

Appendix 13

Construction Methodology – EB3C

Eastern Busway EB3 Commercial

Construction Methodology

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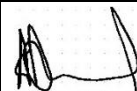
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List of Abbreviations and Definitions

Abbreviation and Definitions	Description
AEE	Assessment of Effects on the Environment
AUP(OP)	Auckland Unitary Plan (Operative in Part) (Updated 20 July 2023)
BSP	Bulk Supply Point
CCP	Community Consultation Plan
CEMP	Construction Environmental Management Plan
CNVMP	Construction Noise and Vibration Management Plan
CMA	Coastal Marine Area
CST	Combined Service Trench
CTMPs	Construction Traffic Management Plans
EB1	Eastern Busway 1 (Panmure to Pakuranga). Note this is completed.
EB2	Eastern Busway 2 (Pakuranga Town Centre), including Reeves Road Flyover (RRF) and Pakuranga Bus Station.
EB3C	Eastern Busway 3 Commercial (Tī Rākau Bridge to Guys Reserve), including two new bridges, an offline bus route through Burswood and a new station at Burswood.
EB3R	Eastern Busway 3 Residential (Pakuranga to Tī Rākau Bridge), including Edgewater and Gossamer Bus Stations.
EB4i	Eastern Busway 4 interim (existing road corridor between Guys Reserve and Tī Irirangi Drive, Botany Town Centre)
EB4L	Eastern Busway 4 Link Road (Through Guys Reserve to Tī Irirangi Drive)
EBA	Eastern Busway Alliance
ESCP	Erosion and Sediment Control Plan
ha	Hectare(s) = 10,000m ²
ITA	Integrated Transport Assessment
ITS	Intelligent Transportation System
km	Kilometre(s)
m	Metre(s)
m ²	Square Metre(s)
m ³	Cubic Metre(s)
MSE	Mechanically Stabilized Earth (walls)
NZCEP	New Zealand Code of Practice for Electrical Safe Distances
RRF	Reeves Road Flyover
SAP	Site Access Point
SEART	South East Arterial (Pakuranga Highway)
t	Tonne

1. Introduction

1.1 Overview of the Eastern Busway Project

The Eastern Busway Project (the Project) is a package of works focusing on promoting an integrated, multi-modal transport system to support population and economic growth in southeast Auckland. This involves the provision of a greater number of improved public transport choices and aims to enhance the safety, quality and attractiveness of public transport and walking and cycling environments. The Project includes:

- 5km of two-lane busway
- Two new bridges for buses across Pakuranga Creek (Bridges A and B)
- A new bridge for buses crossing Guys Reserve and Whaka Maumahara Reserve (Bridge C)
- Improved active mode infrastructure (walking and cycling) along the length of the busway
- Three intermediate bus stations
- Two major interchange bus stations.

The project forms part of the previous Auckland Manukau Eastern Transport Initiative (AMETI) programme (the programme) which includes a dedicated busway and bus stations between Panmure, Pakuranga and Botany town centres. The dedicated busway will provide an efficient rapid transit network (RTN) service between the town centres, while local bus networks will continue to provide more direct local connections within the town centre areas. The project also includes new walking and cycling facilities, as well as modifications and improvements to the road network.

The programme includes the following works which do not form part of the Eastern Busway Project as these are completed:

- Panmure Bus and Rail Station and construction of Te Horeta Road
- Eastern Busway 1 (EB1) – Panmure to Pakuranga.

The Eastern Busway project consists of the following packages:

- Early Works Consents – e.g. William Roberts Road extension from Reeves Road to Tī Rākau Drive
- Eastern Busway 2 (EB2) – Pakuranga Town Centre, including the Reeves Road Flyover (RRF) and Pakuranga Bus Station. EB2 is subject to the lodged and publicly notified Notice of Requirement for a designation and associated resource consents (Council References-LUC60407134, DIS60407135, DIS60407492, CST60408360 and CST60408369) (BUN60407133)
- Eastern Busway 3 Residential (EB3R) – SEART to Gossamer Drive, including Edgewater Bus Station EB3R is subject to the lodged and publicly notified resource consents (Council References- LUC60407123, DIS60407122, DIS60407493, DIS60412893, WAT60412894 LUS60412895, CST60408460, CST60408461)(BUN60407121)
- Eastern Busway 3 Commercial (EB3C) – which commences from Riverhills Park along Tī Rākau Drive to Botany, including two new bridges, and an offline bus route through Burswood. **EB3C is subject to this construction methodology.**
- Eastern Busway 4 Link Road (EB4L) – Guys Reserve to Botany Town Centre, including a link road through Guys Reserve and Whaka Maumahara Reserve to Te Irirangi Drive/Town Centre Drive intersection.

