REPORT

Tonkin+Taylor

Harania Flood Resilience Works - Tennessee Bridge

Erosion Sediment Control Plan

Prepared for
Auckland Council
Prepared by
Tonkin & Taylor Ltd
Date
October 2024
Job Number
1017033.2002 v2

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Document control

Title: Harania Flood Resilience Works - Tennessee Bridge					
Date	Version	Description	Prepared by:	Reviewed by:	Authorised by:
25/10/24	1	Final	P. Hanabadi	B. Chester	C. Bauld
31/10/24	2	Updated for Resource Consent	P. Hanabadi	B. Chester	C. Bauld

Distribution:

Auckland Council	1 PDF copy
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Table of contents

1 Introduction

1.1 Background

The January 2023 floods, followed closely by Cyclone Gabrielle, marked a period of unprecedented weather challenges for Auckland. Auckland Council is carrying out flood resilience projects with the aim of mitigating flood risk to property through a series of blue-green networks, addressing critical flood-prone areas with sustainable stormwater solutions. The Harania catchment was one of the worst affect areas of Auckland following the January 2023 floods. Healthy Waters identified significant flooding, causing risk to life, and widespread flood damage to homes. This occurred due to poor flood conveyance at the location of the current Tennessee Avenue embankment dam.

1.2 Project description

A detailed description of the full project works can be found in the Assessment of Effects on the Environment (AEE) report[1].

The Tennessee Bridge project involves removing the current embankment which carries the existing Eastern Interceptor (EI), an approximately 2.6 m diameter reinforced concrete wastewater pipe. The replacement will comprise a new pipe and pipe bridge in the coastal marine area (CMA) to open up the waterway capacity to allow increased flood conveyance. Diversion chambers are required at either end of the new pipe, connecting it to the existing pipe to facilitate the change over from the old pipe to the new pipe bridge diversion.

1.3 Scope of works

Tonkin & Taylor Ltd (T+T) has been engaged by Auckland Council's Healthy Waters to undertake an Erosion and Sediment Control Plan (ESCP) related to the proposed Tennessee Bridge upgrade works (the Project) and this has been prepared to accompany a resource consent application for the Tennessee Bridge project under the Severe Weather Emergency Recovery (Auckland Flood Resilience Works) Order 2024. The purpose of this ESCP is to indicate how Fulton Hogan Limited (FH, the Contractor) are to manage the environmental impacts associated with the necessary earthworks during the project so that the effects on the receiving environment are managed in accordance with Auckland Council's expectations as detailed within GD05[2].

1.4 Information sources

The following information sources have been used to inform this ESCP:

- Fulton Hogan Harania Culvert Construction Methodology[3], 18/10/2024.
- Fulton Hogan Draft Construction Programme - Harania Culverts Tender Programme[4], 02/08/2024.

[1] *Harania Flood Resilience Works – Tennessee Bridge Assessment of Effects on the Environment*, Beca Limited, November 2024.
[2] Auckland Council Guideline Document GD2016/005, https://knowledgeauckland.org.nz/publications/erosion-and-sediment-control-guide-for-land-disturbing-activities-in-the-auckland-region/
[3] Fulton Hogan 'Harania Culvert Construction Methodology for Planning' received on 16/08/2024
[4] Fulton Hogan 'Harania Culverts Tender Programme' received on 02/08/2024

2 Proposed works

2.1 Proposed development

The overall project generally comprises civil construction activities to install the proposed sewer pipe bridge to divert the existing EI sewer line and associated pedestrian bridge. Furthermore, the project also includes the removal of the existing embankment and double culverts to mitigate upstream flooding effects.

An estimate of the construction timeline is shown on Table 2.1.

Table 2.1: Approximate earthworks durations

Construction Stage	Approximate Duration	General scope of works
Stage 1	Three months	Site establishment, preparatory works and access staging
Stage 2	10 months	Piling, piers, superstructure, pipe laying, tie in chambers, testing and commissioning
Stage 3	One month	Removal of embankment, removal of redundant pipe, stream works reinstatement
Stage 4	One month	Site de-establishment

Note: Approximate durations extracted from Fulton Hogan Draft Construction Programme - 'Harania Culverts Tender Programme'[2], 02/08/2024

2.2 Extent of earthworks

The overall extent of earthworks is estimated to be 3,050 m^2. The approximate total cut volume is 4,000 m^3 and fill volume is 600 m^3. The earthworks will be conducted in stages to minimise the area of exposed soil at any given moment.

The approximate total quantities of earthworks to be undertaken is outlined in Table 2.2:

Please note, the values presented below in Table 2.2 are only preliminary and subject to change as the design progresses.

Table 2.2: Estimated cut and fill volumes

Location	Cut (m^3)	Fill (m^3)	Balance (m^3)	Area (m^2)
Tennessee Av	-4,000	530	-3,470	3,050
Dirty water diversion earth bund	0	70	70	-
Total	-4,000	600	-3,400	3,050

The earthworks cut and fill volume estimations are based on a comparison of the existing surface and the proposed final surface.

2.3 Design philosophy and process

This ESCP has been prepared to support the resource consent application, the contractor will prepare the final ESCP for certification by council prior to works commencing. All erosion and sediment control will be installed in accordance with GD05[1].

This ESCP has been prepared following consultation with the Contractor, to determine best practicable measures of mitigating erosion and sediment runoff into the receiving environment. All control measures will be installed and managed by the Contractor on site as required.

The construction works onsite will be staged and the earthworks will be conducted during the earthworks season (1 October to 30 April) drier months, when stream flows and potential flooding risks are at their lowest. In the situation that our timeframes are not aligned with the above dates, earthworks will be undertaken within the next earthworks season, unless relevant winter works approvals are obtained.

Based on the Contractors methodology the project comprises four key stages involving earthworks activities, listed below. *Note: We are considering two staging options for the proposed works within the CMA, the final methodology will be determined by the contractor.*

- Stage 1 - Site establishment, access staging and gravel working platform (option 1), gravel working platform across CMA width (option 2).
- Stage 2 - Installation of new bridge piers and new pipe.
- Stage 3 - Removal of redundant pipe, embankment and double culverts.
- Stage 4 - Site demobilisation / reinstatement of in-stream features.

A general outline of the methodologies that will be demonstrated during construction of each stage to mitigate erosion and sediment runoff is as follows.

Figure 2.1: Site Aerial

2.4 Potential effects associated with the works

A list of the relevant potential effects associated with the works (temporary and permanent) related to the works undertaken in the Sediment Control Protection Area defined in the Unitary Plan are:

- Sediment could be tracked out onto local roads, which can enter road catch pits and into the stormwater network and discharged into the receiving environment.

- Working within the coastal marine area presents a higher risk that sediment laden runoff to enter directly into the Mangere inlet.
- As a portion of the site works is located within the one in 100-year flood plain there is a risk that sediment could potentially be washed from the site directly into the CMA.
- Dust generation onto neighbouring property and /or public.

2.5 Stage 1 - Site establishment, access staging and gravel working platform (option 1), gravel working platform across CMA width (option 2)

2.5.1 Site establishment

Works on site will commence by securing the eastern and western compounds at Blake Road Reserve and Lenore Foreshore Reserve respectively. This will be done using 1.8 m high fences around the perimeter of the established compound areas on the eastern and western reserves.

The existing access into the eastern compound (Blake Road Reserve) will be maintained between 81 and 83 Blake Road. The proposed access route crosses the existing EI Sewer, which due to being shallow, will require protection from above construction traffic. This will consist of a reinforced concrete slab supported on short piles outside of the sewers influence. The concrete slab will also act as a stabilised entrance into the site constructed as per figure 10 of this report or as found in GD05.

The access into the western compound (Lenore Foreshore Reserve) will be off Bicknell Road. The existing concrete entrance will be utilised for construction access and will also be extended and stabilised as per above.

The existing topsoil will be left undisturbed and covered with geotextile cloth overlayed with 300 mm of aggregate. Overall, the eastern and western compounds will consist of approximately, 3,000 m^2 and 700 m^2 of stabilised aggregate respectively.

Silt fences will be placed around the perimeter of the eastern and western compounds to mitigate coarse sediment from the stabilised gravel working area to runoff into the Harania Creek.

Please see Figure 2.2 below for details on the eastern and western compounds.

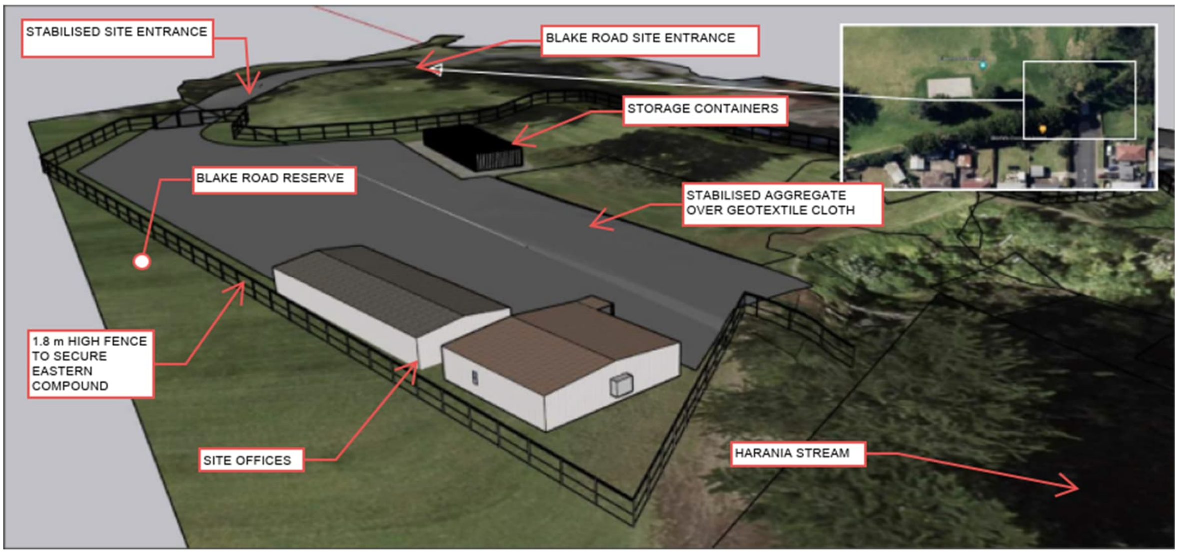


Figure 2.2: Indicative location of eastern compound at Blake Road Reserve, provided by FH

