eco-piles, away from the construction site, thus reducing the likelihood of direct or indirect harm to lizards within the construction area via the creation of new habitats (e.g., Herbert et al., 2023).

If lizards are spotted during construction works, a protocol should be in place to determine next steps. Typically, a Lizard Management Plan (LMP) will be prepared and submitted to the local council for approval. The LMP will detail lizard management activities to be undertaken at the site to remove, minimise or mitigate effects on native lizards. To avoid delays in construction and inform likely mitigation measures, a baseline lizard survey could be conducted to confirm lizard presence.

If the recommended mitigation measures are implemented, the residual level of effect would be reduced to **very low**.

8.1.2.3 Direct harm or mortality to indigenous bats

The likelihood of threatened long-tailed bats utilising vegetation within the project site is considered to be high, due to the number of suitable roosting trees

identified and the detection of long-tailed bats nearby. The magnitude of effect is assessed as **very high** due to potential harm or mortality to individuals, and the overall level of effect would be **high**.

DoC has produced clear protocols to reduce the risk of tree felling to bats, the flow chart for which is available in Appendix D. However, the mitigation hierarchy must first be applied to prevent the loss of critical colony roosting trees if at all possible. Bat surveys are recommended in the first instance to confirm bat activity within the project site.

All potential bat roost trees proposed for felling in the works footprint are required to have tree survey carried out prior to felling, including detectors being deployed the night before, to ensure no bats are killed during works. The surveys will need to be carried out by a qualified and ticketed arborist in the presence of a person with Bat Competency 3.1 or a DoC representative in the case of bats being discovered, to identify other potential roosting habitat on site. If trees are found to have no bats present, they must be felled the same day to prevent a potential return of bats to the site overnight. If trees are found to show signs of bat colony roosting, felling will need to be delayed until they move on.

If the recommended mitigation is carried out the residual level of effect will be reduced to be **very low**.

8.1.3 Noise and vibration from machinery

A temporary increase in noise and vibration is expected during earthworks. This has the potential to negatively impact reptiles and nesting or migratory birds nearby. Increased noise and disturbance during the breeding season for birds can cause parent birds to abandon nests, resulting in reduced juvenile survival.

However, the increase in noise associated with the earth and construction works will be temporary and birds and reptiles likely to be impacted by the disturbance are largely mobile species capable of moving in response to disturbance or noise. Works should be undertaken outside of the bird breeding season where practical, to reduce impacts on nesting individuals.

Bats may tolerate some traffic noise but construction activity poses a greater disturbance risk. To minimise this, passive acoustic monitoring will be carried out in suitable habitat before vegetation clearance. If roosting is detected, a 50 m exclusion zone will be established and works paused until monitoring confirms the bats have moved on. This approach avoids disturbance while allowing work to resume with minimal ecological impact. The magnitude of effect associated with the increased noise and disturbance on indigenous fauna is assessed as **low** with a **very low** residual level of effect. The disturbance will be **temporary** in nature and the effects will not persist following the completion of the construction phase.

8.1.4 Spread of pest and weed plant species due to earthworks

A large proportion of vegetation designated for removal is comprised of exotic species, some of which have been identified as pest plants. In particular blackberry and Chilean needle grass have been identified in the HBRC PMP, with a status of 'boundary' and 'sustained control'. Earthworks and construction has the potential to move pest species to new locations through transfer via machinery, or by clearing land so its bare; allowing pest and weed species to colonise. Seeds may be deposited in stream due to the disturbance of exotics present in the riparian margin.

The value of vegetation in the area ranges from **negligible** to **moderate**. The magnitude of effect from the potential spread of pest plants is assessed as **moderate** and the level of effect could range from **very low** to **moderate** without mitigation.

Pest plant species are recommended to be removed throughout the project site prior to works commencing, to reduce their spread.

Construction machinery should be regularly inspected and cleaned of plant propagules. Washing of construction plant should occur at a designated wash bay.

All plant material removed from site should be disposed of at a registered landfill, council designated disposal site or any other appropriate disposal options to avoid the risk of further encroachment at disposal.

The residual level of effect following these suggested mitigation measures would be reduced to **very low**.

8.1.5 Destruction or hydrological alteration of natural inland wetlands

Works to create the stopbanks and access ramps on the northern end of the site near Keppel Street will result in the loss of all of the rautahi sedgeland wetland (moderate value, 0.05 ha), a small section of the juncus rushland wetland (moderate value, 0.019 ha) and a section of the creeping bent stream margin wetland (low value, 0.005 ha). This is total of 0.074 ha of wetland will be lost.

The establishment of the stopbank and access ramps is likely going to result in some small change in hydrology in the areas of the creeping bent and rautahi sedgeland wetland (which is being removed), however a culvert will be constructed underneath the stopbank with a headwall and a flap gate. This will allow hydrological connection for the stream to be maintained through the stopbank as water can continue to flow from the township-side to towards the river via the unnamed stream. The flapgate will prevent flood water from flowing the opposite way towards the town. Change in hydrology will be much more limited across the road in the juncus rushland wetland. Overall, changes in hydrology should be minimal.

The magnitude of effect from the loss of these wetland areas and permanent alteration of hydrology is considered to have a **very high** magnitude of effect with a resulting **high** overall level of effect**.**

The stopbank alignment has been placed to avoid wetlands as much as possible and to have the least amount of impact on wetlands. Additionally, the culvert under the stopbank will maintain some of the hydrological connection and input. The loss of or effect on the remaining wetlands cannot be mitigated in this instance and so will require offsetting or compensation.

The project will also result in the removal of 0.074 ha of moderate-value wetland and 0.005 ha of low-value creeping bent stream margin. To address this, a 3:1 compensation ratio is proposed for wetland loss and small changes in hydrology. This would require a total of 0.22 ha of wetland enhancement or creation. It is proposed that the paddock in which the creeping bent wetland is located, south of Keppel Street, be used for the 0.22 ha of wetland enhancement, as approximately 0.72 ha of potential suitable area is available.

If wetland offsetting is completed as suggested above, the residual level of effect will be **Very Low.**

8.2 Aquatic Effects

Potential effects on the values of Pōrangahau River relating to the stopbank and flood wall construction were assessed as:

- Riparian vegetation removal resulting in loss of shade and bankside aquatic habitat;
- Vegetation removal resulting in increased bank instability through loss of cover and unstable root systems;
- Noise and vibration from machinery and construction;
- Sediment release during works;
- Stream realignment.

8.2.1 Riparian vegetation removal resulting in loss of shade, bankside aquatic habitat

Vegetation clearance will occur in the direct footprint of the proposed works, as well as adjacent laydown areas required for vehicle movement and storage.

The clearance will most likely reduce the riparian canopy cover and therefore the shaded portions of the river will be reduced with the construction of the flood protection works. This will negatively impact fish cover, water temperatures, organic input and filtering of surface runoff. The magnitude of effect from riparian vegetation removal is assessed as **moderate** and the level effect assessed as **moderate** without mitigation measures in place.

To reduce the effects on aquatic habitat, native riparian planting will need to be undertaken which, over time, will introduce as much shade back into the system as possible. Planting may be limited where the stopbanks are constructed however mitigation planting could be undertaken in other areas to provide shading of the river that link back to a restoration plan providing habitat for birds and lizards. The opposite bank to the planned works provides ample opportunity for further planting to return shade to the river. Additionally, there is opportunity upstream and downstream for further planting and enhancement.

If native riparian planting is undertaken that is likely to increase existing ecological values resulting in a residual level of effect is assessed as **very low** with opportunities for a **net gain**.

8.2.2 Riparian vegetation removal resulting in unstabilised banks

As mentioned above vegetation clearance will occur in the direct footprint of the proposed works, as well as adjacent areas required for vehicle movement and storage.

Vegetation removal will temporarily reduce bank stability (prior to the construction of the stopbanks) and increase erosion potential in areas of bare earth. As there are a number of large trees along the bank edge there is also a risk that root systems within the construction footprint may be damaged causing remaining trees to become unstable and potentially fall. This could result in further loss of shade and habitat and increased erosion potential. The magnitude of effect from reduced bank stability and increased erosion potential is assessed as **high,** and level of effect assessed as **high** without mitigation measured in place.

To mitigate these effects, an erosion and sediment control plan (ESCP) will need to be prepared and implemented during the construction works, to avoid sediment discharges into the river.

Tree removal should be minimised wherever possible to maintain exiting banks stability. Where removal is required, a tree removal plan could also be considered, incorporating a staged approach to removal paired with the planting to stabilise the soil and reduce erosion potential. In some cases, particularly with large willows, it may be appropriate to leave lower trunks and root systems dead but in place to prevent the loosening of substantial sections of soil. Additional measures such as regrading and planting of the banks around the stopbanks could further strengthen long-term stability. Hydroseeding can provide short-term cover and protection until permanent vegetation becomes established.

The residual level of effect from bank instability is assessed as **low**, with the adoption of a combination of the above recommended mitigation measures.

8.2.3 Noise and vibration from machinery

Impacts from noise and vibration will depend on the final construction methodology employed. However, vibration from sheet piling and onsite machinery could cause bank collapse if nearby banks are unstable or eroding. Nearby banks should be assessed prior to works beginning and if they appear unstable and at risk of collapse, instream sediment controls (e.g., sediment curtain) should be installed to contain sediment discharges.

Vibration and noise can also cause behavioural changes and evoke stress responses near the site, impacting fish passage and a reduction in fauna occupation of nearby habitat. Works are generally to be completed on the TLB only (with a small section upstream on the TRB) and above the wetted channel, therefore instream effects are expected to be minimal.

Without mitigation, the magnitude of effects from noise and vibration on freshwater ecosystems has been assessed as **high** with a resulting **moderate** level of effect. If the recommended mitigation measures are adopted, the residual level effect is assessed as **very low**.

8.2.4 Sediment release during works

As discussed, the flood management construction work within Pōrangahau River riparian margins has the potential to release suspended sediment into the river. It is very likely that high sediment loads will be transported to the mouth of the Pōrangahau Estuary, ~5km downstream and a high conservation value area, if not appropriately managed.

Elevated suspended sediment in the water column has the potential to cause significant negative effects on fish migration, spawning, cover and habitat. High turbidity (low water clarity due to suspended sediment) prevents the growth of aquatic plants and decreases the ability of fish to find food or to detect predators (Smith, 2014). This in turn can affect the growth and morphology of some species. Fine deposited sediment can smother benthic macroinvertebrates and result in more pollution tolerant communities.

Based on fish records for the Pōrangahau Stream it is likely that many of these species, including 'At Risk' species (giant bully, īnanga and long fin eel) would be migrating past the project site at certain times of year.

Īnanga are likely to be the species most sensitive to elevated turbidity. While īnanga are common in turbid rivers, juvenile feeding rates are significantly reduced by increases in turbidity, while adults are less affected (Boubee *et al*., 1997). Temporary loss or smothering of spawning habitat in the Pōrangahau River also has the potential to impact on īnanga populations.

Elevated suspended sediment has the potential to disrupt fish migration. The project site is 6.8 km upstream of Pōrangahau Estuary at the coast, is tidally influenced, and water quality measurements indicate existing moderate to high

turbidity at the project site. Sediment load increases caused by the construction works would only cause a short-term increase over baseline sediment load which is expected to be relatively high due to the existing erosion processes occurring within the greater river catchment and the tidal nature of the project site.

The magnitude of effect from sediment release on aquatic ecosystems has been assessed as **moderate**, with a resulting level of effect **moderate**.

If adequate erosion and sediment controls on the bank are implemented during the construction works, this is considered sufficient to manage sediment release to the Pōrangahau River and resulting residual effects are assessed as **low.** It is unlikely that downstream sensitive habitat will be affected if good sediment control measures are in place.

8.2.5 Stream realignment

The unnamed intermittent stream on site is of **low ecological value**. It is fed by township stormwater, passes through pastoral land, and has limited natural instream habitat. Margins are dominated by low value exotic creeping bent grass wetland, with some rautahi sedgeland wetland providing some additional distinct/rare habitat value. Aquatic biodiversity is likely restricted to hardy macroinvertebrates tolerant of stagnant flows, poor physical habitat conditions, and potential contaminants.

The edge of the access ramp on the south side of Keppel Street will require slope grading, which will extend into the paddock where the intermittent stream is situated. This will necessitate a realignment of the stream to maintain connectivity with the stormwater network. A new culvert will be installed under the stopbank, and the current alignment of the flow path will be covered by the access ramp. These works will result in direct modification of the existing stream bed and margins. Given the already modified state, lack of natural substrate, and low ecological value, the magnitude of effect is assessed as **moderate**, provided the new alignment replicates channel function and incorporates stabilisation measures and riparian planting.

The overall level of effect will be **low**.

9.0 Summary of Effects

Table 11: Level and Magnitude of Effects Associated with the Proposed Works on Ecological Features

Ecological Feature	Ecological Value	Activity	Magnitude of Effect	Level of Effect	Timescale of Effect	Recommended Mitigation Measures	Residual Level of Effect
Terrestrial	Negligible to High	Vegetation clearance and material stockpiling causing loss of bird habitat	Moderate	Very Low to Moderate	Short to long-term (depending on vegetation type and length of time to reestablish)	Create a restoration planting plan. Restoration will provide higher quality and contiguous habitat.	Very low to net gain
		Vegetation clearance and material stockpiling causing loss of lizard habitat	High	Low	Short to long-term (depending on vegetation type and length of time to reestablish)	Create a restoration planting plan incorporating woody piles, rock piles and species such as *Coprosma propinqua,*	Very low to net gain
		Vegetation clearance and material stockpiling causing loss of bat habitat	Low-Moderate	Low-Moderate	Permanent	None available due to the many years required to replace mature trees. Alignment has been changed to avoid potential bat roosting trees, resulting in only one tree needing to be felled.	Low to Moderate
		Harm or accidental mortality to indigenous birds	Very high	High	Temporary (construction phase)	Works should be conducted outside of nesting season, where practical, otherwise nest checks conducted with 20 m boundaries established if found.	Very Low
		Harm or accidental mortality to indigenous reptiles	Very high	Moderate	Temporary (construction phase)	Staged vegetation clearance combined with eco-piles should be implemented. A Lizard Management Plan (LMP), approved by the local council and potentially requiring a Wildlife Act Authority permit, will guide management, including lizard relocation if necessary.	Very Low
		Harm or accidental mortality to indigenous bats	Very High	High	Temporary (construction phase)	Pre-felling tree surveys by qualified experts are mandatory, and any roost tree removal.	Very Low
		Noise and vibration from machinery	Low	Low	Temporary (construction phase)	Construction should occur outside nesting season where practical, otherwise nest check will be conducted and a 20 m boundary established around active nests until chicks have fledged. For lizards, staged vegetation clearance and eco-piles will create offsite habitats, minimizing noise and habitat disruption. For bats, passive acoustic monitoring will be carried out in suitable habitat before vegetation clearance. If roosting is detected, a 50 m exclusion zone will be	Very Low

Table 11: Level and Magnitude of Effects Associated with the Proposed Works on Ecological Features

Ecological Feature	Ecological Value	Activity	Magnitude of Effect	Level of Effect	Timescale of Effect	Recommended Mitigation Measures	Residual Level of Effect
						established and works paused until monitoring confirms the bats have moved on.	
		Spread of pest plant and weed species	Moderate	Very Low - Moderate	Permanent	In situ soils should be sieved for plant material before being redistributed to stockpiles or from borrow pits. Construction machinery should be regularly inspected and cleaned of plant propagules. Removed vegetation needs to be disposed of appropriately so that pest species don't spread.	Very Low
		Destruction or hydrological alteration of natural inland wetland	High	Moderate	Permanent (or long-term if vegetation loss offset elsewhere after construction)	Offset loss of wetlands with a 3:1 ratio, where possible adjacent to site such as enhancing the creeping bent margin wetland.	Very Low
Aquatic	Moderate	Riparian vegetation removal resulting in loss of shade	Moderate	Moderate	Short to long-term (depending on vegetation type and length of time to reestablish)	Create a restoration planting plan for along the riparian zone within the footprint of works and/or along the opposite bank. Additionally, there is ample opportunity upstream and downstream of the for further panting and enhancement.	Very low to net gain
		Riparian vegetation removal resulting in loss of bank stability	High	High	Short to long-term (depending on vegetation type and length of time to reestablish)	Consider the following: Minimise tree removal, where removal occurs utilise a tree removal plan. Plan could include a staged approach pairing tree removal with replacement planting, leave lower trunks and root systems in place, post construction bank regrading and planting, and an effective sediment control plan. A combination of these measures is likely to be required to reduce adverse effects to an acceptable level.	Low
		Noise and vibration from machinery and construction	High	Moderate	Temporary (construction phase)	Banks assessed prior to works for collapse potential, instream sediment controls (e.g., sediment curtain) should be installed to contain sediment discharge.	Very Low
		Sediment release during works	Moderate	Moderate	Temporary (construction phase)	Erosion and sediment controls during construction, throughout the construction zone.	Low
	Low	Realignment of intermittent stream	Moderate	Low	Permanent	Culvert to restore hydrological connection with a reinstatement of the stream to connect back up to stream channel. Planting of margins will increase ecological value	Very Low - Low

10.0 Conclusion

Terrestrial vegetation assessments along the stopbank corridor identified six terrestrial vegetation types and four wetland habitats within the stopbank footprint. The project site sits within a wider agricultural environment, and both terrestrial and wetland habitats were assessed as having **negligible** to **high** ecological value in that context.

Overall, the level of effects to terrestrial vegetation and habitats are assessed as **very low to high** before implementation of the effects management hierarchy. Recommended mitigations to reduce impacts to terrestrial environments have been assessed as:

- Development and implementation of a restoration planting plan.
  - A restoration plan should be prepared to mitigate the loss of bird and lizard habitat. It should determine the most suitable areas for restoration and the appropriate species composition to support improvements for both bird and lizard habitat and ability to replace riparian shading over time. There is opportunity for planting along the river margins.
  - The plan should include a total of 0.22 ha of wetland to be enhanced/planted or created to replace wetland lost. The paddock with the creeping bent wetland south of Keppel Street appears suitable for wetland enhancement and is approx. 0.72 ha.
- Management of in-situ substrates and earthworks equipment to minimise the risk of spreading pest plants offsite or to new locations on site.
- Management of risk to indigenous reptiles by a staged vegetation removal. Staged vegetation clearance and installation of eco-piles will create offsite habitats, minimising noise and habitat disruption.
- Management of risk to indigenous bats by roost inspections of any trees scheduled to be removed with bat roost features prior to felling.
- Construction should occur outside the bird nesting season, where practical. If not, nest checks should be conducted with a 20 m boundary established around active nests until chicks have fledged.

If the recommended mitigation measures are implemented, the residual effects on terrestrial vegetation and habitats are assessed as **low, with some resulting in a positive net gain,** especially given the construction footprint is likely to be overestimated. The only exception is bats, where the effect remains **moderate** due to the removal of one potential roost tree. The alignment has already been adjusted to avoid other bat trees, leaving just a single tree requiring felling.

Aquatic assessments have assessed the ecological value of Pōrangahau River as **moderate** in context of the wider environment.

The freshwater assessment identified the presence of three indigenous freshwater fish species that were At Risk (Giant bully, Īnanga, longfin eel). eDNA and TICI scores indicate the catchment has a reduced presence of sensitive species and increased dominance of tolerant species suggesting that water quality and or habitat is sub-optimal.

The overall aquatic ecological value of the project site was moderate due to the sites connection to the Pōrangahu Estuary and being a migratory pathway and habitat for several native fish.

Overall, the level of effects to the aquatic environment is mixed and ranges between **moderate** to **high**. Recommended mitigations to reduce impacts to aquatic environments have been assessed as:

- Develop and implement a restoration planting plan following the completion of the works to mitigate the effects of vegetation clearance causing loss of shade and bank stability.
- A robust ESCP will be implemented under the Environmental Management Plan. Routine inspection and maintenance for onsite sediment controls will be outlined in the ESCP, and as such, we consider that the effects will be managed as effectively as possible.
- Management of in-situ substrates and earthworks equipment to minimise the risk of spreading pest plants offsite or to new locations on site.
- Timing construction to avoid peak migration and spawning of indigenous fish, where practical.
- Realignment and reinstating the intermittent stream post-works with a culvert to maintain hydrological connection to stormwater source of water and some planting to improve the margins and ecological value of the new stream alignment.

If these recommended mitigation measures are implemented, the residual level of effect has been assessed as **very low** to **low** with the potential of **net gains** regarding restoring the riparian zone.

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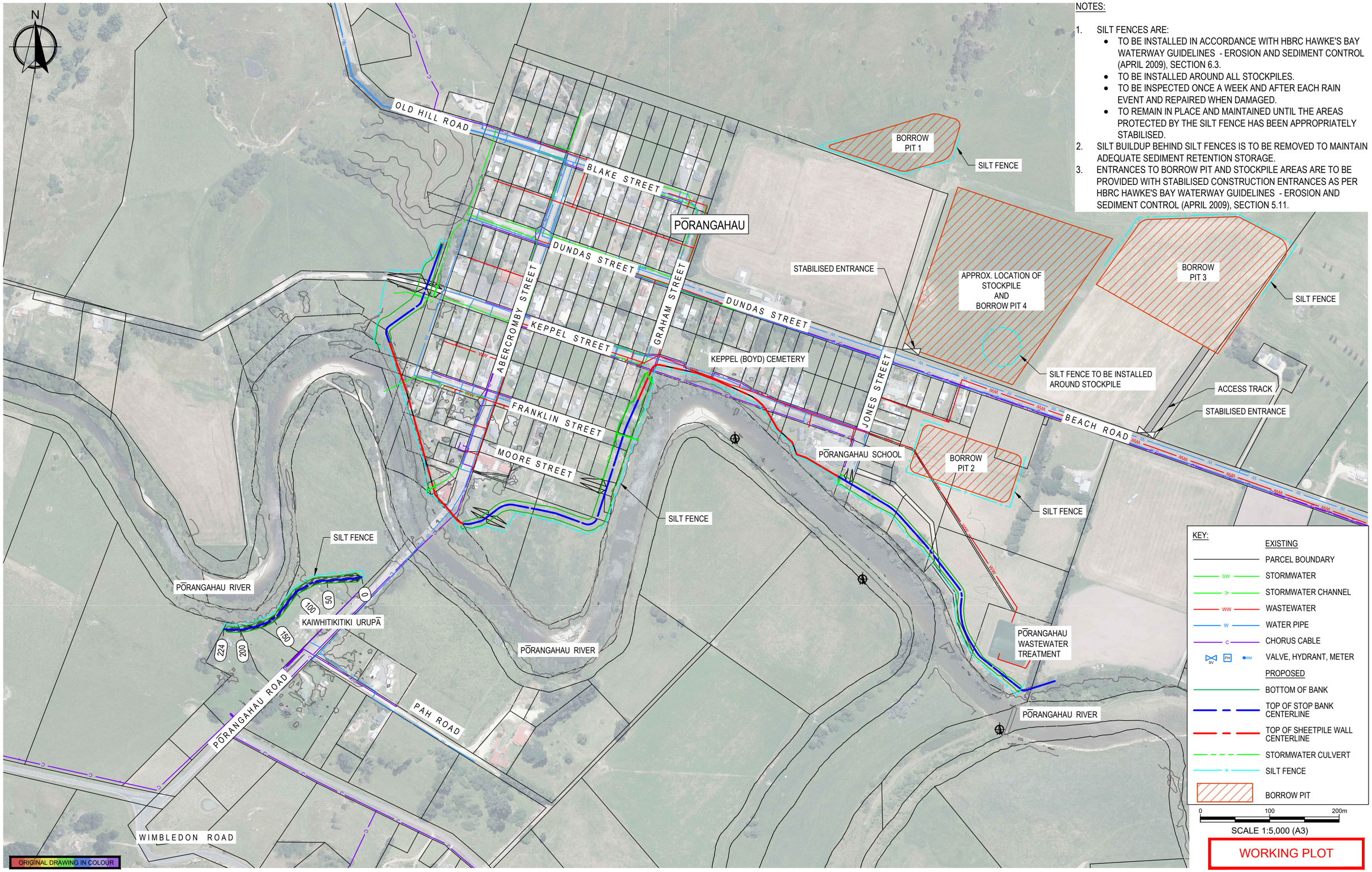
Appendix A: Detailed Designs



NOTES:

1. SILT FENCES ARE:
   - TO BE INSTALLED IN ACCORDANCE WITH HBRC HAWKE'S BAY WATERWAY GUIDELINES - EROSION AND SEDIMENT CONTROL (APRIL 2009), SECTION 6.3.
   - TO BE INSTALLED AROUND ALL STOCKPILES.
   - TO BE INSPECTED ONCE A WEEK AND AFTER EACH RAIN EVENT AND REPAIRED WHEN DAMAGED.
   - TO REMAIN IN PLACE AND MAINTAINED UNTIL THE AREAS PROTECTED BY THE SILT FENCE HAS BEEN APPROPRIATELY STABILISED.
2. SILT BUILDUP BEHIND SILT FENCES IS TO BE REMOVED TO MAINTAIN ADEQUATE SEDIMENT RETENTION STORAGE.
3. ENTRANCES TO BORROW PIT AND STOCKPILE AREAS ARE TO BE PROVIDED WITH STABILISED CONSTRUCTION ENTRANCES AS PER HBRC HAWKE'S BAY WATERWAY GUIDELINES - EROSION AND SEDIMENT CONTROL (APRIL 2009), SECTION 5.11.

KEY:

EXISTING
- PARCEL BOUNDARY
- STORMWATER (SW)
- STORMWATER CHANNEL (>)
- WASTEWATER (WW)
- WATER PIPE (W)
- CHORUS CABLE (C)
- VALVE, HYDRANT, METER (SV, FH, WM)

PROPOSED
- BOTTOM OF BANK
- TOP OF STOP BANK CENTERLINE
- TOP OF SHEETPILE WALL CENTERLINE
- STORMWATER CULVERT
- SILT FENCE
- BORROW PIT

0 100 200m

SCALE 1:5,000 (A3)

WORKING PLOT

NO.	REVISION	DATE	APP.
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HAWKE'S BAY REGIONAL COUNCIL
TE KAUNIHERA Ā-ROHE O TE MATAU-A-MĀUI

PATTLE DELAMORE PARTNERS

CLIENT: HAWKE'S BAY REGIONAL COUNCIL

PROJECT: PŌRANGAHAU STOPBANKS

DESIGNED	DESIGN REVIEW	DATE	APPROVED	DATE
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DRAWN	DRAWING CHECK	DATE	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED	
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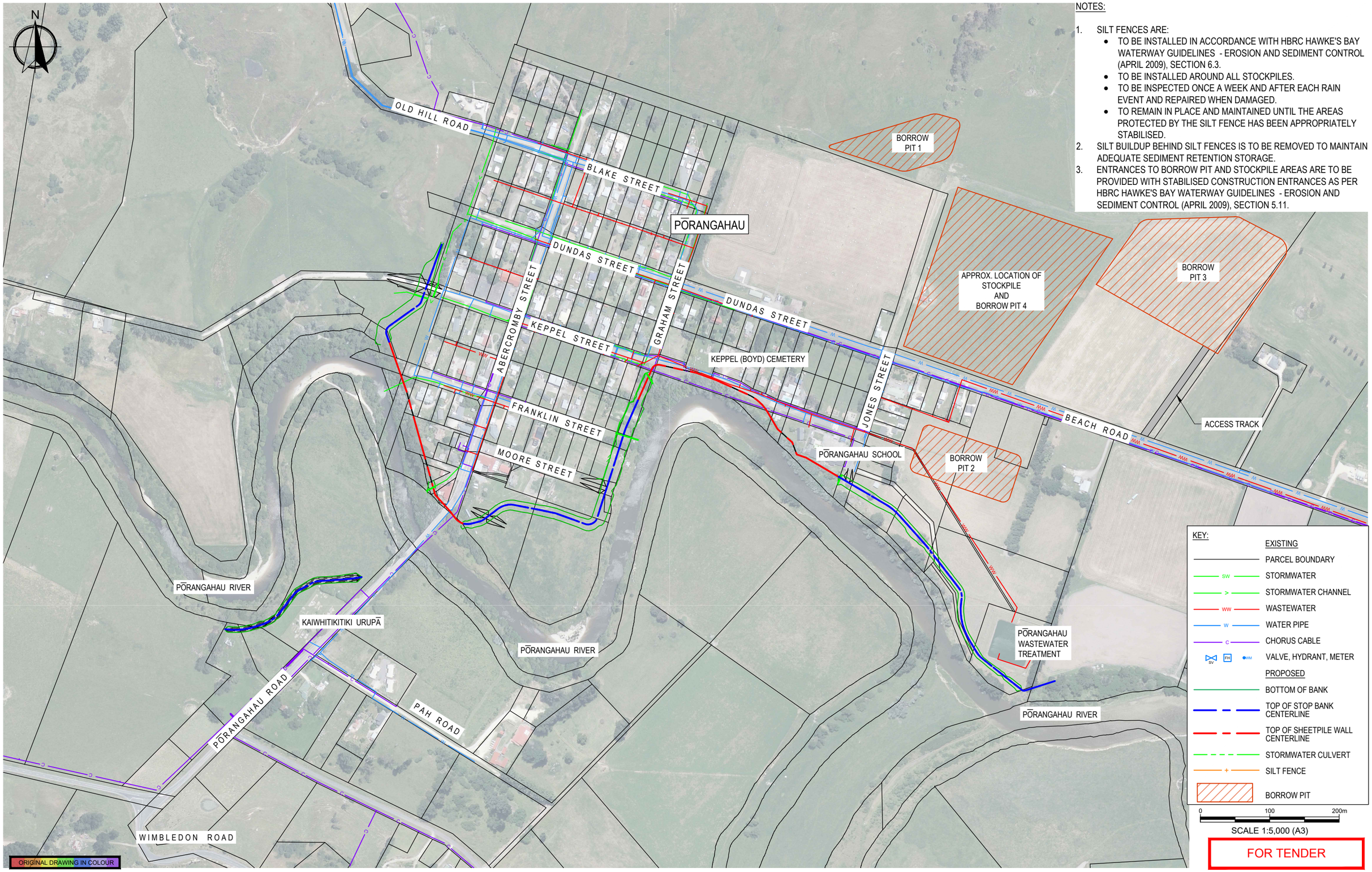
EROSION AND SEDIMENT CONTROL PLAN

SCALE :	DRAWING NO. :	REV :
AS SHOWN (A3)	HB01041700-GT-005	A



NOTES:

1. SILT FENCES ARE:
   - TO BE INSTALLED IN ACCORDANCE WITH HBRC HAWKE'S BAY WATERWAY GUIDELINES - EROSION AND SEDIMENT CONTROL (APRIL 2009), SECTION 6.3.
   - TO BE INSTALLED AROUND ALL STOCKPILES.
   - TO BE INSPECTED ONCE A WEEK AND AFTER EACH RAIN EVENT AND REPAIRED WHEN DAMAGED.
   - TO REMAIN IN PLACE AND MAINTAINED UNTIL THE AREAS PROTECTED BY THE SILT FENCE HAS BEEN APPROPRIATELY STABILISED.
2. SILT BUILDUP BEHIND SILT FENCES IS TO BE REMOVED TO MAINTAIN ADEQUATE SEDIMENT RETENTION STORAGE.
3. ENTRANCES TO BORROW PIT AND STOCKPILE AREAS ARE TO BE PROVIDED WITH STABILISED CONSTRUCTION ENTRANCES AS PER HBRC HAWKE'S BAY WATERWAY GUIDELINES - EROSION AND SEDIMENT CONTROL (APRIL 2009), SECTION 5.11.

KEY:

EXISTING
- PARCEL BOUNDARY
- STORMWATER (SW)
- STORMWATER CHANNEL (>)
- WASTEWATER (WW)
- WATER PIPE (W)
- CHORUS CABLE (C)
- VALVE, HYDRANT, METER (SV, FH, WM)

PROPOSED
- BOTTOM OF BANK
- TOP OF STOP BANK CENTERLINE
- TOP OF SHEETPILE WALL CENTERLINE
- STORMWATER CULVERT
- SILT FENCE (+)
- BORROW PIT

0 100 200m

SCALE 1:5,000 (A3)

FOR TENDER

NO.	REVISION	DATE	APP.
0	FOR TENDER	OCT 25	GS
B	FOR CONSENT	APR 25	
A	FOR INFORMATION	JUL 24	GS

HAWKE'S BAY REGIONAL COUNCIL
TE KAUNIHERA Ā-ROHE O TE MATAU-A-MĀUI

PATTLE DELAMORE PARTNERS

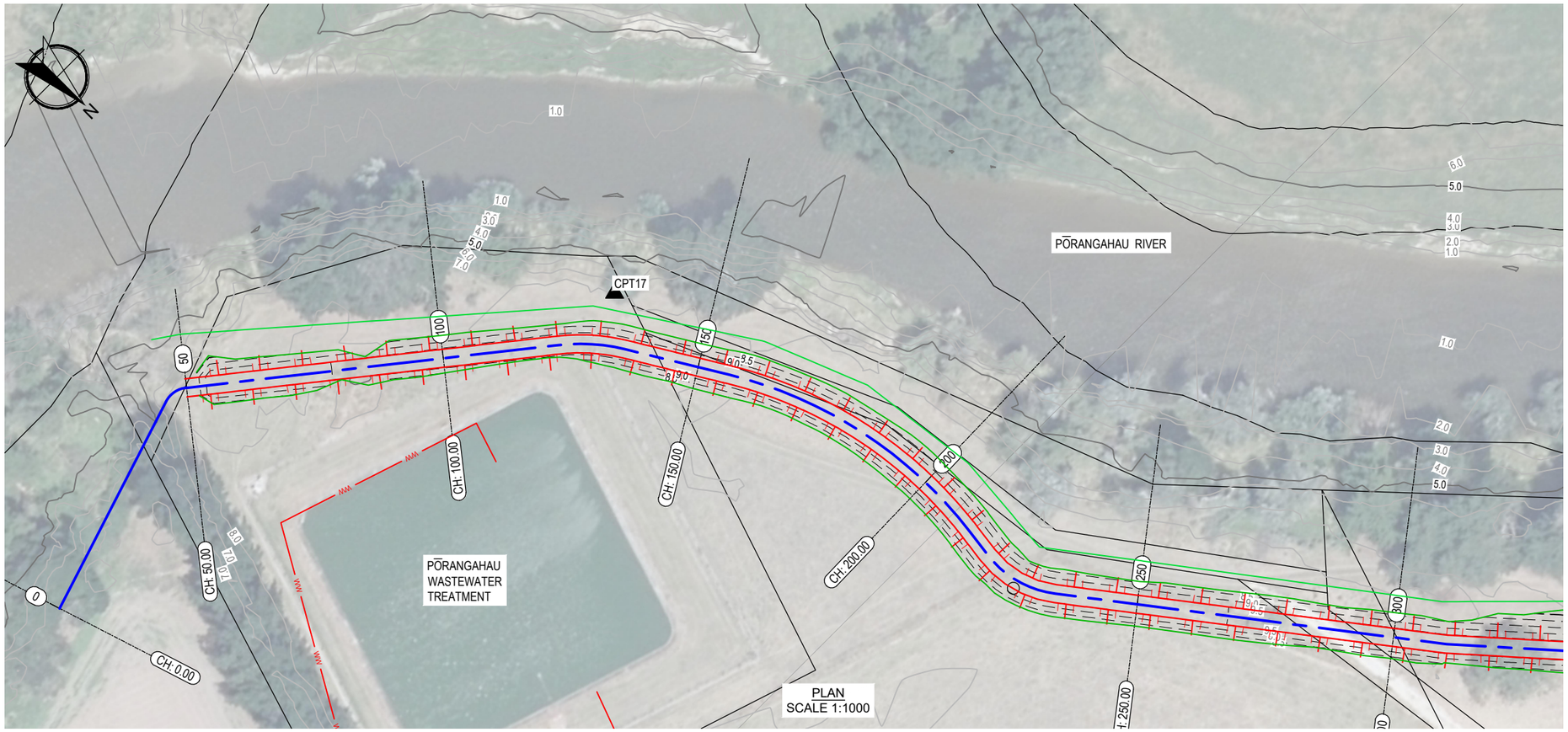
CLIENT: HAWKE'S BAY REGIONAL COUNCIL

PROJECT: PŌRANGAHAU STOPBANKS

DESIGNED	DESIGN REVIEW	DATE	APPROVED	DATE
OH	GS	JUL 24		
DRAWN	DRAWING CHECK	DATE	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED	
SHK		JUL 24		

PORANGAHAU STOPBANKS OVERALL PLAN

SCALE :	DRAWING NO. :	REV :
AS SHOWN (A3)	HB01041700-GT-010	0



PLAN
SCALE 1:1000

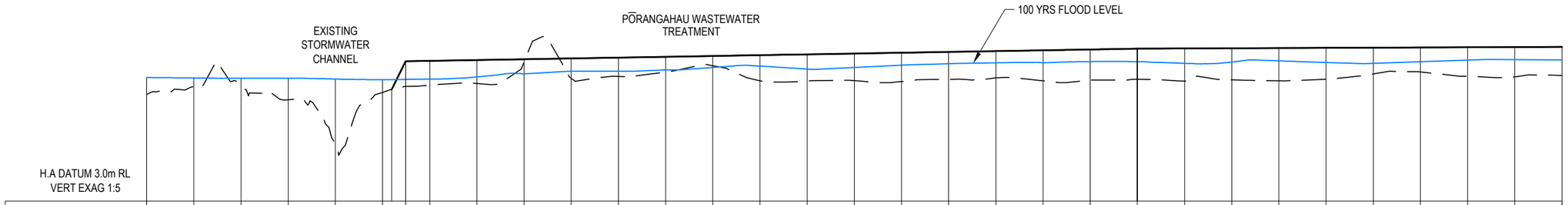
KEY:

EXISTING
- PARCEL BOUNDARY
- STORMWATER
- STORMWATER CHANNEL
- WASTEWATER
- WATER PIPE
- CHORUS CABLE
- VALVE, HYDRANT, METER

PROPOSED
- TOP OF BANK
- STORMWATER DRAIN
- BOTTOM OF BANK
- TOP OF STOP BANK CENTERLINE
- TOP OF SHEETPILE WALL CENTERLINE
- STORMWATER CULVERT

NOTES

1. REFER DRAWING HB01041700-GT-002 FOR GENERAL NOTES.
2. DIMENSIONS IN METRES UNLESS OTHERWISE NOTED.
3. COORDINATES IN TERMS OF NEW ZEALAND TRANSVERSE MERCATOR PROJECTION 2000 (NZTM, EPSG:2193)
4. LEVELS IN TERMS OF NEW ZEALAND VERTICAL DATUM 2016 (NZVD2016).
5. GROUND PROFILE EXTRACTED FROM WSP LIDAR FLOWN JUNE 2024 & LINZ DATA CENTRE HAWKES-BAY LIDAR 1m DEM 2020-2021.
6. ORIGIN OF LEVELS: MARK PIN 1 SO 578686 (F6WK) 5532456.7mE, 1907341.223mN, 7.852mRL.
7. LONGSECTION VERTICAL SCALE IS EXAGGERATED.