The overall Project is shown in Figure 1 below.

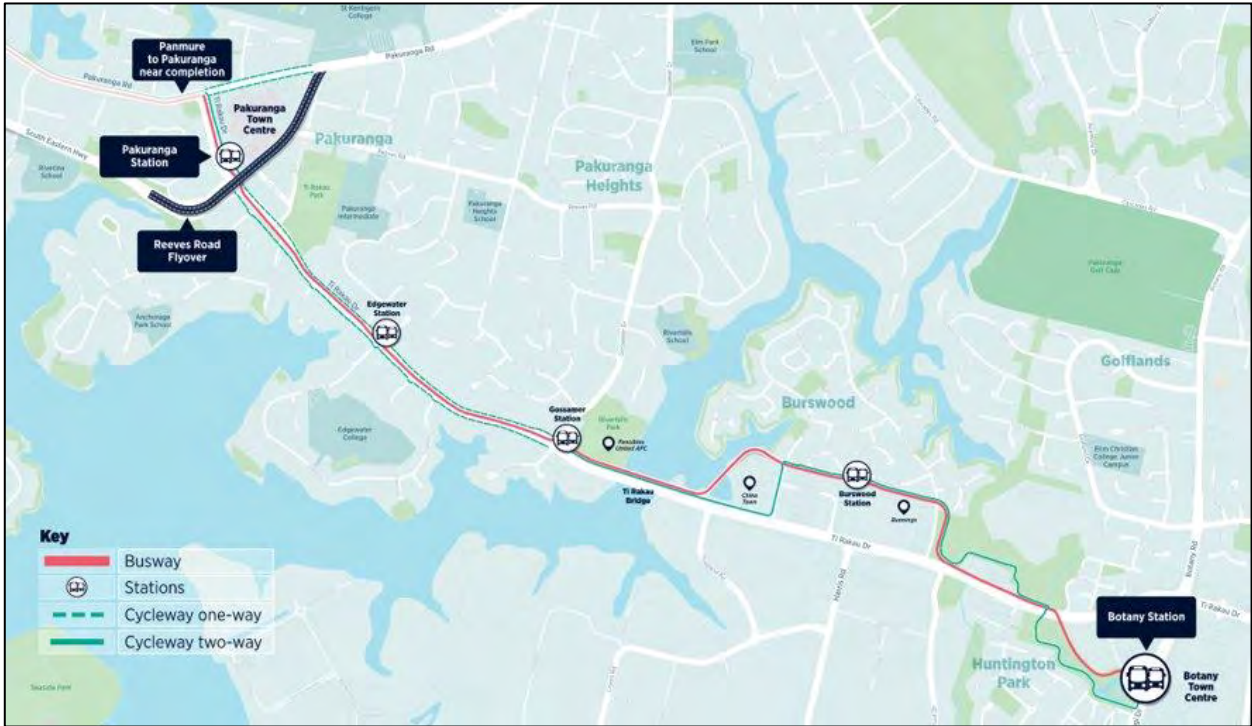


Figure 1 - Project alignment

2. Proposal Description

2.2 Eastern Busway 3 Commercial

This construction methodology addresses EB3C which runs between Riverhills Park in the west and Guys reserve in the east.

Key elements of the EB3C works include the construction of two bridges (Bridges A and B), noise and retaining walls, stormwater drainage, and a cycleway. The EB3C bridge structures, new and upgraded stormwater outfalls and an area of reclamation require works in the coastal marine area (CMA).

The EB3C works will involve the establishment of an ‘off-line’ busway, cycleway and stormwater upgrades. These works will take place within existing road reserves, Council reserves¹ and privately held land. The extent of works for EB3C runs between Riverhills Park (i.e adjacent to the terminus of the earlier EB3R package) in the west to Guys Reserve in the east, through the suburbs of Burswood and East Tāmaki.