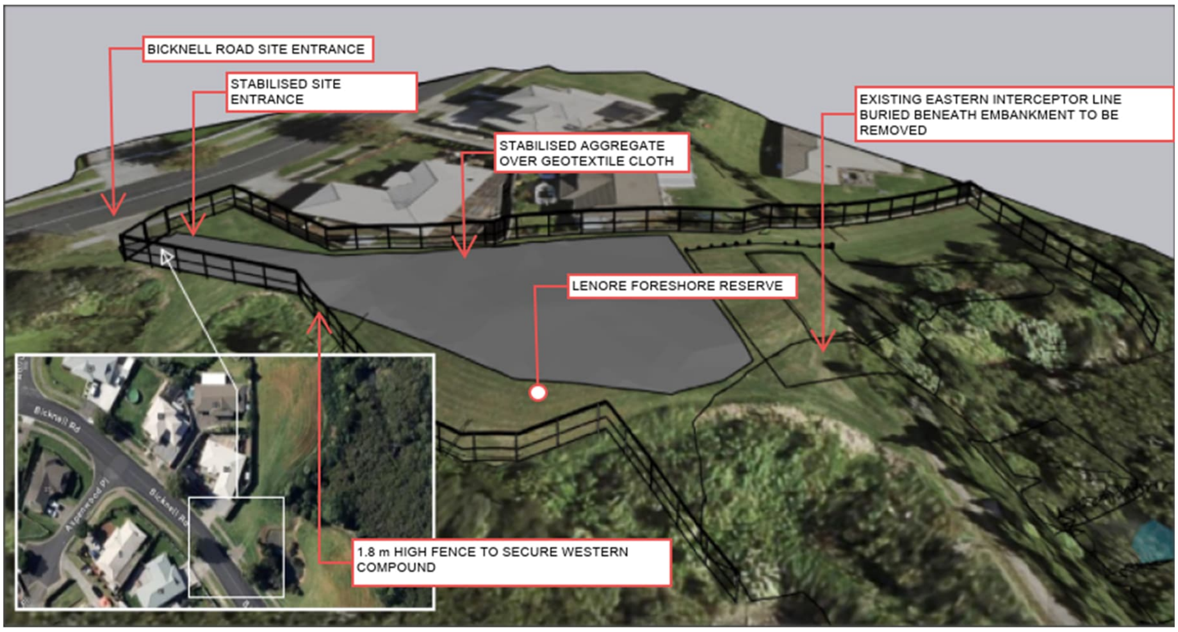


Figure 2.3: Indicative location of western compound at Lenore Foreshore Reserve, provided by FH

2.5.2 Option 1: Gravel working platform and access staging

2.5.2.1 Gravel working platform

Option 1 proposed to construct a gravel working platform beneath the alignment of the new bridge pipe. The gravel working platform will minimise soil disturbance within the CMA when it comes to constructing the required coffer dams and tracking the appropriate machinery down.

Access tracks to form the proposed shallow gravel working platforms will be established on the eastern and western side. Silt fences will be established around the extents of the access tracks, and a Novacoil pipe will be installed beneath the access track to convey the existing OLFP into the Harania Creek. Additionally, silt fences will also be established around the western access track.

Some of the mangroves within the proposed working area and surrounding area have previously been removed as part of emergency flood resilience work. It has been estimated from the Ecological Management Plan (EMP)[5], that approximately 1,000 m^2 of mangrove clearance will be undertaken as part of the works surrounding the Tennessee embankment. This will be done by way of excavator with a selector grab tool within the CMA. Mangroves will be fully de-rooted, removed from the coastal area and transported off site.

When undertaking mangrove removal, the following methods should be adhered to as per EMP[7]:

- As few points of access as possible to the CMA to minimise disturbance. Access of the excavator will be via the Blake Road Reserve.
- Machinery will occupy the coastal area only on the gravel pads or on the temporary access staging.
- All mangroves will be removed at the root, bundled and removed from the CMA to be transferred off-site to green waste. They will not be incorporated back into the site as vegetative material will smother sediments, cause anoxia and is associated with the release of hydrogen sulphide gas.

[5] Tonkin & Taylor 'Harania Flood Resilience Works – Tennessee Bridge Draft Ecological Management Plan' – October 2024

- The contractor (or Project Ecologist if present) will capture mangrove removal process via photographic and / or video recordings to inform ecologists of practicalities and effectiveness of the proposed mangrove removal methods.
- All refuelling or cleaning of equipment to take place on land.

Please see Figure 2.4 below for details Option 1: Preparatory works.

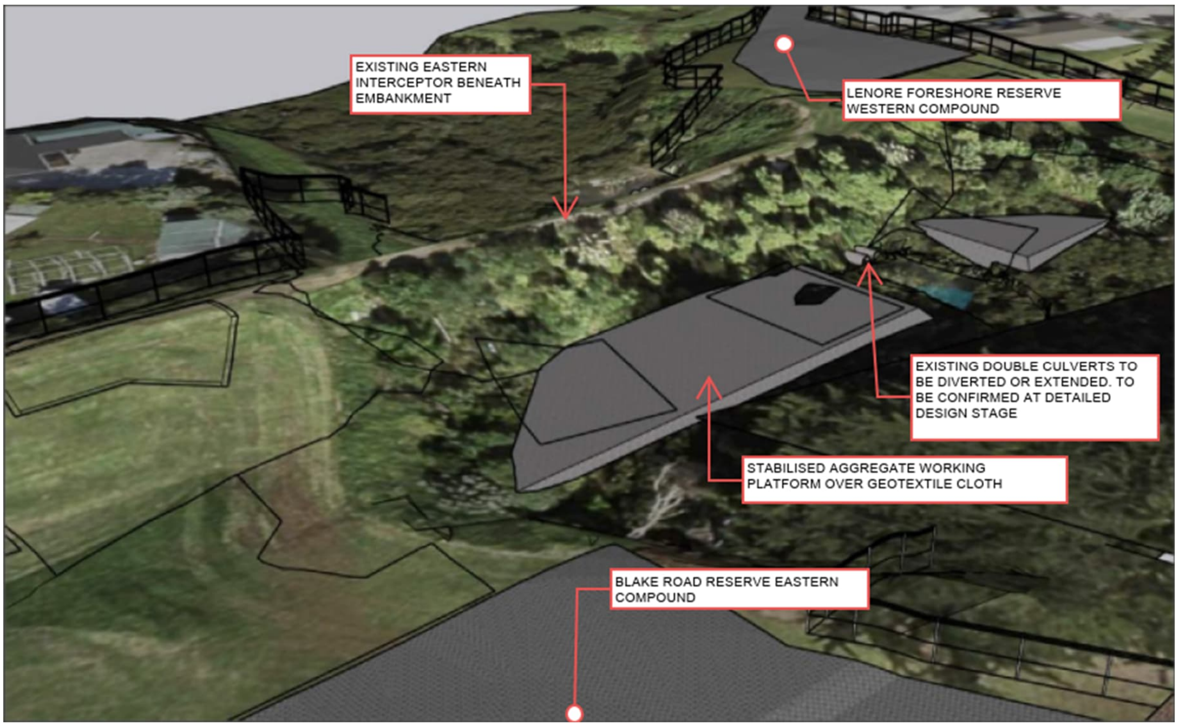


Figure 2.4: Indicative location of Option 1: Preparatory works, provided by FH

2.5.2.2 Access staging

As part of option 1, a temporary access staging to convey heavy machinery across the stream is being considered. The temporary access staging will be constructed in 9 m segments, starting from the eastern reserve haul road and progressing toward the western reserve haul road. Hollow steel-cased piles will be driven into the stream bed using a vibro-hammer suspended from a crane. It is anticipated that this pile driving method will minimise the generation of excess sediment runoff, therefore monitoring of the activity to check that no excess sediment is being produced is sufficient.

Please see Figure 2.5 below for details on the Option 1: Access staging.