CHAINAGE (m)	EXISTING GROUND LEVEL (m RL)	LEVEL DIFFERENCE (m)	PROPOSED DESIGN LEVELS (m RL)
0.00	7.52		
10.00	7.85		
20.00	7.94		
30.00	7.29		
40.00	5.43		
50.00	7.60		
60.00	7.91	1.03	8.92
70.00	7.98	0.99	8.94
80.00	8.88	0.12	8.97
90.00	8.19	0.85	9.01
100.00	8.27	0.80	9.04
110.00	8.46	0.64	9.07
120.00	8.73	0.41	9.11
130.00	8.09	1.09	9.14
140.00	8.08	1.13	9.18
150.00	8.10	1.15	9.21
160.00	8.06	1.22	9.24
170.00	8.16	1.16	9.28
180.00	8.22	1.13	9.31
190.00	8.09	1.29	9.35
200.00	8.12	1.30	9.38
210.00	8.16	1.29	9.42
220.00	8.08	1.38	9.45
230.00	8.13	1.34	9.46
240.00	8.09	1.38	9.47
250.00	8.16	1.33	9.48
260.00	8.38	1.11	9.48
270.00	8.47	1.03	9.49
280.00	8.29	1.22	9.50
290.00	8.26	1.26	9.51
300.00	8.32	1.21	9.52
			9.53

NOTES

1. REFER DRAWING HB01041700-GT-002

0 10 20 30 40 50m
SCALE 1:1,000 (A3)

STOPBANK SECTIONS A LONG SECTION CH0 TO CH300
HORIZONTAL SCALE 1:1000
VERTICAL SCALE 1:200

ORIGINAL DRAWING IN COLOUR

FOR TENDER

NO.	REVISION	DATE	APP.
0	FOR TENDER	OCT 25	GS
B	FOR CONSENT	APR 25	
A	FOR INFORMATION	JUL 24	GS

HAWKES BAY REGIONAL COUNCIL
TE KAUNIHERA Ā-ROHE O TE MATAU-A-MĀUI

PATTLE DELAMORE PARTNERS

CLIENT: HAWKE'S BAY REGIONAL COUNCIL

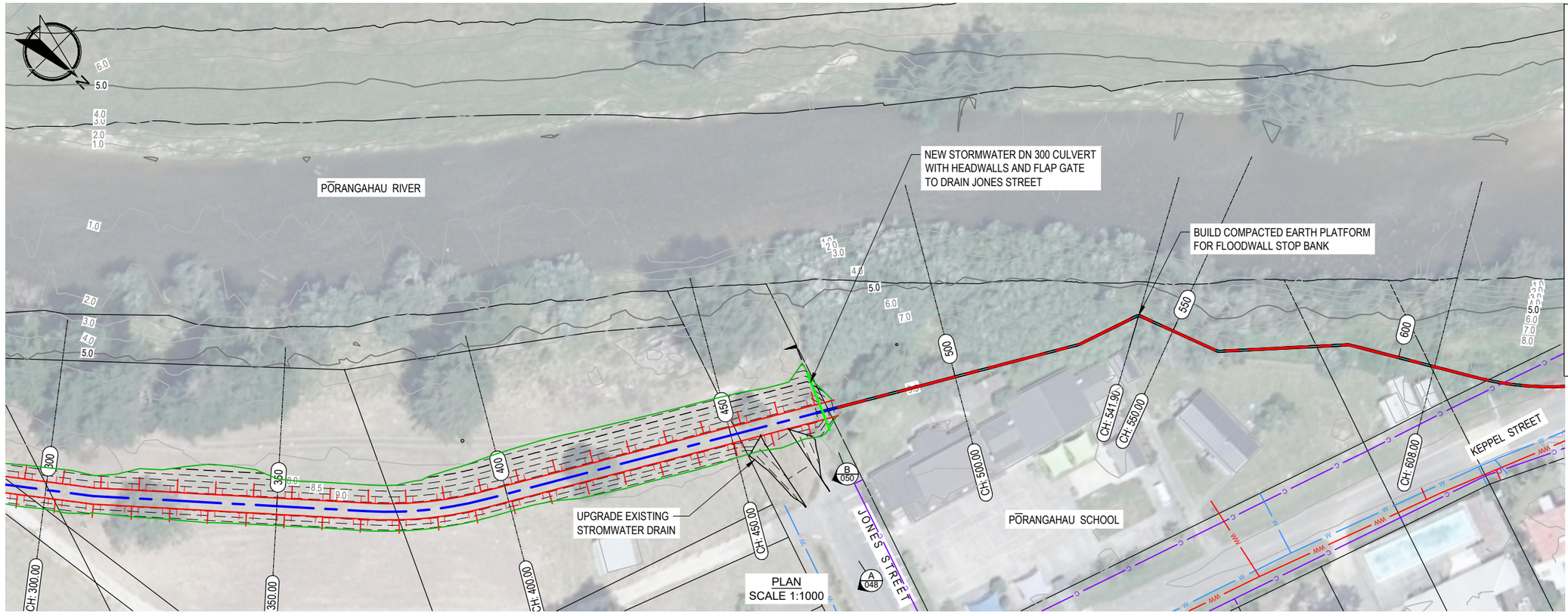
PROJECT: PŌRANGAHAU STOPBANKS

DESIGNED	DESIGN REVIEW	DATE	APPROVED	DATE
OH	GS	JUL 24		
DRAWN	DRAWING CHECK	DATE		
SHK		JUL 24		

THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED

PORANGAHAU STOPBANK PLAN & LONGSECTION SHEET 1

SCALE :	DRAWING NO. :	REV :
AS SHOWN (A3)	HB01041700-GT-011	0



KEY:

EXISTING
- PARCEL BOUNDARY
- STORMWATER
- STORMWATER CHANNEL
- WASTEWATER
- WATER PIPE
- CHORUS CABLE
- VALVE, HYDRANT, METER

PROPOSED
- TOP OF BANK
- STORMWATER DRAIN
- BOTTOM OF BANK
- TOP OF STOP BANK CENTERLINE
- TOP OF SHEETPILE WALL CENTERLINE
- STORMWATER CULVERT

NOTES

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2. DIMENSIONS IN METRES UNLESS OTHERWISE NOTED.
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4. LEVELS IN TERMS OF NEW ZEALAND VERTICAL DATUM 2016 (NZVD2016).
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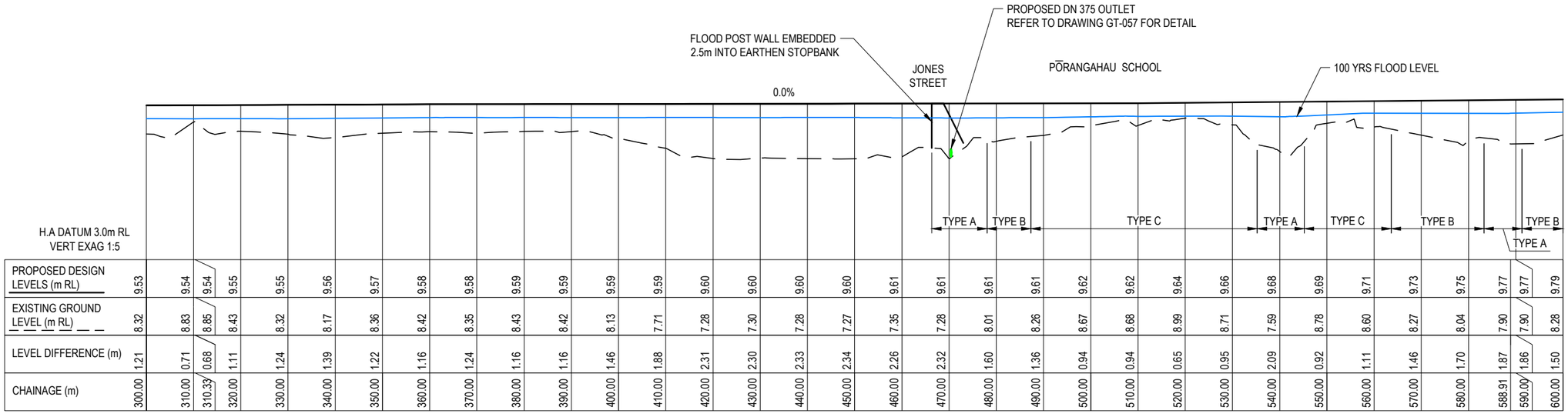
7. LONGSECTION VERTICAL SCALE IS EXAGGERATED.
8. FLOOD WALL TO BE SHEET PILLED WALL. REFER TO DRAWING HB01041700-GT-056 FOR DETAILS.
9. LEVELS FOR FLOOD WALLS ARE MINIMUM LEVELS RL.
10. FOR SHEET PILE TYPES, REFER TO DRAWING HB04041700-GT-059.



H.A DATUM 3.0m RL
VERT EXAG 1:5

CHAINAGE (m)	300.00	310.00	310.33	320.00	330.00	340.00	350.00	360.00	370.00	380.00	390.00	400.00	410.00	420.00	430.00	440.00	450.00	460.00	470.00	480.00	490.00	500.00	510.00	520.00	530.00	540.00	550.00	560.00	570.00	580.00	588.91	590.00	600.00
PROPOSED DESIGN LEVELS (m RL)	9.53	9.54	9.54	9.55	9.55	9.56	9.57	9.58	9.58	9.59	9.59	9.59	9.59	9.60	9.60	9.60	9.60	9.61	9.61	9.61	9.61	9.62	9.62	9.64	9.66	9.68	9.69	9.71	9.73	9.75	9.77	9.77	9.79
EXISTING GROUND LEVEL (m RL)	8.32	8.83	8.85	8.43	8.32	8.17	8.36	8.42	8.35	8.43	8.42	8.13	7.71	7.28	7.30	7.28	7.27	7.35	7.28	8.01	8.26	8.67	8.88	8.99	8.71	7.59	8.78	8.60	8.27	8.04	7.90	7.90	8.28
LEVEL DIFFERENCE (m)	1.21	0.71	0.68	1.11	1.24	1.39	1.22	1.16	1.24	1.16	1.16	1.46	1.88	2.31	2.30	2.33	2.34	2.26	2.32	1.60	1.36	0.94	0.94	0.65	0.95	2.09	0.92	1.11	1.46	1.70	1.87	1.86	1.50

0 10 20 30 40 50m
SCALE 1:1,000 (A3)

STOPBANK SECTIONS A LONG SECTION CH300 TO CH600

HORIZONTAL SCALE 1:1000
VERTICAL SCALE 1:200

ORIGINAL DRAWING IN COLOUR

FOR TENDER

NO.	REVISION	DATE	APP.
0	FOR TENDER	OCT 25	GS
B	FOR CONSENT	APR 25	
A	FOR INFORMATION	JUL 24	GS

HAWKES BAY REGIONAL COUNCIL
TE KAUNIHERA Ā-ROHE O TE MATAU-A-MĀUI

PATTLE DELAMORE PARTNERS

CLIENT: HAWKE'S BAY REGIONAL COUNCIL

PROJECT: PŌRANGAHAU STOPBANKS

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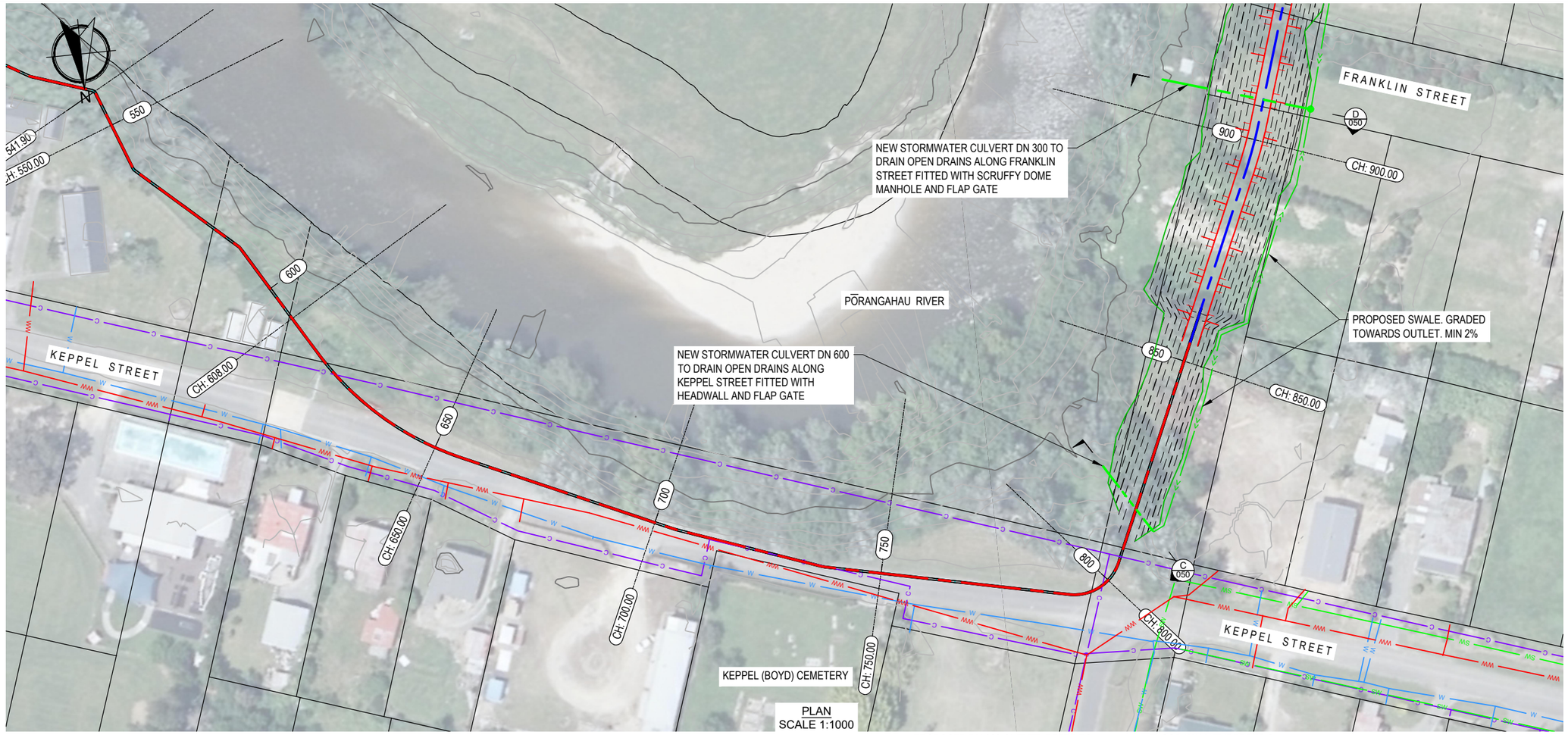
SHK		JUL 24		

PORANGAHAU STOPBANK PLAN & LONGSECTION SHEET 2

SCALE :	DRAWING NO. :	REV :
AS SHOWN (A3)	HB01041700-GT-012	0



PLAN
SCALE 1:1000

KEY:

EXISTING
- PARCEL BOUNDARY
- STORMWATER
- STORMWATER CHANNEL
- WASTEWATER
- WATER PIPE
- CHORUS CABLE
- VALVE, HYDRANT, METER

PROPOSED
- TOP OF BANK
- STORMWATER DRAIN
- BOTTOM OF BANK
- TOP OF STOP BANK CENTERLINE
- TOP OF SHEETPILE WALL CENTERLINE
- STORMWATER CULVERT

NOTES

1. REFER DRAWING HB01041700-GT-002 FOR GENERAL NOTES.
2. DIMENSIONS IN METRES UNLESS OTHERWISE NOTED.
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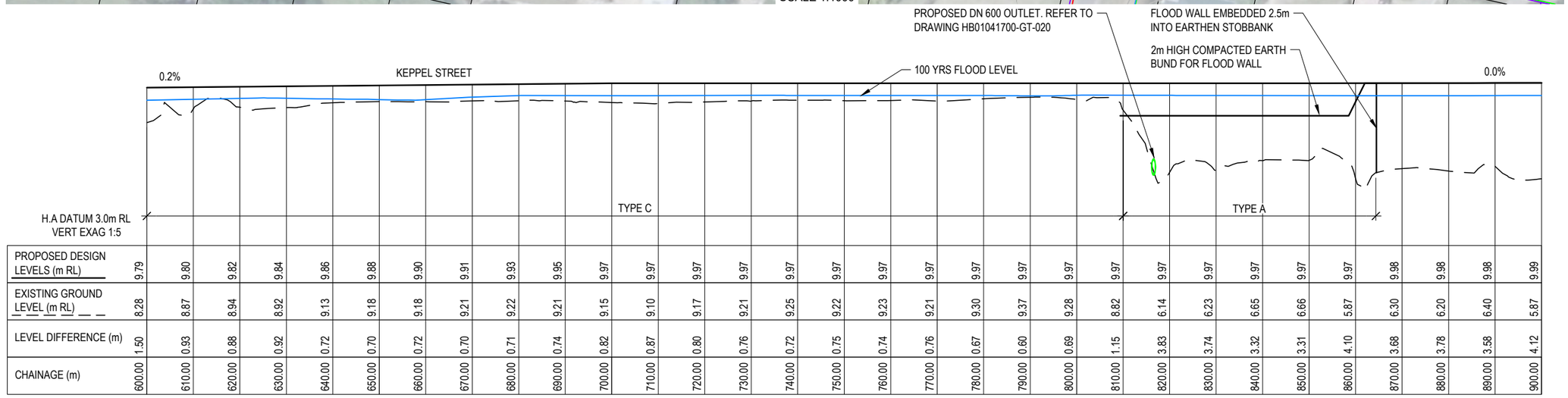
7. LONGSECTION VERTICAL SCALE IS EXAGGERATED.
8. FLOOD WALL TO BE SHEET PILLED WALL. REFER TO DRAWING HB01041700-GT-056 FOR DETAILS.
9. LEVELS FOR FLOOD WALLS ARE MINIMUM LEVELS RL.
10. FOR SHEET PILE TYPES, REFER TO DRAWING HB04041700-GT-059.



CHAINAGE (m)	600.00	610.00	620.00	630.00	640.00	650.00	660.00	670.00	680.00	690.00	700.00	710.00	720.00	730.00	740.00	750.00	760.00	770.00	780.00	790.00	800.00	810.00	820.00	830.00	840.00	850.00	860.00	870.00	880.00	890.00	900.00
LEVEL DIFFERENCE (m)	1.50	0.93	0.88	0.92	0.72	0.70	0.72	0.70	0.71	0.74	0.82	0.87	0.80	0.76	0.72	0.75	0.74	0.76	0.67	0.60	0.69	1.15	3.83	3.74	3.32	3.31	4.10	3.68	3.78	3.58	4.12
EXISTING GROUND LEVEL (m RL)	8.28	8.87	8.94	8.92	9.13	9.18	9.18	9.21	9.22	9.21	9.15	9.10	9.17	9.21	9.25	9.22	9.23	9.21	9.30	9.37	9.28	8.82	6.14	6.23	6.65	6.66	5.87	6.30	6.20	6.40	5.87
PROPOSED DESIGN LEVELS (m RL)	9.79	9.80	9.82	9.84	9.86	9.88	9.90	9.91	9.93	9.95	9.97	9.97	9.97	9.97	9.97	9.97	9.97	9.97	9.97	9.97	9.97	9.97	9.97	9.97	9.97	9.97	9.97	9.98	9.98	9.98	9.99

STOPBANK SECTIONS C & D LONG SECTION CH0 TO CH300

HORIZONTAL SCALE 1:1000
VERTICAL SCALE 1:200

0 10 20 30 40 50m
SCALE 1:1,000 (A3)

FOR TENDER

ORIGINAL DRAWING IN COLOUR

NO.	REVISION	DATE	APP.
0	FOR TENDER	OCT 25	GS
B	FOR CONSENT	APR 25	
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HAWKES BAY REGIONAL COUNCIL
TE KAUNIHERA Ā-ROHE O TE MATAU-A-MĀUI

PATTLE DELAMORE PARTNERS

ACE MEMBER

CLIENT: HAWKE'S BAY REGIONAL COUNCIL

PROJECT: PŌRANGAHAU STOPBANKS

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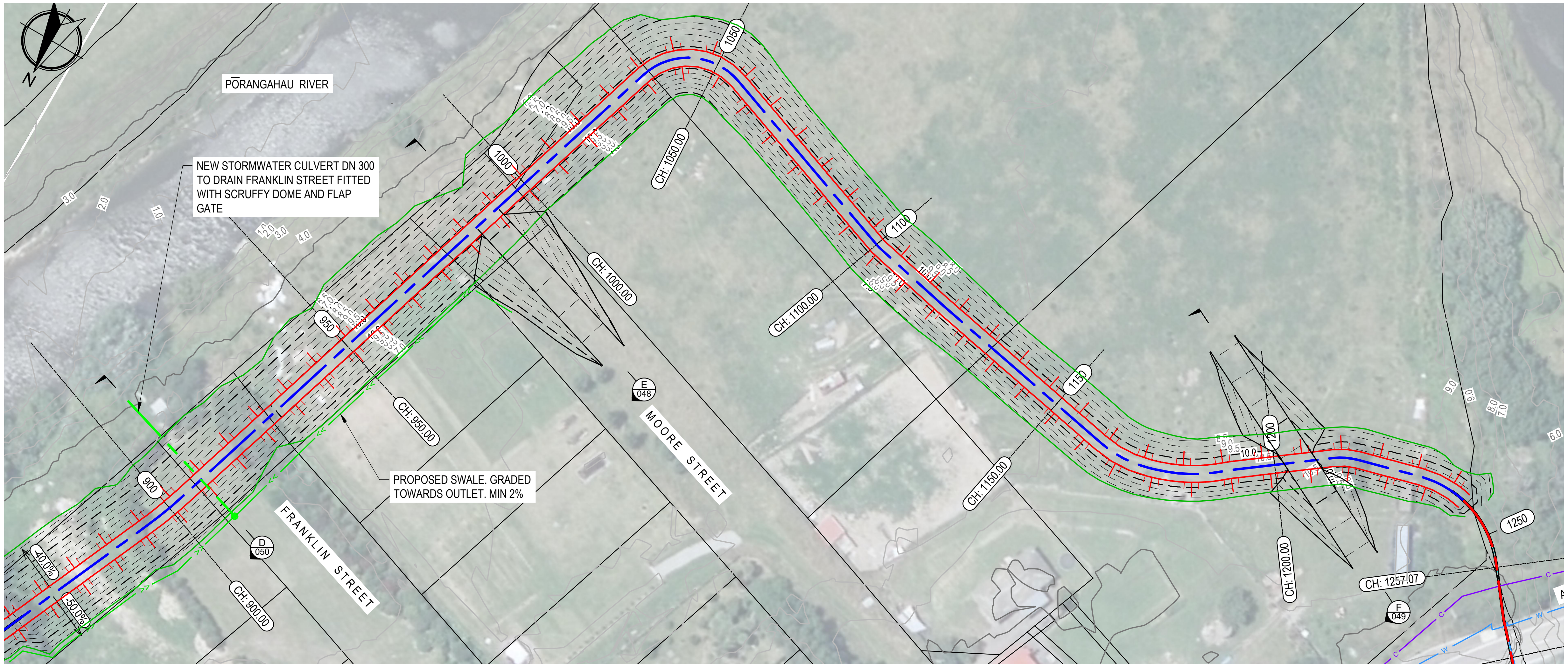
SHK		JUL 24		

PORANGAHAU STOPBANK PLAN & LONGSECTION SHEET 3

SCALE :	DRAWING NO. :	REV :
AS SHOWN (A3)	HB01041700-GT-013	0



KEY:

EXISTING
- PARCEL BOUNDARY
- STORMWATER
- STORMWATER CHANNEL
- WASTEWATER
- WATER PIPE
- CHORUS CABLE
- VALVE, HYDRANT, METER

PROPOSED
- TOP OF BANK
- STORMWATER DRAIN
- BOTTOM OF BANK
- TOP OF STOP BANK CENTERLINE
- TOP OF SHEETPILE WALL CENTERLINE
- STORMWATER CULVERT

NOTES

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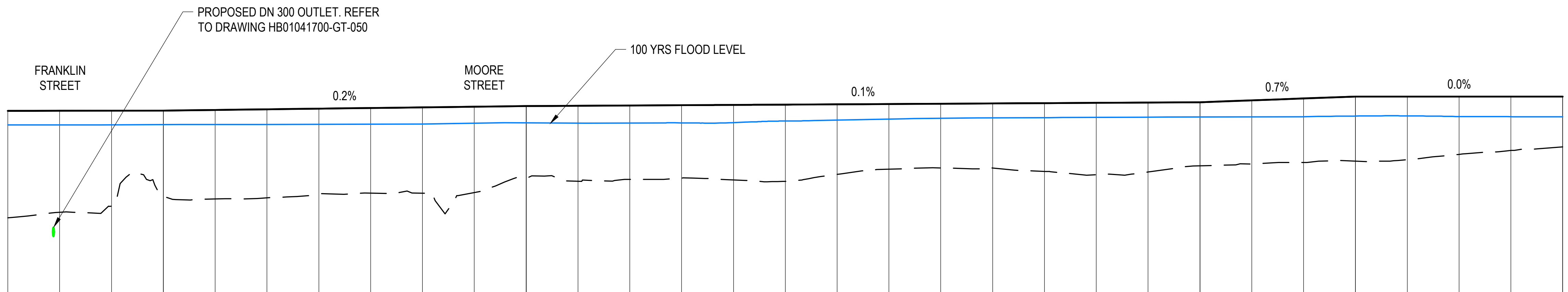
7. LONGSECTION VERTICAL SCALE IS EXAGGERATED.



CHAINAGE (m)	900.00	910.00	920.00	930.00	940.00	950.00	960.00	970.00	980.00	990.00	1000.00	1010.00	1020.00	1030.00	1040.00	1050.00
PROPOSED DESIGN LEVELS (m RL)	9.99	9.99	10.00	10.00	10.02	10.05	10.07	10.10	10.12	10.15	10.17	10.18	10.19	10.20	10.22	10.23
EXISTING GROUND LEVEL (m RL)	5.87	6.08	6.32	6.70	6.60	6.64	6.78	6.82	6.81	6.84	7.42	7.27	7.35	7.40	7.33	7.27
LEVEL DIFFERENCE (m)	4.12	3.92	3.67	3.30	3.43	3.41	3.30	3.28	3.31	3.30	2.75	2.91	2.85	2.81	2.89	2.96

CHAINAGE (m)	1060.00	1070.00	1080.00	1090.00	1100.00	1110.00	1120.00	1130.00	1140.00	1150.00	1160.00	1170.00	1180.00	1190.00	1200.00
PROPOSED DESIGN LEVELS (m RL)	10.24	10.25	10.26	10.27	10.29	10.30	10.31	10.32	10.39	10.47	10.54	10.54	10.54	10.54	10.54
EXISTING GROUND LEVEL (m RL)	7.54	7.74	7.79	7.78	7.66	7.53	7.63	7.87	7.94	8.00	8.05	8.10	8.31	8.46	8.60
LEVEL DIFFERENCE (m)	2.70	2.51	2.48	2.49	2.63	2.77	2.67	2.45	2.45	2.46	2.49	2.44	2.23	2.08	1.94

STOPBANK SECTION C LONG SECTION

HORIZONTAL SCALE 1:1000
VERTICAL SCALE 1:200

0 10 20 30 40 50m
SCALE 1:1,000 (A3)

FOR TENDER

ORIGINAL DRAWING IN COLOUR

NO.	REVISION	DATE	APP.
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HAWKES BAY REGIONAL COUNCIL
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PATTLE DELAMORE PARTNERS

ACE MEMBER

CLIENT: HAWKE'S BAY REGIONAL COUNCIL

PROJECT: PŌRANGAHAU STOPBANKS

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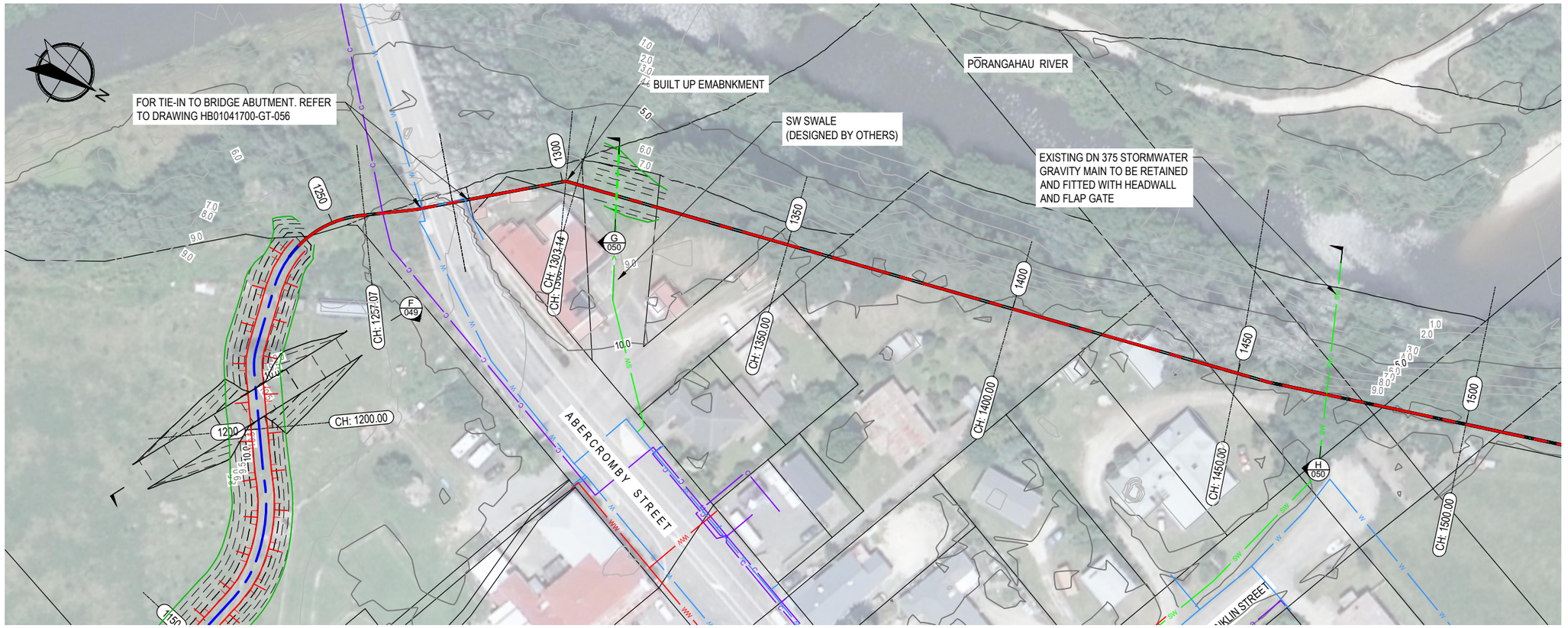
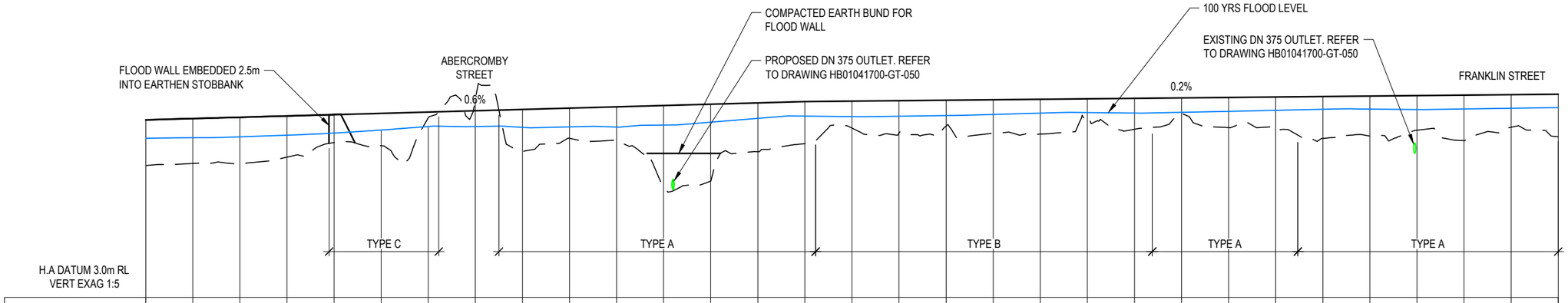
SHK		JUL 24	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED	

PORANGAHAU STOPBANKS PLAN & LONGSECTION SHEET 4

SCALE : AS SHOWN (A3)
DRAWING NO. : HB01041700-GT-014
REV : 0





H.A DATUM 3.0m RL
VERT EXAG 1:5

CHAINAGE (m)	1200.00	1210.00	1220.00	1230.00	1240.00	1250.00	1260.00	1270.00	1280.00	1290.00	1300.00	1310.00	1320.00	1330.00	1340.00	1350.00	1360.00	1370.00	1380.00	1390.00	1400.00	1410.00	1420.00	1430.00	1440.00	1450.00	1460.00	1470.00	1480.00	1490.00	1500.00
PROPOSED DESIGN LEVELS (m RL)	10.54	10.60	10.65	10.71	10.76	10.82	10.87	10.93	10.99	11.04	11.10	11.15	11.21	11.26	11.32	11.34	11.36	11.38	11.40	11.42	11.44	11.46	11.47	11.49	11.51	11.53	11.55	11.57	11.59	11.61	11.63
EXISTING GROUND LEVEL (m RL)	8.60	8.69	8.68	8.96	9.58	9.44	10.63	11.40	9.20	9.76	9.67	7.70	7.94	9.18	9.53	10.19	9.99	10.28	9.97	9.94	10.59	10.14	10.82	10.22	10.10	9.75	9.85	10.10	9.66	10.23	9.82
LEVEL DIFFERENCE (m)	1.94	1.91	1.97	1.75	1.19	1.38	0.25	-0.47	1.78	1.28	1.43	3.45	3.27	2.08	1.79	1.15	1.37	1.10	1.43	1.48	0.84	1.32	0.66	1.28	1.41	1.79	1.70	1.47	1.93	1.38	1.81

STOPBANK SECTIONS A, B & C LONG SECTION CH1200 TO CH1500

HORIZONTAL SCALE 1:1000
VERTICAL SCALE 1:200

KEY:

EXISTING
- PARCEL BOUNDARY
- STORMWATER
- STORMWATER CHANNEL
- WASTEWATER
- WATER PIPE
- CHORUS CABLE
- VALVE, HYDRANT, METER

PROPOSED
- TOP OF BANK
- STORMWATER DRAIN
- BOTTOM OF BANK
- TOP OF STOP BANK CENTERLINE
- TOP OF SHEETPILE WALL CENTERLINE
- STORMWATER CULVERT

NOTES

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8. FLOOD WALL TO BE SHEET PILLED WALL. REFER TO DRAWING HB01041700-GT-056 FOR DETAILS.
9. LEVELS FOR FLOOD WALLS ARE MINIMUM LEVELS RL.
10. FOR SHEET PILE TYPES, REFER TO DRAWING HB04041700-GT-059.