The busway will be largely off-line (i.e., outside the current Tī Rākau Drive corridor), first crossing Pakuranga Creek by way of a new two-lane bridge (Bridge A) including abutments² and scour protection. It will then cross a coastal headland at 242 Tī Rākau Drive (a Mobil branded service station), and then an embayment within which a retaining wall, and a 4m² coastal reclamation will be constructed. The busway will cross a second headland at 254 Tī Rākau Drive (currently occupied by a pet store), before crossing a mangrove filled bay to the west of 262 Tī Rākau Drive (the ‘Chinatown’ retail business) via a second bridge (Bridge B). Bridge B will include two abutments with scour protection. Bridge B will require construction of a reinforced embankment at its northern end which includes imported fill, rip rap and permanent wick drains, and 549m² coastal reclamation. In parallel, a retaining wall will be constructed to the eastern side of the embankment. Following this, the busway runs between the commercial area and residential area north of Tī Rākau Drive, crossing several residential sites. The busway also crosses Burswood Drive twice, with raised signalised crossings established to control both the busway and road traffic.

A new ‘intermediate’ style bus station will be established at Burswood, before the busway then crosses over Burswood Esplanade Reserve and onto a widened Tī Rākau Drive (by the Howick and Eastern bus depot). The busway will then run beside the eastbound lanes of Tī Rākau Drive, before crossing over Tī Rākau Drive to connect with EB4L at Guys Reserve.

The busway will include a new cycleway, which will largely run parallel to the busway for most of this section of the Project. The exceptions to this includes Bridge B, between 254 Tī Rākau Drive and Burswood Esplanade (west) – for this section the cycleway will continue along Tī Rākau Drive before turning into Burswood Drive West, as well as where the cycleway runs behind the Howick and Eastern bus depot.

¹ Including Burswood Reserve Esplanade Reserve and Bard Place Reserve

² The western abutment and associated scour protection was included in the EB3R consenting package

Other works included in EB3C are the relocation of existing utility services, the provision of new or upgraded stormwater infrastructure and open space upgrades. Stormwater works will involve new outfalls discharging to Pakuranga Creek (and its tributaries) and rain gardens.

Lastly, EB3C involves the establishment of two laydown areas, one at 242 Tī Rākau Drive and the other within the boundaries of Burswood Esplanade Reserve. Both laydown areas are located on land that will be occupied by the Project upon its completion.



Figure 2 - Eastern Busway 3 Commercial Project Area

3. General Construction Aspects

This section contains a description of the following general construction aspects across the whole Project:

- Enabling works
- Site establishment works
 - Traffic / public management
 - Existing utility services location
 - Site access points (SAP's) & fencing
 - Construction laydowns, compounds and satellite office
 - Main laydown and site deliveries
- Protection and/or relocation of existing network services
- Construction activities
 - Erosion & sediment controls
 - Building removal & site clearance
 - Earthworks
 - Civil works
 - Utilities relocations
 - Drainage & ducting
 - Traffic services
 - Urban design & landscaping
 - Pavement works
 - Shared paths
 - Bus lanes
 - Traffic lanes
 - Structures
 - Bridges
 - Retaining walls
 - Night works
- Dis-establishment
- Testing and Commissioning.

3.1 Enabling Works

Prior to the main phase of construction commencing, there are several activities that are required along the alignment. These include:

- Site investigations and data collection of the existing ground levels & features, pavements, traffic services, lighting, signage, ITS & signal systems, drainage, soil types, potential contaminated lands, and ground water
- Investigation, location, and protection of existing network utility services
- Property dilapidation surveys of existing houses, buildings, and structures
- Removal of buildings and houses as required including utilities disconnections
- Retaining the utilities connections for continuity of services for properties not impacted
- Site establishment activities in preparation of the main construction works including haul road construction and laydown areas.

3.2 Site Establishment

3.2.1 Existing network services location

As part of the enabling works, and before any setup or construction works commence on the Project, existing network services will be relocated and marked by either the provider themselves or specially trained utility location personnel.

Once identified, each service will be potholed or measured to determine the exact location and depth / height.

Potholing and measuring are permitted activities under the AUP(OP) and will be supervised by the network utility provider(s) and follow the Auckland Council codes of practices for working around live services.