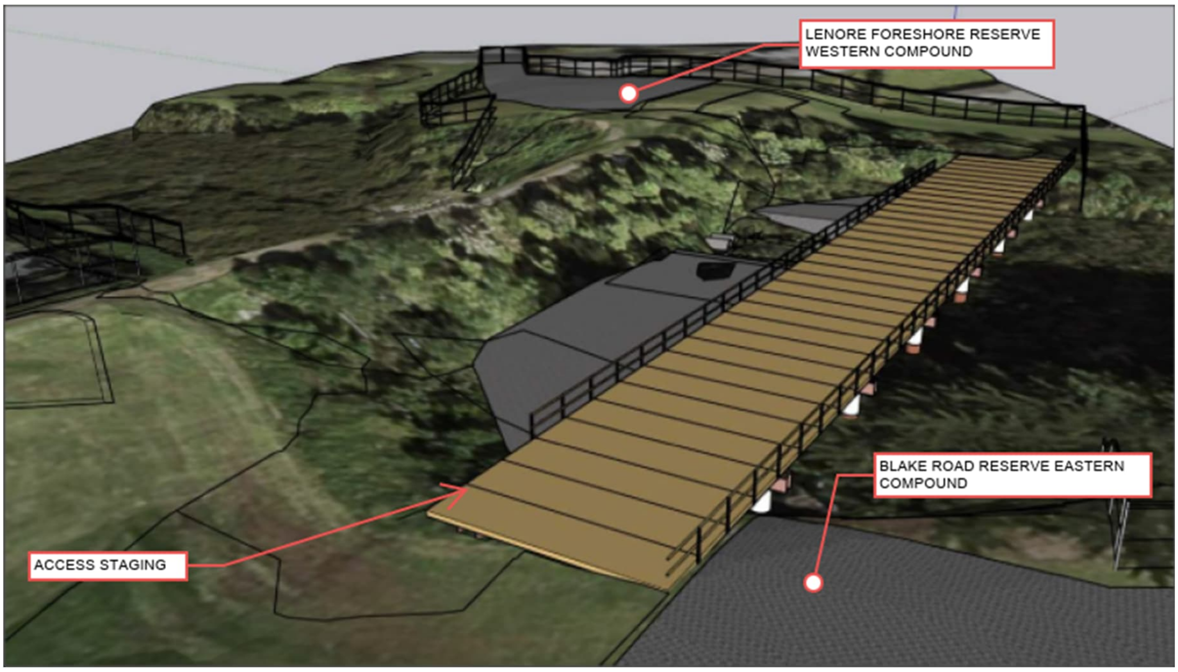


Figure 2.5: Option 1: Access staging, provided by FH

2.5.3 Option 2: Gravel working platform across CMA width

Option two involves constructing a gravel working platform that spans the full width of the Harania Creek, in contrast to the localised platform proposed in option one. This option requires installing a manhole with a diameter of approximately 3.4 m and an approximate depth of 4 m to allow for the extension and re-routing of the existing double culvert by approximately 10 m downstream to maintain water flow during construction of coffer dam 3.

The platform will be shallow to minimise soil disturbance within the CMA and will facilitate the constriction of the coffer dams while providing full machinery access across the stream. As with option one, silt fences will be established on both the eastern and western sides to manage erosion and a Novacoil pipe will be installed to convey the flow of the OLFP on the eastern reserve, protecting the CMA from potential sedimentation. Any mangroves interfering with construction will be removed as per section 2.5.2.1 of this report and as detailed in the EMP.

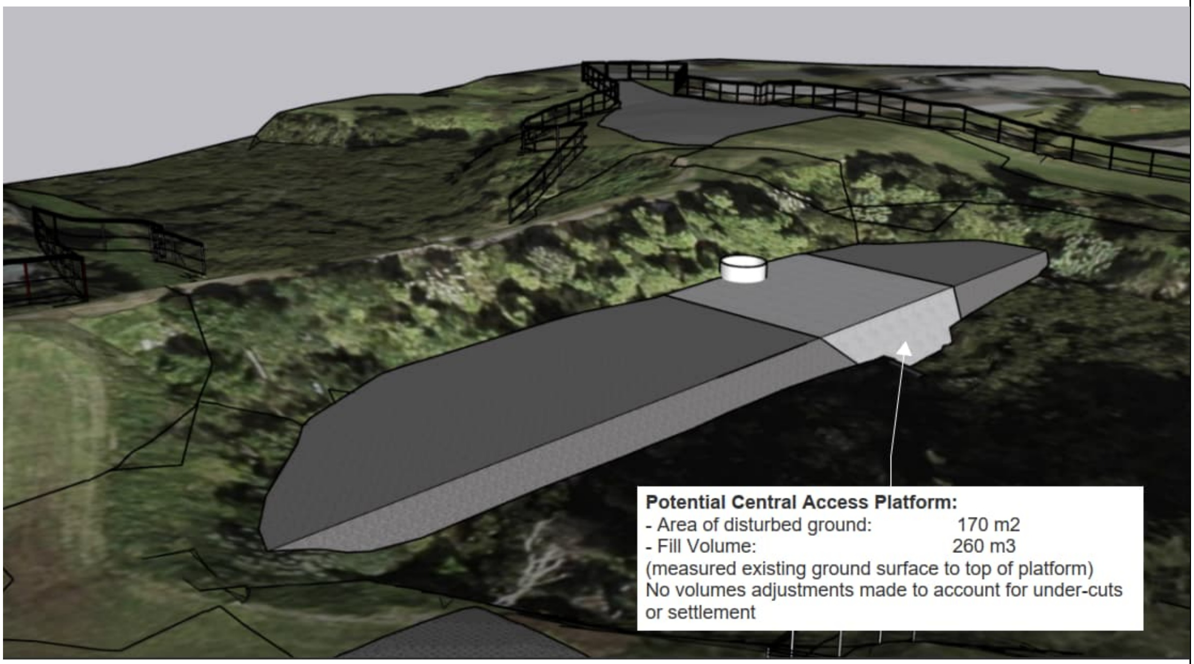


Figure 6: Option 2: Gravel working platform across CMA, provided by FH

2.6 Stage 2 - Installation of new bridge piers and new pipe

2.6.1 Coffer dams

Upon completion of the access tracks, gravel platform and temporary access staging, construction of the three cofferdams within the CMA can commence. The purpose for the coffer dams is to keep stream flows out of the excavations to form the pipe bridge piers. Sheet piles will be driven to a dense sand layer using a pile driver mounted on an excavator. This operation will be carried out on the shallow gravel platform during low tide, as well as on the access staging (should that option be selected).

Excavated material from within the cofferdams will be loaded directly into tip trucks and transported to the designated stockpile location at Blake Road Reserve via the access staging.

Please see Figure 2.7 below for details on the coffer dams.

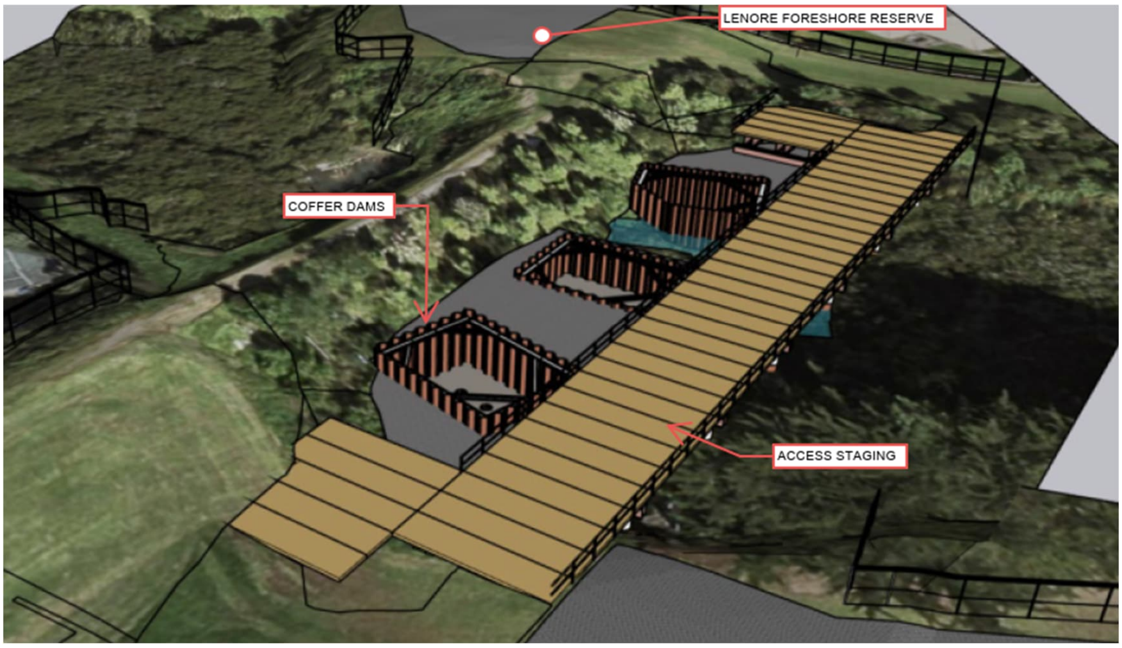


Figure 2.7: Indicative location of coffer dams, provided by FH

2.6.2 Western and Eastern connection chambers

Excavation of the western and eastern chambers will be conducted on either side of the existing EI. The purpose of the chambers is to tie into the existing EI sewer line. To mitigate runoff into the stream during excavation, a combination of dirty water diversions and silt fences will be installed to capture dirty water running off the excavation chambers. Additionally, exposed batters will be rapidly stabilised with geotextile fabric, and the ground within the excavations will be stabilised using aggregate.

The installation of screw piles in the western and eastern connection chambers is not expected to generate significant sediment. Additionally, the screw piling will take place within an excavated trench, which will contain any sediment within the excavation area, minimising the potential for sediment to disperse into the surrounding environment.

If stormwater runoff begins pooling within the excavation chambers, several methods to treat and manage this runoff can be employed. For smaller volumes of water, a turkey's nest can be established on the downslope side of the excavation to collect stormwater runoff and allow it to slowly percolate back into the ground. For larger volumes of water, it is recommended to pump the water out into a Siltbuster, or similar approved device for effective treatment.

Please see Figure 2.8 and Figure 2.9 for details on the excavation of the western and eastern connection chambers.