0 10 20 30 40 50m

SCALE 1:1,000 (A3)

FOR TENDER

ORIGINAL DRAWING IN COLOUR

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0	FOR TENDER	OCT 25	GS
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TE KAUNIHERA Ā-ROHE O TE MATAU-A-MĀUI

PATTLE DELAMORE PARTNERS

CLIENT: HAWKE'S BAY REGIONAL COUNCIL

PROJECT: PŌRANGAHAU STOPBANKS

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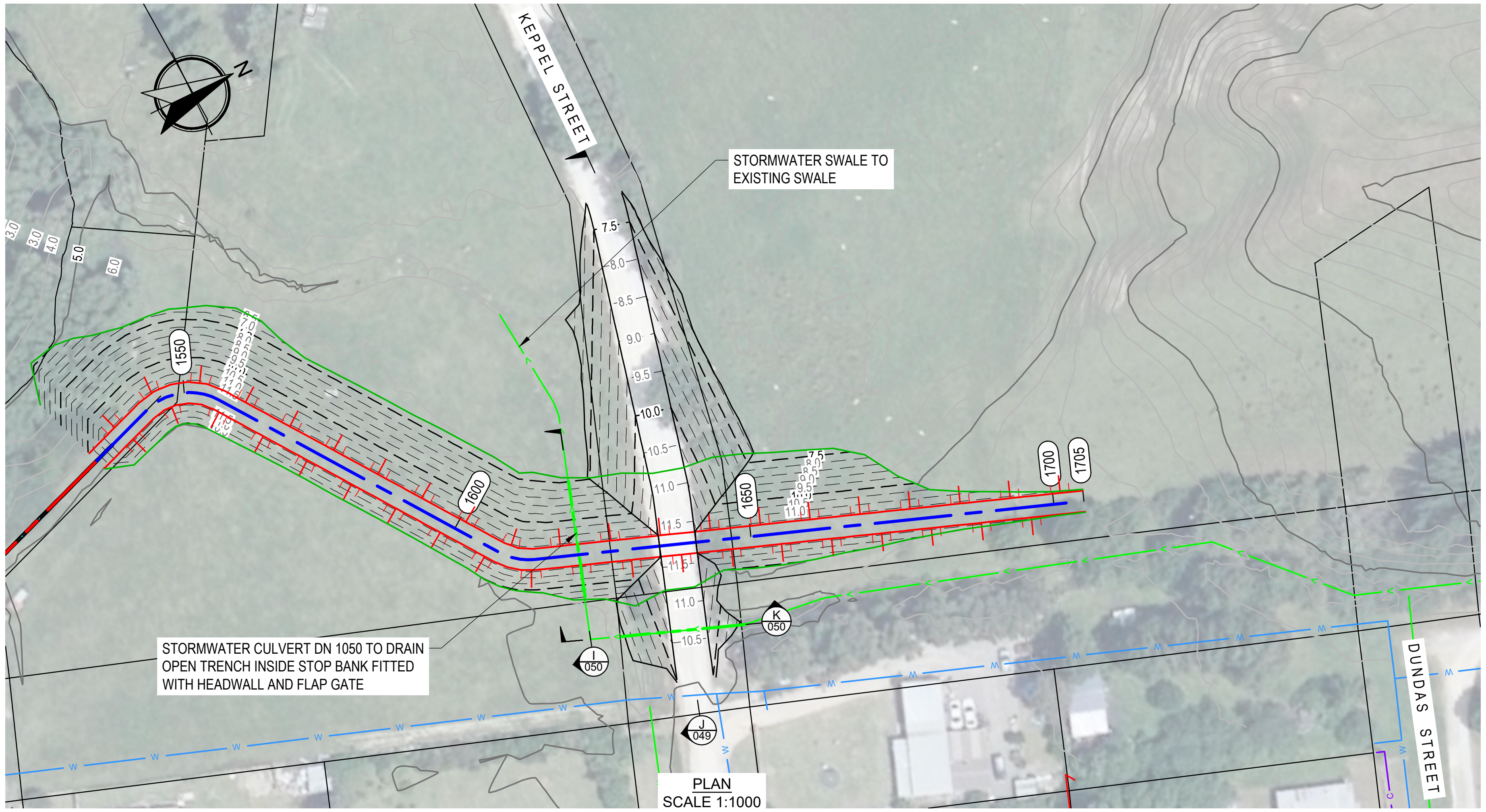
DRAWN	DRAWING CHECK	DATE	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED	
SHK		JUL 24		

PORANGAHAU STOPBANKS PLAN & LONGSECTION SHEET 5

SCALE :	DRAWING NO. :	REV :
AS SHOWN (A3)	HB01041700-GT-015	0



PLAN
SCALE 1:1000

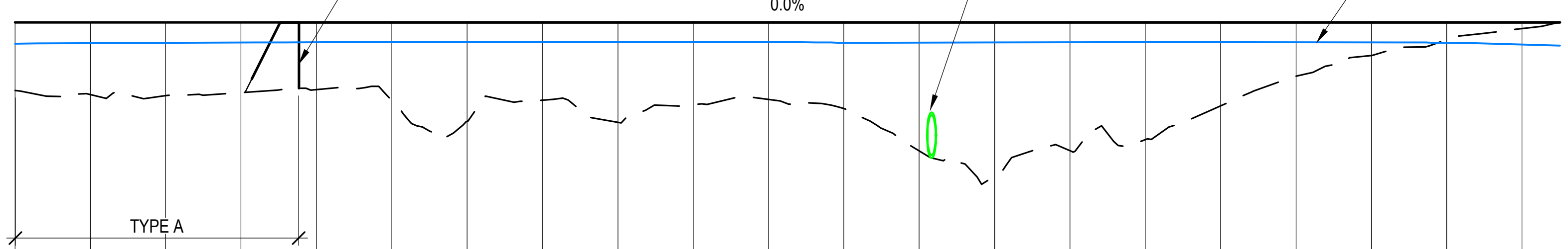
KEY:

EXISTING
- PARCEL BOUNDARY
- STORMWATER
- STORMWATER CHANNEL
- WASTEWATER
- WATER PIPE
- CHORUS CABLE
- VALVE, HYDRANT, METER

PROPOSED
- TOP OF BANK
- STORMWATER DRAIN
- BOTTOM OF BANK
- TOP OF STOP BANK CENTERLINE
- TOP OF SHEETPILE WALL CENTERLINE
- STORMWATER CULVERT

NOTES

1. REFER DRAWING HB01041700-GT-002 FOR GENERAL NOTES.
2. DIMENSIONS IN METRES UNLESS OTHERWISE NOTED.
3. COORDINATES IN TERMS OF NEW ZEALAND TRANSVERSE MERCATOR PROJECTION 2000 (NZTM, EPSG:2193)
4. LEVELS IN TERMS OF NEW ZEALAND VERTICAL DATUM 2016 (NZVD2016).
5. GROUND PROFILE EXTRACTED FROM WSP LIDAR FLOWN JUNE 2024 & LINZ DATA CENTRE HAWKES-BAY LIDAR 1m DEM 2020-2021.
6. ORIGIN OF LEVELS: MARK PIN 1 SO 578686 (F6WK) 5532456.7mE, 1907341.223mN, 7.852mRL.
7. LONGSECTION VERTICAL SCALE IS EXAGGERATED.
8. FLOOD WALL TO BE SHEET PILLED WALL. REFER TO DRAWING HB01041700-GT-056 FOR DETAILS.
9. LEVELS FOR FLOOD WALLS ARE MINIMUM LEVELS RL.
10. FOR SHEET PILE TYPES, REFER TO DRAWING HB04041700-GT-059.



H.A DATUM 3.0m RL
VERT EXAG 1:5

CHAINAGE (m)	PROPOSED DESIGN LEVELS (m RL)	EXISTING GROUND LEVEL (m RL)	LEVEL DIFFERENCE (m)
1500.00	11.63	9.82	1.81
1510.00	11.63	9.71	1.92
1520.00	11.63	9.69	1.94
1530.00	11.63	9.76	1.87
1535.87	11.63	9.86	1.77
1540.00	11.63	9.84	1.79
1550.00	11.63	9.55	2.08
1560.00	11.63	9.00	2.63
1570.00	11.63	9.57	2.06
1580.00	11.63	8.97	2.66
1590.00	11.63	9.44	2.19
1600.00	11.63	9.59	2.04
1610.00	11.63	9.34	2.29
1620.00	11.63	8.21	3.42
1630.00	11.63	7.54	4.09
1640.00	11.63	8.22	3.41
1650.00	11.63	8.51	3.12
1660.00	11.63	9.41	2.22
1670.00	11.63	10.20	1.43
1680.00	11.63	10.75	0.88
1690.00	11.63	11.17	0.46
1700.00	11.63	11.47	0.16
	11.63		
1710.00			
1720.00			
1726.00			

STOPBANK SECTIONS A LONG SECTION CH1500 TO CH1640
HORIZONTAL SCALE 1:1000
VERTICAL SCALE 1:200

0 10 20 30 40 50m
SCALE 1:1,000 (A3)

FOR TENDER

ORIGINAL DRAWING IN COLOUR

NO.	REVISION	DATE	APP.
0	FOR TENDER	OCT 25	GS
B	FOR CONSENT	APR 25	
A	FOR INFORMATION	JUL 24	GS

HAWKES BAY REGIONAL COUNCIL
TE KAUNIHERA Ā-ROHE O TE MATAU-A-MĀUI

PATTLE DELAMORE PARTNERS

ACE MEMBER

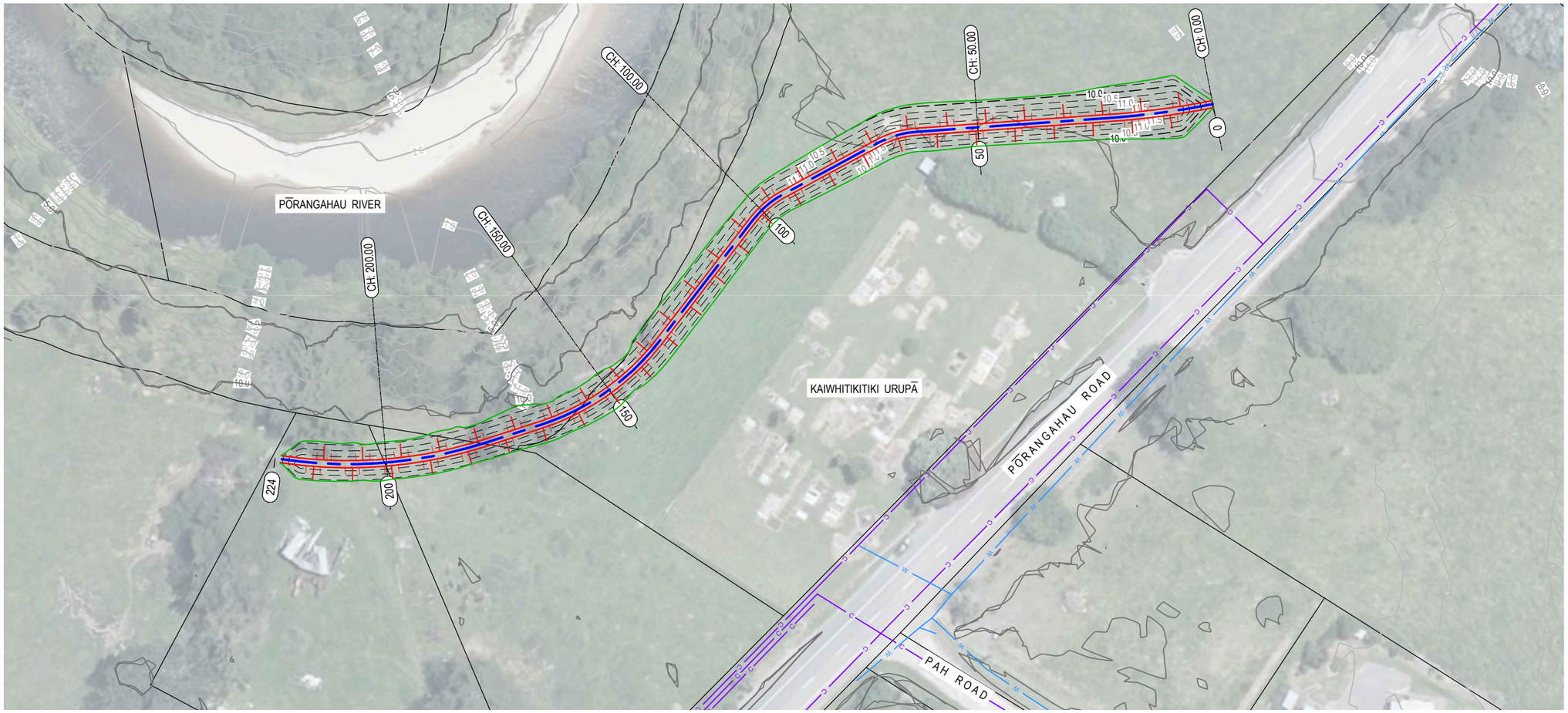
CLIENT: HAWKE'S BAY REGIONAL COUNCIL
PROJECT: PŌRANGAHAU STOPBANKS

DESIGNED	DESIGN REVIEW	DATE	APPROVED	DATE
OH	GS	JUL 24		
DRAWN	DRAWING CHECK	DATE	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED	
SHK		JUL 24		

PORANGAHAU STOPBANKS PLAN & LONGSECTION SHEET 6

SCALE : AS SHOWN (A3)
DRAWING NO. : HB01041700-GT-016
REV : 0

www.pdp.co.nz
DO NOT SCALE DRAWING
Plot: 14/10/2025 9:07:57 am
FILED: HB01041700-GT-016.dwg



PLAN
SCALE 1:1000

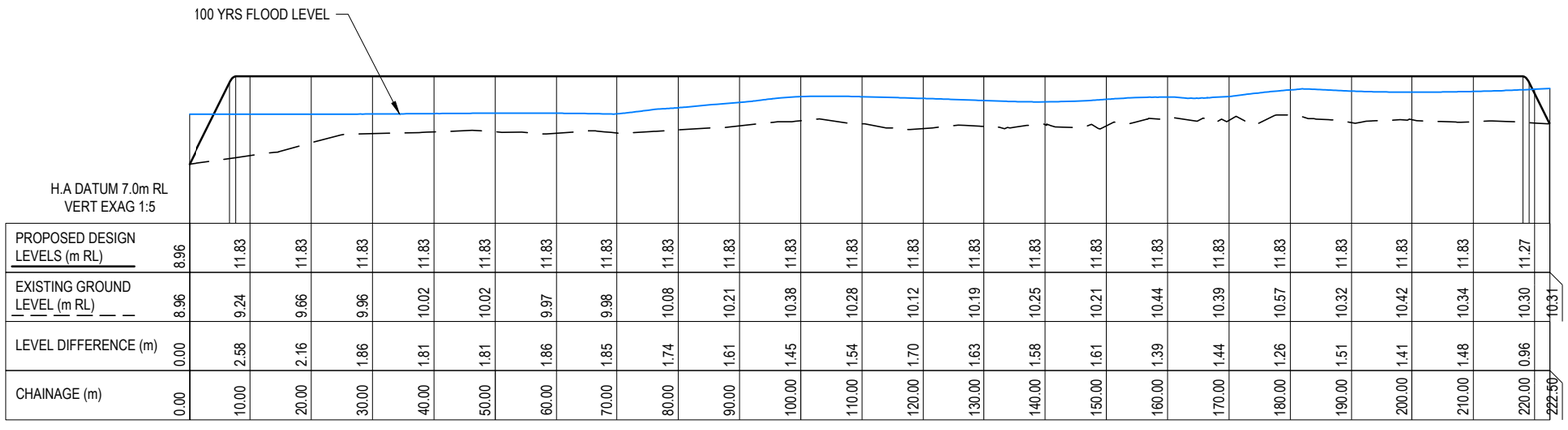
KEY:

EXISTING
- PARCEL BOUNDARY
- STORMWATER
- STORMWATER CHANNEL
- WASTEWATER
- WATER PIPE
- CHORUS CABLE
- VALVE, HYDRANT, METER

PROPOSED
- TOP OF BANK
- STORMWATER DRAIN
- BOTTOM OF BANK
- TOP OF STOP BANK CENTERLINE
- TOP OF SHEETPILE WALL CENTERLINE
- STORMWATER CULVERT

NOTES

1. REFER DRAWING HB01041700-GT-002 FOR GENERAL NOTES.
2. DIMENSIONS IN METRES UNLESS OTHERWISE NOTED.
3. COORDINATES IN TERMS OF NEW ZEALAND TRANSVERSE MERCATOR PROJECTION 2000 (NZTM, EPSG:2193)
4. LEVELS IN TERMS OF NEW ZEALAND VERTICAL DATUM 2016 (NZVD2016).
5. GROUND PROFILE EXTRACTED FROM WSP LIDAR FLOWN JUNE 2024 & LINZ DATA CENTRE HAWKES-BAY LIDAR 1m DEM 2020-2021.
6. ORIGIN OF LEVELS: MARK PIN 1 SO 578686 (F6WK) 5532456.7mE, 1907341.223mN, 7.852mRL.
7. LONGSECTION VERTICAL SCALE IS EXAGGERATED.



PROPOSED DESIGN LEVELS (m RL)	8.96	11.83	11.83	11.83	11.83	11.83	11.83	11.83	11.83	11.83	11.83	11.83	11.83	11.83	11.83	11.83	11.83	11.83	11.83	11.83	11.83	11.83	11.83	11.83	11.83	11.83	11.27
EXISTING GROUND LEVEL (m RL)	8.96	9.24	9.66	9.96	10.02	10.02	9.97	9.98	10.08	10.21	10.38	10.28	10.12	10.19	10.25	10.21	10.44	10.39	10.57	10.32	10.42	10.34	10.30	10.31			
LEVEL DIFFERENCE (m)	0.00	2.58	2.16	1.86	1.81	1.81	1.86	1.85	1.74	1.61	1.45	1.54	1.70	1.63	1.58	1.61	1.39	1.44	1.26	1.51	1.41	1.48	0.96				
CHAINAGE (m)	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.00	150.00	160.00	170.00	180.00	190.00	200.00	210.00	220.00	222.50			

NOTES

1. REFER DRAWING HB01041700-GT-002

0 10 20 30 40 50m
SCALE 1:1,000 (A3)

FOR TENDER

KAIWHITIKITIKI URUPĀ STOPBANK LONG SECTION CH0 TO CH305
HORIZONTAL SCALE 1:1000
VERTICAL SCALE 1:200

ORIGINAL DRAWING IN COLOUR

NO.	REVISION	DATE	APP.
0	FOR TENDER	OCT 25	GS
B	FOR CONSENT	APR 25	
A	FOR INFORMATION	JUL 24	GS

HAWKES BAY REGIONAL COUNCIL
TE KAUNIHERA Ā-ROHE O TE MATAU-A-MĀUI

PATTLE DELAMORE PARTNERS

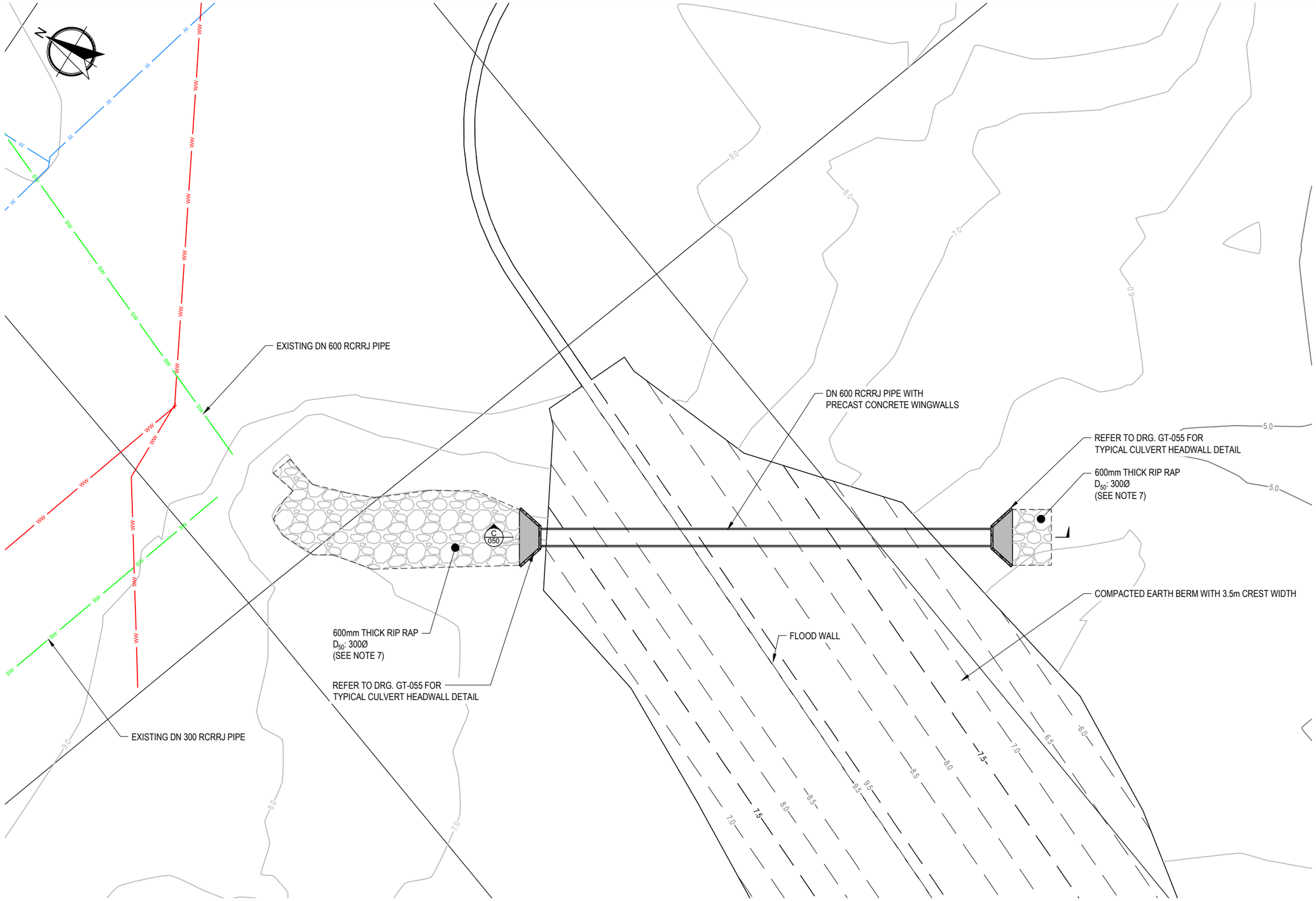
CLIENT: HAWKE'S BAY REGIONAL COUNCIL

PROJECT: PŌRANGAHAU STOPBANKS

DESIGNED	DESIGN REVIEW	DATE	APPROVED	DATE
OH	GS	JUL 24		
DRAWN	DRAWING CHECK	DATE	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED	
SHK		JUL 24		

KAIWHITIKITIKI URUPA STOPBANK PLAN & LONGSECTION

SCALE :	DRAWING NO. :	REV :
AS SHOWN (A3)	HB01041700-GT-017	0



KEY:

EXISTING
- PARCEL BOUNDARY
- STORMWATER (SW)
- STORMWATER CHANNEL
- WASTEWATER (WW)
- WATER PIPE (W)
- CHORUS CABLE (C)
- VALVE (SV), HYDRANT (FH), METER (WM)

PROPOSED
- TOP OF BANK
- STORMWATER DRAIN (>>)
- BOTTOM OF BANK
- TOP OF STOP BANK CENTERLINE
- TOP OF SHEETPILE WALL CENTERLINE
- STORMWATER CULVERT

NOTES

1. REFER DRAWING HB01041700-GT-002 FOR GENERAL NOTES.
2. DIMENSIONS IN METRES UNLESS OTHERWISE NOTED.
3. COORDINATES IN TERMS OF NEW ZEALAND TRANSVERSE MERCATOR PROJECTION 2000 (NZTM, EPSG:2193)
4. LEVELS IN TERMS OF NEW ZEALAND VERTICAL DATUM 2016 (NZVD2016).
5. GROUND PROFILE EXTRACTED FROM WSP LIDAR FLOWN JUNE 2024 & LINZ DATA CENTRE HAWKES-BAY LIDAR 1m DEM 2020-2021.
6. ORIGIN OF LEVELS: MARK PIN 1 SO 578686 (F6WK) 5532456.7mE, 1907341.223mN, 7.852mRL.
7. EXTENT OF RIPRAP AT EXISTING OUTLETS TO SUIT ON-SITE CONDITIONS.

0 2 4 6m

SCALE 1:150 (A3)

WORKING PLOT

ORIGINAL DRAWING IN COLOUR

NO.	REVISION	DATE	APP.
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HAWKE'S BAY REGIONAL COUNCIL
TE KAUNIHERA Ā-ROHE O TE MATAU-A-MĀUI

PATTLE DELAMORE PARTNERS

CLIENT: HAWKE'S BAY REGIONAL COUNCIL

PROJECT: PŌRANGAHAU STOPBANKS

DESIGNED	DESIGN REVIEW	DATE	APPROVED	DATE
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DRAWN	DRAWING CHECK	DATE	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED	
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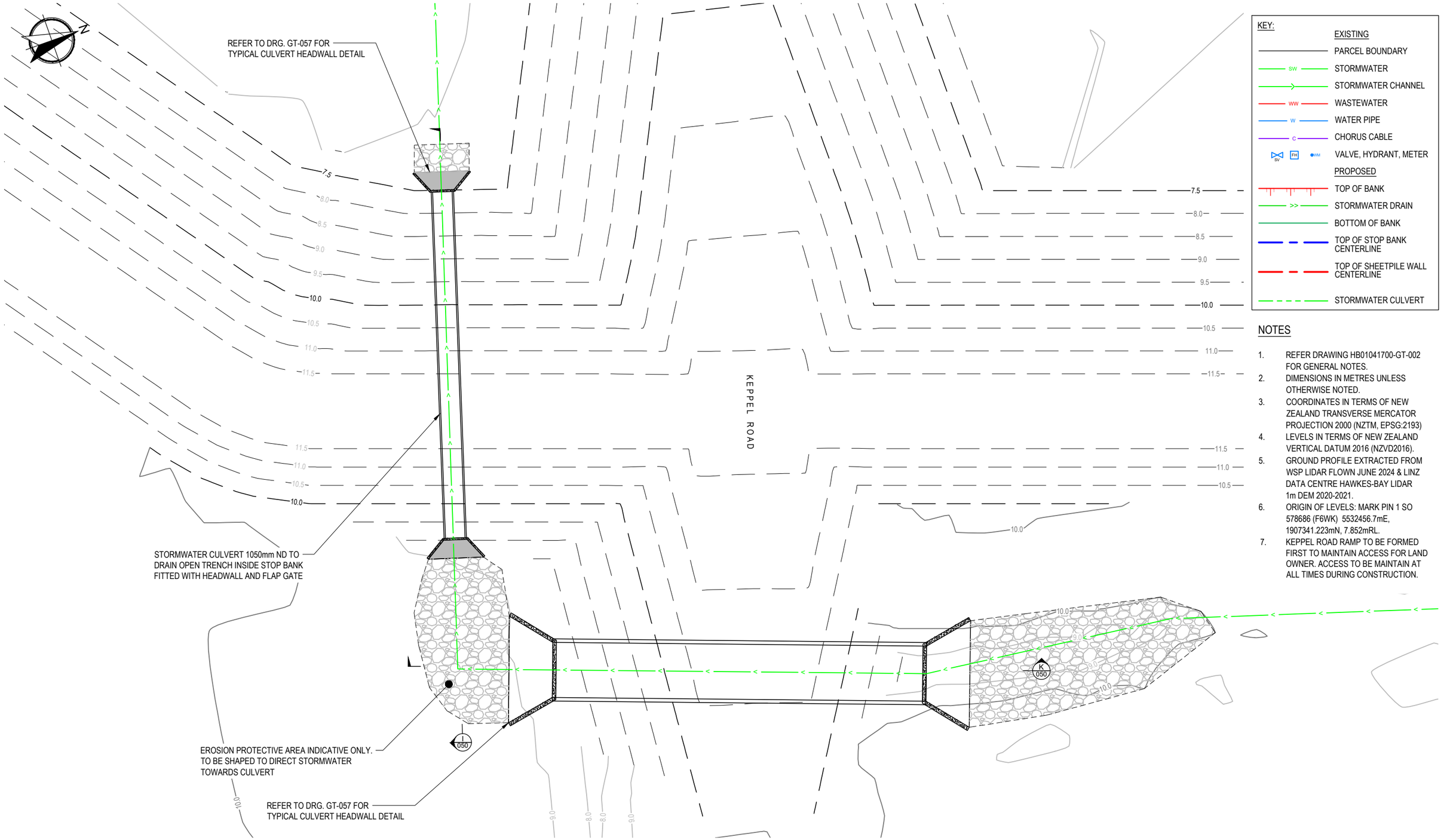
DETAILED PLAN VIEW OF KEPPEL STREET OUTLET

SCALE :	DRAWING NO. :	REV :
AS SHOWN (A3)	HB01041700-GT-020	A



KEY:

EXISTING
- PARCEL BOUNDARY
- SW — STORMWATER
- STORMWATER CHANNEL
- WW — WASTEWATER
- W — WATER PIPE
- C — CHORUS CABLE
- SV FH WM — VALVE, HYDRANT, METER

PROPOSED
- TOP OF BANK
- >> — STORMWATER DRAIN
- BOTTOM OF BANK
- TOP OF STOP BANK CENTERLINE
- TOP OF SHEETPILE WALL CENTERLINE
- STORMWATER CULVERT

NOTES

1. REFER DRAWING HB01041700-GT-002 FOR GENERAL NOTES.
2. DIMENSIONS IN METRES UNLESS OTHERWISE NOTED.
3. COORDINATES IN TERMS OF NEW ZEALAND TRANSVERSE MERCATOR PROJECTION 2000 (NZTM, EPSG:2193)
4. LEVELS IN TERMS OF NEW ZEALAND VERTICAL DATUM 2016 (NZVD2016).
5. GROUND PROFILE EXTRACTED FROM WSP LIDAR FLOWN JUNE 2024 & LINZ DATA CENTRE HAWKES-BAY LIDAR 1m DEM 2020-2021.
6. ORIGIN OF LEVELS: MARK PIN 1 SO 578686 (F6WK) 5532456.7mE, 1907341.223mN, 7.852mRL.
7. KEPPEL ROAD RAMP TO BE FORMED FIRST TO MAINTAIN ACCESS FOR LAND OWNER. ACCESS TO BE MAINTAIN AT ALL TIMES DURING CONSTRUCTION.