3.2.2 Construction laydowns, compounds and satellite office

3.2.2.1 *Construction Compounds and Satellite Offices*

Two areas within the EB3C footprint (Burswood Reserve and 242 Ti Rākau Drive) have been identified as key construction compounds/project offices. Other smaller site facilities (for worker welfare) will be set up as works progress along the alignment. Note that the Burswood Reserve compound does not occupy any more of the reserve than is required to complete the permanent works.

The description of the construction compounds and satellite offices is set out in Table 1 - Temporary Site Compounds. These two compounds have been chosen after considering their proximity to the works, possible access routes to and from them and their distance away from the residential area to minimise noise and disruption to the residents.

The final construction compound and satellite office locations and activities may change depending on the final construction methodology and will be confirmed once properties are made available to the Project. However, the location, size and scale of these compounds will be governed by resource consent and designation conditions.

The construction compounds and satellite areas may contain the following (or similar) activities commonly associated with construction:

- Temporary site buildings – workers' facilities, site offices and meeting rooms
- Plant and equipment maintenance facilities
- Fuel storage and minor refuelling facilities in accordance with Hazardous Substances & New Organisms (HSNO) regulations 1996 – 20ft max bunded containers
- Material laydown areas including stockpiling of materials and spoil
- 10ft, 20ft and 40ft material storage containers
- Wheel washing and cleaning facilities
- Lighting / fencing / security temporary mesh panels 1.8m high/ hoarding
- Vehicle parking
- Plant and equipment parking.

In addition to these compounds and satellite offices, typical construction activities (such as stockpile, laydown and assembly areas, plant and equipment storage) will occur throughout the construction footprint.

Compounds and storage sites will also be regularly monitored for environmental compliance in line with the Erosion and Sediment Control Effects Assessment.

The works are generally planned to be completed during day time however from time to time night-time works may required (refer to section 3.4.8 Night works) and the compounds will be used to support these activities.

Site establishment activities for the construction compounds and satellite office areas will include site clearance, ground preparation, and establishing erosion and sediment control measures prior to any construction activities occurring. Upon completion of the works, the construction compounds and satellite offices will be disestablished.

The compounds will be provided with water, telecommunications and power connections, and where required wastewater connections. In most cases, these services are able to be connected directly to the existing adjacent networks. Where there is no existing network adjacent to the yard, a temporary connection will be made. These temporary connections will be removed upon completion of construction.

Within each satellite compound, designated carparking areas will be set up for construction staff and visitors. Parking on side streets by construction staff will be discouraged and monitored to ensure minimum disruption to the community and users of sports fields, public reserves, on event/opening day(s).

The final location of construction compounds and satellite offices and the activities undertaken within each area will be confirmed in the Construction Environment Management Plan (CEMP).

Compound	Location	Compound specific activities	Approximate commencement date	Approximate duration of use
Compound 1 – Satellite Office / Carparking	Burswood Esplanade Reserve	Satellite office and transfer station for the construction of EB3C. Access will be off Burswood Dr. Temporary buildings (portacoms) will be installed on site for the duration of construction	Mid-late 2024	42 months (or 3.5 years)
Compound 2 – Satellite Office / Carparking	242 Tī Rākau Dr (“Mobil”)	Satellite office / lunch room for the construction of Bridge A and Bridge B and western Civil works. Access will be off Tī Rākau Dr, utilizing the existing driveway cross as the entry point.	Mid-late 2024	42 months (or 3.5 years)