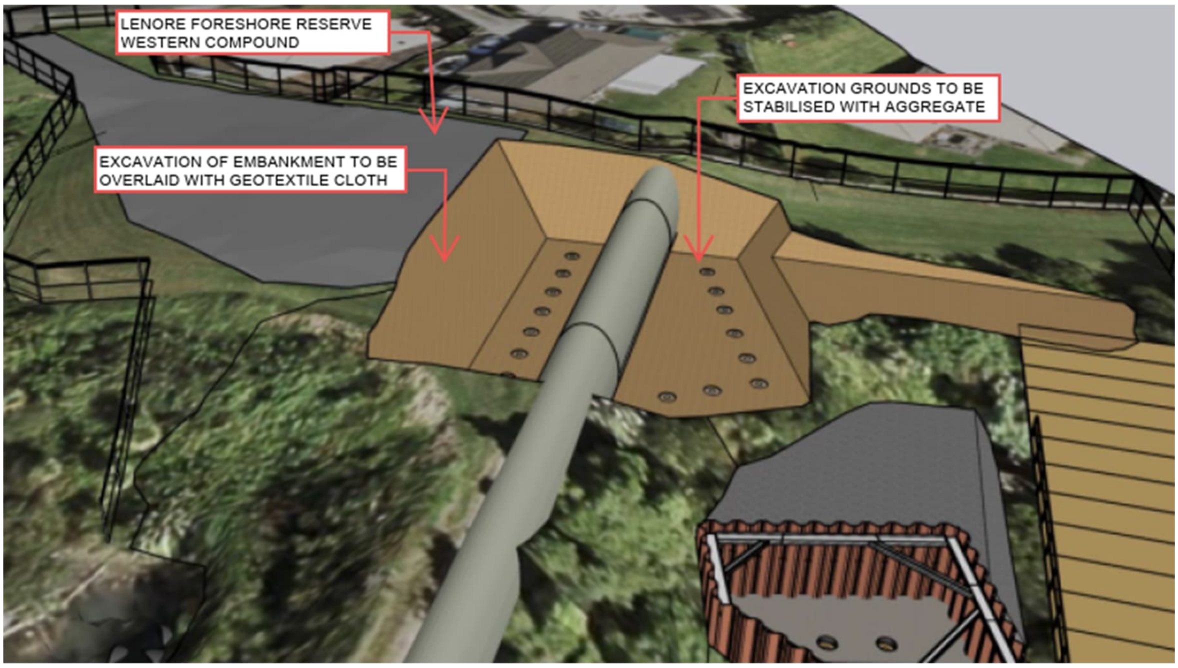


Figure 2.8: Indicative location of western chamber excavation extents, provided by FH

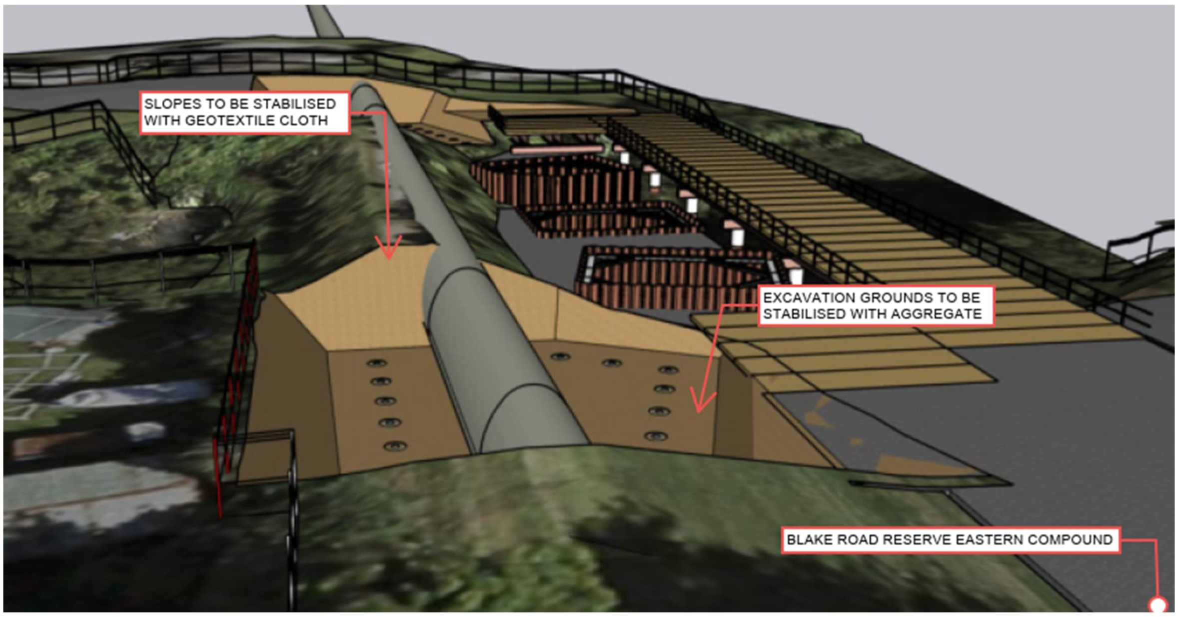


Figure 2.9: Indicative location of eastern chamber excavation extents, provided by FH

2.6.3 Pier pile caps

Once the coffer dams are fully installed, including the placement of reinforcement steel cages, concrete will be poured using a pump stationed on the access staging. To prevent sediment or contaminants from entering the CMA, a designated concrete wash-down area will be provided outside of the CMA, utilising a plastic lined skip with a water blaster on standby. This setup is essential to avoid accidental concrete spills or wash-off impacting the surrounding environment. Erosion and sediment control measures will remain in place throughout the process to prevent runoff into the CMA. After the piers and the eastern and western connection chambers are completed, the coffer dams will be carefully removed, and stabilisation of the areas around the new foundations will begin promptly to reduce the risk of erosion. Remediation efforts will focus on restoring any disturbed areas and limiting sediment displacement.

Please see Figure 2.10 below for details on the pier pile caps.

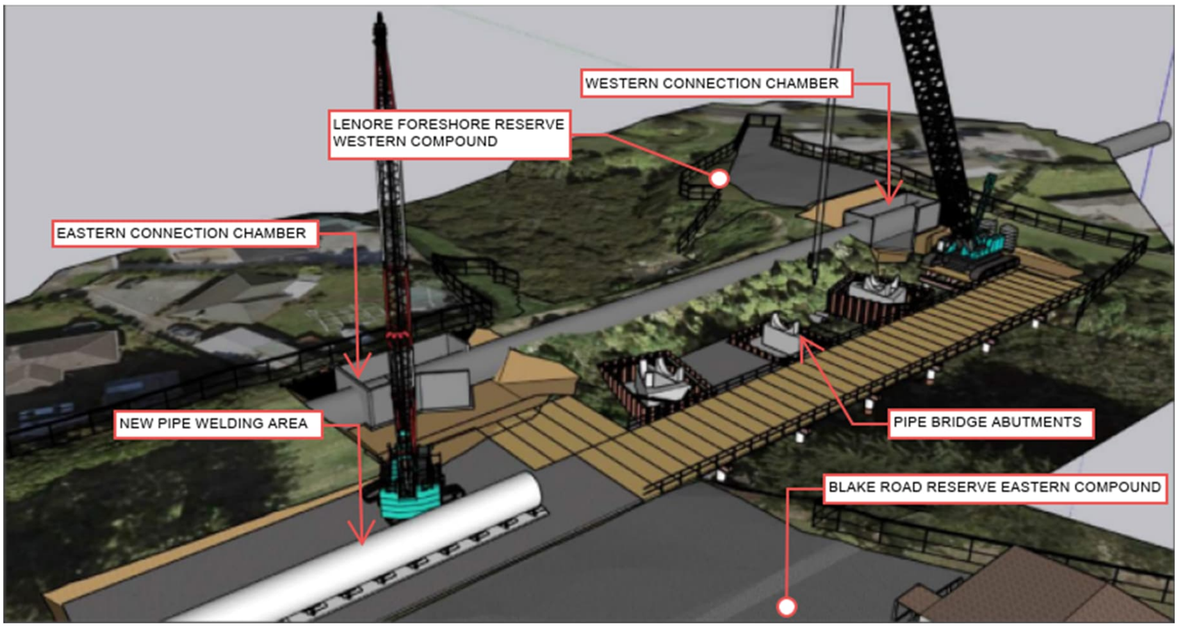


Figure 2.10: Indicative location of coffer dams being removed and remediation around new foundations, provided by FH

2.7 Stage 3 - Removal of redundant pipe, embankment, double culverts and proposed stream formation

Once the new pipe has been welded in place, removal of the redundant EI sewer pipe and embankment can commence. The redundant section of pipeline will firstly be excavated and removed working from east to west, loading excavated material into 6-wheel trucks from the western compound for disposal off site. Silt fences will be established on the northern and southern sides of the embankment.

Once the redundant pipe has been removed, the remainder of the embankment will be excavated down to the design finished ground profile in stages working from east to west. A silt fence will be placed just above the MWHS and one in 100-year flood plain levels at approximately 1.69 m (NZVD2016 vertical datum). Dirty water diversions will be established on the western side of the proposed stream extents as the embankment is progressively removed.

The flow of the stream and fish passage will be maintained through the existing double culvert pipes until the remainder of the embankment has been excavated up to the proposed stream extents. All truck movement will be via the western entrance.

Following this, sandbags will be used to temporarily dam the upstream and downstream ends of the eastern culvert, diverting the stream flow entirely through the western culvert. This will allow the removal of the eastern culvert while maintaining the stream flow through the western side.

The water remaining within the sandbagged area will be pumped out to an appropriate treatment device, allowing the construction of the eastern side of the proposed stream channel. Once the eastern section is excavated and stabilized, the sandbags will be repositioned to dam the eastern side of the stream. A temporary PE pipe will be installed to divert the stream flow to the eastern side, enabling the removal of the western culvert and excavation of the western stream channel in dry conditions.

The downstream and upstream cutover for the permanent stream realignment works will be undertaken in the dry by the following steps:

Step 1: Temporarily dam upstream and downstream ends of the eastern culvert to allow flow to be conveyed entirely through the western culvert.

Step 2: Cut embankment to design levels and remove eastern culvert.