0 2 4 6 8 10m

SCALE 1:200 (A3)

ORIGINAL DRAWING IN COLOUR

NO.	REVISION	DATE	APP.
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HAWKES BAY REGIONAL COUNCIL
TE KAUNIHERA Ā-ROHE O TE MATAU-A-MĀUI

PATTLE DELAMORE PARTNERS

CLIENT: HAWKE'S BAY REGIONAL COUNCIL

PROJECT: PŌRANGAHAU STOPBANKS

DESIGNED	DESIGN REVIEW	DATE	APPROVED	DATE
----		----		----
DRAWN	DRAWING CHECK	DATE	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED	
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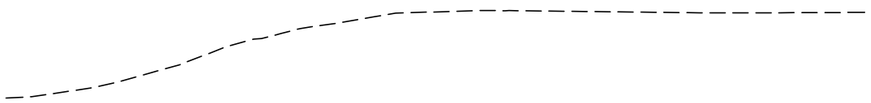
DETAILED PLAN OF KEPPEL ROAD CULVERTS

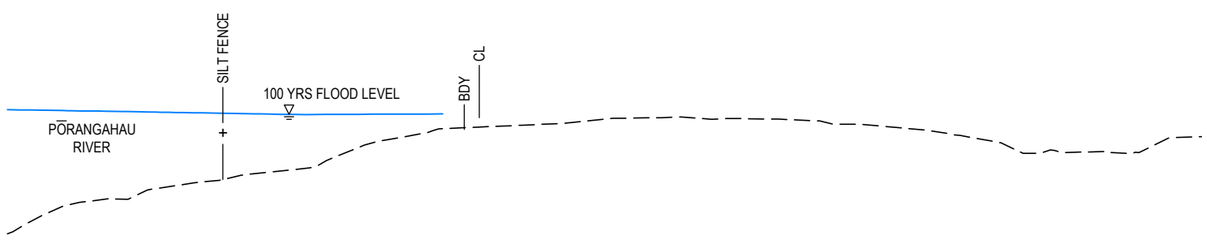
SCALE :	DRAWING NO. :	REV :
AS SHOWN (A3)	HB01041700-GT-021	A



H.A.DATUM: 0m RL

PROPOSED DESIGN LEVELS (m RL)	
EXISTING LEVELS (m RL)	
LEVEL DIFFERENCE (m)	
OFFSETS (m)	

XSEC CL-STOPBANK-COMBINED-SLG_61 (CH:00)
SCALE 1:250



H.A.DATUM: 0m RL

PROPOSED DESIGN LEVELS (m RL)	
EXISTING LEVELS (m RL)	
LEVEL DIFFERENCE (m)	
OFFSETS (m)	

XSEC CL-STOPBANK-COMBINED-SLG_62 (CH:50)
SCALE 1:250

0 5 10m
SCALE 1:250 (A3)

FOR TENDER

ORIGINAL DRAWING IN COLOUR

NO.	REVISION	DATE	APP.
0	FOR TENDER	OCT 25	GS
B	FOR CONSENT	APR 25	
A	FOR INFORMATION	JUL 24	GS

HAWKE'S BAY REGIONAL COUNCIL
TE KAUNIHERA Ā-ROHE O TE MATAU-A-MĀUI

PATTLE DELAMORE PARTNERS

ACE MEMBER

CLIENT: HAWKE'S BAY REGIONAL COUNCIL

PROJECT: PŌRANGAHAU STOPBANKS

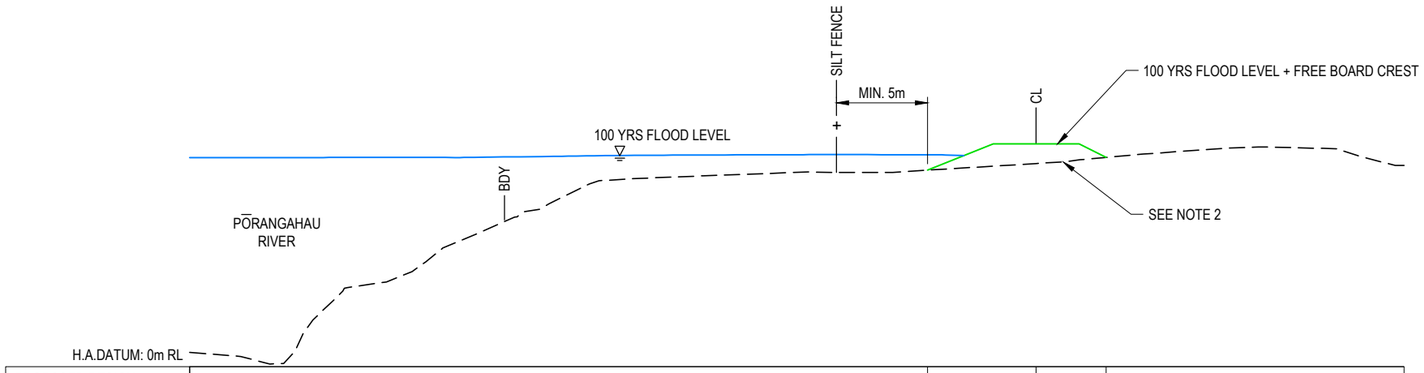
DESIGNED	DESIGN REVIEW	DATE	APPROVED	DATE
OH	GS	JUL 24		
DRAWN	DRAWING CHECK	DATE	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED	
SHK		JUL 24		

PORANGAHAU STOPBANKS CROSS SECTIONS SHEET 1

SCALE :	DRAWING NO. :	REV :
AS SHOWN (A3)	HB01041700-GT-030	0

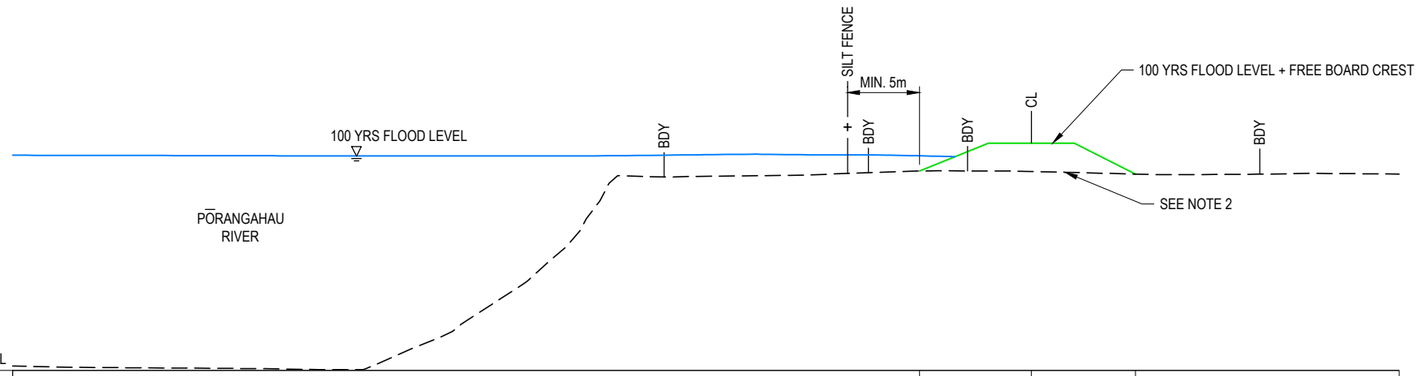
NOTES:

1. FOR GENERAL NOTES REFER HB01041700-GT-002.
2. STOPBANK FOOTPRINT TO BE CLEARED OF ALL VEGETATION AND TOPSOIL REMOVED TO STOCK PILE AREA.
3. FOOTPRINT TO BE COMPACTED IN-SITU.
4. ALL EARTHWORKS VOLUMES TO BE MEASURED TO THE DIMENSIONS ON THE DRAWINGS.
5. ALL EARTHWORKS TO BE COMPACTED TO 95% STANDARD NZ COMPACTION (HEAVY).
6. ALL EARTHWORKS TO BE OVERFILLED AND TRIMMED BACK TO THE DIMENSIONS ON THE DRAWINGS.
7. REFER TO DRAWING HB01041700-GT-055 FOR TYPICAL STOPBANK DETAIL.



PROPOSED DESIGN LEVELS (m RL)	8.002	9.074	8.523		
EXISTING LEVELS (m RL)	8.00	8.27	8.52		
LEVEL DIFFERENCE (m)	0.00	0.80	0.00		
OFFSETS (m)	-4.43	0.00	2.85		

XSEC CL-STOPBANK-COMBINED-SLG_63 (CH:100)
SCALE 1:250



PROPOSED DESIGN LEVELS (m RL)	8.121	9.245	7.994		
EXISTING LEVELS (m RL)	8.12	8.10	7.99		
LEVEL DIFFERENCE (m)	0.00	1.15	0.00		
OFFSETS (m)	-4.56	0.00	4.25		

XSEC CL-STOPBANK-COMBINED-SLG_64 (CH:150)
SCALE 1:250

0 5 10m
SCALE 1:250 (A3)

FOR TENDER

ORIGINAL DRAWING IN COLOUR

NO.	REVISION	DATE	APP.
0	FOR TENDER	OCT 25	GS
B	FOR CONSENT	APR 25	
A	FOR INFORMATION	JUL 24	GS

HAWKES BAY REGIONAL COUNCIL
TE KAUNIHERA Ā-ROHE O TE MATAU-A-MĀUI

PATTLE DELAMORE PARTNERS

ACE MEMBER

CLIENT: HAWKE'S BAY REGIONAL COUNCIL

PROJECT: PŌRANGAHAU STOPBANKS

DESIGNED	DESIGN REVIEW	DATE	APPROVED	DATE
OH	GS	JUL 24		
DRAWN	DRAWING CHECK	DATE		
SHK		JUL 24		

THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED

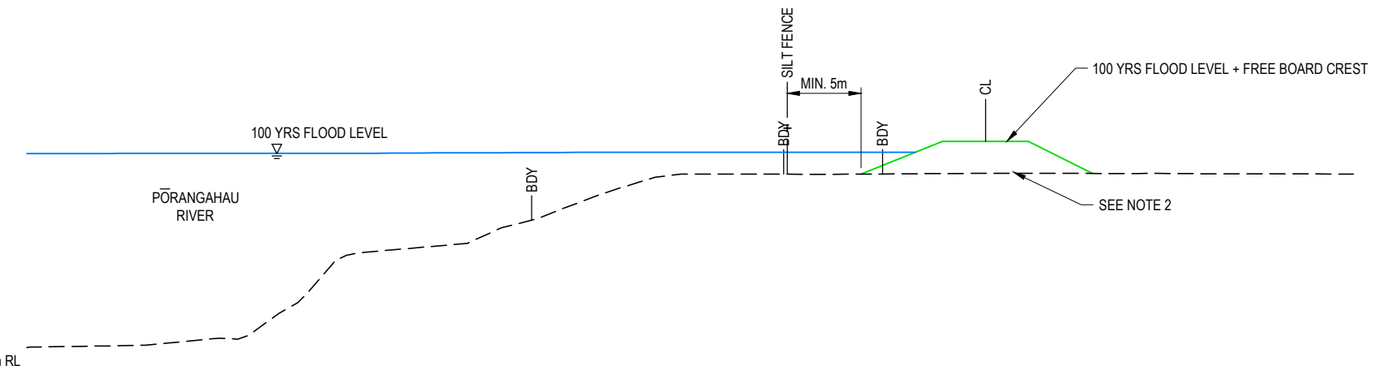
PORANGAHAU STOPBANKS CROSS SECTIONS SHEET 2

SCALE :	DRAWING NO. :	REV :
AS SHOWN (A3)	HB01041700-GT-031	0

Plot: 14/10/2025 9:13:48 am
FILED: HB01041700-GT-031.dwg

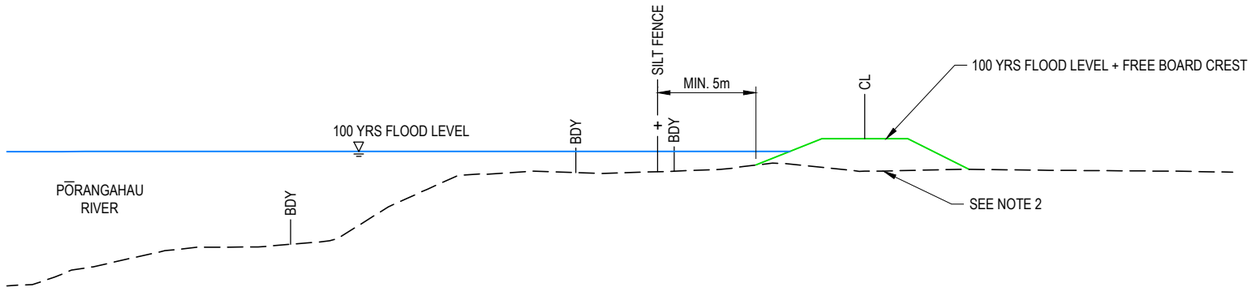
NOTES:

1. FOR GENERAL NOTES REFER HB01041700-GT-002.
2. STOPBANK FOOTPRINT TO BE CLEARED OF ALL VEGETATION AND TOPSOIL REMOVED TO STOCK PILE AREA.
3. FOOTPRINT TO BE COMPACTED IN-SITU.
4. ALL EARTHWORKS VOLUMES TO BE MEASURED TO THE DIMENSIONS ON THE DRAWINGS.
5. ALL EARTHWORKS TO BE COMPACTED TO 95% STANDARD NZ COMPACTION (HEAVY).
6. ALL EARTHWORKS TO BE OVERFILLED AND TRIMMED BACK TO THE DIMENSIONS ON THE DRAWINGS.



PROPOSED DESIGN LEVELS (m RL)		8.087	9.416	8.113	
EXISTING LEVELS (m RL)		8.09	8.12	8.11	
LEVEL DIFFERENCE (m)		0.00	1.30	0.00	
OFFSETS (m)		-5.07	0.00	4.36	

XSEC CL-STOPBANK-COMBINED-SLG_65 (CH:200)
SCALE 1:250



H.A.DATUM: 0m RL

PROPOSED DESIGN LEVELS (m RL)		8.408	9.485	8.233	
EXISTING LEVELS (m RL)		8.41	8.16	8.23	
LEVEL DIFFERENCE (m)		0.00	1.33	0.00	
OFFSETS (m)		-4.44	0.00	4.25	

XSEC CL-STOPBANK-COMBINED-SLG_66 (CH:250)
SCALE 1:250

0 5 10m
SCALE 1:250 (A3)

FOR TENDER

ORIGINAL DRAWING IN COLOUR

NO.	REVISION	DATE	APP.
0	FOR TENDER	OCT 25	GS
B	FOR CONSENT	APR 25	
A	FOR INFORMATION	JUL 24	GS

HAWKE'S BAY REGIONAL COUNCIL
TE KAUNIHERA Ā-ROHE O TE MATAU-A-MĀUI

PATTLE DELAMORE PARTNERS

ACE MEMBER

CLIENT: HAWKE'S BAY REGIONAL COUNCIL

PROJECT: PŌRANGAHAU STOPBANKS

DESIGNED	DESIGN REVIEW	DATE	APPROVED	DATE
OH	GS	JUL 24		
DRAWN	DRAWING CHECK	DATE		
SHK		JUL 24		

THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED

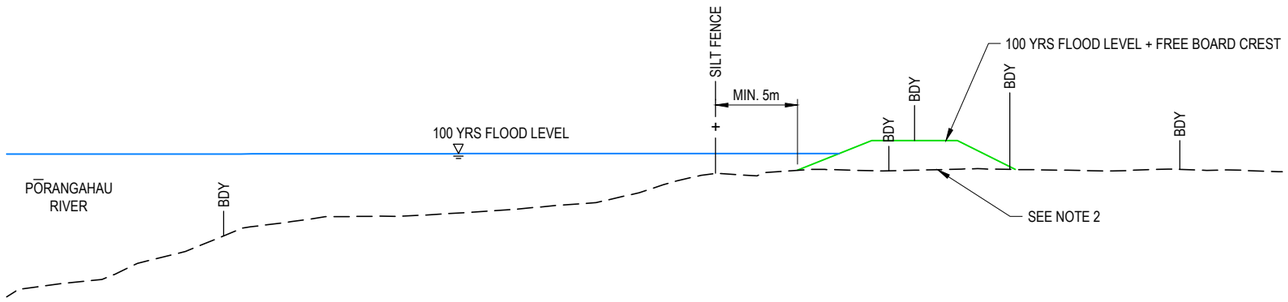
PORANGAHAU STOPBANKS CROSS SECTIONS SHEET 3

SCALE :	DRAWING NO. :	REV :
AS SHOWN (A3)	HB01041700-GT-032	0

Plot: 14/10/2025 9:15:03 am
FILED: HB01041700-GT-032.dwg

NOTES:

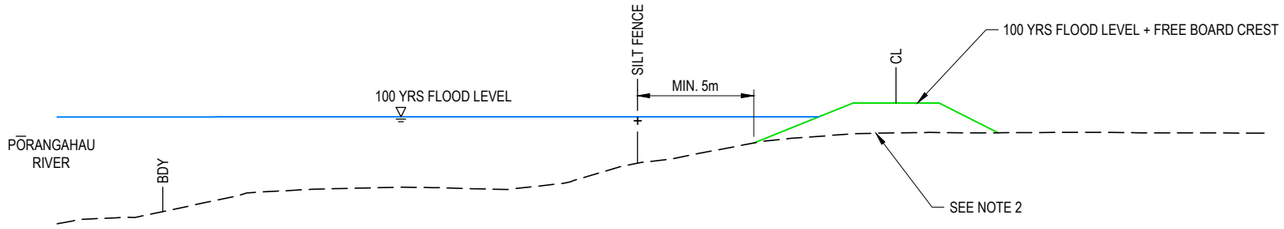
1. FOR GENERAL NOTES REFER HB01041700-GT-002.
2. STOPBANK FOOTPRINT TO BE CLEARED OF ALL VEGETATION AND TOPSOIL REMOVED TO STOCK PILE AREA.
3. FOOTPRINT TO BE COMPACTED IN-SITU.
4. ALL EARTHWORKS VOLUMES TO BE MEASURED TO THE DIMENSIONS ON THE DRAWINGS.
5. ALL EARTHWORKS TO BE COMPACTED TO 95% STANDARD NZ COMPACTION (HEAVY).
6. ALL EARTHWORKS TO BE OVERFILLED AND TRIMMED BACK TO THE DIMENSIONS ON THE DRAWINGS.



H.A.DATUM: 0m RL

PROPOSED DESIGN LEVELS (m RL)	8.318	9.528	8.349		
EXISTING LEVELS (m RL)	8.32	8.32	8.35		
LEVEL DIFFERENCE (m)	0.00	1.21	0.00		
OFFSETS (m)	-4.77	0.00	4.11		

XSEC CL-STOPBANK-COMBINED-SLG_67 (CH:300)
SCALE 1:250



H.A.DATUM: 0m RL

PROPOSED DESIGN LEVELS (m RL)	7.950	9.571	8.364		
EXISTING LEVELS (m RL)	7.95	8.36	8.36		
LEVEL DIFFERENCE (m)	0.00	1.22	0.00		
OFFSETS (m)	-5.80	0.00	4.16		

XSEC CL-STOPBANK-COMBINED-SLG_68 (CH:350)
SCALE 1:250

0 5 10m
SCALE 1:250 (A3)

FOR TENDER

ORIGINAL DRAWING IN COLOUR

NO.	REVISION	DATE	APP.
0	FOR TENDER	OCT 25	GS
B	FOR CONSENT	APR 25	
A	FOR INFORMATION	JUL 24	GS

HAWKE'S BAY REGIONAL COUNCIL
TE KAUNIHERA Ā-ROHE O TE MATAU-A-MĀUI

PATTLE DELAMORE PARTNERS

ACE MEMBER

CLIENT: HAWKE'S BAY REGIONAL COUNCIL

PROJECT: PŌRANGAHAU STOPBANKS

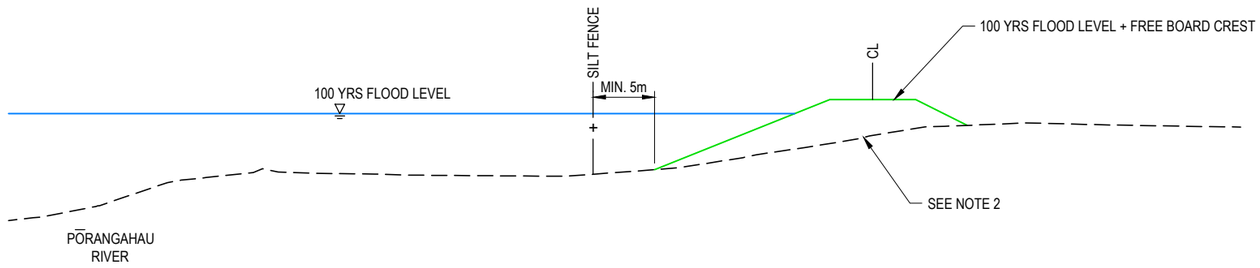
DESIGNED	DESIGN REVIEW	DATE	APPROVED	DATE
OH	GS	JUL 24		
DRAWN	DRAWING CHECK	DATE	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED	
SHK		JUL 24		

PORANGAHAU STOPBANKS CROSS SECTIONS SHEET 4

SCALE :	DRAWING NO. :	REV :
AS SHOWN (A3)	HB01041700-GT-033	0

NOTES:

1. FOR GENERAL NOTES REFER HB01041700-GT-002.
2. STOPBANK FOOTPRINT TO BE CLEARED OF ALL VEGETATION AND TOPSOIL REMOVED TO STOCK PILE AREA.
3. FOOTPRINT TO BE COMPACTED IN-SITU.
4. ALL EARTHWORKS VOLUMES TO BE MEASURED TO THE DIMENSIONS ON THE DRAWINGS.
5. ALL EARTHWORKS TO BE COMPACTED TO 95% STANDARD NZ COMPACTION (HEAVY).
6. ALL EARTHWORKS TO BE OVERFILLED AND TRIMMED BACK TO THE DIMENSIONS ON THE DRAWINGS.
7. REFER TO DRAWING HB01041700-GT-055 FOR TYPICAL STOPBANK DETAIL.



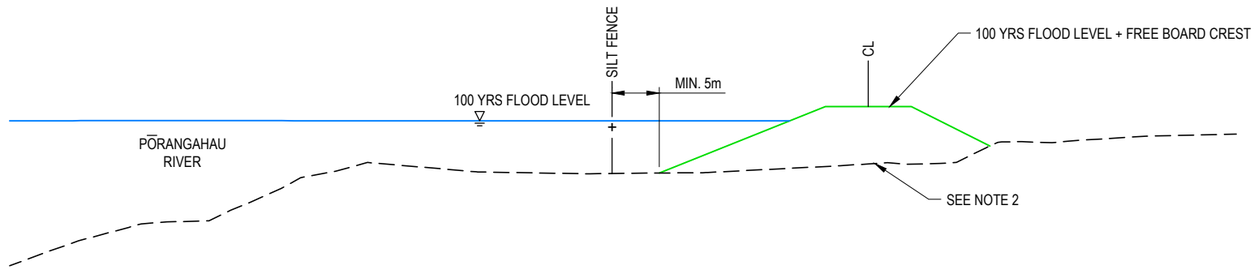
H.A.DATUM: 0m RL

PROPOSED DESIGN LEVELS (m RL)	6.732	9.591	8.539	
EXISTING LEVELS (m RL)	6.73	8.13	8.54	
LEVEL DIFFERENCE (m)	0.00	1.46	0.00	
OFFSETS (m)	-8.90	0.00	3.85	

XSEC CL-STOPBANK-COMBINED-SLG_69 (CH:400)
SCALE 1:250

ILT FENCE

ICE



H.A.DATUM: 0m RL

PROPOSED DESIGN LEVELS (m RL)	6.895	9.604	7.998	
EXISTING LEVELS (m RL)	6.90	7.27	8.00	
LEVEL DIFFERENCE (m)	0.00	2.34	0.00	
OFFSETS (m)	-8.52	0.00	4.96	

XSEC CL-STOPBANK-COMBINED-SLG_610 (CH:450)
SCALE 1:250

0 5 10m
SCALE 1:250 (A3)

FOR TENDER

ORIGINAL DRAWING IN COLOUR

NO.	REVISION	DATE	APP.
0	FOR TENDER	OCT 25	GS
B	FOR CONSENT	APR 25	
A	FOR INFORMATION	JUL 24	GS

HAWKE'S BAY REGIONAL COUNCIL
TE KAUNIHERA Ā-ROHE O TE MATAU-A-MĀUI

PATTLE DELAMORE PARTNERS

ACE MEMBER

CLIENT: HAWKE'S BAY REGIONAL COUNCIL

PROJECT: PŌRANGAHAU STOPBANKS

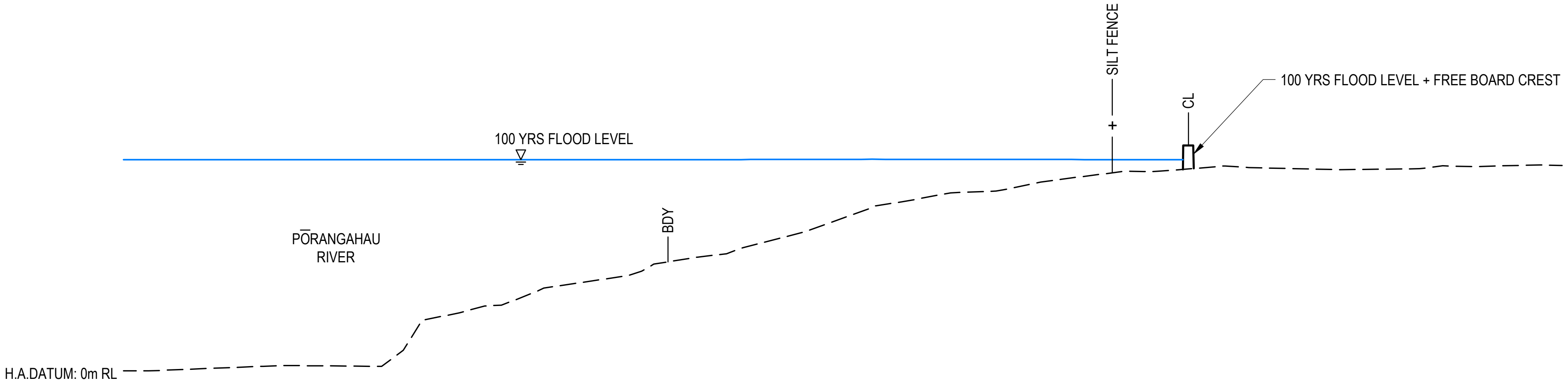
DESIGNED	DESIGN REVIEW	DATE	APPROVED	DATE
OH	GS	JUL 24		
DRAWN	DRAWING CHECK	DATE	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED	
SHK		JUL 24		

PORANGAHAU STOPBANKS CROSS SECTIONS SHEET 5

SCALE :	DRAWING NO. :	REV :
AS SHOWN (A3)	HB01041700-GT-034	0

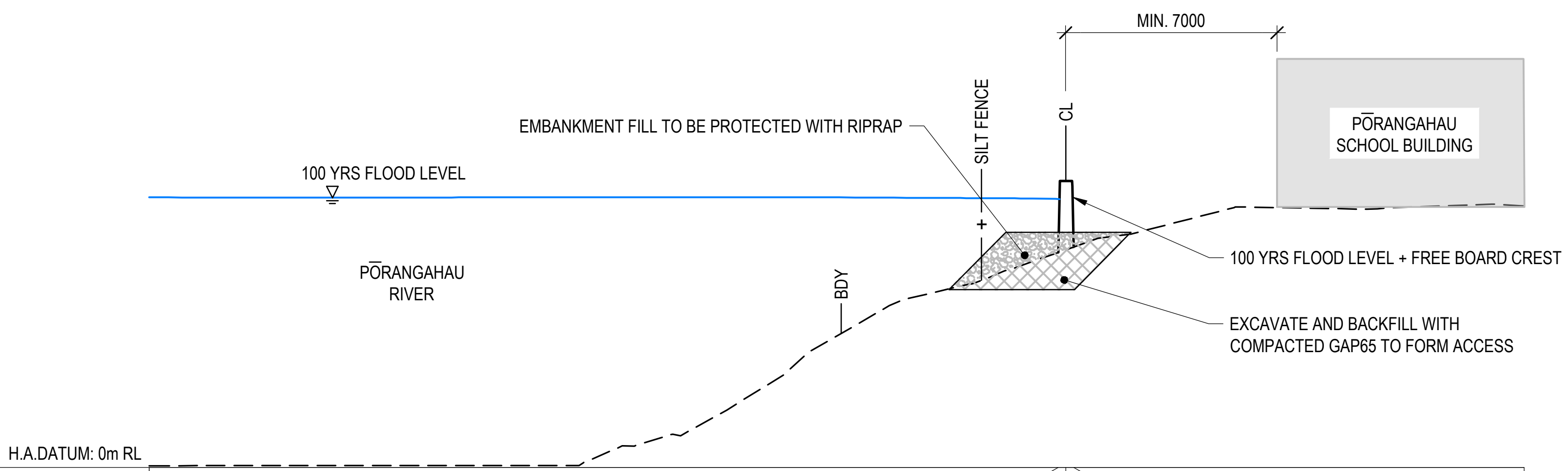
NOTES:

1. FOR GENERAL NOTES REFER HB01041700-GT-002.
2. REFER TO DRAWING HB01041700-GT-056 FOR TYPICAL FLOOD WALL DETAIL.



PROPOSED DESIGN LEVELS (m RL)	8.655	9.617	8.691
EXISTING LEVELS (m RL)	8.66	8.67	8.69
LEVEL DIFFERENCE (m)	0.00	0.94	0.00
OFFSETS (m)	-0.22	0.00	0.22

XSEC CL-STOPBANK-COMBINED-SLG_611 (CH:500)
SCALE 1:250



PROPOSED DESIGN LEVELS (m RL)	7.262	9.679	7.446
EXISTING LEVELS (m RL)	7.26	7.35	7.45
LEVEL DIFFERENCE (m)	0.00	2.33	0.00
OFFSETS (m)	-0.25	0.00	0.25

XSEC CL-STOPBANK-COMBINED-SLG_634 (CH:542)
SCALE 1:250

0 5 10m
SCALE 1:250 (A3)

FOR TENDER

ORIGINAL DRAWING IN COLOUR

NO.	REVISION	DATE	APP.
0	FOR TENDER	OCT 25	GS
B	FOR CONSENT	APR 25	
A	FOR INFORMATION	JUL 24	GS

HAWKES BAY REGIONAL COUNCIL
TE KAUNIHERA Ā-ROHE O TE MATAU-A-MĀUI

PATTLE DELAMORE PARTNERS

ACE MEMBER

CLIENT: HAWKE'S BAY REGIONAL COUNCIL

PROJECT: PŌRANGAHAU STOPBANKS

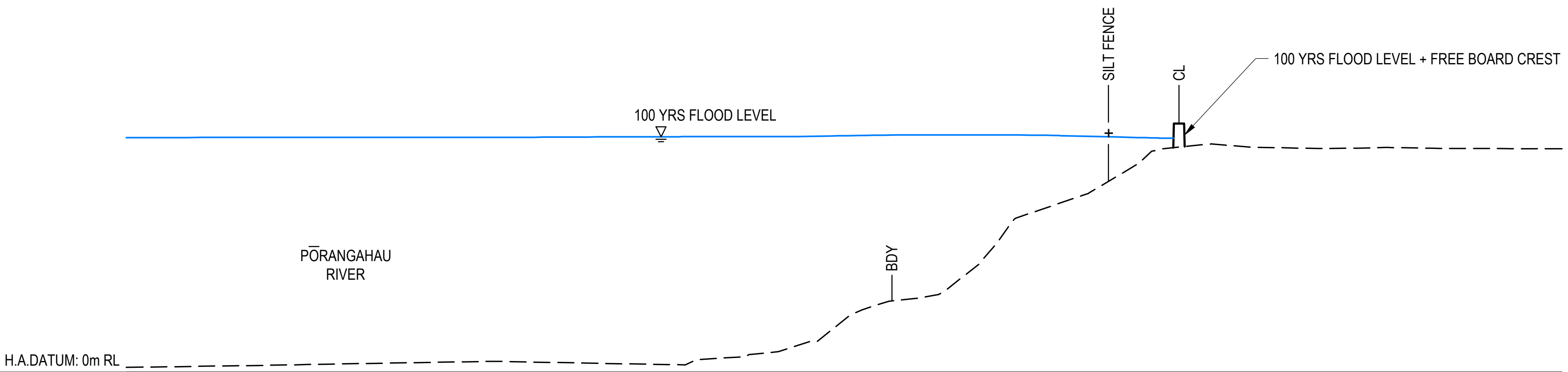
DESIGNED	DESIGN REVIEW	DATE	APPROVED	DATE
OH	GS	JUL 24		
DRAWN	DRAWING CHECK	DATE	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED	
SHK		JUL 24		

PORANGAHAU STOPBANKS CROSS SECTIONS SHEET 6

SCALE :	DRAWING NO. :	REV :
AS SHOWN (A3)	HB01041700-GT-035	0

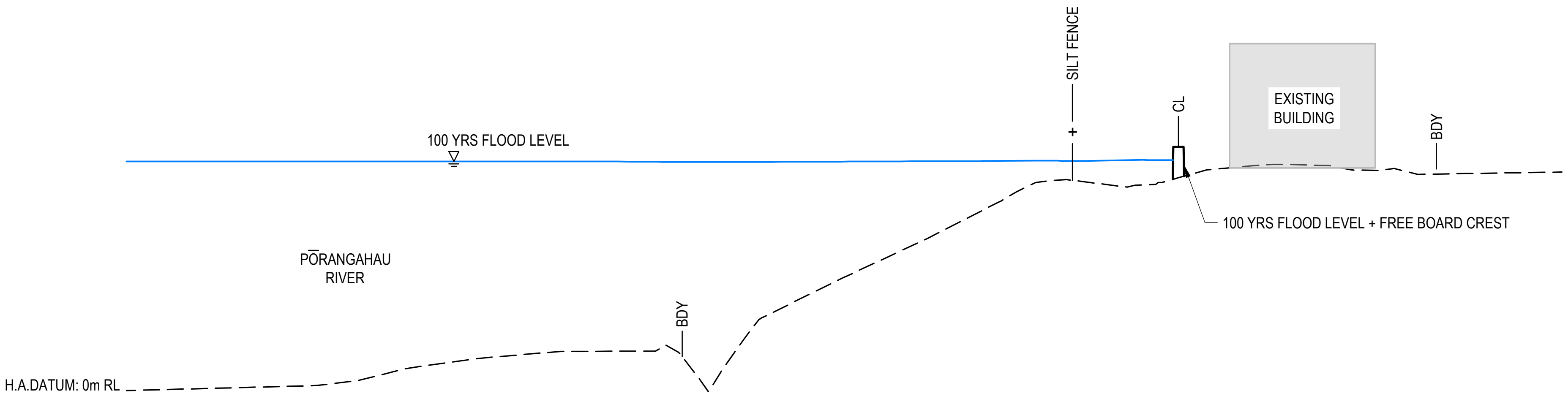
NOTES:

1. FOR GENERAL NOTES REFER HB01041700-GT-002.
2. REFER TO DRAWING HB01041700-GT-056 FOR TYPICAL FLOOD WALL DETAIL.



PROPOSED DESIGN LEVELS (m RL)	8.756	9.694	8.799
EXISTING LEVELS (m RL)	8.76	8.78	8.80
LEVEL DIFFERENCE (m)	0.00	0.92	0.00
OFFSETS (m)	-0.22	0.00	0.22

XSEC CL-STOPBANK-COMBINED-SLG_612 (CH:550)
SCALE 1:250



PROPOSED DESIGN LEVELS (m RL)	8.523	9.801	8.647
EXISTING LEVELS (m RL)	8.52	8.59	8.65
LEVEL DIFFERENCE (m)	0.00	1.22	0.00
OFFSETS (m)	-0.23	0.00	0.22

XSEC CL-STOPBANK-COMBINED-SLG_613 (CH:608)
SCALE 1:250

0 5 10m
SCALE 1:250 (A3)