Table 1 - Temporary Site Compounds

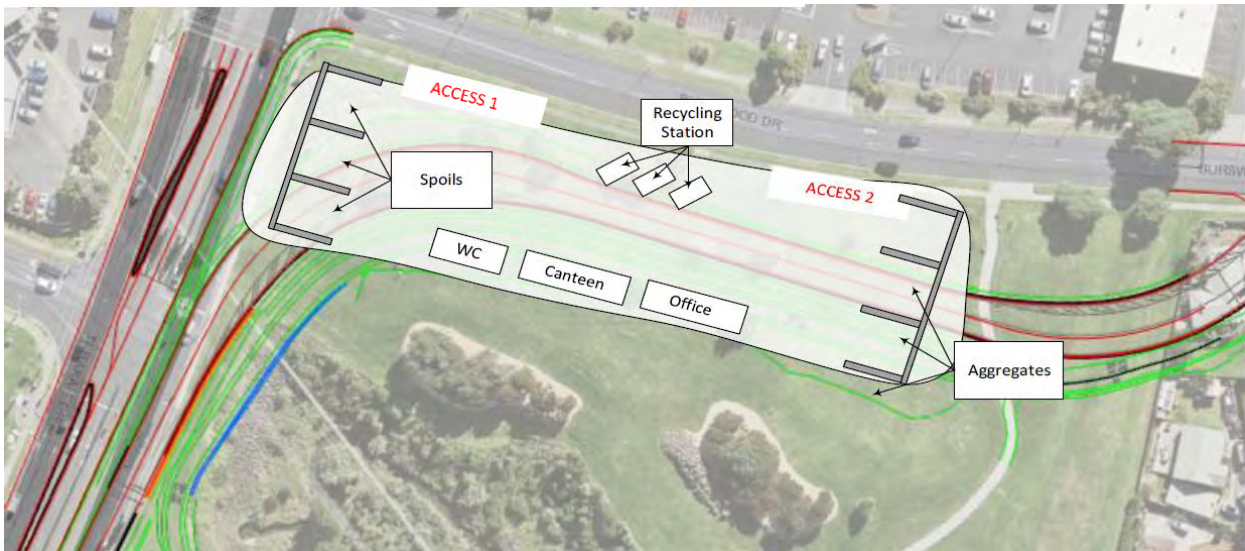


Figure 3 - Indicative layout of Burswood Reserve Compound

3.2.2.2 Temporary Staging

To provide access for plant and personnel to construct Bridge A and Bridge B, temporary staging (refer to Figure 4 - Typical temporary staging), consisting of piles driven into the ground, structural steel work and a precast concrete deck, will be installed in the CMA. Once construction of the bridges is complete the piles, deck and structural steel will be removed. If the piles are too heavily imbedded they will be cut off below ground level.



Figure 4 - Typical temporary staging – the orange crane and truck are sitting on the temporary staging. The new bridge is to the right

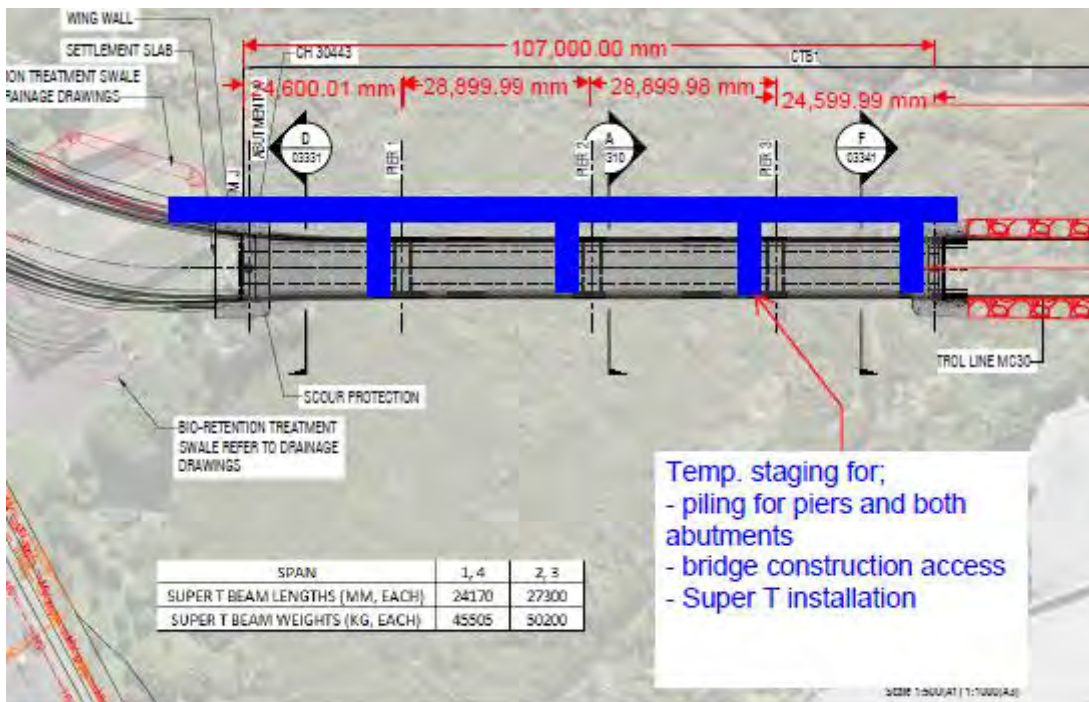


Figure 5 - indicative temporary staging shown alongside Bridge B

3.2.2.3 Main laydown and site deliveries

Bulk deliveries of construction materials and the export of waste will predominantly be via one of the two construction laydown yards (refer to Table 1 - Temporary Site Compounds). Materials will be transferred between site specific locations and the construction compounds in trucks throughout the Project duration. The CTMP(s) will define the site traffic movements to and from the site. Specific deliveries for example retaining wall blocks, will be delivered directly to the site location.