Step 4: Allow to dewater the tie in works area by pumping dirty water to the secondary treatment device.

Step 5: Commence the excavation works of the eastern stream channel.

Step 6: Ensure that at the end of each workday all exposed areas with the tie in point are stabilised with geotextile fabric.

Step 7: Once the eastern side of the stream channel has been formed and stabilised, a PE pipe will be installed to divert the Harania Creek flows through the newly constructed eastern channel. The sandbags will then be moved to the western side, redirecting the stream flows entirely through the temporary pipe on the eastern side. This will allow the western stream cutover to be completed in dry conditions.

Step 8: At the start of each workday to complete the downstream tie in, follow step 4 to step 7.

The works will be undertaken during fine weather and neap tidal conditions.

2.8 Stage 4 - Site demobilisation and reinstatement of in-stream features

Once the work has been completed, the access staging can be removed by firstly removing the deck panels, beams, headstock and trimming the pile steel casings down to the stream bed level.

Stabilisation of the stream bed post embankment removal can then begin by lightly compacting the stream bed to compress loose particles of sediment together. Refer to Boffa Miskell landscape plan[6] for specifics on in-stream reinstatement.

Reinstatement of Blake Road Reserve and Lenore Foreshore Reserve can commence by removing all aggregate and geotextile fabric spread on top of the topsoil. Silt fences can then be removed along with the 1.8 m high fence to secure the eastern and western compound. If the existing grass beneath the geotextile layer has perished, then re-grassing of the Blake Road Reserve and Lenore Forshore Reserve is recommended.

3 Erosion and sediment control approach

3.1 Key principles and approaches

The primary objective for an ESCP is to avoid causing or accelerating erosion and the subsequent generation of sediment.

[6] Boffa Miskell, Harania Tennessee Bridge Landscape Plan

The Auckland Council Guidelines, GD05, outlines the key principles that apply to earthworks for this project as follows:

1 Minimise disturbance: Only work those areas required for construction to take place.
2 Stage construction: Carefully plan works to minimise the area of disturbance at any one time.
3 Protect steep slopes: Where steep slopes exist within the works area, ensure that these are protected using geotextile cloth or similar.
4 Protect receiving environments: Existing stream should be indicated on the plans with specific ESCP measures to protect the receiving environment.
5 Rapidly stabilise exposed areas: Using either geotextile cloth or aggregate.
6 Install perimeter controls: Silt fences will be installed around the perimeter of all proposed earthwork to mitigate sediment runoff. Dirty water diversion bunds to be established as per drawings and to be confirmed on site. Clean water will be conveyed through an existing overland flow path (OLFP) to be maintained, clean water diversions will also be established as per drawings and to be confirmed on site.
7 Employ sediment retention devices: Sediment laden water will be treated by retention devices such as turkeys nest, decanting earth bund via pumping, or pumping from excavated low points with sufficient volume.
8 Experience and training: Key roles and responsibilities for implementing and maintaining the controls during the project.
9 Make sure the plan evolves: The ESCP is considered as a ‘live’ document. The plan should be reviewed routinely and updated during the works to reflect changes associated with construction methodology and/or monitoring results.
10 Adjust ESCP as needed: As construction progresses and the nature of land disturbing activities change, the ESCP may need to be modified to reflect the changing conditions on site.

3.2 Ecology Principles

The approach of this ESCP is to minimise the effects to the receiving environment as far as practicable. The effects management hierarchy will be followed as per.

1 Avoid effects – such as the uncontrolled release of sediment into the receiving environment. Activities such as open earthworks cannot be avoided but the effects will be minimised by implementing controls such as silt fences, stabilised working areas, dirty water diversions, etc.
2 Remediation – Once earthworks is complete, reinstatement of open earthworks areas and site laydown areas can commence by regressing / revegetating.
3 Offsetting and compensation – If any residual effects remain after all practicable measures have been taken to remedy the impacts of activities, and these effects cannot be fully addressed, they may be subject to offsetting by implementing positive ecological impacts elsewhere.

The main potential adverse effects in relation to our project will be the effects on water quality (including kaimoana and mauri) from sediment along with impacts on the local habitat. Impacts on water quality and habitat, particularly from sediment, can significantly alter habitat characteristics in the receiving environment. Suspended sediment in streams not only affects habitat features but can also harm aquatic life, such as fish, by causing physical damage to their skin. The proposed plan will align with the principles outlined in GD05, with all measures in place to minimise potential effects. As a result, no residual effects are anticipated, removing the need for offsetting or compensation.

4 General erosion and sediment control measures

4.1.1 Standard earthworks management controls

The following sections provide guidance on the selection of erosion and sediment control measures to be implemented over the course of the project. The control measures proposed are based on the controls and principles outlined in the Auckland Council GD05 guidelines.

Further to the over-arching principles in Section 3.1 of this report, the following information will apply to all earthworks on this Project:

a The development of the proposed sediment controls will be in general accordance with the principles of this ESCP and allow for adaptability throughout the construction earthworks phase.

b The proposed in-stream works will be undertaken on the basis that these are higher risk activities, and where practical will be undertaken off-line in 'dry' conditions, with tie-ins to be typically done by temporary dam and divert via existing western culvert and a temporary PE pipe.

c Sediment treatment devices will be fitted with floating decants with the ability to raise and lower decanting arms to manually control the outflow, if required.

This ESCP provides a suite of controls relevant to the type and scale of earthworks to be undertaken, based on the nature and scale of the activity. A description of the suite of 'erosion control' practices are listed in Table 4.1 below. Similarly, Table 4.2 provides appropriate 'sediment control' practices, and Table 4.3 'ancillary considerations' for earthworks management.

Refer to typical erosion and sediment control maintenance checklist in Appendix B.

Table 4.1: Erosion control practices

Typical control	Key design criteria	Relevant section of GD05 guidelines
Runoff diversion channel or bund	Prevent clean surface water and stormwater from the surrounding area entering the work site (clean water diversion), or to divert sediment-laden runoff to an appropriate sediment control device. Use a bund constructed of stabilised material (e.g., compacted soil wrapped in geotextile cloth or rapidly vegetated) around the perimeter of the site to divert clean surface or stormwater run-off. Bund height should be a minimum of 550 mm high.	E2.1 & E2.2
Stabilisation of exposed areas	Stockpiles (e.g., topsoil) or large stripped areas (e.g., >250 m^2) are to be stabilised if not worked for more than six weeks. Stockpiles and exposed areas are to be stabilised or covered using control measures such as seeding, hydroseeding, mulching, turfing, geosynthetic erosion control systems, aggregate etc.	E3.0
Rock check dams	Small temporary dams constructed across a channel, usually in series, to reduce flow velocity. May also help retain sediment. These reduce the velocity of concentrated flows, thereby reducing erosion of the channel. Build rock check dams with a maximum centre height of 600 mm.	E2.4

Table 4.2: Sediment control practices

Typical control	Key design criteria	Relevant section of GD05 guidelines
Secondary Treatment device	Options for a secondary treatment device are: • Decanting earth bund (DEB) • 20,000 litre rain tanks for use as settling tanks • Portable open top steel rectangular settlement chamber (sizes vary, typically containerised) • Portable sediment tank with screens/baffles wall (approximate size similar to a 20-foot shipping container). • Siltbuster (for larger volumes) • Turkeys nest (for smaller volumes) The use of flocculent should be considered.	F1.2, F1.5 & F2.0
Silt fence and Super Silt fence	• To be installed along the perimeter of the work area where ‘dirty water’ run-off from the work area will discharge. • Silt fence must be supported by a top-wire to be run between wooden battens/waratahs no more than 2 m apart, unless a strong woven material and wire support is used – then they can be extended to 4 m apart. • Super silt fence must be supported by a top wire and lower wire to be run between wooden battens/waratahs no more than 3 m apart. • Embedded a minimum of 200 mm into the ground. • Silt fence fabric is to be installed a minimum of 400 mm above ground level. • Super silt fence fabric is to be installed a minimum of 800 mm above ground level and trenched in 200 mm below ground. • The site side of the trench is to be backfilled and well compacted to secure the silt fence. Joins in lengths of silt fence fabric are to be done by doubling fabric around a waratah or stapling each fabric end to a batten and butting together.	F1.3 & F1.4

Table 4.3: Ancillary considerations

Typical control	Key design criteria	Relevant section of GD05

Dewatering	• Earthworks are to be undertaken in such a manner to minimise the accumulation/ponding of water.
	• If water from within the work area needs to be removed through pumping, then care must be taken to ensure such an activity is closely managed and monitored ensuring:
	  – Sediment within the water has settled out with a minimum of 100 mm clarity required prior to pumping.
	  – Pumps are to be set up to dewater from the top of the water and to minimise disturbance of the settled water.
		G1.0

Typical control	Key design criteria	Relevant section of GD05
	– Alternatively, ponded water could be pumped into secondary treatment devices, where batch dosing with chemical treatment could be considered to assist with silt settlement. • A variety of other options also exist in which sediment can be removed by pumping the water through a sediment tank with baffles, turkey's nest or pipe sock. • A sucker truck may be used if all other options for pumping and disposal on-site is unworkable, and if truck access is possible to remove water from the open quarry pit and take it to an appropriate off-site facility.	
Dust	• Generation of dust from the work area needs to be visually monitored and controlled. • Typically dust control measures include: – Limit vehicle movements and speed on unsealed areas – Remove/clean fines from sealed areas. – Limit stockpiling work and/or cover stockpiles during sustained dry and windy conditions – Minimise the extent of disturbed areas by undertaking works in a staged manner. – Dampen down work areas with water	G9.0
Monitoring and maintenance	• Copy of ESCP should be held on site. • Weekly inspection (as a minimum) of all controls should be undertaken. • Additional inspection before and after heavy rainfall should also be undertaken. • Accumulated sediment should be cleaned out regularly and disposed of appropriately. • Any damaged or underperforming controls should be maintained and/or remediated.	C1.5
Decommissioning controls	• Only once the work area is permanently stabilised can the controls be removed. • During removal care is to be taken to ensure any built-up sediment is appropriately managed and any disturbed areas immediately stabilised. • The shed and tanks should be removed from the site and stored for reuse.	C1.6 F2.4

4.2 Specific erosion and sediment control measures

4.2.1 General

The proposed ESC measures are shown on the Drawings in Appendix A and will be constructed in accordance with Auckland Councils Guideline GD05. In summary, the proposed measures are:

1. Earthworks will be carried out in Stages 1 to 4.
2. All earthworks area will be enclosed with silt fences to prevent sediment-laden water to runoff untreated into the Harania Creek.
3. Eastern and western working compounds will be stabilised aggregate.
4. All stockpiles will be placed over geotextile fabric and aggregate. The stockpile areas will be enclosed with silt fences. Alternatively, stockpiles will be covered with geotextile fabric.