FOR TENDER

ORIGINAL DRAWING IN COLOUR

NO.	REVISION	DATE	APP.
0	FOR TENDER	OCT 25	GS
B	FOR CONSENT	APR 25	
A	FOR INFORMATION	JUL 24	GS

CLIENT: HAWKE'S BAY REGIONAL COUNCIL

PROJECT: PŌRANGAHAU STOPBANKS

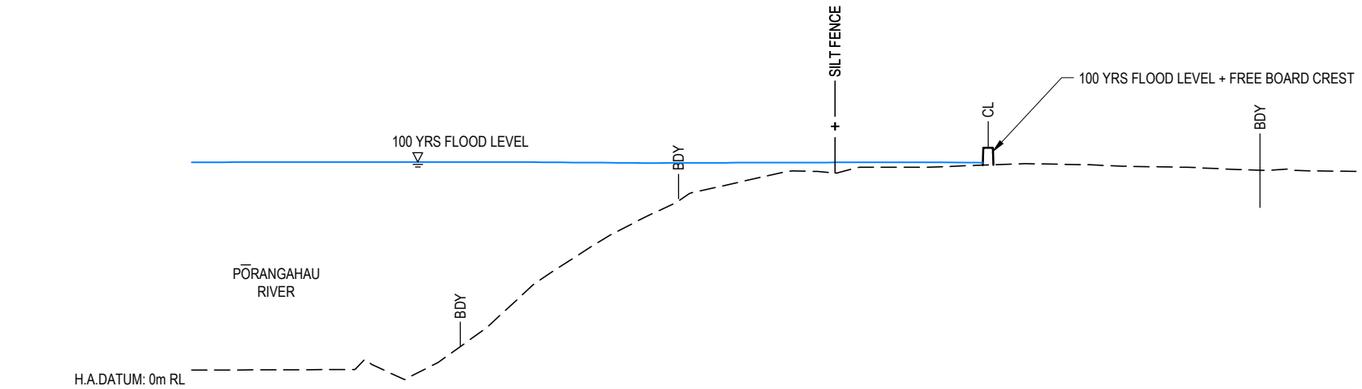
DESIGNED	DESIGN REVIEW	DATE	APPROVED	DATE
OH	GS	JUL 24		
DRAWN	DRAWING CHECK	DATE	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED	
SHK		JUL 24		

PORANGAHAU STOPBANKS CROSS SECTIONS SHEET 7

SCALE : AS SHOWN (A3)
DRAWING NO. : HB01041700-GT-036
REV : 0

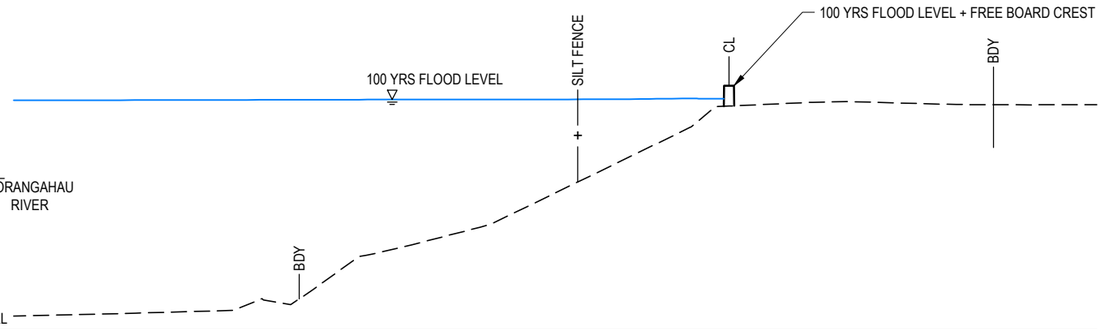
NOTES:

1. FOR GENERAL NOTES REFER HB01041700-GT-002.
2. REFER TO DRAWING HB01041700-GT-056 FOR TYPICAL FLOOD WALL DETAIL.



PROPOSED DESIGN LEVELS (m RL)	9.173	9.878	9.188
EXISTING LEVELS (m RL)	9.17	9.18	9.19
LEVEL DIFFERENCE (m)	0.00	0.70	0.00
OFFSETS (m)	-0.21	0.00	0.21

XSEC CL-STOPBANK-COMBINED-SLG_614 (CH:650)
SCALE 1:250



PROPOSED DESIGN LEVELS (m RL)	9.135	9.970	9.155
EXISTING LEVELS (m RL)	9.14	9.15	9.15
LEVEL DIFFERENCE (m)	0.00	0.82	0.00
OFFSETS (m)	-0.22	0.00	0.22

XSEC CL-STOPBANK-COMBINED-SLG_615 (CH:700)
SCALE 1:250

0 5 10m
SCALE 1:250 (A3)

FOR TENDER

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B	FOR CONSENT	APR 25	
A	FOR INFORMATION	JUL 24	GS

HAWKE'S BAY REGIONAL COUNCIL
TE KAUNIHERA Ā-ROHE O TE MATAU-A-MĀUI

PATTLE DELAMORE PARTNERS

ACE MEMBER

CLIENT: HAWKE'S BAY REGIONAL COUNCIL

PROJECT: PŌRANGAHAU STOPBANKS

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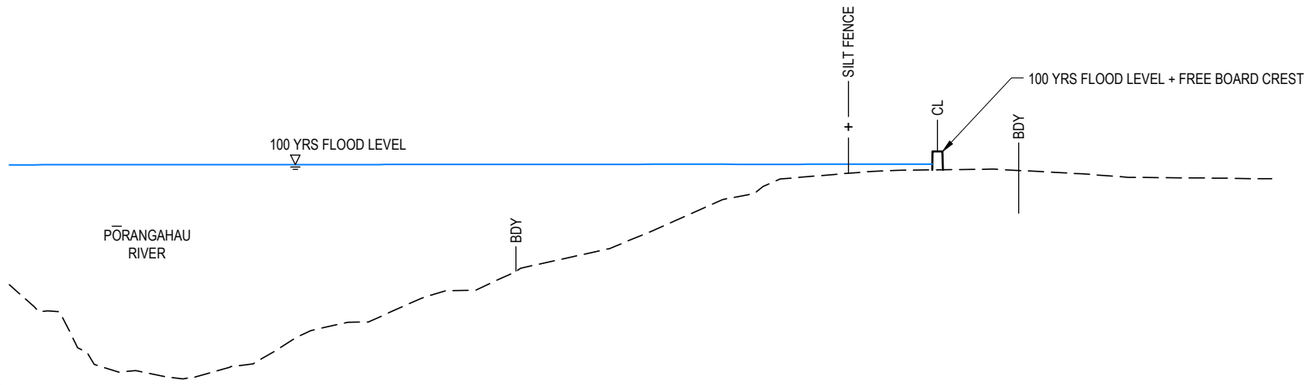
SHK		JUL 24		

PORANGAHAU STOPBANKS CROSS SECTIONS SHEET 8

SCALE :	DRAWING NO. :	REV :
AS SHOWN (A3)	HB01041700-GT-037	0

NOTES:

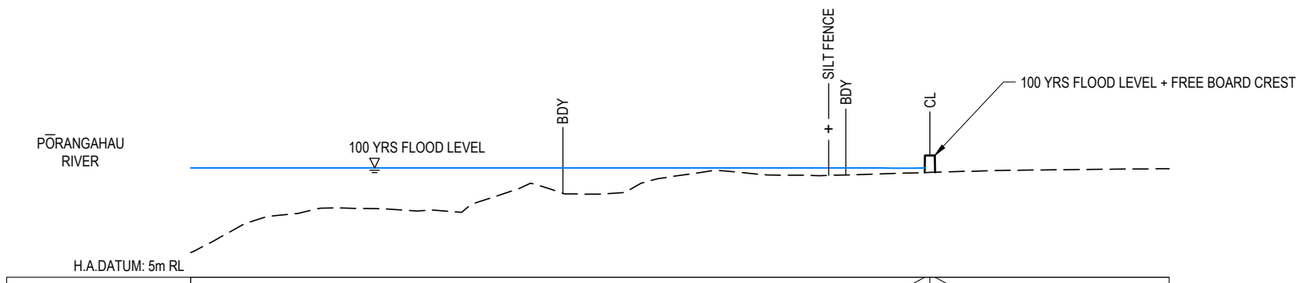
1. FOR GENERAL NOTES REFER HB01041700-GT-002.
2. REFER TO DRAWING HB01041700-GT-056 FOR TYPICAL FLOOD WALL DETAIL.



H.A.DATUM: 0m RL

PROPOSED DESIGN LEVELS (m RL)	9.219	9.970	9.224
EXISTING LEVELS (m RL)	9.22	9.22	9.22
LEVEL DIFFERENCE (m)	0.00	0.75	0.00
OFFSETS (m)	-0.22	0.00	0.21

XSEC CL-STOPBANK-COMBINED-SLG_616 (CH:750)
SCALE 1:250



H.A.DATUM: 5m RL

PROPOSED DESIGN LEVELS (m RL)	9.270	9.970	9.282
EXISTING LEVELS (m RL)	9.27	9.28	9.28
LEVEL DIFFERENCE (m)	0.00	0.69	0.00
OFFSETS (m)	-0.21	0.00	0.21

XSEC CL-STOPBANK-COMBINED-SLG_617 (CH:800)
SCALE 1:250

0 5 10m
SCALE 1:250 (A3)

FOR TENDER

ORIGINAL DRAWING IN COLOUR

NO.	REVISION	DATE	APP.
0	FOR TENDER	OCT 25	GS
B	FOR CONSENT	APR 25	
A	FOR INFORMATION	JUL 24	GS

HAWKE'S BAY REGIONAL COUNCIL
TE KAUNIHERA Ā-ROHE O TE MATAU-A-MĀUI

PATTLE DELAMORE PARTNERS

ACE MEMBER

CLIENT: HAWKE'S BAY REGIONAL COUNCIL

PROJECT: PŌRANGAHAU STOPBANKS

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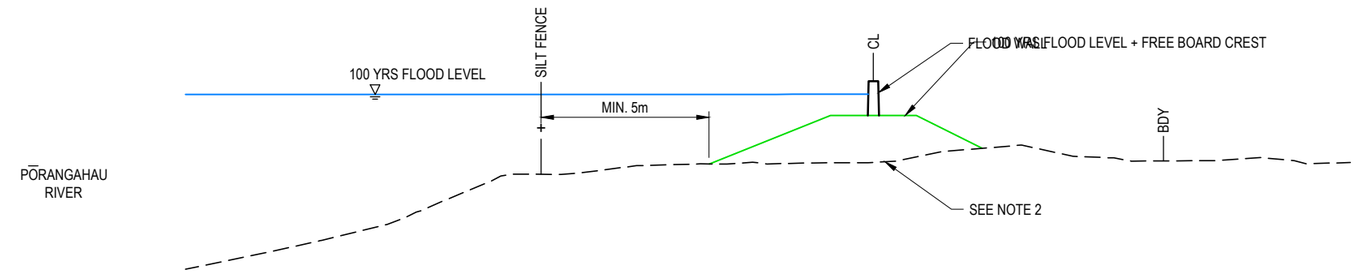
OH	GS	JUL 24		
DRAWN	DRAWING CHECK	DATE	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED	
SHK		JUL 24		

PORANGAHAU STOPBANKS CROSS SECTIONS SHEET 9

SCALE :	DRAWING NO. :	REV :
AS SHOWN (A3)	HB01041700-GT-038	0

NOTES:

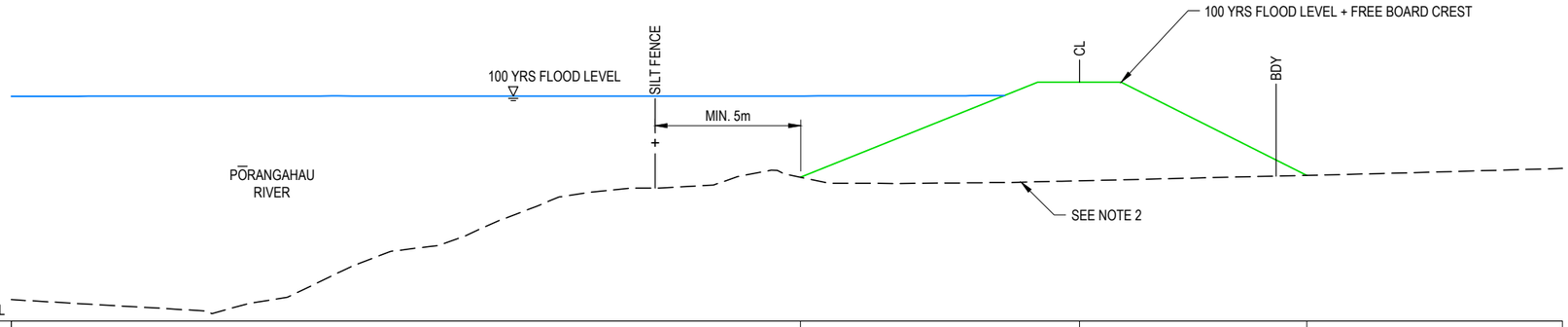
1. FOR GENERAL NOTES REFER HB01041700-GT-002.
2. STOPBANK FOOTPRINT TO BE CLEARED OF ALL VEGETATION AND TOPSOIL REMOVED TO STOCK PILE AREA.
3. FOOTPRINT TO BE COMPACTED IN-SITU.
4. ALL EARTHWORKS VOLUMES TO BE MEASURED TO THE DIMENSIONS ON THE DRAWINGS.
5. ALL EARTHWORKS TO BE COMPACTED TO 95% STANDARD NZ COMPACTION (HEAVY).
6. ALL EARTHWORKS TO BE OVERFILLED AND TRIMMED BACK TO THE DIMENSIONS ON THE DRAWINGS.
7. REFER TO DRAWING HB01041700-GT-055 FOR TYPICAL STOPBANK DETAIL.
7. REFER TO DRAWING HB01041700-GT-056 FOR TYPICAL FLOOD WALL DETAIL.



H.A.DATUM: 0m RL

PROPOSED DESIGN LEVELS (m RL)	6.599	9.970	7.238	
EXISTING LEVELS (m RL)	6.60	6.66	7.24	
LEVEL DIFFERENCE (m)	0.00	3.31	0.00	
OFFSETS (m)	-6.70	0.00	4.43	

XSEC CL-STOPBANK-COMBINED-SLG_618 (CH:850)
SCALE 1:250



H.A.DATUM: 0m RL

PROPOSED DESIGN LEVELS (m RL)	6.010	9.989	6.093	
EXISTING LEVELS (m RL)	6.01	5.87	6.09	
LEVEL DIFFERENCE (m)	0.00	4.12	0.00	
OFFSETS (m)	-11.70	0.00	9.54	

XSEC CL-STOPBANK-COMBINED-SLG_619 (CH:900)
SCALE 1:250

0 5 10m
SCALE 1:250 (A3)

FOR TENDER

ORIGINAL DRAWING IN COLOUR

NO.	REVISION	DATE	APP.
0	FOR TENDER	OCT 25	GS
B	FOR CONSENT	APR 25	
A	FOR INFORMATION	JUL 24	GS

HAWKE'S BAY REGIONAL COUNCIL
TE KAUNIHERA Ā-ROHE O TE MATAU-A-MĀUI

PATTLE DELAMORE PARTNERS

ACE MEMBER

CLIENT: HAWKE'S BAY REGIONAL COUNCIL

PROJECT: PŌRANGAHAU STOPBANKS

DESIGNED	DESIGN REVIEW	DATE	APPROVED	DATE
OH	GS	JUL 24		
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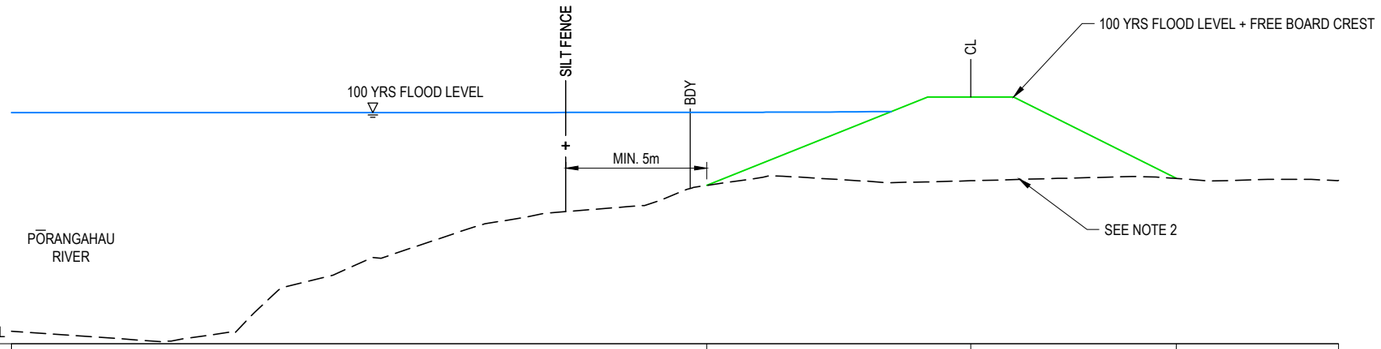
SHK		JUL 24		

PORANGAHAU STOPBANKS CROSS SECTIONS SHEET 10

SCALE :	DRAWING NO. :	REV :
AS SHOWN (A3)	HB01041700-GT-039	0

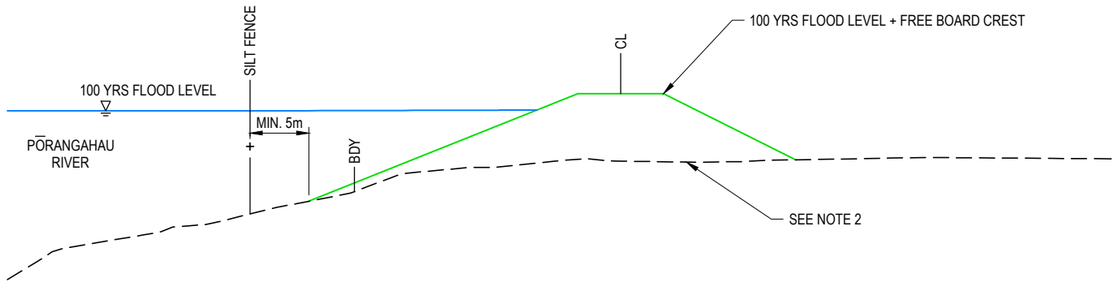
NOTES:

1. FOR GENERAL NOTES REFER HB01041700-GT-002.
2. STOPBANK FOOTPRINT TO BE CLEARED OF ALL VEGETATION AND TOPSOIL REMOVED TO STOCK PILE AREA.
3. FOOTPRINT TO BE COMPACTED IN-SITU.
4. ALL EARTHWORKS VOLUMES TO BE MEASURED TO THE DIMENSIONS ON THE DRAWINGS.
5. ALL EARTHWORKS TO BE COMPACTED TO 95% STANDARD NZ COMPACTION (HEAVY).
6. ALL EARTHWORKS TO BE OVERFILLED AND TRIMMED BACK TO THE DIMENSIONS ON THE DRAWINGS.
7. REFER TO DRAWING HB01041700-GT-055 FOR TYPICAL STOPBANK DETAIL.



PROPOSED DESIGN LEVELS (m RL)	6.447	10.049	6.732	
EXISTING LEVELS (m RL)	6.45	6.64	6.73	
LEVEL DIFFERENCE (m)	0.00	3.41	0.00	
OFFSETS (m)	-10.75	0.00	8.38	

XSEC CL-STOPBANK-COMBINED-SLG_620 (CH:950)
SCALE 1:250



H.A.DATUM: 0m RL

PROPOSED DESIGN LEVELS (m RL)	5.784	10.170	7.472	
EXISTING LEVELS (m RL)	5.78	7.42	7.47	
LEVEL DIFFERENCE (m)	0.00	2.75	0.00	
OFFSETS (m)	-12.71	0.00	7.15	

XSEC CL-STOPBANK-COMBINED-SLG_621 (CH:1000)
SCALE 1:250

0 5 10m
SCALE 1:250 (A3)

FOR TENDER

ORIGINAL DRAWING IN COLOUR

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0	FOR TENDER	OCT 25	GS
B	FOR CONSENT	APR 25	
A	FOR INFORMATION	JUL 24	GS

HAWKE'S BAY REGIONAL COUNCIL
TE KAUNIHERA Ā-ROHE O TE MATAU-A-MĀUI

PATTLE DELAMORE PARTNERS

ACE MEMBER

CLIENT: HAWKE'S BAY REGIONAL COUNCIL

PROJECT: PŌRANGAHAU STOPBANKS

DESIGNED	DESIGN REVIEW	DATE	APPROVED	DATE
OH	GS	JUL 24		
DRAWN	DRAWING CHECK	DATE		
SHK		JUL 24		

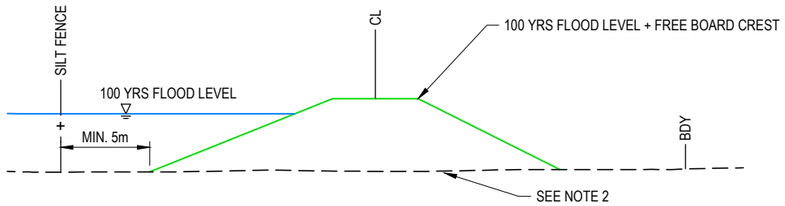
THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED

PORANGAHAU STOPBANKS CROSS SECTIONS SHEET 11

SCALE :	DRAWING NO. :	REV :
AS SHOWN (A3)	HB01041700-GT-040	0

NOTES:

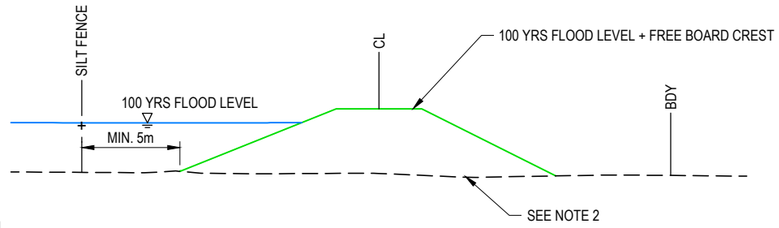
1. FOR GENERAL NOTES REFER HB01041700-GT-002.
2. STOPBANK FOOTPRINT TO BE CLEARED OF ALL VEGETATION AND TOPSOIL REMOVED TO STOCK PILE AREA.
3. FOOTPRINT TO BE COMPACTED IN-SITU.
4. ALL EARTHWORKS VOLUMES TO BE MEASURED TO THE DIMENSIONS ON THE DRAWINGS.
5. ALL EARTHWORKS TO BE COMPACTED TO 95% STANDARD NZ COMPACTION (HEAVY).
6. ALL EARTHWORKS TO BE OVERFILLED AND TRIMMED BACK TO THE DIMENSIONS ON THE DRAWINGS.
7. REFER TO DRAWING HB01041700-GT-055 FOR TYPICAL STOPBANK DETAIL.



H.A.DATUM: 5m RL

PROPOSED DESIGN LEVELS (m RL)	7.247	10.228	7.341	
EXISTING LEVELS (m RL)	7.25	7.27	7.34	
LEVEL DIFFERENCE (m)	0.00	2.96	0.00	
OFFSETS (m)	-9.20	0.00	7.52	

XSEC CL-STOPBANK-COMBINED-SLG_622 (CH:1050)
SCALE 1:250



H.A.DATUM: 5m RL

PROPOSED DESIGN LEVELS (m RL)	7.741	7.746	10.285	7.556	
EXISTING LEVELS (m RL)	7.74	7.74	7.66	7.56	
LEVEL DIFFERENCE (m)	0.00	0.01	2.63	0.00	
OFFSETS (m)	-8.11	-8.10	0.00	7.21	

XSEC CL-STOPBANK-COMBINED-SLG_623 (CH:1100)
SCALE 1:250

0 5 10m
SCALE 1:250 (A3)

FOR TENDER

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0	FOR TENDER	OCT 25	GS
B	FOR CONSENT	APR 25	
A	FOR INFORMATION	JUL 24	GS

HAWKE'S BAY REGIONAL COUNCIL
TE KAUNIHERA Ā-ROHE O TE MATAU-A-MĀUI

PATTLE DELAMORE PARTNERS

ACE MEMBER

CLIENT: HAWKE'S BAY REGIONAL COUNCIL

PROJECT: PŌRANGAHAU STOPBANKS

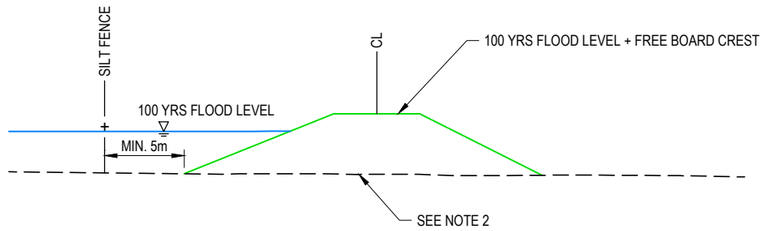
DESIGNED	DESIGN REVIEW	DATE	APPROVED	DATE
OH	GS	JUL 24		
DRAWN	DRAWING CHECK	DATE	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED	
SHK		JUL 24		

PORANGAHAU STOPBANKS CROSS SECTIONS SHEET 12

SCALE :	DRAWING NO. :	REV :
AS SHOWN (A3)	HB01041700-GT-041	0

NOTES:

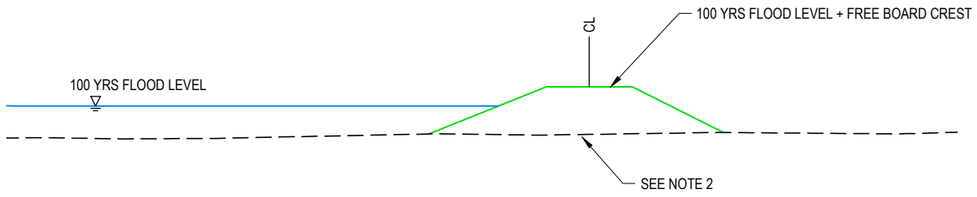
1. FOR GENERAL NOTES REFER HB01041700-GT-002.
2. STOPBANK FOOTPRINT TO BE CLEARED OF ALL VEGETATION AND TOPSOIL REMOVED TO STOCK PILE AREA.
3. FOOTPRINT TO BE COMPACTED IN-SITU.
4. ALL EARTHWORKS VOLUMES TO BE MEASURED TO THE DIMENSIONS ON THE DRAWINGS.
5. ALL EARTHWORKS TO BE COMPACTED TO 95% STANDARD NZ COMPACTION (HEAVY).
6. ALL EARTHWORKS TO BE OVERFILLED AND TRIMMED BACK TO THE DIMENSIONS ON THE DRAWINGS.
7. REFER TO DRAWING HB01041700-GT-055 FOR TYPICAL STOPBANK DETAIL.



H.A.DATUM: 5m RL

PROPOSED DESIGN LEVELS (m RL)	8.025	10.467	7.967	
EXISTING LEVELS (m RL)	8.02	8.00	7.97	
LEVEL DIFFERENCE (m)	0.00	2.46	0.00	
OFFSETS (m)	-7.85	0.00	6.75	

XSEC CL-STOPBANK-COMBINED-SLG_624 (CH:1150)
SCALE 1:250



H.A.DATUM: 5m RL

PROPOSED DESIGN LEVELS (m RL)	8.617	10.540	8.677	
EXISTING LEVELS (m RL)	8.62	8.60	8.68	
LEVEL DIFFERENCE (m)	0.00	1.94	0.00	
OFFSETS (m)	-6.56	0.00	5.48	

XSEC CL-STOPBANK-COMBINED-SLG_625 (CH:1200)
SCALE 1:250

0 5 10m
SCALE 1:250 (A3)

FOR TENDER

ORIGINAL DRAWING IN COLOUR

NO.	REVISION	DATE	APP.
0	FOR TENDER	OCT 25	GS
B	FOR CONSENT	APR 25	
A	FOR INFORMATION	JUL 24	GS

HAWKES BAY REGIONAL COUNCIL
TE KAUNIHERA Ā-ROHE O TE MATAU-A-MĀUI

PATTLE DELAMORE PARTNERS

ACE MEMBER

CLIENT: HAWKE'S BAY REGIONAL COUNCIL

PROJECT: PŌRANGAHAU STOPBANKS

DESIGNED	DESIGN REVIEW	DATE	APPROVED	DATE
OH	GS	JUL 24		
DRAWN	DRAWING CHECK	DATE		
SHK		JUL 24		

THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED

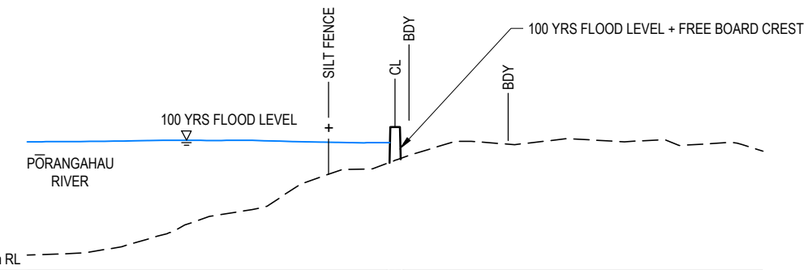
PORANGAHAU STOPBANKS CROSS SECTIONS SHEET 13

SCALE :	DRAWING NO. :	REV :
AS SHOWN (A3)	HB01041700-GT-042	0

Plot: 14/10/2025 9:26:48 am
FILED: HB01041700-GT-042.dwg

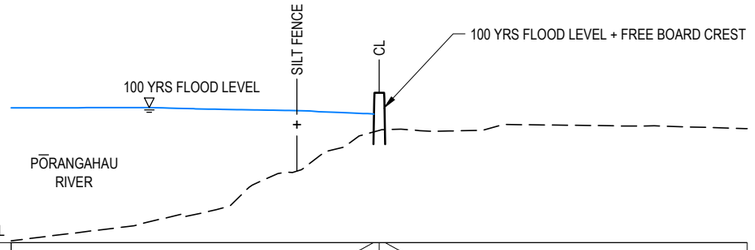
NOTES:

1. FOR GENERAL NOTES REFER HB01041700-GT-002.
2. REFER TO DRAWING HB01041700-GT-056 FOR TYPICAL FLOOD WALL DETAIL.



PROPOSED DESIGN LEVELS (m RL)	9.391	10.858	9.543
EXISTING LEVELS (m RL)	9.41	9.50	9.58
LEVEL DIFFERENCE (m)	-0.02	1.36	-0.04
OFFSETS (m)	-0.23	0.00	0.23

XSEC CL-STOPBANK-COMBINED-SLG_626 (CH:1257)
SCALE 1:250



PROPOSED DESIGN LEVELS (m RL)	9.008	11.101	9.006
EXISTING LEVELS (m RL)	9.50	9.57	9.60
LEVEL DIFFERENCE (m)	-0.50	1.53	-0.60
OFFSETS (m)	-0.24	0.00	0.24

XSEC CL-STOPBANK-COMBINED-SLG_635 (CH:1301)
SCALE 1:250

100 YRS FLOOD LEVEL + FREE BOARD CREST

0 5 10m
SCALE 1:250 (A3)

FOR TENDER

ORIGINAL DRAWING IN COLOUR

NO.	REVISION	DATE	APP.
0	FOR TENDER	OCT 25	GS
B	FOR CONSENT	APR 25	
A	FOR INFORMATION	JUL 24	GS

HAWKE'S BAY REGIONAL COUNCIL
TE KAUNIHERA Ā-ROHE O TE MATAU-A-MĀUI

PATTLE DELAMORE PARTNERS

ACE MEMBER

CLIENT: HAWKE'S BAY REGIONAL COUNCIL

PROJECT: PŌRANGAHAU STOPBANKS

DESIGNED	DESIGN REVIEW	DATE	APPROVED	DATE
OH	GS	JUL 24		
DRAWN	DRAWING CHECK	DATE	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED	
SHK		JUL 24		

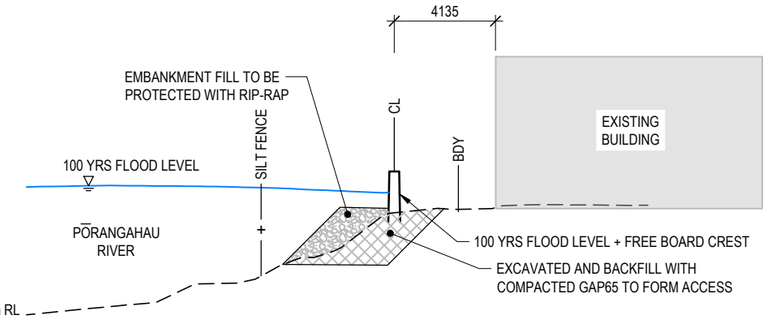
PORANGAHAU STOPBANKS CROSS SECTIONS SHEET 14

SCALE :	DRAWING NO. :	REV :
AS SHOWN (A3)	HB01041700-GT-043	0

Plot: 14/10/2025 9:28:09 am
FILED: HB01041700-GT-043.dwg

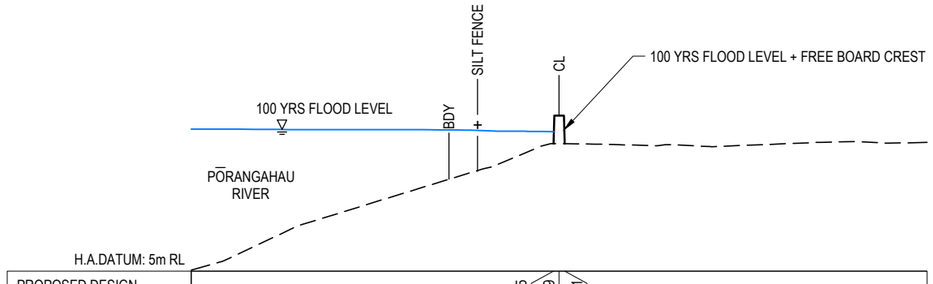
NOTES:

1. FOR GENERAL NOTES REFER HB01041700-GT-002.
2. REFER TO DRAWING HB01041700-GT-056 FOR TYPICAL FLOOD WALL DETAIL.



PROPOSED DESIGN LEVELS (m RL)	9.052	11.115	9.050
EXISTING LEVELS (m RL)	9.40	9.44	9.46
LEVEL DIFFERENCE (m)	-0.35	1.88	-0.41
OFFSETS (m)	-0.24	0.00	0.24

XSEC CL-STOPBANK-COMBINED-SLG_627 (CH:1303)
SCALE 1:250



PROPOSED DESIGN LEVELS (m RL)	10.195	11.339	10.191
EXISTING LEVELS (m RL)	10.19	10.19	10.19
LEVEL DIFFERENCE (m)	0.00	1.15	0.00
OFFSETS (m)	-0.22	0.00	0.22

XSEC CL-STOPBANK-COMBINED-SLG_628 (CH:1350)
SCALE 1:250

0 5 10m
SCALE 1:250 (A3)

FOR TENDER

ORIGINAL DRAWING IN COLOUR

NO.	REVISION	DATE	APP.
0	FOR TENDER	OCT 25	GS
B	FOR CONSENT	APR 25	
A	FOR INFORMATION	JUL 24	GS

HAWKE'S BAY REGIONAL COUNCIL
TE KAUNIHERA Ā-ROHE O TE MATAU-A-MĀUI

PATTLE DELAMORE PARTNERS

ACE MEMBER

CLIENT: HAWKE'S BAY REGIONAL COUNCIL

PROJECT: PŌRANGAHAU STOPBANKS

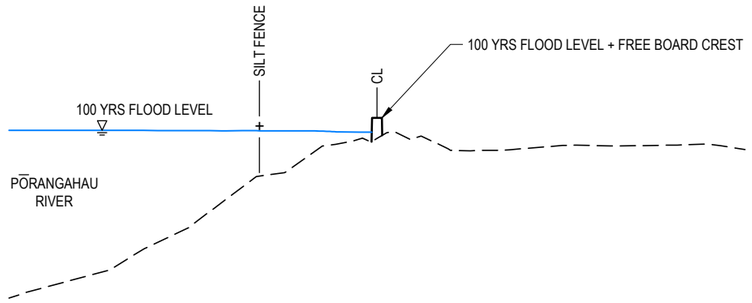
DESIGNED	DESIGN REVIEW	DATE	APPROVED	DATE
OH	GS	JUL 24		
DRAWN	DRAWING CHECK	DATE	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED	
SHK		JUL 24		

PORANGAHAU STOPBANKS CROSS SECTIONS SHEET 15

SCALE :	DRAWING NO. :	REV :
AS SHOWN (A3)	HB01041700-GT-044	0

NOTES:

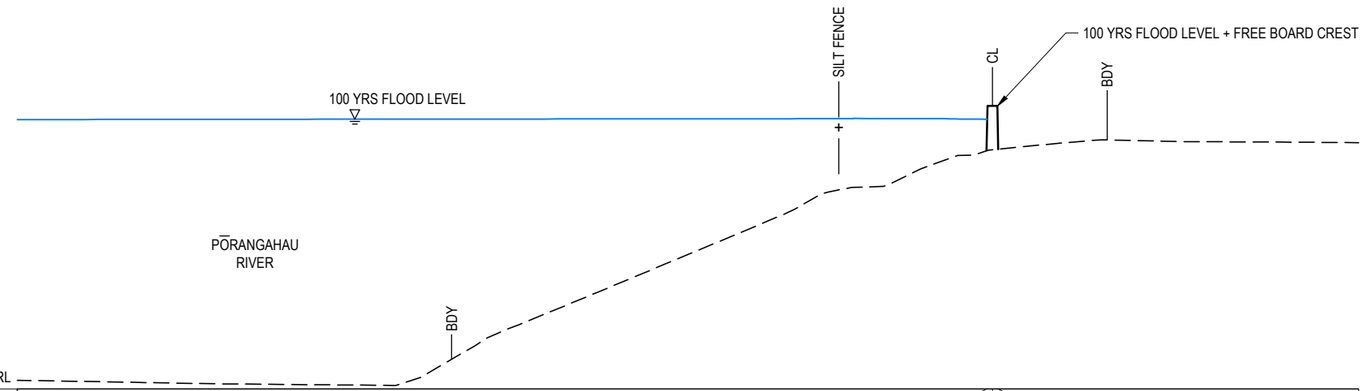
1. FOR GENERAL NOTES REFER HB01041700-GT-002.
2. REFER TO DRAWING HB01041700-GT-056 FOR TYPICAL FLOOD WALL DETAIL.