Access to construction work zones will be via Burswood Drive and Tī Rākau Drive. No access to the works will occur from Dulwich, Tullis or Heathridge Places.

For deliveries that would either disrupt the public and/or traffic flow on a regular basis, and/or for a long period of time, i.e. bridge beam deliveries, night deliveries will occur. Deliveries will typically commence in line with temporary traffic management plan approvals, often being between 22:00 hrs to 05:00 hrs.

When materials are stored on site and/or in laydown yards, they are to be either stored in clearly marked 'bins' or stockpiles, stacked in an orderly fashion to a safe height and size, housed in secure and/or specialist containers/drip trays and covered and protected from the elements as specified by the manufacturer. Any aggregate stockpiles will be managed to ensure they generate no dust.

3.2.3 Site access points (SAP's) and fencing

Each construction compound and site egress point will have a site-specific Site Access Point (SAP) management plan, and will also be managed through the Project's construction traffic management plans (CTMPs). A SAP is a control interface point between the public and construction activities.

A SAP embraces either the construction of new permanent egress facilities (e.g. pull-off lanes, turning bays, signalled intersections, driveway crossings (amongst others) or is a temporary traffic management

egress point onto and off the site. It is also an authorised entry / exit check point, and co-ordinates the entry and exit of deliveries and road worthiness of existing vehicles (clean tyres amongst others).

SAP's will be one of the first items constructed on site, along with safety and security fencing around works areas and compounds. The fencing will provide a physical barrier between the works and public.

SAP's consist of:

- Either a permanent or temporary traffic management egress setup
- Sealed entry way off the adjacent carriageway
- Lockable gate and perimeter fencing around the circumference of the compound or works area
- A sign-in / sign-out station, including safety and environmental protocols within
- Wheel washing facilities.

The final locations of SAPs and the facilities and activities within each may change depending on the final construction methodology and sequencing of the works but are likely to include the following locations

- Burswood Drive east
- Burswood Drive reserve
- Burswood Drive west (2)
- 242 Tī Rākau Drive
- Tī Rākau Drive (various locations to allow access to work zones).



Figure 6 - Burswood Dr East SAP

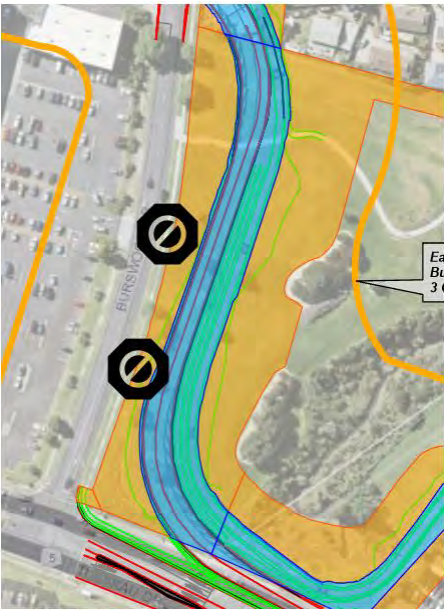


Figure 7 - Burswood Reserve SAPs



Figure 8 - Burswood Dr west SAPs



Figure 9 - 242 Tī Rākau Dr SAP

SAP's will be individually numbered to allow efficient wayfinding for site traffic planning and communications.

3.3 Protection and/or relocation of existing network services

The Project traverses a highly modified urban environment and as a result there are numerous network utilities within and crossing the alignment. These services range from major arterial networks (such as water supply mains, electricity transmission, telecommunications, and gas) to local reticulation services.