5 Dirty water will be pumped out of excavation chambers and treated.
6 Clean water OLFP to be maintained through a culvert beneath the access staging.
7 Geotextile fabric to be used on cut batters to minimise dirty water runoff.
8 Exposed earthworks to be stabilised at the end of each working day.

The information below outlines specific erosion and sediment control measures applicable to the project.

4.2.2 Staged construction

The works on site will be carried out in four stages to minimise the duration of the exposure and risk of erosion and sediment runoff into the nearby Harania Creek. All excavations must be stabilised prior to moving onto the next stage of the construction.

4.2.3 Silt fences and super silt fences

Silt fences will be established at various locations and will be shifted according to the earthwork stages. Additionally, super silt fences will also be installed around exposed earthworks areas to prevent clean water entering the excavation along with dirty sediment-laden runoff from flowing back into the Harania Creek prior to treatment.

Silt fences and super silt fences will be installed in accordance with F1.3 GD05 and should be inspected at least once per week and after each rainfall event.

4.2.4 Dirty water management

It is expected that dirty water will need to be managed at various degrees during the construction stages. Depending on the volume of dirty water captured, different methods can be utilised to treat and release the water back into the environment.

For larger volumes of water, a Siltbuster (or similar) can be used to treat and release the water back into the receiving environment. For smaller volumes of water, a turkeys' nest can be implemented to slowly allow runoff to percolate back into the ground.

Dirty water diversion bunds will also be established at certain stages and locations, to be confirmed on site, as per T+T drawings in Appendix A.

4.2.5 Clean water management

The existing OLFP at the southwestern end of Blake Road reserve will be maintained. It is proposed that flow from this OLFP will be diverted into a culvert (to be sized) beneath the access staging area.

Clean water and dirty water diversion bunds will also be established at certain stages and locations, to be confirmed on site, as per T+T drawings in Appendix A.

4.2.6 Stabilisation

A stabilised surface is defined as inherently resistant to erosion or rendered resistant, such as by:

1 Applying geotextile or another method to cover the erodible surface.
2 Applying compacted GAP65.
3 Grassing or vegetating. Note the surface is only considered stabilised once 80% vegetative cover has been established.

Temporary stabilisation of exposed slopes before a rain event should be done by applying a geotextile or equivalent to prevent erosion of exposed works areas. It is important that, as this works area is in an active flood hazard area, preparation for rain at the work site be undertaken with extra care.

At the end of each working day, all exposed earthwork areas within the stream flow will be stabilised with geotextile fabric to prevent erosion in case of higher stream flows overnight. At the start of each workday, the fabric will be removed, and construction will resume. Special care must be taken during installation, with the geotextile fabric installed in an overlapping manner and securely pinned down. Given the potential for storm events, the fabric should be pinned more frequently than usual to prevent displacement or failure during heavy rainfall or increased stream flow events.

Temporary stabilisation measures should be inspected after each rainfall event or periods of excessive wind. Once areas have been topsoiled and hydroseeded, they will be inspected weekly. Where there are signs of poor surface coverage or overland flow, the areas will be repaired, and the source of the overland flow will be stopped.

Upon completion of a fill or cut surface, the area will be stabilised by placing a layer of topsoil and/or erosion protection such as geotextile fabric and aggregate. Top-soiled areas will be progressively revegetated as completion occurs by either hand spreading or hydro-seeding. All bare land areas will be top soiled and established with suitable vegetation. Works within the flood plain or CMA will be stabilised by lightly compacting the stream bed.

For areas where the long-term vegetation cover will be trees and/ or shrubs, the surface may be covered in tree mulch to stabilise it.

Stabilisation is not limited to the methods set out above. Additional methods and technologies may be investigated during earthworks to improve the effectiveness of stabilisation. Should a new method be proposed, approval from Auckland Council will be sought prior to implementation.

4.2.7 Stabilised construction access

Two site access points will be created via Blake Road and Bicknell Road to access the eastern and western compounds. All access will be constructed to GD05 stabilised entrance standards.

A portable water blaster will be available on standby to prevent vehicles leaving the works site from spreading sediments. The existing concrete entrance at the Blake Road site access can be utilised a clean surface as trucks and vehicles exit the site. Dirty wheel wash will be captured and directed to a designated containment or treatment area, where sediment can settle before the water is either treated or discharged appropriately to prevent contamination of nearby areas.

4.3 Methods for control and management of dust emissions

The recommended dust controls have been developed in accordance with relevant recommendations of the Ministry for the Environment Good Practice Guide for Assessing and Managing the Environmental Effects of Dust Emissions (MfE, 2016).

The following dust control measures are suggested for all general activities:

- Sufficient water should be made available for dust control and used to wet excavation works or work areas if necessary.
- Review daily forecast wind speed, wind direction and soil conditions before commencing activities with high dust potential.
- The area of surfaces covered with fine materials should be minimised and exposed surfaces should be stabilised wherever practicable, excavated material can be placed in skip bins or directly into trucks where possible to minimise the need for stockpiling if required.

- If required, dust shielding (such as shelter cloth on fences) could be installed where practicable.

5 Monitoring and maintenance

5.1 Onsite maintenance and monitoring

On-going monitoring during the construction programme will be required to assist with the on-going erosion and sediment control management. The monitoring will support an adaptive sediment management approach where it can provide feedback on the effectiveness of sediment controls and the need for modified or additional controls. Should there be any modifications to the ESCP measures, it will be discussed on site with a compliance officer, and the ESCP will be modified to reflect the change. Updates will be provided to council for approval prior to on-site implementation.

The frequency of the maintenance of the ESC devices will be conducted as required if the devices show signs of fatigue and failure to perform as per GD05 standards.

Refer to the maintenance checklist in Appendix B.

Current and long-term weather forecasts shall be monitored to enable construction activities to be planned and resourced to respond to changing weather conditions. All erosion and sediment control measures shall be inspected by the Contractor daily when works are occurring.

The contractor shall monitor and maintain all erosion and sediment control measures in accordance with GD05.

5.2 Extreme rainfall events

All erosion and sediment controls should be checked before and after extreme and heavy rainfall to ensure the controls are operating correctly.

A rainfall event is considered to be extreme if the MetVUW[7] rainfall forecast in greater than 20 mm over six hours.

Monitoring of all erosion and sediment control devices will be undertaken regularly with elements inspected recorded and kept onsite.

Prior to commencing earthworks, weather conditions shall be monitored constantly to allow for advanced warning of rainfall event, and weather forecasts shall be used to plan the works. The works shall be planned for an appropriate fine weather window when there are no rainfall events (>5 mm rain in a 24-hour period) forecast for the next three days.

5.3 Incident management

In the event there is an incident on site involving the release of excess sediment of harmful chemicals into the receiving environment, the incident is to be documented, council is to be notified and remediation of the incident / ESC device can take place.

- Document incident, notify council, remediate the ESCP device.

[7] https://www.metvuw.com/forecast/forecast.php?type=rain&region=nzni

6 Applicability

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

Tonkin & Taylor Ltd
Environmental and Engineering Consultants

Report prepared by:	Authorised for Tonkin & Taylor Ltd by:
Peter HB	
....	....
Peter Hanabadi Civil Engineer	Chris Bauld Project Director

Reviewed by:

....

Steven Lopati
Senior Civil Engineer

PEHA
p:\1017033\1017033.2002\issueddocuments\2024.10.25 - issued for resource consent\civil\rev 2 harania flood resilience works - tennessee bridge escp_final.docx