H.A.DATUM: 0m RL

PROPOSED DESIGN LEVELS (m RL)	10.460	11.436	10.720
EXISTING LEVELS (m RL)	10.46	10.59	10.72
LEVEL DIFFERENCE (m)	0.00	0.84	0.00
OFFSETS (m)	-0.22	0.00	0.21

XSEC CL-STOPBANK-COMBINED-SLG_629 (CH:1400)
SCALE 1:250



H.A.DATUM: 0m RL

PROPOSED DESIGN LEVELS (m RL)	9.712	11.533	9.772
EXISTING LEVELS (m RL)	9.71	9.75	9.77
LEVEL DIFFERENCE (m)	0.00	1.79	0.00
OFFSETS (m)	-0.24	0.00	0.24

XSEC CL-STOPBANK-COMBINED-SLG_630 (CH:1450)
SCALE 1:250

0 5 10m
SCALE 1:250 (A3)

FOR TENDER

ORIGINAL DRAWING IN COLOUR

NO.	REVISION	DATE	APP.
0	FOR TENDER	OCT 25	GS
B	FOR CONSENT	APR 25	
A	FOR INFORMATION	JUL 24	GS

HAWKE'S BAY REGIONAL COUNCIL
TE KAUNIHERA Ā-ROHE O TE MATAU-A-MĀUI

PATTLE DELAMORE PARTNERS

CLIENT: HAWKE'S BAY REGIONAL COUNCIL

PROJECT: PŌRANGAHAU STOPBANKS

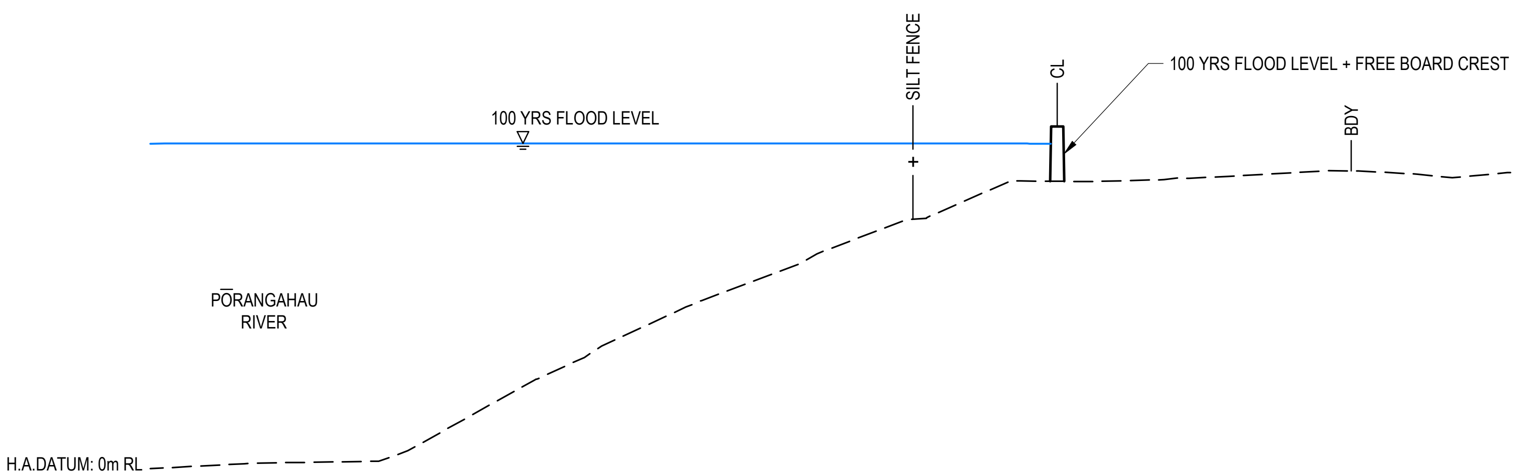
DESIGNED	DESIGN REVIEW	DATE	APPROVED	DATE
OH	GS	JUL 24		
DRAWN	DRAWING CHECK	DATE	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED	
SHK		JUL 24		

PORANGAHAU STOPBANKS CROSS SECTIONS SHEET 16

SCALE :	DRAWING NO. :	REV :
AS SHOWN (A3)	HB01041700-GT-045	0

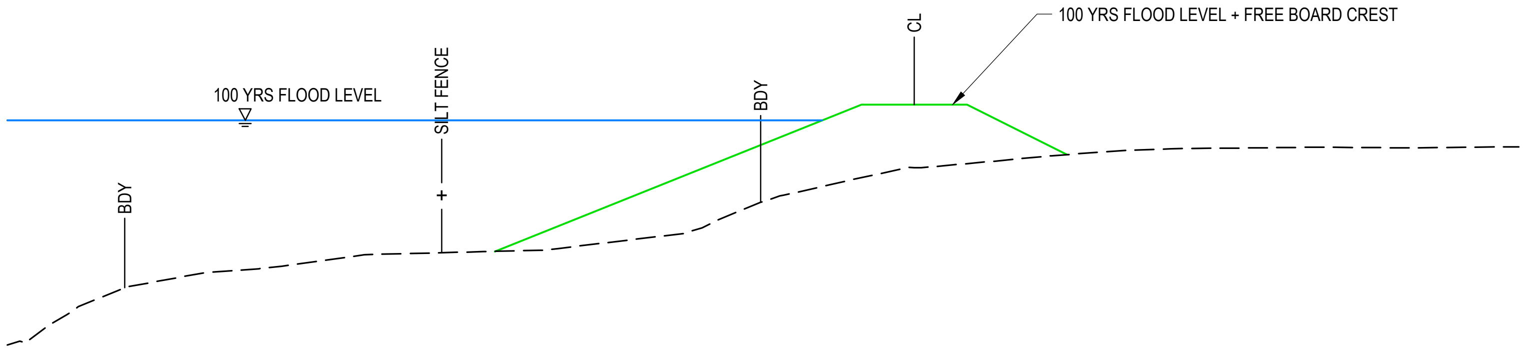
NOTES:

1. FOR GENERAL NOTES REFER HB01041700-GT-002.
2. REFER TO DRAWING HB01041700-GT-056 FOR TYPICAL FLOOD WALL DETAIL.



PROPOSED DESIGN LEVELS (m RL)	9.823	11.630	9.819
EXISTING LEVELS (m RL)	9.82	9.82	9.82
LEVEL DIFFERENCE (m)	0.00	1.81	0.00
OFFSETS (m)	-0.24	0.00	0.24

XSEC CL-STOPBANK-COMBINED-SLG_631 (CH:1500)
SCALE 1:250



PROPOSED DESIGN LEVELS (m RL)	6.782	11.630	9.981
EXISTING LEVELS (m RL)	6.78	9.55	9.98
LEVEL DIFFERENCE (m)	0.00	2.08	0.00
OFFSETS (m)	-13.87	0.00	5.05

XSEC CL-STOPBANK-COMBINED-SLG_632 (CH:1550)
SCALE 1:250

0 5 10m
SCALE 1:250 (A3)

FOR TENDER

ORIGINAL DRAWING IN COLOUR

www.pdp.co.nz
DO NOT SCALE DRAWING
Plot: 14/10/2025 9:31:14 am
FILED: HB01041700-GT-046.dwg

NO.	REVISION	DATE	APP.
0	FOR TENDER	OCT 25	GS
B	FOR CONSENT	APR 25	
A	FOR INFORMATION	JUL 24	GS

HAWKE'S BAY REGIONAL COUNCIL
TE KAUNIHERA Ā-ROHE O TE MATAU-A-MĀUI

PATTLE DELAMORE PARTNERS

ACE MEMBER

CLIENT: HAWKE'S BAY REGIONAL COUNCIL

PROJECT: PŌRANGAHAU STOPBANKS

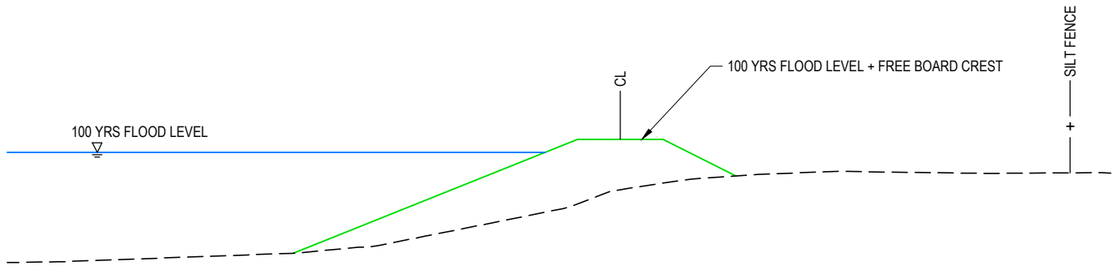
DESIGNED	DESIGN REVIEW	DATE	APPROVED	DATE
OH	GS	JUL 24		
DRAWN	DRAWING CHECK	DATE	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED	
SHK		JUL 24		

PORANGAHAU STOPBANKS CROSS SECTIONS SHEET 17

SCALE :	DRAWING NO. :	REV :
AS SHOWN (A3)	HB01041700-GT-046	0

NOTES:

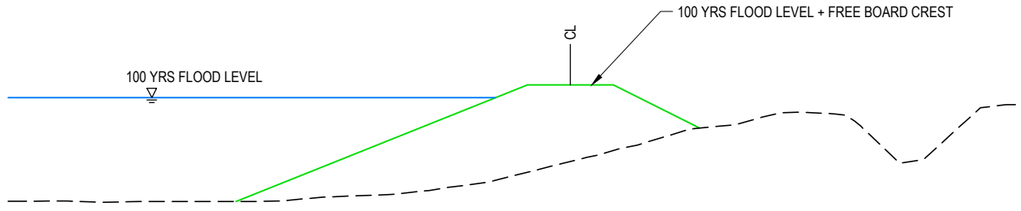
1. FOR GENERAL NOTES REFER HB01041700-GT-002.
2. REFER TO DRAWING HB01041700-GT-056 FOR TYPICAL FLOOD WALL DETAIL.



H.A.DATUM: 5m RL

PROPOSED DESIGN LEVELS (m RL)	7.000	11.630	10.147	
EXISTING LEVELS (m RL)	7.00	9.59	10.15	
LEVEL DIFFERENCE (m)	0.00	2.04	0.00	
OFFSETS (m)	-13.33	0.00	4.72	

XSEC CL-STOPBANK-COMBINED-SLG_633 (CH:1600)
SCALE 1:250



H.A.DATUM: 5m RL

PROPOSED DESIGN LEVELS (m RL)	6.877	11.630	9.873	
EXISTING LEVELS (m RL)	6.88	8.51	9.87	
LEVEL DIFFERENCE (m)	0.00	3.12	0.00	
OFFSETS (m)	-13.63	0.00	5.26	

XSEC CL-STOPBANK-COMBINED-SLG_636 (CH:1650)
SCALE 1:250

0 5 10m
SCALE 1:250 (A3)

FOR TENDER

ORIGINAL DRAWING IN COLOUR

NO.	REVISION	DATE	APP.
0	FOR TENDER	OCT 25	GS
B	FOR CONSENT	APR 25	
A	FOR INFORMATION	JUL 24	GS

HAWKE'S BAY REGIONAL COUNCIL
TE KAUNIHERA Ā-ROHE O TE MATAU-A-MĀUI

PATTLE DELAMORE PARTNERS

CLIENT: HAWKE'S BAY REGIONAL COUNCIL

PROJECT: PŌRANGAHAU STOPBANKS

DESIGNED	DESIGN REVIEW	DATE	APPROVED	DATE
OH	GS	JUL 24		
DRAWN	DRAWING CHECK	DATE		
SHK		JUL 24		

THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED

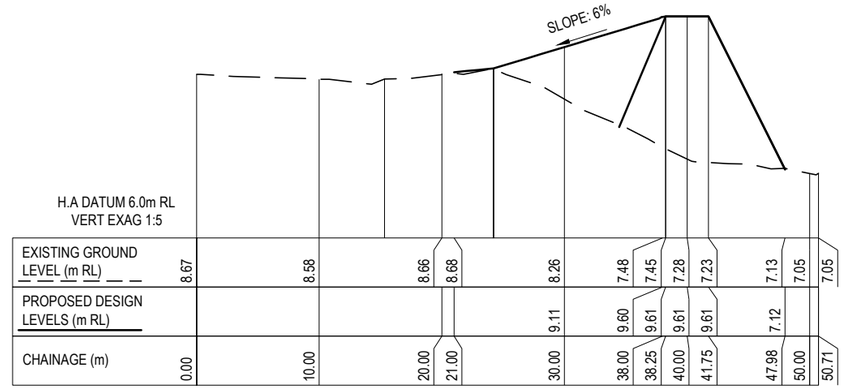
PORANGAHAU STOPBANKS CROSS SECTIONS SHEET 18

SCALE :	DRAWING NO. :	REV :
AS SHOWN (A3)	HB01041700-GT-047	0

Plot: 14/10/2025 9:32:32 am
FILED: HB01041700-GT-047.dwg

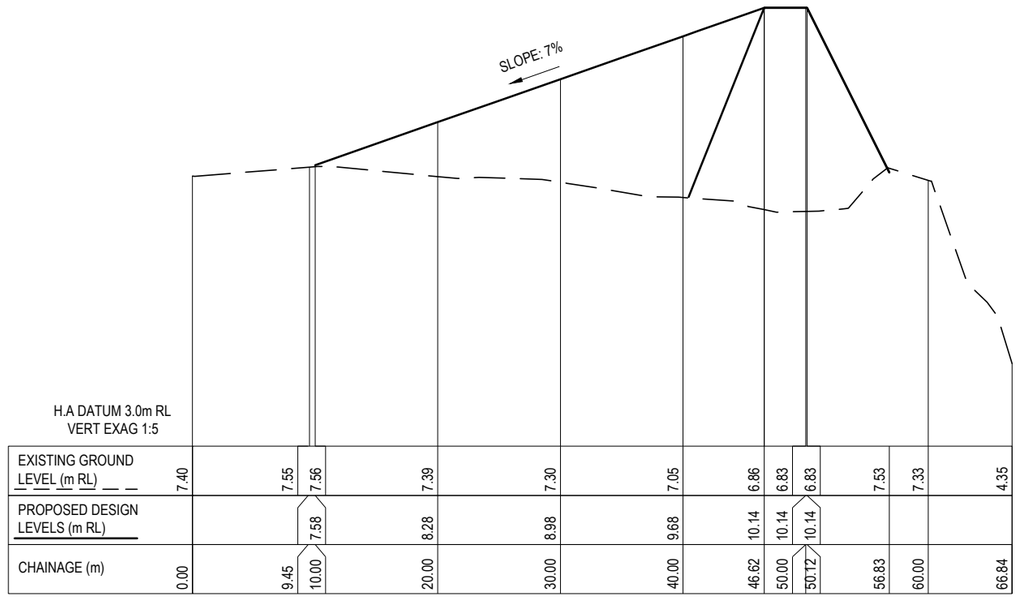
NOTES:

1. FOR GENERAL NOTES REFER HB01041700-GT-002.
2. REFER TO DRAWING HB01041700-GT-055 FOR TYPICAL STOPBANK DETAIL.



JONES STREET ON-RAMP LONG SECTION (A / 012)

HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:100



MOORE STREET ON-RAMP LONG SECTION (E / 014)

HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:100

0 10 20m

SCALE 1:500 (A3)

FOR TENDER

ORIGINAL DRAWING IN COLOUR

NO.	REVISION	DATE	APP.
0	FOR TENDER	OCT 25	GS

HAWKE'S BAY REGIONAL COUNCIL
TE KAUNIHERA Ā-ROHE O TE MATAU-A-MĀUI

PATTLE DELAMORE PARTNERS

ACE MEMBER

CLIENT: HAWKE'S BAY REGIONAL COUNCIL

PROJECT: PŌRANGAHAU STOPBANKS

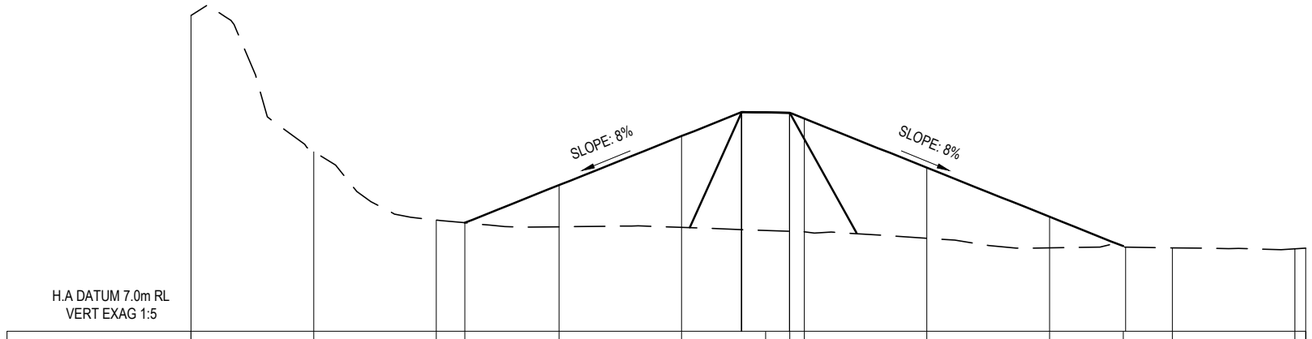
DESIGNED	DESIGN REVIEW	DATE	APPROVED	DATE
OH	GS	SEP 25		----
DRAWN	DRAWING CHECK	DATE	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED	
SHK		SEP 25		

PORANGAHAU STOPBANKS RAMP LONG SECTIONS - SHEET 1

SCALE :	DRAWING NO. :	REV :
AS SHOWN (A3)	HB01041700-GT-048	0

NOTES:

1. FOR GENERAL NOTES REFER HB01041700-GT-002.
2. REFER TO DRAWING HB01041700-GT-055 FOR TYPICAL STOPBANK DETAIL.

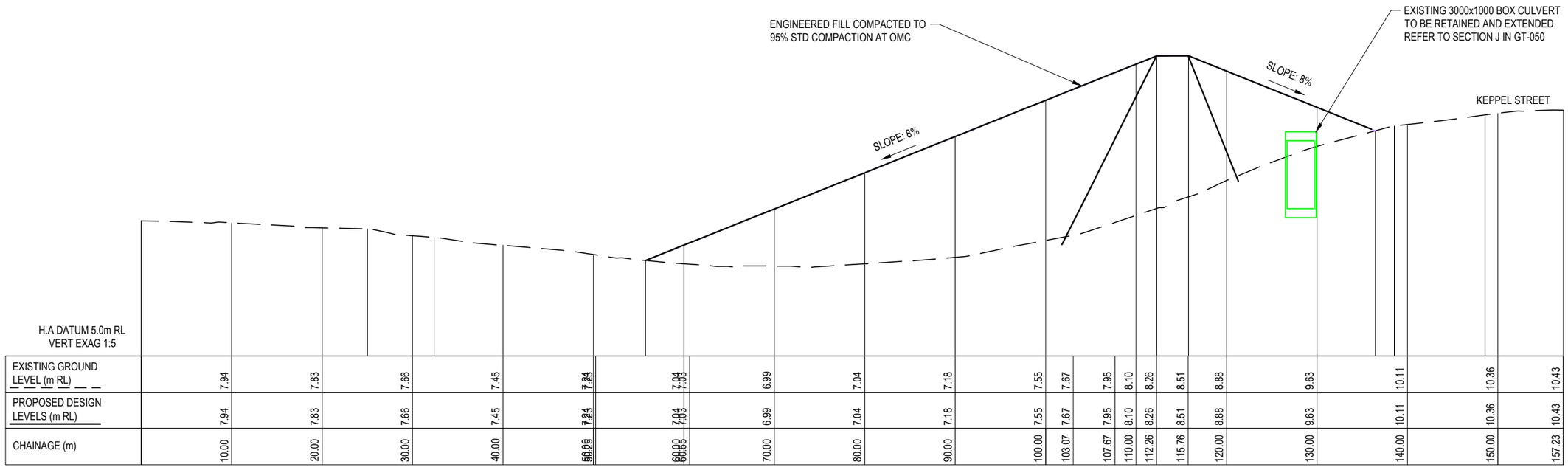


H.A DATUM 7.0m RL
VERT EXAG 1:5

EXISTING GROUND LEVEL (m RL)	12.15	9.93	8.81	8.77	8.71	8.70	8.65	8.63	8.62	8.52	8.36	8.38	8.36	8.35 8.35
PROPOSED DESIGN LEVELS (m RL)				8.77	9.38	10.18	10.57	10.56	10.47	9.67	8.87			
CHAINAGE (m)	0.00	10.00	20.00	22.32	30.00	40.00	46.86	48.81	50.00	60.00	70.00	76.00	80.00	90.00 90.00

ABERCROMBY STREET ON-RAMP LONG SECTION (F 014)

HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:100



H.A DATUM 5.0m RL
VERT EXAG 1:5

EXISTING GROUND LEVEL (m RL)	7.94	7.83	7.66	7.45	7.24 7.24	7.04 7.04	6.99	7.04	7.18	7.55	7.67	7.95	8.10	8.26	8.51	8.88	9.63	10.11	10.36	10.43
PROPOSED DESIGN LEVELS (m RL)	7.94	7.83	7.66	7.45	7.24 7.24	7.04 7.04	6.99	7.04	7.18	7.55	7.67	7.95	8.10	8.26	8.51	8.88	9.63	10.11	10.36	10.43
CHAINAGE (m)	10.00	20.00	30.00	40.00	60.00 60.00	60.00 60.00	70.00	80.00	90.00	100.00	103.07	107.67	110.00	112.26	115.76	120.00	130.00	140.00	150.00	157.23

KEPPEL STREET ON-RAMP LONG SECTION (J 016)

HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:100

0 10 20m
SCALE 1:500 (A3)

FOR TENDER

ORIGINAL DRAWING IN COLOUR

NO.	REVISION	DATE	APP.
0	FOR TENDER	OCT 25	GS

HAWKE'S BAY REGIONAL COUNCIL
TE KAUNIHERA Ā-ROHE O TE MATAU-A-MĀUI

PATTLE DELAMORE PARTNERS

ACE MEMBER

CLIENT: HAWKE'S BAY REGIONAL COUNCIL

PROJECT: PŌRANGAHAU STOPBANKS

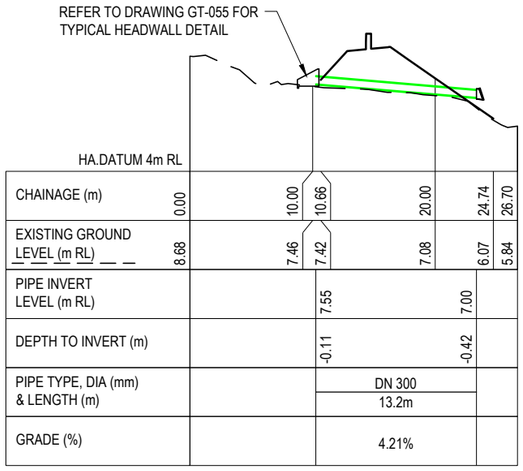
DESIGNED	DESIGN REVIEW	DATE	APPROVED	DATE
OH	GS	SEP 25		----
DRAWN	DRAWING CHECK	DATE		
SHK		SEP 25		

THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED

PORANGAHAU STOPBANKS RAMP LONG SECTIONS - SHEET 2

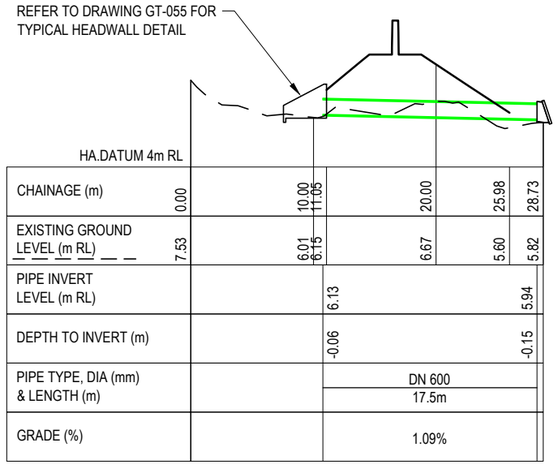
SCALE :	DRAWING NO. :	REV :
AS SHOWN (A3)	HB01041700-GT-049	0

NOTES:
1. REFER TO HB01041700-GT-002 FOR GENERAL NOTES.
2. ALL DIMENSIONS IN MILLIMETERS UNLESS OTHERWISE SPECIFIED.
3. BOX CULVERT BEDDING AND BACKFILL TO BE IN ACCORDANCE WITH HDC STANDARD DETAIL AS SHOWED IN DRAWING GT-055.



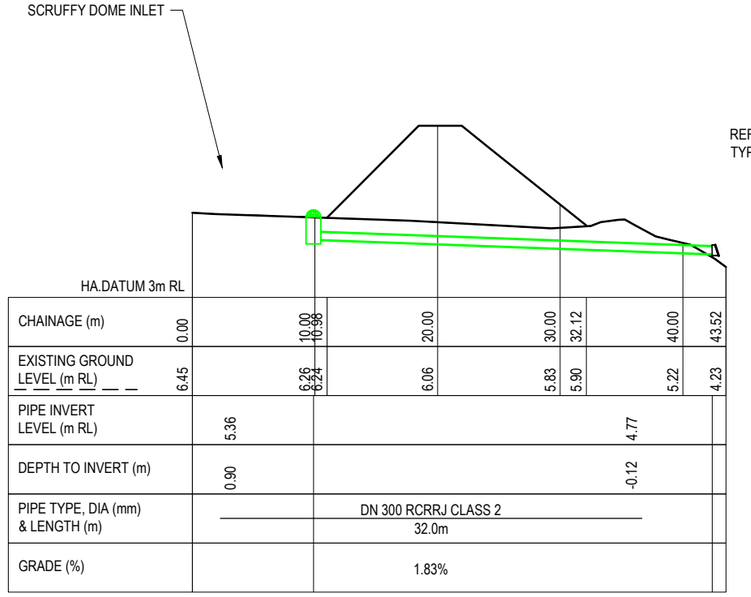
HA.DATUM 4m RL						
CHAINAGE (m)	0.00	10.00	10.66	20.00	24.74	26.70
EXISTING GROUND LEVEL (m RL)	8.68	7.46	7.42	7.08	6.07	5.84
PIPE INVERT LEVEL (m RL)			7.55	7.00		
DEPTH TO INVERT (m)			-0.11	-0.42		
PIPE TYPE, DIA (mm) & LENGTH (m)			DN 300 13.2m			
GRADE (%)			4.21%			

OUTLET 1 - LONG SECTION (B / 012)
HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:250



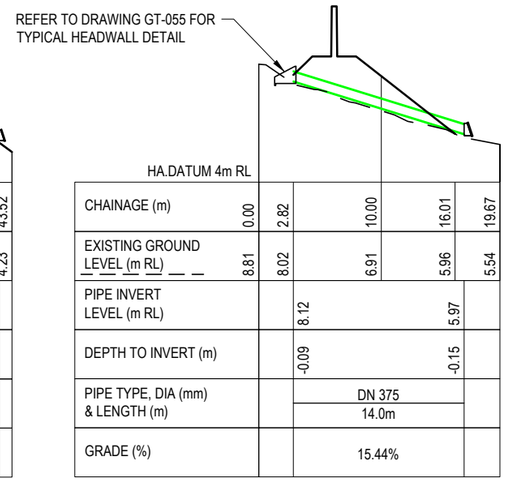
HA.DATUM 4m RL						
CHAINAGE (m)	0.00	10.00	11.05	20.00	25.98	28.73
EXISTING GROUND LEVEL (m RL)	7.53	6.01	6.15	6.67	5.60	5.82
PIPE INVERT LEVEL (m RL)			6.13		5.94	
DEPTH TO INVERT (m)			-0.06		-0.15	
PIPE TYPE, DIA (mm) & LENGTH (m)			DN 600 17.5m			
GRADE (%)			1.09%			

OUTLET 2 - LONG SECTION (C / 013)
HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:250



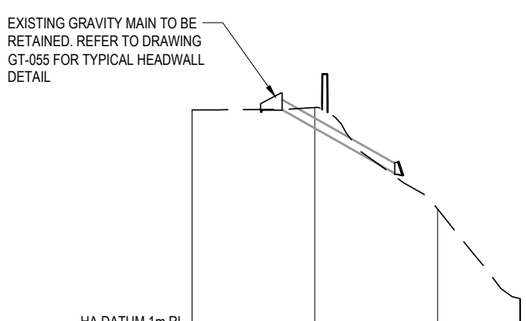
HA.DATUM 3m RL							
CHAINAGE (m)	0.00	10.00	10.98	20.00	30.00	32.12	40.00	43.52
EXISTING GROUND LEVEL (m RL)	6.45	6.26	6.24	6.06	5.83	5.90	5.22	4.23
PIPE INVERT LEVEL (m RL)	5.36					4.77		
DEPTH TO INVERT (m)	0.90					-0.12		
PIPE TYPE, DIA (mm) & LENGTH (m)			DN 300 RCRRJ CLASS 2 32.0m					
GRADE (%)			1.83%					

OUTLET 2 - LONG SECTION (D / 014)
HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:250



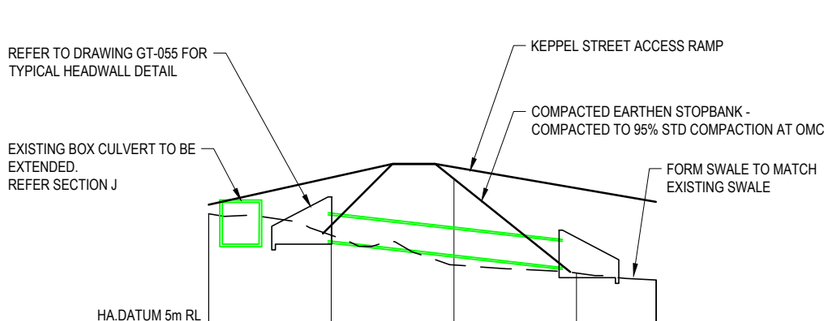
HA.DATUM 4m RL						
CHAINAGE (m)	0.00	2.82	10.00	16.01	19.67	
EXISTING GROUND LEVEL (m RL)	8.81	8.02	6.91	5.96	5.54	
PIPE INVERT LEVEL (m RL)		8.12		5.97		
DEPTH TO INVERT (m)		-0.09		-0.15		
PIPE TYPE, DIA (mm) & LENGTH (m)		DN 375 14.0m				
GRADE (%)		15.44%				

OUTLET 3 - LONG SECTION (G / 015)
HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:250



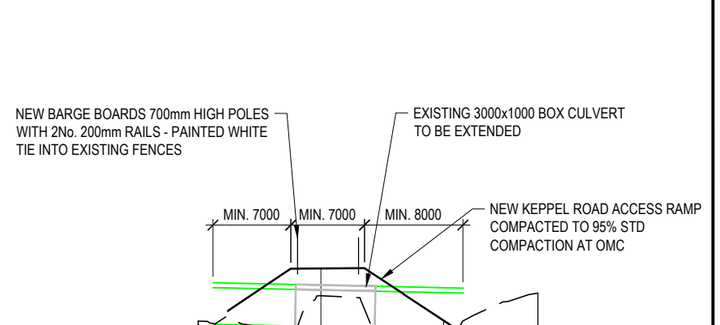
HA.DATUM 1m RL						
CHAINAGE (m)	0.00	10.00	10.58	11.04	20.00	26.72
EXISTING GROUND LEVEL (m RL)	10.11	10.21	10.14	10.02	6.07	2.42
PIPE INVERT LEVEL (m RL)		10.13		7.54		
DEPTH TO INVERT (m)		-0.01		-0.14		
PIPE TYPE, DIA (mm) & LENGTH (m)		EXISTING DN 375 9.2m				
GRADE (%)		28.18%				

OUTLET 4 - LONG SECTION (H / 015)
HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:250



HA.DATUM 5m RL							
CHAINAGE (m)	0.00	9.31	10.00	20.00	29.49	30.00	36.50
EXISTING GROUND LEVEL (m RL)	9.80	8.85	8.73	7.52	7.23	7.19	6.90
PIPE INVERT LEVEL (m RL)			8.50		7.41		
DEPTH TO INVERT (m)			0.27		-0.16		
PIPE TYPE, DIA (mm) & LENGTH (m)			DN 1050 19.2m				
GRADE (%)			-5.68%				

OUTLET 5 - LONG SECTION (I / 016)
HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:250



HA.DATUM 6m RL					
CHAINAGE (m)	0.00	10.00	20.00	27.68	
EXISTING GROUND LEVEL (m RL)	8.49	9.53	7.59	9.63	
PIPE INVERT LEVEL (m RL)	8.36		8.13		
PIPE TYPE, DIA (mm) & LENGTH (m)	EX BOX CULVERT (3000X1000) 20.5m				
GRADE (%)	-1.11%				

EXISTING BOX CULVERT - LONG SECTION (K / 016)
HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:250

ORIGINAL DRAWING IN COLOUR

0 10 20m
SCALE 1:500 (A3)

FOR TENDER

NO.	REVISION	DATE	APP.
0	FOR TENDER	OCT 25	GS

HAWKE'S BAY REGIONAL COUNCIL
TE KAUNIHERA Ā-ROHE O TE MATAU-A-MĀUI

PATTLE DELAMORE PARTNERS

ACE MEMBER

CLIENT: HAWKE'S BAY REGIONAL COUNCIL
PROJECT: PŌRANGAHAU STOPBANKS

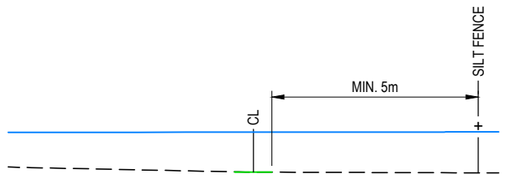
DESIGNED	DESIGN REVIEW	DATE	APPROVED	DATE
OH	GS	SEP 25		----
DRAWN	DRAWING CHECK	DATE	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED	
SHK		SEP 25		

PORANGAHAU STOPBANKS STORMWATER OUTLET LONG SECTIONS

SCALE :	DRAWING NO. :	REV :
AS SHOWN (A3)	HB01041700-SK-050	0

NOTES:

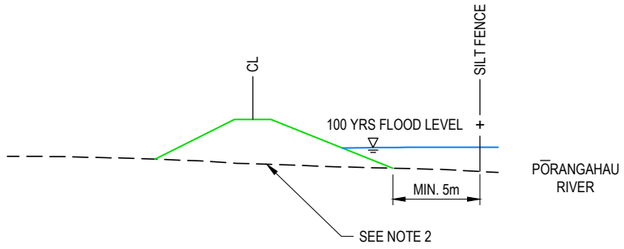
1. FOR GENERAL NOTES REFER HB01041700-GT-002.
2. STOPBANK FOOTPRINT TO BE CLEARED OF ALL VEGETATION AND TOPSOIL REMOVED TO STOCK PILE AREA.
3. FOOTPRINT TO BE COMPACTED IN-SITU.
4. ALL EARTHWORKS VOLUMES TO BE MEASURED TO THE DIMENSIONS ON THE DRAWINGS.
5. ALL EARTHWORKS TO BE COMPACTED TO 95% STANDARD NZ COMPACTION (HEAVY).
6. ALL EARTHWORKS TO BE OVERFILLED AND TRIMMED BACK TO THE DIMENSIONS ON THE DRAWINGS.
7. REFER TO DRAWING HB01041700-GT-055 FOR TYPICAL STOPBANK DETAIL.