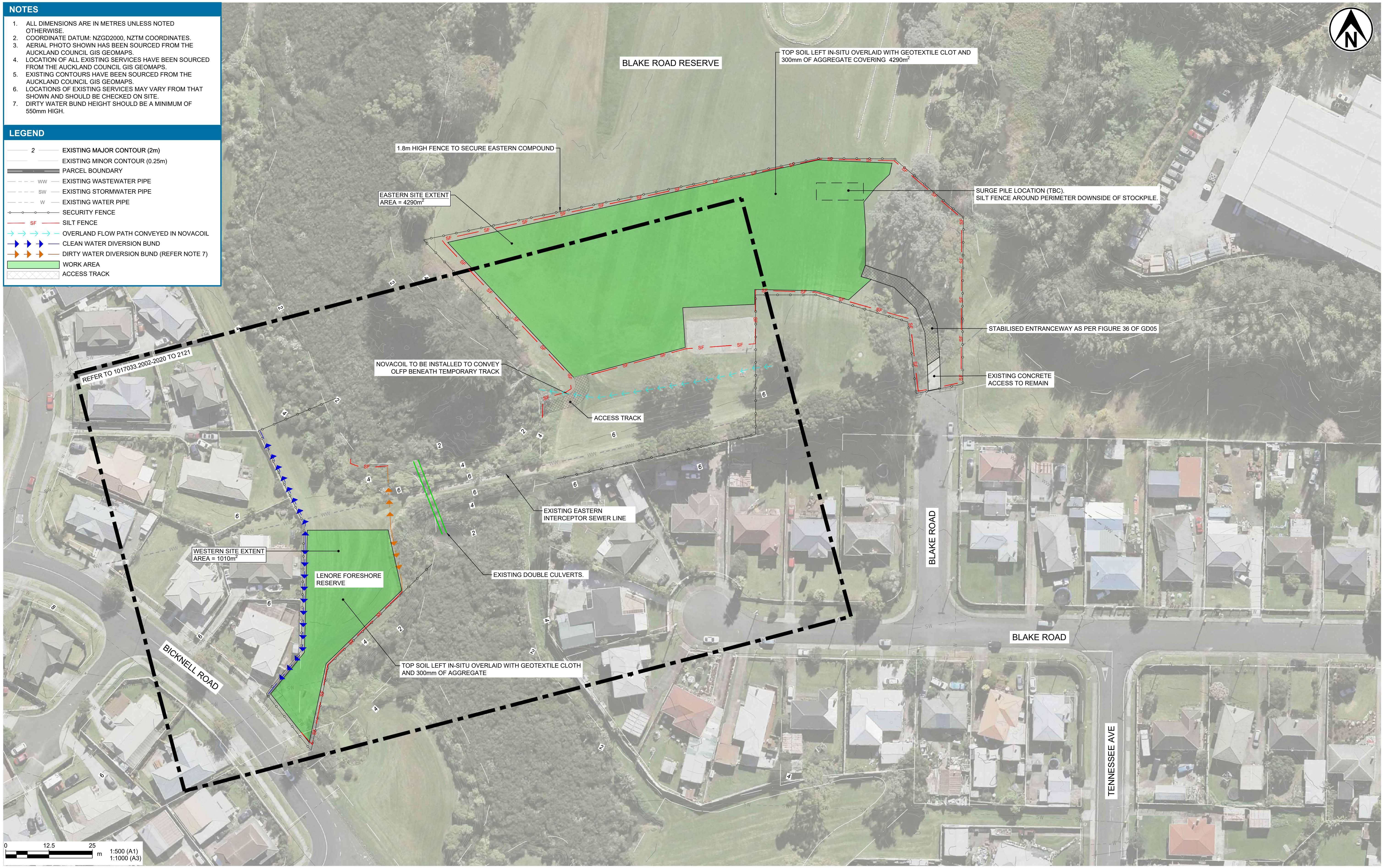
Appendix A Erosion and sediment control plan

NOTES

1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
2. COORDINATE DATUM: NZGD2000, NZTM COORDINATES.
3. AERIAL PHOTO SHOWN HAS BEEN SOURCED FROM THE AUCKLAND COUNCIL GIS GEOMAPS.
4. LOCATION OF ALL EXISTING SERVICES HAVE BEEN SOURCED FROM THE AUCKLAND COUNCIL GIS GEOMAPS.
5. EXISTING CONTOURS HAVE BEEN SOURCED FROM THE AUCKLAND COUNCIL GIS GEOMAPS.
6. LOCATIONS OF EXISTING SERVICES MAY VARY FROM THAT SHOWN AND SHOULD BE CHECKED ON SITE.
7. DIRTY WATER BUND HEIGHT SHOULD BE A MINIMUM OF 550mm HIGH.

LEGEND

2	EXISTING MAJOR CONTOUR (2m)
	EXISTING MINOR CONTOUR (0.25m)
	PARCEL BOUNDARY
WW	EXISTING WASTEWATER PIPE
SW	EXISTING STORMWATER PIPE
W	EXISTING WATER PIPE
	SECURITY FENCE
SF	SILT FENCE
	OVERLAND FLOW PATH CONVEYED IN NOVACOIL
	CLEAN WATER DIVERSION BUND
	DIRTY WATER DIVERSION BUND (REFER NOTE 7)
	WORK AREA
	ACCESS TRACK



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REV	DESCRIPTION	CAD	CHK	DATE
1	FOR RESOURCE CONSENT	ALPO	SL	25.10.2024

DESIGNED	PEHA	SEPT.24
DRAWN	TECO	SEPT.24
DESIGN CHECKED	SL	25.10.24
DRAWING CHECKED	JC	25.10.24

APPROVED DATE

DRAWING STATUS
RESOURCE CONSENT
PROJECT PHASE

NOT FOR CONSTRUCTION

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CLIENT **HEALTHY WATERS**

PROJECT HARANIA BLUE GREEN NETWORKS STAGE 2

TITLE HARANIA TENNESSEE BRIDGE ESCP
BLAKE ROAD RESERVE SITE ESTABLISHMENT STAGE 1

SCALE (A1) 1:500 DWG No. 1017033.2002-2010 REV 1

NOTES

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LEGEND

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- EXISTING MINOR CONTOUR (0.25m)
- PARCEL BOUNDARY
- WW EXISTING WASTEWATER PIPE
- SW EXISTING STORMWATER PIPE
- W EXISTING WATER PIPE
- SECURITY FENCE
- SF SILT FENCE
- OVERLAND FLOW PATH CONVEYED IN NOVACOIL
- CLEAN WATER DIVERSION BUND
- DIRTY WATER DIVERSION BUND (REFER NOTE 7)
- ACCESS TRACK
- WORK AREA

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RESOURCE CONSENT
PROJECT PHASE

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CLIENT **HEALTHY WATERS**
PROJECT HARANIA BLUE GREEN NETWORKS STAGE 2
TITLE HARANIA TENNESSEE BRIDGE ESCP
LENORE FORESHORE RESERVE SITE ESTABLISHMENT STAGE 1
SCALE (A1) 1:250 DWG No. 1017033.2002-2020 REV 1

NOTES

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- EXISTING WATER PIPE
- HIGH FENCE
- SILT FENCE
- OVERLAND FLOW PATH CONVEYED IN NOVACOIL
- CLEAN WATER DIVERSION BUND
- DIRTY WATER DIVERSION BUND (REFER NOTE 7)
- ACCESS TRACK
- EXTENT OF ACCESS STAGING
- COFFER DAMS
- WORK AREA

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PROJECT PHASE

CLIENT HEALTHY WATERS

PROJECT HARANIA BLUE GREEN NETWORKS STAGE 2

TITLE HARANIA TENNESSEE BRIDGE ESCP
CMA PREPARATORY WORKS STAGE 1 - OPTION 1

SCALE (A1) 1:250 **DWG No.** 1017033.2002-2030 **REV** 1

NOTES

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PROJECT PHASE

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CLIENT: **HEALTHY WATERS**

PROJECT: HARANIA BLUE GREEN NETWORKS STAGE 2

TITLE: HARANIA TENNESSEE BRIDGE ESCP
CMA PREPARATORY WORKS STAGE 1 - OPTION 2

SCALE (A1): 1:250 DWG No. 1017033.2002-2031 REV 1

NOTES

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- DIRTY WATER DIVERSION BUND (REFER NOTE 7)
- ACCESS TRACK
- EXTENT OF ACCESS STAGING
- COFFER DAMS
- WORK AREA

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CLIENT **HEALTHY WATERS**

PROJECT BLUE GREEN NETWORKS - HARANIA UPGRADES

TITLE HARANIA TENNESSEE BRIDGE ESCP
COFFER DAM CONSTRUCTION STAGE 2 - OPTION 1

SCALE (A1) 1:250 DWG No. 1017033.2002-2100 REV 1

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NOTES

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- ACCESS TRACK
- COFFER DAMS
- WORK AREA