H.A.DATUM: 5m RL

PROPOSED DESIGN LEVELS (m RL)	8.973	8.963	8.959	
EXISTING LEVELS (m RL)	8.97	8.96	8.96	
LEVEL DIFFERENCE (m)	0.00	0.00	0.00	
OFFSETS (m)	-0.77	0.00	0.76	

XSEC CL-STOPBANK-CEMETARY-SLG_51 (CH:00)
SCALE 1:250



H.A.DATUM: 5m RL

PROPOSED DESIGN LEVELS (m RL)	10.208	11.826	9.838	
EXISTING LEVELS (m RL)	10.21	10.02	9.84	
LEVEL DIFFERENCE (m)	0.00	1.81	0.00	
OFFSETS (m)	-3.98	0.00	5.72	

XSEC CL-STOPBANK-CEMETARY-SLG_52 (CH:50)
SCALE 1:250

0 5 10m
SCALE 1:250 (A3)

FOR TENDER

ORIGINAL DRAWING IN COLOUR

NO.	REVISION	DATE	APP.
0	FOR TENDER	OCT 25	GS
B	FOR CONSENT	APR 25	
A	FOR INFORMATION	JUL 24	GS

HAWKE'S BAY REGIONAL COUNCIL
TE KAUNIHERA Ā-ROHE O TE MATAU-A-MĀUI

PATTLE DELAMORE PARTNERS

CLIENT: HAWKE'S BAY REGIONAL COUNCIL

PROJECT: PŌRANGAHAU STOPBANKS

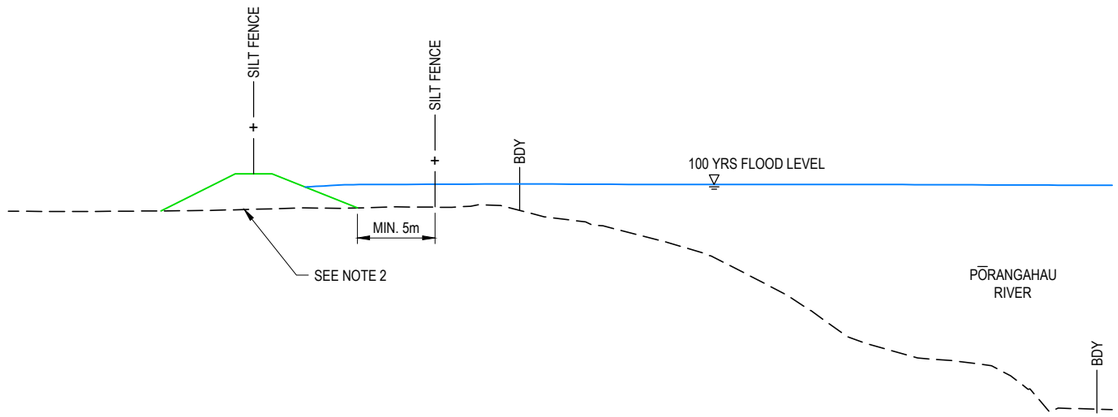
DESIGNED	DESIGN REVIEW	DATE	APPROVED	DATE
OH	GS	JUL 24		
DRAWN	DRAWING CHECK	DATE	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED	
SHK		JUL 24		

KAIWHITIKITIKI URUPA STOPBANK CROSS SECTIONS SHEET 1

SCALE :	DRAWING NO. :	REV :
AS SHOWN (A3)	HB01041700-GT-051	0

NOTES:

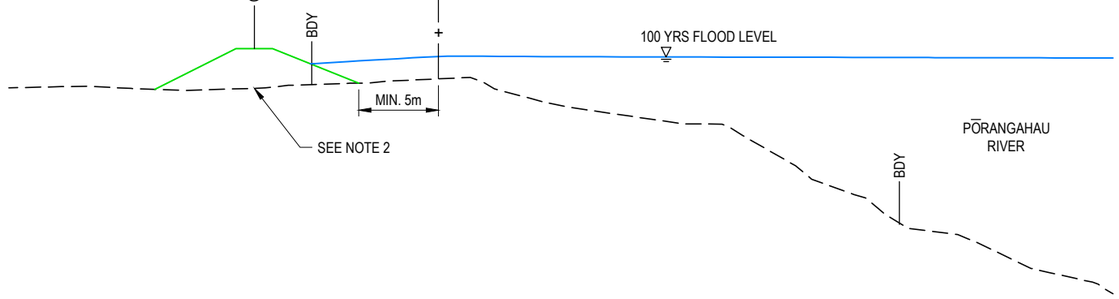
1. FOR GENERAL NOTES REFER HB01041700-GT-002.
2. STOPBANK FOOTPRINT TO BE CLEARED OF ALL VEGETATION AND TOPSOIL REMOVED TO STOCK PILE AREA.
3. FOOTPRINT TO BE COMPACTED IN-SITU.
4. ALL EARTHWORKS VOLUMES TO BE MEASURED TO THE DIMENSIONS ON THE DRAWINGS.
5. ALL EARTHWORKS TO BE COMPACTED TO 95% STANDARD NZ COMPACTION (HEAVY).
6. ALL EARTHWORKS TO BE OVERFILLED AND TRIMMED BACK TO THE DIMENSIONS ON THE DRAWINGS.
7. REFER TO DRAWING HB01041700-GT-055 FOR TYPICAL STOPBANK DETAIL.



H.A.DATUM: 0m RL

PROPOSED DESIGN LEVELS (m RL)	10.312	11.825	10.432	
EXISTING LEVELS (m RL)	10.31	10.38	10.43	
LEVEL DIFFERENCE (m)	0.00	1.45	0.00	
OFFSETS (m)	-3.78	0.00	4.23	

XSEC CL-STOPBANK-CEMETARY-SLG_53 (CH:100)
SCALE 1:250



H.A.DATUM: 0m RL

PROPOSED DESIGN LEVELS (m RL)	10.172	11.825	10.423	
EXISTING LEVELS (m RL)	10.17	10.21	10.42	
LEVEL DIFFERENCE (m)	0.00	1.61	0.00	
OFFSETS (m)	-4.06	0.00	4.26	

XSEC CL-STOPBANK-CEMETARY-SLG_54 (CH:150)
SCALE 1:250

0 5 10m
SCALE 1:250 (A3)

FOR TENDER

ORIGINAL DRAWING IN COLOUR

NO.	REVISION	DATE	APP.
0	FOR TENDER	OCT 25	GS
B	FOR CONSENT	APR 25	
A	FOR INFORMATION	JUL 24	GS

HAWKES BAY REGIONAL COUNCIL
TE KAUNIHERA Ā-ROHE O TE MATAU-A-MĀUI

PATTLE DELAMORE PARTNERS

ACE MEMBER

CLIENT: HAWKE'S BAY REGIONAL COUNCIL

PROJECT: PŌRANGAHAU STOPBANKS

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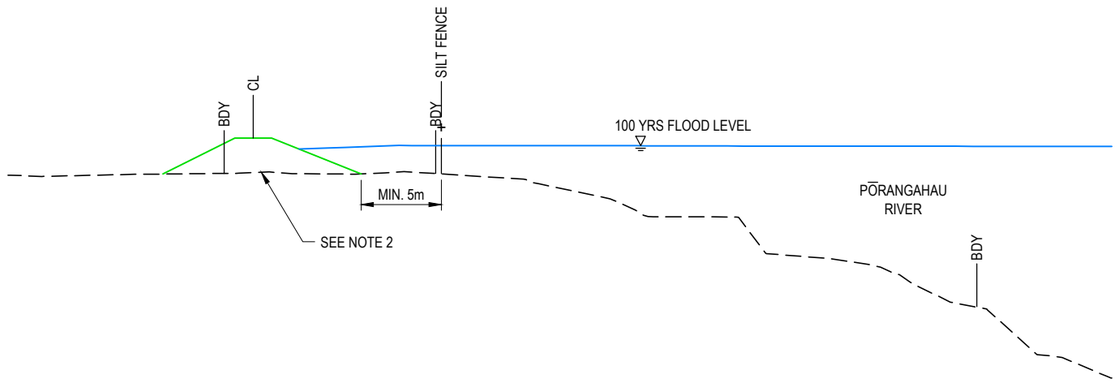
OH	GS	JUL 24		
DRAWN	DRAWING CHECK	DATE	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED	
SHK		JUL 24		

KAIWHITIKITIKI URUPA STOPBANK CROSS SECTIONS SHEET 2

SCALE :	DRAWING NO. :	REV :
AS SHOWN (A3)	HB01041700-GT-052	0

Plot: 14/10/2025 9:40:25 am
FILED: HB01041700-GT-052.dwg



H.A.DATUM: 0m RL

PROPOSED DESIGN LEVELS (m RL)	10.359	11.825	10.365	
EXISTING LEVELS (m RL)	10.36	10.42	10.36	
LEVEL DIFFERENCE (m)	0.00	1.41	0.00	
OFFSETS (m)	-3.68	0.00	4.40	

XSEC CL-STOPBANK-CEMETARY-SLG_55 (CH:200)
SCALE 1:250

NOTES:

1. FOR GENERAL NOTES REFER HB01041700-GT-002.
2. STOPBANK FOOTPRINT TO BE CLEARED OF ALL VEGETATION AND TOPSOIL REMOVED TO STOCK PILE AREA.
3. FOOTPRINT TO BE COMPACTED IN-SITU.
4. ALL EARTHWORKS VOLUMES TO BE MEASURED TO THE DIMENSIONS ON THE DRAWINGS.
5. ALL EARTHWORKS TO BE COMPACTED TO 95% STANDARD NZ COMPACTION (HEAVY).
6. ALL EARTHWORKS TO BE OVERFILLED AND TRIMMED BACK TO THE DIMENSIONS ON THE DRAWINGS.
7. REFER TO DRAWING HB01041700-GT-055 FOR TYPICAL STOPBANK DETAIL.

0 5 10m
SCALE 1:250 (A3)

FOR TENDER

ORIGINAL DRAWING IN COLOUR

NO.	REVISION	DATE	APP.
0	FOR TENDER	OCT 25	GS
B	FOR CONSENT	APR 25	
A	FOR INFORMATION	JUL 24	GS

HAWKE'S BAY REGIONAL COUNCIL
TE KAUNIHERA Ā-ROHE O TE MATAU-A-MĀUI

PATTLE DELAMORE PARTNERS

ACE MEMBER

CLIENT: HAWKE'S BAY REGIONAL COUNCIL

PROJECT: PŌRANGAHAU STOPBANKS

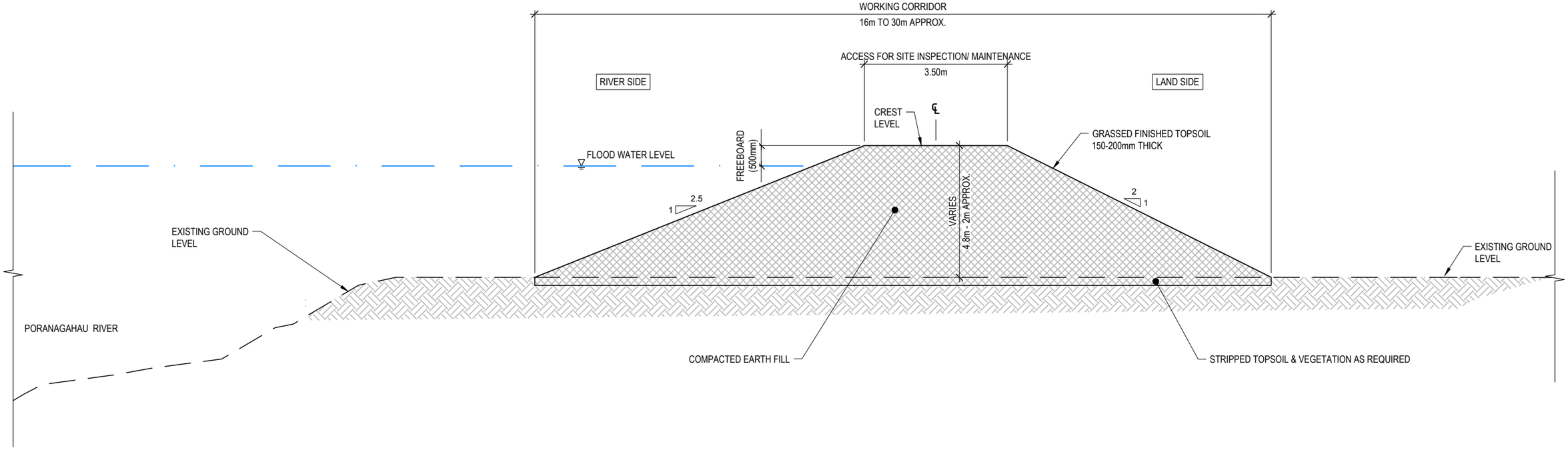
DESIGNED	DESIGN REVIEW	DATE	APPROVED	DATE
OH	GS	JUL 24		
DRAWN	DRAWING CHECK	DATE	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED	
SHK		JUL 24		

KAIWHITIKITIKI URUPA STOPBANK CROSS SECTIONS SHEET 3

SCALE :	DRAWING NO. :	REV :
AS SHOWN (A3)	HB01041700-GT-053	0

NOTES:

1. REFER TO DRAWING HB01041700-GT-002 FOR GENERAL NOTES.
2. DIMENSIONS IN METERS UNLESS OTHERWISE SHOWN.
3. ALL CULVERT BEDDING MATERIAL TO BE IN ACCORDANCE WITH NZS 3725.
4. ALL EARTHWORKS VOLUMES TO BE MEASURED TO DIMENSION ON THE DRAWINGS.
5. ALL FILL TO BE PLACED IN MAX. 300mm LIFTS TO AT LEAST 95% OF MAX DRY DENSITY (HEAVY).
6. ALL EARTHWORKS TO BE OVERFILLED AND TRIMMED BACK TO DIMENSIONS ON THE DRAWINGS.
7. COMPLICATED SURFACES TO BE SACRIFICED AFTER APPROVAL OF TEST RESULTS BEFORE APPLYING THE NEXT LAYER.
8. REFER TO DRAWING HB01041700-GT-059 FOR TYPICAL STORMWATER OUTLET DETAIL.



EARTH FILL STOPBANK TYPICAL SECTION (1/-)
SCALE 1:100

0 1 2 3 4 5m
SCALE 1:100 (A3)

WORKING PLOT

ORIGINAL DRAWING IN COLOUR

NO.	REVISION	DATE	APP.
----	----	----	

HAWKES BAY REGIONAL COUNCIL
TE KAUNIHERA Ā-ROHE O TE MATAU-A-MĀUI

PATTLE DELAMORE PARTNERS

CLIENT: HAWKE'S BAY REGIONAL COUNCIL

PROJECT: PŌRANGAHAU STOPBANKS

DESIGNED	DESIGN REVIEW	DATE	APPROVED	DATE
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DRAWN	DRAWING CHECK	DATE	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED	
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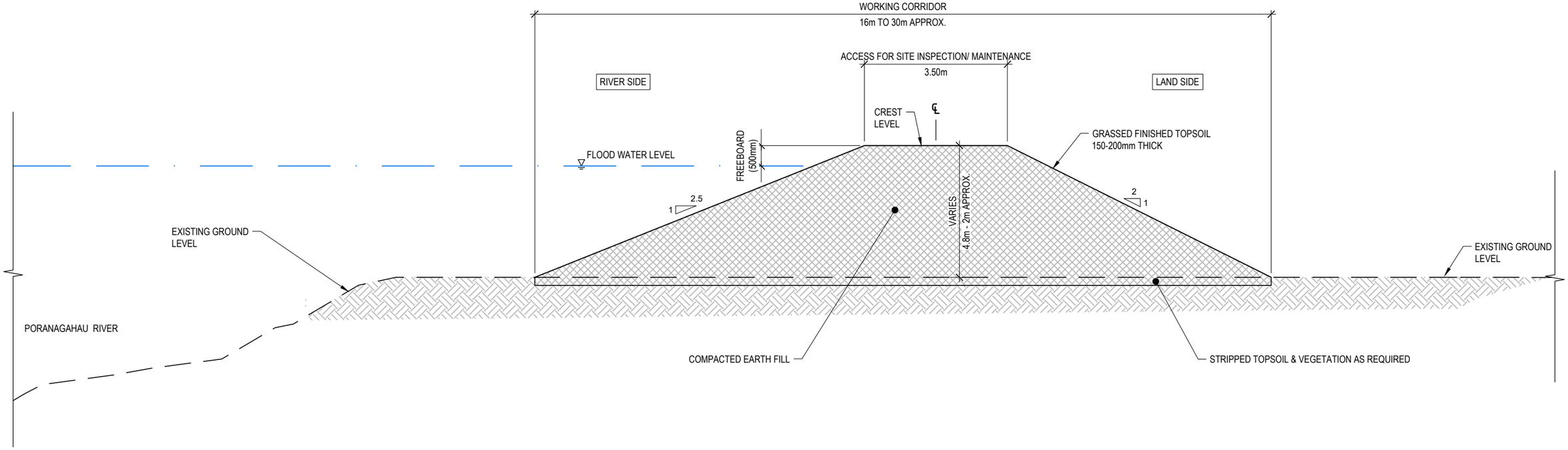
EARTH FILL STOPBANK TYPICAL SECTION

SCALE :	DRAWING NO. :	REV :
AS SHOWN (A3)	HB01041700-GT-055	A

NOTES:

1. REFER TO DRAWING HB01041700-GT-002 FOR GENERAL NOTES.
2. DIMENSIONS IN METERS UNLESS OTHERWISE SHOWN.
3. ALL CULVERT BEDDING MATERIAL TO BE IN ACCORDANCE WITH NZS 3725.
4. ALL EARTHWORKS VOLUMES TO BE MEASURED TO DIMENSION ON THE DRAWINGS.
5. ALL FILL TO BE PLACED IN MAX. 300mm LIFTS TO AT LEAST 95% OF MAX DRY DENSITY (HEAVY).
6. ALL EARTHWORKS TO BE OVERFILLED AND TRIMMED BACK TO DIMENSIONS ON THE DRAWINGS.
7. COMPLICATED SURFACES TO BE SACRIFICED AFTER APPROVAL OF TEST RESULTS BEFORE APPLYING THE NEXT LAYER.
8. REFER TO DRAWING HB01041700-GT-059 FOR TYPICAL STORMWATER OUTLET DETAIL.



EARTH FILL STOPBANK TYPICAL SECTION (1/-)
SCALE 1:100

0 1 2 3 4 5m
SCALE 1:100 (A3)

WORKING PLOT

ORIGINAL DRAWING IN COLOUR

NO.	REVISION	DATE	APP.
----	----	----	

HAWKES BAY REGIONAL COUNCIL
TE KAUNIHERA Ā-ROHE O TE MATAU-A-MĀUI

PATTLE DELAMORE PARTNERS

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----		----		----
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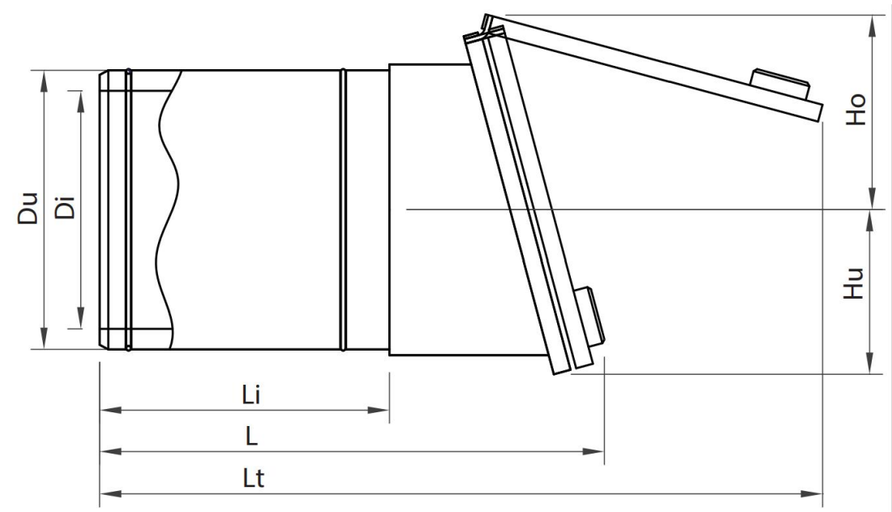
----		----		

EARTH FILL STOPBANK TYPICAL SECTION

SCALE :	DRAWING NO. :	REV :
AS SHOWN (A3)	HB01041700-GT-055	A

WAFLAPTM

FLAP VALVE - KVI DN/OD 200-630



DIMENSIONS IN [MM]

DN/OD	Ø	Du	Di	B	Li	L	Lt	Ho	Hu	WEIGHT [KG]
200	200	181-200	164	225	200	395	530	166	107	4,1
225	225	205-225	184	275	200	400	560	181	121	4,8
250	250	230-250	205	275	250	470	650	197	132	6,1
280	280	250-280	230	305	250	495	670	214	147	7,5
300	315	280-315	258	345	300	500	735	239	165	10,9
350	355	320-355	291	405	300	630	775	245	203	15,2
400	400	359-400	327	450	400	730	940	274	226	18,6
450	450	405-450	368	510	450	800	1080	322	256	29
500	500	451-500	409	560	500	900	1175	338	281	42
550	550	500-560	458	610	560	980	1320	387	306	53,2
600	630	558-630	516	710	600	1040	1460	431	357	73,2

Other dimensions on request. Reserves the right to changes.

Contact: wapro.com +46 (0)454 185 10 sales@wapro.com
Contact GB and IE: wapro.com +44 114 308 0123 sales@wapro.com

FOR TENDER

NO.	REVISION	DATE	APP.
0	FOR TENDER	OCT 25	GS

CLIENT: HAWKE'S BAY REGIONAL COUNCIL
PROJECT: PŌRANGAHAU STOPBANKS

DESIGNED	DESIGN REVIEW	DATE	APPROVED	DATE
OH	GS	SEP 25		----
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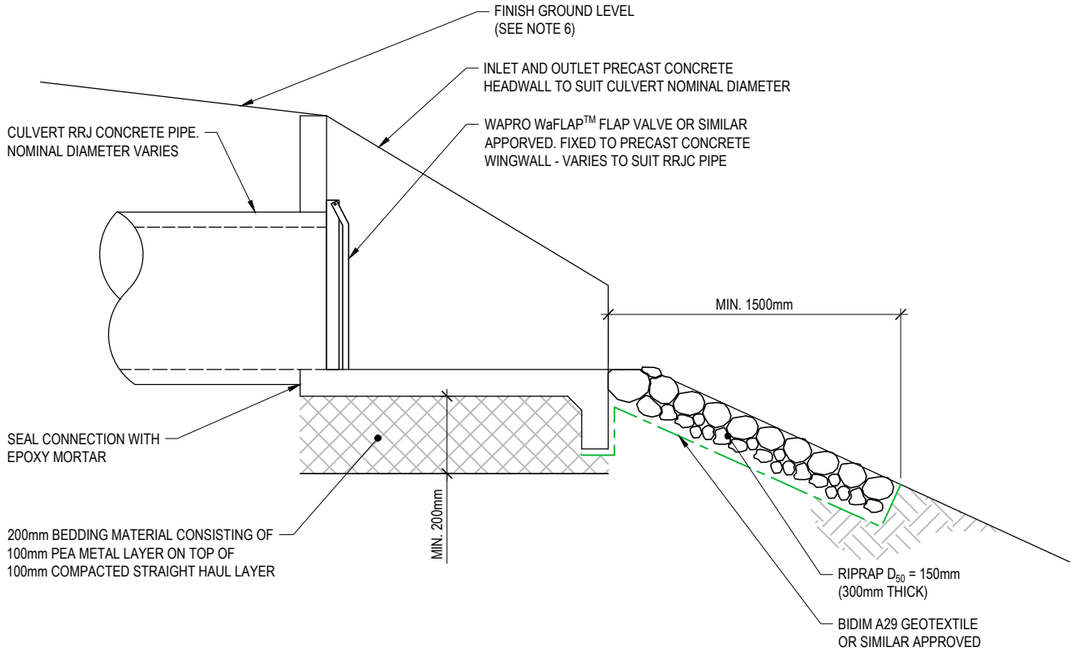
SHK		SEP 25		

TYPICAL DETAILS SHEET 2

SCALE :	DRAWING NO. :	REV :
AS SHOWN (A3)	HB01041700-GT-058	0



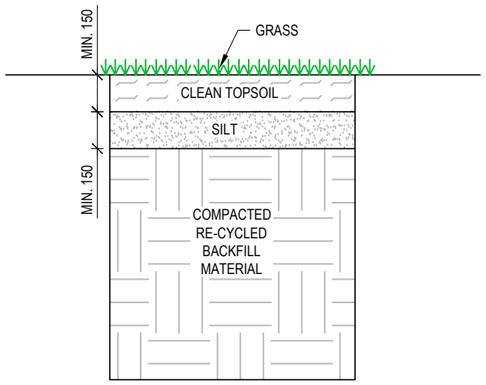
TYPICAL CULVERT HEADWALL DETAILS

NTS

TABLE OF PIPE CULVERTS		
DESCRIPTION	NOMINAL DIAMETER	PIPE MATERIAL
OUTLET 1	300mm	RRJ CONCRETE
OUTLET 2	600mm	RRJ CONCRETE
OUTLET 3	300mm	RRJ CONCRETE
OUTLET 4	375mm	RRJ CONCRETE
OUTLET 5	375mm	TO SUIT EXISTING SW PIPE
OUTLET 6	1050mm	RRJ CONCRETE

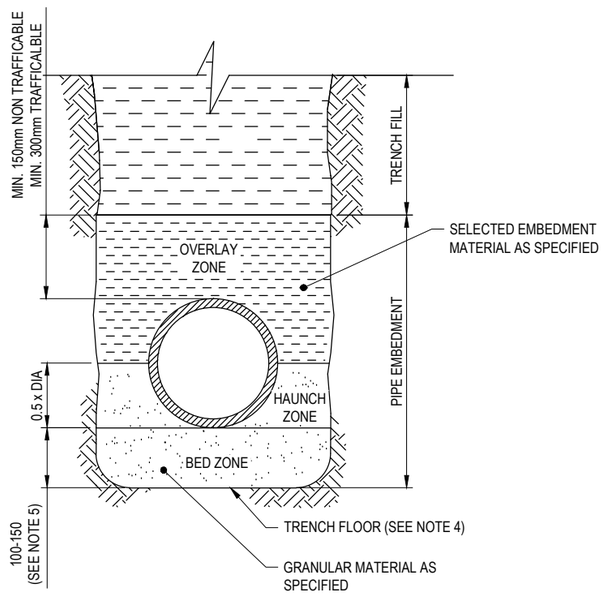
NOTES:

1. ALL DIMENSION ARE IN MILLIMETRES UNLESS SPECIFIED.
2. PIPE TRENCH DETAIL:
   2.1. RIGID PIPES: REINFORCE CONCRETE
3. PLACEMENT OF EMBEDMENT, TRENCHFILL AND COMPACTION TO MEET THE REQUIRMENTS OF THE CONTRACT SPECIFICATIONS.
4. EXCAVATE OR COMPACT TRENCH FLOOR TO PROVIDE A FIRM BASE (MIN. 50KPa) TO SUPPORT BEDDING MATERIAL AND MINIMISE PIPELINE SETTLEMENT.
5. ENSURE BEDDING IS DEEP ENOUGH THAT PIPE JOINT PROJECTIONS (SOCKETS, FLANGES) DO NOT TOUCH THE TRENCH FLOOR.
6. PRECAST HEADWALLS ARE NOT TO SIT PROUD AGAINST SURROUNDING SURFACE.



TYPICAL URBAN BERM REINSTATEMENT DETAIL

NTS



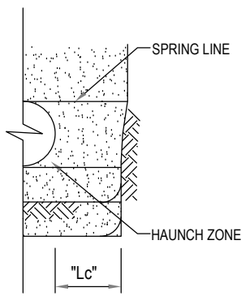
TYPICAL EMBEDMENT DETAIL - TYPE HS2 SUPPOT

NTS

SPRING LINE TRENCH CLEARANCE

NOMINAL DIAMETER DN	MINIMUM CLEARANCE "Lc"
<150	100
>150-<300	150
>300-<450	200
>450-<900	300
>900-<1500	350

TRENCH WIDTH TO BE SUFFICIENT TO
SAFELY LAY PIPE AND
COMPACT THE SIDE SUPPORT ZONE.



MINIMUM TRENCH WIDTH

NTS

0 5 10m

SCALE 1:250 (A3)

FOR TENDER

NO.	REVISION	DATE	APP.
0	FOR TENDER	OCT 25	GS

HAWKES BAY REGIONAL COUNCIL
TE KAUNIHERA Ā-ROHE O TE MATAU-A-MĀUI

PATTLE DELAMORE PARTNERS

CLIENT: HAWKE'S BAY REGIONAL COUNCIL

PROJECT: PŌRANGAHAU STOPBANKS

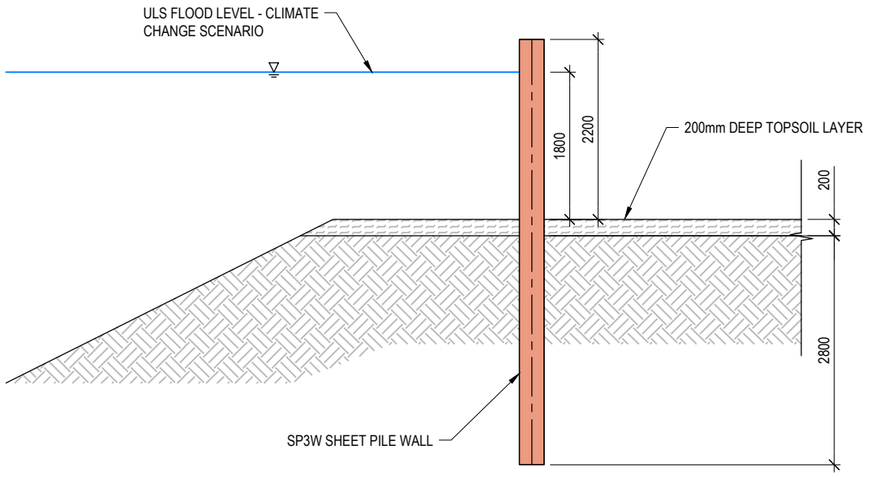
DESIGNED	DESIGN REVIEW	DATE	APPROVED	DATE
OH	GS	SEP 25		----
DRAWN	DRAWING CHECK	DATE	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED	
SHK		SEP 25		

TYPICAL DETAILS SHEET 3

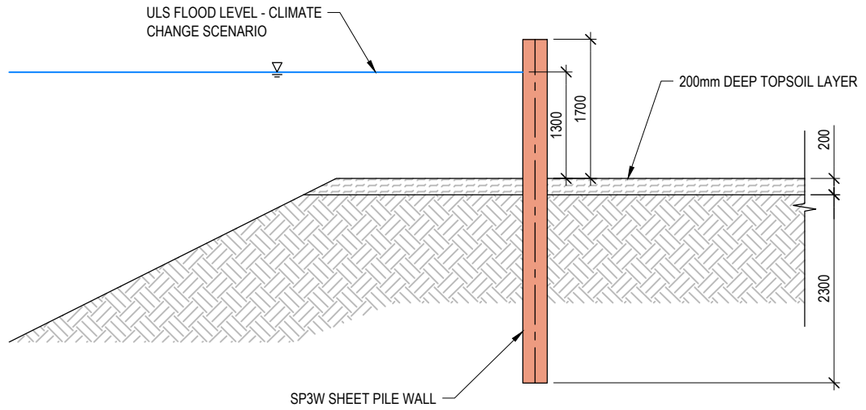
SCALE :	DRAWING NO. :	REV :
AS SHOWN (A3)	HB01041700-GT-057	0

NOTES

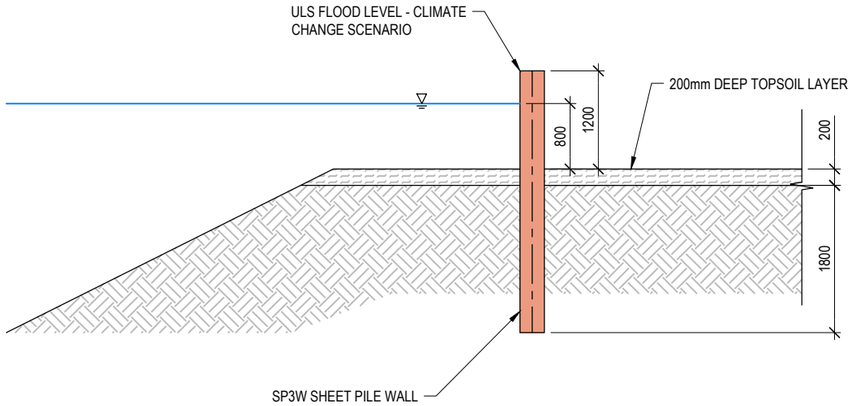
1. NUMBER OF REQUIRED SHEET-PILES ARE ESTIMATES, IT SHOULD BE CHECKED AND CONFIRMED BY QUANTITY SURVEYOR.
2. HIT AND MISS WELDING REQUIRED CLUTCHES.



TYPE A - 2.2m HIGH SHEET PILE WALL
SCALE 1:75



TYPE B - 1.7m HIGH SHEET PILE WALL
SCALE 1:75



TYPE C - 1.2m HIGH SHEET PILE WALL
SCALE 1:75

FOR TENDER

NO.	REVISION	DATE	APP.
0	FOR TENDER	OCT 25	GS

HAWKE'S BAY REGIONAL COUNCIL
TE KAUNIHERA Ā-ROHE O TE MATAU-A-MĀUI

PATTLE DELAMORE PARTNERS

ACE MEMBER

CLIENT: HAWKE'S BAY REGIONAL COUNCIL

PROJECT: PŌRANGAHAU STOPBANKS

DESIGNED	DESIGN REVIEW	DATE	APPROVED	DATE
OH	GS	OCT 25		----
DRAWN	DRAWING CHECK	DATE	THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED	
SHK	DFP	OCT 25		

TYPICAL DETAILS SHEET 5

SCALE :	DRAWING NO. :	REV :
AS SHOWN (A3)	HB01041700-GT-061	0

Plot: 14/10/2025 10:53:41 am
FILED: HB01041700-GT-061.dwg

Appendix B: EIANZ Tables

Table B-1: Attributes to be considered when assigning ecological value or importance to a site or area of vegetation/habitat/community. Adapted from EIANZ (2018)

Matters	Attributes to be considered
Representativeness	Criteria for representative vegetation and aquatic habitats: ⁘ Typical structure and composition; ⁘ Indigenous species dominate; ⁘ Expected species and tiers are present; and, ⁘ Thresholds may need to be lowered where all examples of a type are strongly modified. Criteria for representative species and species assemblages: ⁘ Species assemblages that are typical of the habitat; and, ⁘ Indigenous species that occur in most of the guilds expected for the habitat type.
Rarity/distinctiveness	Criteria for rare/distinctive vegetation and habitats: ⁘ Naturally uncommon, or induced scarcity; ⁘ Amount of habitat or vegetation remaining; ⁘ Distinctive ecological features; and, ⁘ National priority for protection. Criteria for rare/distinctive species or species assemblages: ⁘ Habitat supporting nationally Threatened or At Risk species, or locally uncommon species; ⁘ Regional or national distribution limits of species or communities; ⁘ Unusual species or assemblages; and, ⁘ Endemism.

Table B-1: Attributes to be considered when assigning ecological value or importance to a site or area of vegetation/habitat/community. Adapted from EIANZ (2018)

Matters	Attributes to be considered
Diversity and pattern	⁘ Level of natural diversity, abundance, and distribution; ⁘ Biodiversity reflecting underlying diversity; ⁘ Biogeographical considerations – pattern, complexity; and, ⁘ Temporal considerations, considerations of lifecycles, daily or seasonal cycles of habitat availability and utilisation.
Ecological context	⁘ Site history, and local environmental conditions which have influenced the development of habitats and communities; ⁘ The essential characteristics that determine an ecosystem's integrity, form, functioning, and resilience (from "intrinsic value" as defined in RMA); ⁘ Size, shape, and buffering; ⁘ Condition and sensitivity to change; ⁘ Contribution of the site to ecological networks, linkages, pathways and the protection and exchange of genetic material; and, ⁘ Species role in ecosystem functioning – high level, key species identification, habitat as proxy.

Table B-2: Attributes to be considered when assigning ecological value to a freshwater site or area. Adapted from EIANZ (2018)

Matters	Attributes to be assessed
Representativeness	⁘ Extent to which site/catchment is typical or characteristic; ⁘ Stream order; ⁘ Permanent, intermittent or ephemeral waterway; ⁘ Catchment size; and, ⁘ Standing water characteristics.
Rarity/distinctiveness	⁘ Supporting nationally or locally Threatened, At Risk or uncommon species; ⁘ National distribution limits; ⁘ Endemism; ⁘ Distinctive ecological features; and, ⁘ Type of lake/pond/wetland/spring.
Diversity and pattern	⁘ Level of natural diversity; ⁘ Diversity metrics; ⁘ Complexity of community; and, ⁘ Biogeographical considerations – pattern, complexity, size, shape.
Ecological context	⁘ Stream order; ⁘ Instream habitat; ⁘ Riparian habitat; ⁘ Local environmental conditions and influences, site history and development; ⁘ Intactness, health and resilience of populations and communities; ⁘ Contribution to ecological networks, linkages, pathways; and, ⁘ Role in ecosystem functioning – high level, proxies.

Table B-3: Factors considered in assigning value to terrestrial species. Adapted from EIANZ (2018)	
Determining factors	**Value**
Nationally Threatened species found in the Zone of Impact (ZOI), either permanently or seasonally	Very high
Species listed as At Risk – Declining found in the ZOI, either permanently or seasonally	High
Species listed under any other category of At Risk found within the ZOI, either permanently or seasonally	Moderate
Locally (Ecological District) uncommon or distinctive species	Moderate
Nationally and locally common indigenous species	Low
Exotic species, including pests, species having recreational value	Very low

Table B-4: Scoring sites combining values for four matters in Tables B-1 or B-2. Adapted from EIANZ (2018)	
Value	**Description**
Very high	Area rates High for three or all of the four assessment matters listed in Tables B-1 or B-2. Likely to be nationally important and recognised as such
High	Area rates High for two of the assessment matters, Moderate and Low for the remainder, or Area rates High for one of the assessment matters, Moderate for the remainder. Likely to be regionally important and recognised as such
Moderate	Area rates High for one matter. Moderate and Low for the remainder, or Area rates moderate for two or more assessment matters and Low or Very low for the remainder Likely to be important at the level of the Ecological District
Low	Area rates Low or Very Low for the majority of assessment matters and Moderate for one. Limited ecological value other than as local habitat for tolerant native species
Very low	Area rates Very Low for three or all matters and Moderate or Low for the remainder.

Table B-5: Criteria for describing magnitude of effect. Adapted from EIANZ (2018)	
Magnitude of effect	**Description**
Very high	Total loss of, or major alteration to, baseline condition.
High	Major loss or alteration to baseline conditions.
Moderate	Loss or alteration to one or more key elements/features of the original baseline condition; and, Loss of a moderate proportion of the known population or range of the element/feature.
Low	Minor shift away from existing baseline condition; and/or, Having a minor effect on the known population or range of the element/feature.
Negligible	Very slight change from existing baseline condition; and/or, Having negligible effect on the known population or range of the element/feature.

Table B-6: Criteria for describing level of effects. Adapted from EIANZ (2018)					
Magnitude of effect	**Ecological Value**				
	Very High	**High**	**Moderate**	**Low**	**Very Low**
Very High	Very High	Very High	High	Moderate	Low
High	Very High	Very High	Moderate	Low	Very Low
Moderate	High	High	Moderate	Low	Very Low
Low	Moderate	Low	Low	Very Low	Very Low
Negligible	Low	Very Low	Very Low	Very Low	Very Low

Appendix C: eDNA Results

Table C-1: Select Pōrangahau River eDNA Results, 2022

Scientific name	Common name	Group	515823	515824	515825	515826	515827	515828
Litoria	Australasian tree frogs	Amphibians	20	54	139	17	0	0
Anura	Anurans	Amphibians	7	0	10	0	0	0
Anas platyrhynchos	Rakiraki,Mallard duck	Birds	881	597	1809	1120	106	768
Tadorna variegata	Pūtangitangi,Paradise Shelduck	Birds	5	16	95	0	0	43
Phalacrocorax carbo	Kawau pū,Black Shag	Birds	69	6	0	23	0	55
Columba livia	Pigeon	Birds	0	20	96	0	0	0
Microcarbo melanoleucos	Kawaupaka,Little shag	Birds	0	39	0	23	0	0
Turdus philomelos	Song thrush	Birds	0	21	20	0	0	0
Cygnus atratus	Wāna; wani,Black swan	Birds	0	0	24	12	0	0
Fringilla coelebs	Pahirini,Common chaffinch	Birds	30	0	0	5	0	0
Sturnus vulgaris	Tāringi,Common starling	Birds	14	0	12	0	0	7
Egretta novaehollandiae	Matuku moana,White-faced heron	Birds	0	24	0	0	0	7
Turdus merula	Manu pango,Blackbird	Birds	0	12	0	0	0	9
Hirundo neoxena	Warou,Welcome swallow	Birds	0	20	0	0	0	0
Circus approximans	Swamp harrier	Birds	0	19	0	0	0	0
Passer domesticus	Tiu,House sparrow	Birds	0	0	14	0	0	0
Anas chlorotis or gracilis	Pāteke,Brown or grey teal	Birds	0	0	0	11	0	0
Zosterops lateralis	Pihipihi; tauhou; hiraka,Silvereye	Birds	6	0	0	0	0	0
Turdus	Manu pango,Thrush	Birds	0	28	0	0	0	43
Egretta	Kōtuku,Plumed egrets	Birds	0	0	0	10	0	0
Anserinae	Swans and geese	Birds	0	0	44	45	0	0
Phalacrocoracidae	Cormorants and shags	Birds	15	0	19	6	0	0
Charadriidae		Birds	0	0	0	21	0	0
Acanthocyclops robustus	Copepod	Crustaceans	358	265	571	315	336	555
Mesocyclops leuckarti	Copepod	Crustaceans	0	200	84	67	56	233
Porcellio scaber	Woodlouse; Slater	Crustaceans	0	0	0	39	6	0
Paratya curvirostris	Koeke,NZ endemic freshwater shrimp	Crustaceans	0	0	6	10	9	0
Arcitalitrus	Sandhopper	Crustaceans	6	8	5	0	0	0
Eucypris		Crustaceans	0	0	6	0	0	0
Cyclopidae		Crustaceans	6	21	0	0	0	30
Hexanauplia		Crustaceans	0	0	0	0	0	8
Gobiomorphus huttoni	Redfin bully	Fish	644	702	851	903	26	757
Retropinna retropinna	Ngaore; paraki; pōrohe,Common smelt	Fish	142	989	373	835	19	276
Anguilla dieffenbachii	Tuna; kūwharuwharu; reherehe; kirirua,Longfin eel	Fish	129	276	134	239	5	177
Carassius auratus	Morihana,Goldfish	Fish	189	60	273	51	10	26
Galaxias maculatus	Īnanga,Inanga	Fish	67	34	145	75	26	93
Gobiomorphus cotidianus	Tīpokopoko; toitoi,Common bully	Fish	31	0	84	20	0	31
Anguilla australis	Tuna; hao; aopori; hikumutu,Shortfin eel	Fish	51	96	0	0	0	0
Gobiomorphus gobioides	Tītarakura; tīpokopoko,Giant bully	Fish	0	34	78	0	0	0
Galaxias fasciatus	Kokōpu,Banded kokopu	Fish	0	19	15	0	0	0
Mugil cephalus	Kanae; kanae raukura,Grey mullet	Fish	0	0	0	0	0	31
Rhombosolea leporina	Pātiki; pātiki tōtara; pātōtara,Yellowbelly flounder	Fish	0	0	0	18	0	0
Forsterygion lapillum	Common triplefin	Fish	0	0	0	0	0	13
Anguilla reinhardtii	Speckled longfin eel	Fish	0	0	0	11	0	0
Gobiomorphus	Bullies	Fish	888	1806	1553	1701	140	947
Gobiomorphus cotidianus/basalis/dinae	Titikura,Common/Cran/Dinahs bully	Fish	82	131	194	97	0	56
Galaxias	Galaxiids	Fish	7	19	0	0	0	0
Retropinnidae	Smelt	Fish	15	0	13	5	8	0
Eleotrinae		Fish	0	0	0	0	7	0
Cyprinoidei	Cyprinid fish	Fish	0	5	0	0	0	0
Percomorphaceae		Fish	0	0	0	0	0	32
Tuberolachnus salignus	Giant willow aphid	Insects	49	39	111	54	72	106
Rhopalosiphum padi	Bird cherry-oat aphid	Insects	30	20	52	5	52	39
Coloburiscus humeralis	NZ spinygilled mayfly	Insects	0	0	16	0	0	46
Ectopsocus briggsi	Psocopteran fly	Insects	26	0	0	26	0	8
Paratanytarsus grimmii	Chironomid	Insects	5	22	0	10	0	6
Capitophorus elaeagni	Artichoke aphid	Insects	0	0	6	15	12	6
Mythimna separata	Armyworm	Insects	6	7	12	0	0	13
Chrysomya rufifacies	Hairy maggot blow fly	Insects	8	0	0	9	0	8
Hydropsyche catherinae	Netspinning caddisfly	Insects	0	21	0	0	0	0
Corynoneura scutellata	Non-biting midge	Insects	10	0	0	0	9	0
Wesmaelius subnebulosus	Brown lacewing	Insects	0	15	0	0	0	0
Symplecta pilipes pilipes	Cranefly	Insects	0	0	0	0	0	11
Lucida lucia oebasus		Insects	0	0	0	0	10	0
Epiphyas postvittana	Light brown apple moth	Insects	0	0	0	0	0	8
Teleogryllus commodus	Black field cricket	Insects	0	0	7	0	0	0
Hydroptilidae sp. 12KH6B	Purse-case caddisfly	Insects	6	0	0	0	0	0
Austrosimulium australense	Sandfly	Insects	0	0	0	0	0	6
Xanthocnemis zealandica	Red damselfly	Insects	5	0	0	0	0	0
Lasionemopoda hirsuta		Insects	5	0	0	0	0	0
Latridiidae sp.		Insects	0	5	0	0	0	0
Chironomus	Midges	Insects	14	109	39	46	18	0
Deleatidium	NZ mayfly	Insects	0	24	0	13	0	7
Chironomus		Insects	0	14	0	0	0	25
Hydropsyche	Netspinning caddisfly	Insects	0	0	0	13	0	12
Limnophyes	Non-biting midge	Insects	0	0	11	0	0	0
Opogona	Fungus moth	Insects	11	0	0	0	0	0
Hudsonema	Cased caddisfly	Insects	6	0	0	0	0	0
Calliphora		Insects	0	0	0	5	0	0
Tuberolachnus	Giant willow aphid	Insects	5	0	0	0	0	0
Mythimna	Armyworm	Insects	5	0	0	0	0	0
Aphididae	Aphids	Insects	6	9	8	5	5	0
Hydropsychinae	Caddisflies	Insects	0	0	12	0	0	0
Chironomidae	Nonbiting midges	Insects	0	0	0	0	0	9
Trichoptera	Caddisflies	Insects	21	0	27	11	0	0
Diptera	Flies	Insects	19	25	5	0	0	0
Hemiptera		Insects	0	11	0	0	0	0
Lepidoptera	Butterflies and moths	Insects	7	0	0	0	0	0
Bos taurus	Kau,Cattle	Mammals	3658	4291	5039	4841	544	4364
Ovis aries	Pirikahu; hipi,Sheep	Mammals	202	574	498	429	78	189
Rattus norvegicus	Pouhawaiki; pou o hawaiki; kaingarua; maungarua,Norway Rat	Mammals	0	33	70	24	0	10
Cervus elaphus	Tia,Red Deer	Mammals	56	12	0	17	11	11
Rattus rattus	Hinamoki; inamoki,Black Rat	Mammals	0	0	0	17	0	9
Erinaceus europaeus	Hetiheti; tuatete,European hedgehog	Mammals	0	24	0	0	0	0
Mus musculus	House mouse	Mammals	0	0	18	0	0	0
Trichosurus vulpecula	Paihamu; paihama,Common brushtail possum	Mammals	5	0	0	0	5	0
Canis lupus familiaris	Pero,Dog	Mammals	0	0	0	9	0	0
Ovis	Hipi,Sheep; Ovine	Mammals	59	99	33	13	0	20
Caprinae		Mammals	122	160	185	26	16	56
Bovidae	Even-toed ungulates	Mammals	0	22	0	0	0	0
Artiodactyla	Hoofed Animals	Mammals	0	0	13	14	0	11
Potamopyrgus antipodarum	Mud Snail	Molluscs	13	10	0	39	0	9
Physella acuta	Left handed sinistral snail	Molluscs	7	14	11	0	0	35
Potamopyrgus	Mud snails	Molluscs	71	222	557	250	36	169
Milax		Molluscs	0	5	0	0	0	0
Helicoidea		Molluscs	12	31	19	6	0	13
Tateidae	Aquatic snails	Molluscs	10	0	22	0	0	9
Helicidae		Molluscs	0	0	7	0	0	0
Caenogastropoda		Molluscs	71	74	96	91	122	60
Gastropoda	Gastropods	Molluscs	51	38	58	95	85	62
Chaetogaster diastrophus	Oligochaete worm	Worms	2481	428	1388	319	3959	3320
Potamothrix bavaricus	Aquatic oligochaete worm	Worms	104	447	382	223	58	211
Nais christinae	Sludgeworm	Worms	0	63	208	27	0	25
Lumbricus rubellus	Red earthworm	Worms	7	116	15	17	11	50
Branchiura sowerbyi	Oligochaete worm	Worms	5	23	105	32	0	19
Tubifex tubifex	Sludge worm	Worms	10	102	32	0	0	0
Eiseniella tetraedra	Squaretail worm	Worms	20	44	45	13	0	13
Allolobophora chlorotica	Green worm	Worms	0	37	51	13	0	0
Lumbriculus variegatus	Blackworm	Worms	0	34	13	21	7	0
Bothrioneurum vejdovskyanum	Worm	Worms	0	0	53	0	0	0
Lumbricus terrestris	Common earthworm	Worms	9	0	17	18	0	0
Aulodrilus pluriseta	Aquatic oligochaete worm	Worms	0	0	29	0	0	14
Eukerria saltensis	Worm	Worms	0	0	11	0	17	0
Enchytraeus dichaetus	White worm	Worms	0	0	23	0	0	0
Aporrectodea trapezoides	Southern worm	Worms	0	6	0	9	0	0
Limnodrilus udekemianus	Worm	Worms	0	0	0	0	0	10
Limnodrilus claparedianus	Worm	Worms	0	0	10	0	0	0
Nais elinguis	Sludgeworm	Worms	0	0	0	9	0	0
Limnodrilus hoffmeisteri	Redworm	Worms	0	0	0	0	0	8
Amynthas hupeiensis	Worm	Worms	0	5	0	0	0	0
Limnodrilus	Worm	Worms	13	27	127	75	7	62
Nais	Sludgeworm	Worms	10	8	59	11	6	24
Amynthas	Worm	Worms	0	0	15	0	7	0
Bothrioneurum	Worm	Worms	0	0	0	14	5	0
Chaetogaster	Oligochaete worm	Worms	7	0	0	0	0	0
Murchieona	Worm	Worms	0	6	0	0	0	0
Naidinae	Sludgeworms	Worms	42	10	25	6	56	183
Naididae	Sludgeworms	Worms	11	0	0	9	7	0
Tubificinae		Worms	0	0	0	11	0	0
Lumbricidae		Worms	0	0	7	0	0	0
Lumbricinae		Worms	0	0	0	0	6	0
unclassified Chaetogaster		Worms	0	0	11	0	0	17

Table C-2: Select Pōrangahau River eDNA Results, 2023

Scientific name	Common name	Group	711031	711032	711033	711034	711035	711036
Microcarbo melanoleucos	Kawaupaka,Little shag	Birds	89	206	32	41	163	12
Anas platyrhynchos	Rakiraki,Mallard duck	Birds	103	0	0	84	129	69
Fringilla coelebs	Pahirini,Common chaffinch	Birds	0	0	0	0	222	0
Carduelis carduelis	Goldfinch	Birds	0	0	125	0	0	0
Sturnus vulgaris	Tāringi,Common starling	Birds	0	0	0	0	105	0
Phalacrocorax carbo	Kawau pū,Black Shag	Birds	0	0	0	33	0	0
Turdus	Manu pango,Thrush	Birds	0	0	0	0	192	0
Anserinae	Swans and geese	Birds	0	0	0	0	41	0
Acanthocyclops robustus	Copepod	Crustaceans	924	318	772	302	139	196
Mesocyclops leuckarti	Copepod	Crustaceans	53	236	975	0	59	15
Chydorus brevilabris	Water flea	Crustaceans	6	0	5	0	15	0
Paracyclops fimbriatus	Copepod	Crustaceans	0	0	5	0	0	0
Chydorus		Crustaceans	0	12	0	0	0	0
Simocephalus		Crustaceans	0	6	0	0	0	0
Arcitalitrus	Sandhopper	Crustaceans	0	0	0	0	6	0
Cyclopidae		Crustaceans	94	21	134	19	0	0
Gobiomorphus huttoni	Redfin bully	Fish	12978	15629	23019	9054	15779	10492
Gobiomorphus cotidianus	Tīpokopoko; toitoi,Common bully	Fish	6264	8648	4883	9051	1852	9680
Retropinna retropinna	Ngaore; paraki; pōrohe,Common smelt	Fish	6016	2115	3420	1644	3128	5763
Galaxias maculatus	Īnanga,Inanga	Fish	1528	554	238	2481	728	284
Anguilla dieffenbachii	Tuna; kūwharuwharu; reherehe; kirirua,Longfin eel	Fish	709	223	499	369	491	116
Mugil cephalus	Kanae; kanae raukura,Grey mullet	Fish	261	187	289	154	214	109
Anguilla australis	Tuna; hao; aopori; hikumutu,Shortfin eel	Fish	39	114	11	76	189	400
Gobiomorphus gobioides	Tītarakura; tīpokopoko,Giant bully	Fish	0	0	0	48	240	0
Salmo trutta	Taraute; tarauta,Brown trout	Fish	0	189	0	75	0	0
Gobiomorphus	Bullies	Fish	3227	3876	5926	2551	2776	3706
Gobiomorphus cotidianus/basalis/dinae	Titikura,Common/Cran/Dinahs bully	Fish	1157	1621	738	923	1093	1409
Galaxias	Galaxiids	Fish	0	0	0	1012	0	0
Mugil	Mullets	Fish	85	151	14	0	0	80
Retropinnidae	Smelt	Fish	0	0	0	0	267	141
Eleotridae	Bullies	Fish	0	0	0	0	0	16
Galaxiiformes	Galaxiids	Fish	0	0	386	16	0	0
Gobiiformes	Gobies and sleepers	Fish	38	0	0	0	0	0
Chironomus cloacalis	Grey midge	Insects	12	18	12	12	45	36
Paratanytarsus grimmii	Chironomid	Insects	25	21	11	14	29	19
Symplecta pilipes pilipes	Cranefly	Insects	14	0	10	29	0	0
Rhopalosiphum padi	Bird cherry-oat aphid	Insects	21	0	0	0	14	0
Corynoneura scutellata	Non-biting midge	Insects	0	0	6	0	25	0
Austrosimulium australense	Sandfly	Insects	0	0	6	6	17	0
Tuberolachnus salignus	Giant willow aphid	Insects	0	5	0	0	5	15
Capitophorus elaeagni	Artichoke aphid	Insects	0	0	19	0	0	6
Mythimna separata	Armyworm	Insects	5	0	0	0	9	10
Oxysarcodexia varia		Insects	0	0	0	0	13	9
Ectopsocus briggsi	Psocopteran fly	Insects	0	5	9	0	5	0
Ablabesmyia sp. NZ08.Motel		Insects	0	0	0	0	16	0
Coloburiscus humeralis	NZ spinygilled mayfly	Insects	5	0	0	0	9	0
Smittia sp. 8ES		Insects	0	0	0	0	0	7
Hydroptilidae sp. 12KH6B	Purse-case caddisfly	Insects	0	0	0	0	0	7
Epiphyas postvittana	Light brown apple moth	Insects	0	0	0	6	0	0
Hydropsyche catherinae	Netspinning caddisfly	Insects	0	0	0	0	6	0
Trioxys sunnysidensis	Parasitoid wasp	Insects	0	0	0	0	0	6
Psychoda sp. BOLD:AAP4716	Drainfly; mothfly	Insects	0	0	6	0	0	0
Triplectides obsoletus	NZ caddisfly	Insects	0	0	0	0	0	5
Rhopalomyia sp. BIOUG23125-E04	Gall midge	Insects	0	0	0	0	5	0
Deleatidium	NZ mayfly	Insects	12	31	11	7	8	14
Sitona		Insects	0	0	0	10	14	0
Limnophyes	Non-biting midge	Insects	10	5	0	0	0	0
Rhopalosiphum	Aphid	Insects	12	0	0	0	0	0
Carpelimus		Insects	0	8	0	0	0	0
Forcipomyia		Insects	0	0	0	0	0	8
Hydropsyche	Netspinning caddisfly	Insects	0	0	0	7	0	0
Culex		Insects	0	6	0	0	0	0
Ectopsocus	Psocopteran fly	Insects	0	0	0	0	6	0
Aphididae	Aphids	Insects	0	0	0	13	5	0
Chironomidae	Nonbiting midges	Insects	5	0	0	9	0	0
Hydropsychinae	Caddisflies	Insects	0	7	0	0	0	0
Cecidomyiidae	Gall midges	Insects	5	0	0	0	0	0
Olethreutinae		Insects	5	0	0	0	0	0
Diptera	Flies	Insects	39	41	0	0	56	60
Trichoptera	Caddisflies	Insects	0	35	18	12	0	0
Lepidoptera	Butterflies and moths	Insects	0	0	0	5	0	0
Bos taurus	Kau,Cattle	Mammals	1812	2025	1525	1047	1559	1827
Ovis aries	Pirikahu; hipi,Sheep	Mammals	581	242	213	250	490	191
Cervus elaphus	Tia,Red Deer	Mammals	0	70	276	112	149	205
Felis catus	Ngeru; poti,Cat	Mammals	37	35	0	0	176	55
Rattus rattus	Hinamoki; inamoki,Black Rat	Mammals	181	72	0	0	0	0
Rattus norvegicus	Pouhawaiki; pou o hawaiki; kaingarua; maungarua,Norway Rat	Mammals	77	32	19	0	0	0

Scientific name	Common name	Group	711031	711032	711033	711034	711035	711036
Caprinae		Mammals	410	161	228	241	131	315
Bovidae	Even-toed ungulates	Mammals	0	0	21	51	53	0
Artiodactyla	Hoofed Animals	Mammals	0	42	0	0	0	0
Potamopyrgus antipodarum	Mud Snail	Molluscs	6	8	6	0	15	8
Physella acuta	Left handed sinistral snail	Molluscs	0	9	0	0	0	0
Deroceras laeve	Marsh slug	Molluscs	0	0	0	0	0	5
Potamopyrgus	Mud snails	Molluscs	20	21	23	0	51	45
Gastropoda	Gastropods	Molluscs	10	16	0	16	7	23
Caenogastropoda		Molluscs	7	11	6	0	14	7
Potamothrix bavaricus	Aquatic oligochaete worm	Worms	1124	324	616	656	248	220
Tubifex tubifex	Sludge worm	Worms	554	213	130	1176	16	44
Lumbricus rubellus	Red earthworm	Worms	150	340	373	280	0	168
Chaetogaster diastrophus	Oligochaete worm	Worms	48	42	97	561	222	15
Branchiura sowerbyi	Oligochaete worm	Worms	62	185	46	101	54	14
Eiseniella tetraedra	Squaretail worm	Worms	19	103	63	115	0	109
Limnodrilus hoffmeisteri	Redworm	Worms	0	0	70	72	0	230
Nais christinae	Sludgeworm	Worms	69	70	110	21	7	62
Lumbriculus variegatus	Blackworm	Worms	64	155	28	13	23	0
Chaetogaster diaphanus	Oligochaete worm	Worms	15	95	58	48	24	26
Globulidrilus riparius	Worm	Worms	0	0	0	0	141	0
Lumbricus castaneus	Worm	Worms	28	37	66	0	0	0
Aporrectodea caliginosa	Worm	Worms	19	23	0	47	5	10
Aulodrilus pluriseta	Aquatic oligochaete worm	Worms	24	0	67	0	0	0
Eukerria saltensis	Worm	Worms	0	38	51	0	0	0
Amynthas hupeiensis	Worm	Worms	0	17	57	0	0	0
Allolobophora chlorotica	Green worm	Worms	0	0	61	0	0	6
Nais elinguis	Sludgeworm	Worms	0	0	38	0	0	0
Bothrioneurum vejdovskyanum	Worm	Worms	33	0	0	0	0	0
Aporrectodea trapezoides	Southern worm	Worms	0	5	0	0	9	0
Octolasion cyaneum	Worm	Worms	0	12	0	0	0	0
Limnodrilus udekemianus	Worm	Worms	0	0	0	11	0	0
Bimastos rubidus	Worm	Worms	0	0	0	5	0	0
Nais	Sludgeworm	Worms	62	168	186	73	56	69
Limnodrilus	Worm	Worms	0	28	45	98	132	36
Amynthas	Worm	Worms	12	5	13	0	0	0
Eiseniella	Worm	Worms	0	0	6	0	0	6
Tubifex	Worm	Worms	0	0	0	0	0	7
Chaetogaster	Oligochaete worm	Worms	0	0	0	0	6	0
Aeolosomatidae		Worms	95	0	68	7	15	491
Naididae	Sludgeworms	Worms	0	0	0	0	183	8
Naidinae	Sludgeworms	Worms	0	0	0	54	0	0
Lumbricidae		Worms	0	0	0	8	5	5
Enchytraeidae		Worms	0	0	0	0	13	0
Tubificinae		Worms	0	8	0	0	0	0
Tubificida		Worms	0	0	10	0	0	5
Clitellata		Worms	18	26	6	0	31	10
unclassified Chaetogaster		Worms	0	0	0	0	532	0

Table C-3: Select Pōrangahau River eDNA Results, 2024

Scientific name	Common name	Group	724461	724462	724463	724464	724465	724466
Retropinna retropinna	Ngaore; paraki; pōrohe,Common smelt	Fish	1111	1973	1393	2044	1405	262
Gobiomorphus huttoni	Redfin bully	Fish	675	1155	2717	1294	1469	213
Potamothrix bavaricus	Aquatic oligochaete worm	Worms	0	26	904	1754	1467	234
Branchiura sowerbyi	Oligochaete worm	Worms	741	1108	820	971	293	123
Ovis aries	Pirikahu; hipi,Sheep	Mammals	1072	761	497	141	595	955
Anas platyrhynchos	Rakiraki,Mallard duck	Birds	786	498	951	254	508	397
Anguilla dieffenbachii	Tuna; kūwharuwharu; reherehe; kirirua,Longfin eel	Fish	1176	124	895	399	373	244
Gobiomorphus cotidianus	Tīpokopoko; toitoi,Common bully	Fish	643	744	334	556	688	0
Mesocyclops leuckarti	Copepod	Crustaceans	419	0	522	202	0	994
Bos taurus	Kau,Cattle	Mammals	155	625	750	178	103	185
Anguilla australis	Tuna; hao; aopori; hikumutu,Shortfin eel	Fish	280	375	976	65	246	0
Galaxias maculatus	Īnanga,Inanga	Fish	0	0	178	500	6	313
Acanthocyclops robustus	Copepod	Crustaceans	23	0	7	88	235	160
Gobiomorphus gobioides	Tītarakura; tīpokopoko,Giant bully	Fish	0	0	212	0	159	0
Anguilla reinhardtii	Speckled longfin eel	Fish	0	0	176	0	151	0
Eukerria saltensis	Worm	Worms	0	0	0	326	0	0
Trichosurus vulpecula	Paihamu; paihama,Common brushtail possum	Mammals	11	51	65	0	196	0
Chaetogaster diastrophus	Oligochaete worm	Worms	32	33	18	42	88	39
Physella acuta	Left handed sinistral snail	Molluscs	16	20	7	15	109	32
Epirinus aquilus	Dung beetle	Insects	0	172	0	0	0	0
Potamopyrgus antipodarum	Mud Snail	Molluscs	9	17	5	52	49	35
Meleagris gallopavo	Pīpipi; korukoru,Turkey	Birds	159	0	0	0	0	0
Tuberolachnus salignus	Giant willow aphid	Insects	18	20	22	19	38	27
Rattus rattus	Hinamoki; inamoki,Black Rat	Mammals	0	131	0	0	0	6
Passer domesticus	Tiu,House sparrow	Birds	0	137	0	0	0	0
Symplecta pilipes pilipes	Cranefly	Insects	0	0	0	113	0	0
Microcarbo melanoleucos	Kawaupaka,Little shag	Birds	0	0	0	0	0	98
Aulodrilus pluriseta	Aquatic oligochaete worm	Worms	0	97	0	0	0	0
Chydorus brevilabris	Water flea	Crustaceans	8	0	0	15	23	17
Rhopalosiphum nymphaeae	Waterlily aphid	Insects	0	0	42	0	0	0
Hydropsyche catherinae	Netspinning caddisfly	Insects	16	7	0	0	0	0
Hygraula nitens	Australian water moth	Insects	9	5	0	0	0	5
Tadorna variegata	Pūtangitangi,Paradise Shelduck	Birds	0	9	0	0	0	0
Euura proxima	Introduced sawfly	Insects	9	0	0	0	0	0
Naupactus leucoloma	Broad-nosed weevil	Insects	0	0	0	0	0	8
Hydrobiosis copis	NZ caddisfly	Insects	0	0	7	0	0	0
Capitophorus elaeagni	Artichoke aphid	Insects	6	0	0	0	0	0
Hyadaphis passerinii	Aphid	Insects	0	6	0	0	0	0
Gobiomorphus	Bullies	Fish	2789	3101	3419	3340	2571	2198
Nais	Sludgeworm	Worms	380	1973	557	654	1086	178
Potamopyrgus	Mud snails	Molluscs	620	566	266	324	104	495
Limnodrilus	Worm	Worms	0	434	0	325	686	0
Sulcospira		Molluscs	118	235	190	213	266	166
Simocephalus		Crustaceans	0	0	0	0	69	0
Mugil	Mullets	Fish	0	0	47	0	0	0
Pristina	Worm	Worms	0	0	0	32	0	0
Hydropsyche	Netspinning caddisfly	Insects	8	0	0	0	23	0
Pterocomma		Insects	8	0	0	0	8	0
Turdus	Manu pango,Thrush	Birds	0	0	0	15	0	0
Nabis		Insects	0	11	0	0	0	0
Anguilla	Eels	Fish	7	0	0	0	0	0
Deleatidium	NZ mayfly	Insects	0	0	0	0	5	0
Tateidae	Aquatic snails	Molluscs	0	247	173	0	124	0
Caprinae		Mammals	0	0	233	0	138	0
Aphididae	Aphids	Insects	5	0	11	50	10	8
Retropinnidae	Smelt	Fish	0	0	0	11	0	0
Coccinellidae	Lady beetles	Insects	0	0	0	0	6	0
Syrphidae	Drone flies	Insects	0	0	0	0	5	0
Galaxiiformes	Galaxiids	Fish	0	0	0	113	102	0
Trichoptera	Caddisflies	Insects	11	6	5	18	0	12
Gobiiformes	Gobies and sleepers	Fish	11	18	0	12	0	0
Diptera	Flies	Insects	0	37	0	0	0	0
Artiodactyla	Hoofed Animals	Mammals	0	0	5	5	0	10
Caenogastropoda		Molluscs	63	74	88	65	43	46
Gastropoda	Gastropods	Molluscs	55	69	70	48	45	54
Neoptera	Winged insects	Insects	13	0	0	0	0	5
Branchiopoda		Crustaceans	9	0	0	0	0	0
Clitellata		Worms	0	6	0	0	0	0
unclassified Aeolosoma		Worms	41	19	10	24	12	42

Appendix D: DoC Protocols for the Removal of Tree in Bat Areas

Figure 1. Tree removal in bat areas flow chart

Each numbered step relates to a step in the Decision Tool for Tree Removal. Follow each step fully in the text to work through the process.