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PROJECT PHASE

CLIENT HEALTHY WATERS

PROJECT BLUE GREEN NETWORKS - HARANIA UPGRADES

TITLE HARANIA TENNESSEE BRIDGE ESCP
COFFER DAM CONSTRUCTION STAGE 2 - OPTION 2

SCALE (A1) 1:250 **DWG No.** 1017033.2002-2101 **REV** 1

NOTES

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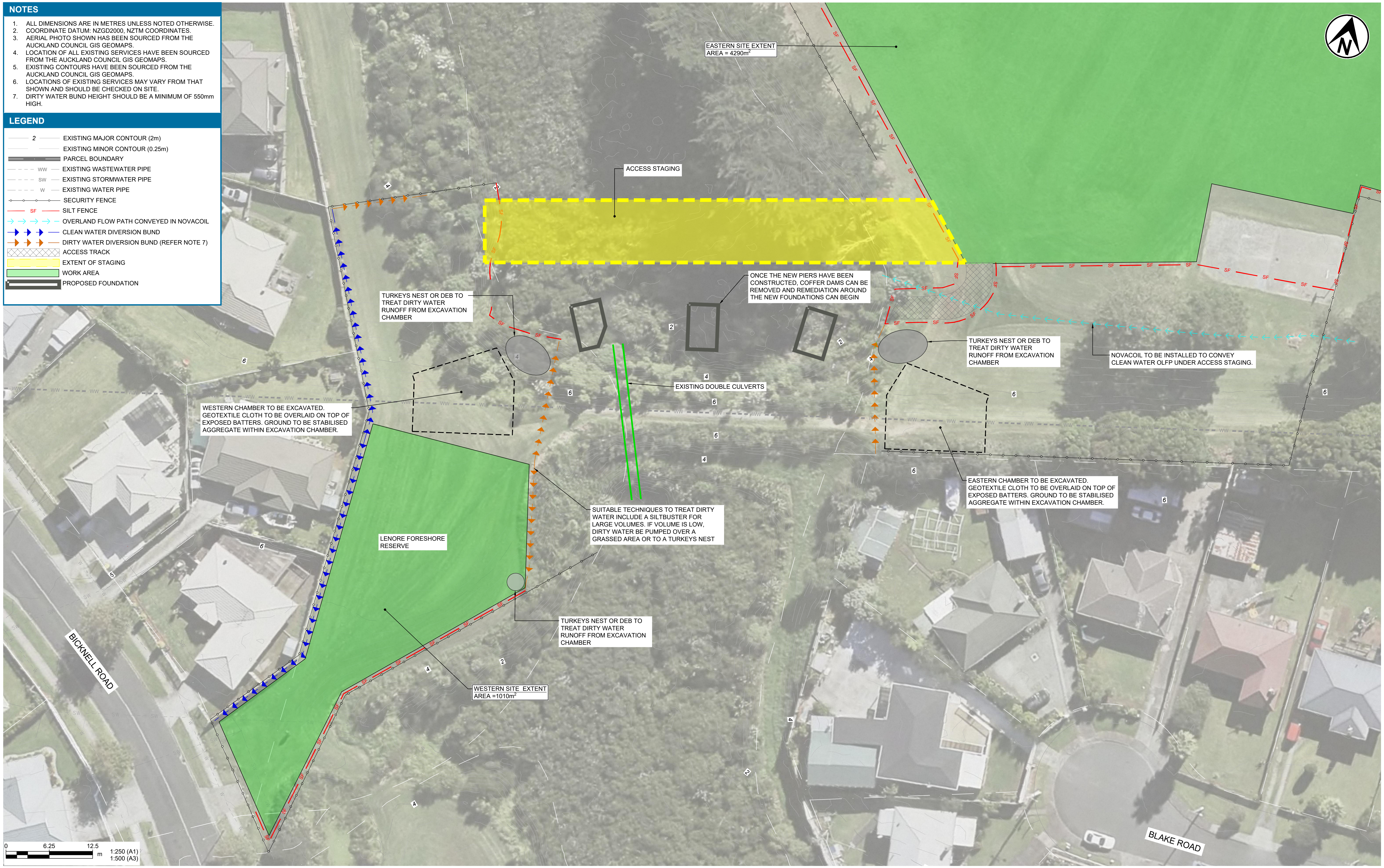
- CLEAN WATER DIVERSION BUND
- DIRTY WATER DIVERSION BUND (REFER NOTE 7)
- ACCESS TRACK
- EXTENT OF STAGING
- WORK AREA
- PROPOSED FOUNDATION



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1	PRELIMINARY DESIGN	ALPO	SL	25.10.2024		

DESIGNED	PEHA	SEPT.24
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RESOURCE CONSENT
PROJECT PHASE

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CLIENT **HEALTHY WATERS**
PROJECT HARANIA BLUE GREEN NETWORKS STAGE 2
TITLE HARANIA TENNESSEE BRIDGE ESCP
EASTERN & WESTERN CONNECTION CHAMBERS STAGE 3

SCALE (A1) 1:250 DWG No. 1017033.2002-2110 REV 1

NOTES

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6. LOCATIONS OF EXISTING SERVICES MAY VARY FROM THAT SHOWN AND SHOULD BE CHECKED ON SITE.
7. PLANS ARE INDICATIVE OF OPTION 1. THE SAME STEPS ARE EXPECTED TO BE CARRIED OUT FOR OPTION 2.

LEGEND

- 2 EXISTING MAJOR CONTOUR (2m)
- EXISTING MINOR CONTOUR (0.25m)
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- W EXISTING WASTEWATER PIPE
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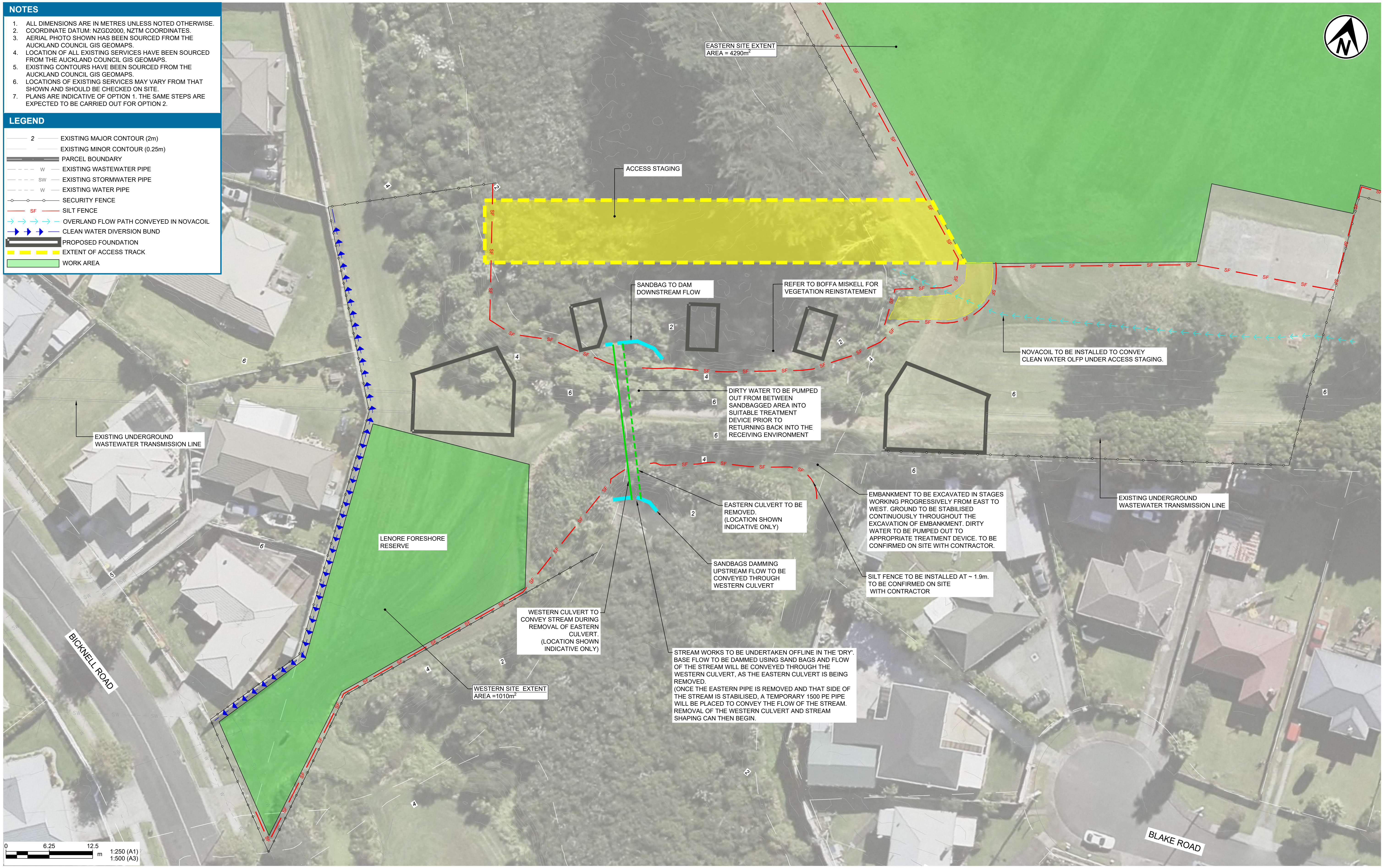
- EXTENT OF ACCESS TRACK
- WORK AREA



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PROJECT PHASE

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CLIENT **HEALTHY WATERS**

PROJECT HARANIA BLUE GREEN NETWORKS STAGE

TITLE HARANIA TENNESSEE BRIDGE ESCP EMBANKMENT REMOVAL - STAGE 4, PART 1

SCALE (A1) 1:250 DWG No. 1017033.2002-2120 REV 1

Appendix B Erosion and sediment control maintenance checklist

SITE EROSION & SEDIMENT CONTROL INSPECTION CHECKLIST

Site: **Harania Tennessee Bridge** **Project No: 1017033.2002**

Inspection by: …………………………………………………… **Date:** ………………… **Time:** ………………

Current Weather Condition: (circle) **Wind Direction / Conditions**

STRONG

MODERATE

LIGHT / STILL

Area Inspected (tick)**:** ☐ Cleanfill ☐ Clay extraction ☐ Other (please specify):

……………………………………………………………

ITEM / SCOPE OF INSPECTION	(circle)	COMMENTS
EROSION & SEDIMENT CONTROL		
- Are there any signs of scour at the piped outlet into the receiving environment?	Y N N/A	
- Does the visual appearance of the water in the receiving environment appear overly turbid or otherwise?	Y N N/A	
- Is there any evidence of uncontrolled dirty water discharge from the site?	Y N N/A	
- Is there any visible discolouration of waters leaving the site?	Y N N/A	
- Are there any rips, tears or holes over the length of silt fence fabric?	Y N N/A	
- Is there damage to silt fence waratahs and returns from machinery?	Y N N/A	
- Are previous repair to rips, tears and holes in silt fence fabric forming tight seal?	Y N N/A	
- Is the bottom edge of the silt fence fabric trenched in the required depth?	Y N N/A	
- Is the minimum height of the silt fence maintained?	Y N N/A	
- Are there bulges due to silt build ups? Has silt build up reached 50% of the fence height? Is so, de-silt is required.	Y N N/A	
- Has the silt fence fabric degraded or collapsed? If so, replace immediately.	Y N N/A	
- Has the area been appropriately stabilised where silt fence has been removed?	Y N N/A	
Are the catchment areas above clean water diversions maintained as clean?	Y N N/A	
Is the stabilised entrance needing maintenance to ensure the surface remains clean?	Y N N/A	

RECOMMENDATIONS			
Priority (H/M/L)	Action	By whom	By when

Reviewed and Accepted by **Date:**..............................

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