The key services within the Project include:

- High voltage transmission overhead lines (Section 3.3.1)
- High voltage transmission underground cables (Section 3.3.1)
- High pressure gas mains (Section 3.3.2)
- Water transmissions, bulk water supply and wastewater infrastructure (Section 3.3.3)
- Fibre optic communication cables and telephone lines (Section 3.3.4)
- Electricity and gas distribution (Section 3.3.5)
- Stormwater drainage (Section 3.3.6).

Discussions have been undertaken with network utility operators and agreements are being developed with each operator regarding their assets. Services will be either protected or relocated to the relevant provider's standards and where possible located within dedicated service corridors. Services will be constructed and tested in the realigned position to enable a short switch-over timeframe with minimal disruption to users.

Construction methodologies for each service will be developed in consultation with each operator. Options being considered include directional drilling for small services within existing corridors and trenching.

3.3.1 High voltage transmission lines (including towers)

There are two electricity transmission lines either crossing or in close proximity to the Project which are assets owned and operated by Transpower New Zealand Limited. Refer to Figure 10 and Figure 11 below which shows the continuous overhead power lines (110kV) while discontinuous ones indicate underground cables (220kV).



Figure 10 – High Voltage Transmission Plan at Burswood Reserve (overhead line is solid orange line, underground line is dashed orange line)



Figure 11 - High Voltage Transmission Plan at China Town (underground line is dashed orange line)

The New Zealand Code of Practice for Electrical Safe Distances (NZECP:34) specifies minimum approach distances to all overhead power lines for construction activities and the permanent road alignment. The design has sought to avoid transmission lines and cables wherever possible. However, there are locations where the lines are affected by both construction activities and the permanent works and as a result, works are required to realign the span between affected towers and increase the clearance under conductors by raising the height of the transmission towers.

For the overhead conductors 110kV (OTA-PEN-A) through Burswood Reserve, Auckland Transport (AT) is in discussions with Transpower regarding the specific design and proposed construction timing for realignment / modification of these transmission assets. Transpower will seek the necessary consents for these works separately and will be responsible for carrying them out.

There is another major electrical transmission underground 220kV Transpower cable located under Tī Rākau Drive. This is a very critical and sensitive network which includes three high voltage ducts with several joint bays along the alignment. The major portion of the underground duct remains unaffected and does not require any relocation. However, there are potential locations of conflicts with proposed drainage and services crossings. The protection around joint bays and around the ducts may be required at the location of compromised covers.

3.3.2 Medium pressure gas pipelines

There is an existing medium pressure gas main running under Tī Rākau Drive (shown in dark green in Figure 12 -High Pressure Gas Pipelines) that will require protection.



Figure 12 -High Pressure Gas Pipelines

Utility gas providers require minimum approach distances to their assets, for construction activities and the permanent road alignment works. The design has sought to avoid these gas mains wherever possible.

3.3.3 Water and wastewater infrastructure

There are local water and wastewater reticulation located within and adjacent to the road alignment. The water infrastructure will require removal, relocation and/or some form of protection during construction. However, it is expected that the water and wastewater infrastructure will be kept operational during construction or an alternative implemented with the agreement of the provider. The Project team is in discussions with Watercare regarding the relocation of water and wastewater assets.

3.3.4 Fibre optic communication cables

The Project conflicts with a number of below ground fibre and copper telecommunication cables and these will require relocation during construction. These networks are owned by Chorus, Vector and Vodafone. Ducting will be installed to relocate these services with the existing cables kept operational until the new ducts are available (or alternative measures implemented as agreed by the utility operators). The relocations will be undertaken as part of the enabling work for the Project.

EBA is in discussions with Chorus, Vodafone, and Vector Communications Networks regarding the specific design and relocation of assets.

3.3.5 Electricity and gas distribution

Most of the local reticulation network in the Project area is underground with the exception of overhead infrastructure in isolated areas. The power network is owned by Vector which includes LV (400V), medium (11kV), and high voltage cables (33kV). There are some electrical substations and transformers as well in the network which will be impacted by the alignment and require relocation. Relocation of existing ducts will be required to avoid or manage conflict. Where required, the overhead lines will be undergrounded into common services trenches out of the direct earthwork / carriageway construction zones.

There are a number of low to medium pressure gas mains and a DRS gas cabinet within the Project area. Any affected services will be relocated or protected during construction. Such works can be managed for continuity of supply during construction.

EBA is in discussions with utility providers regarding the specific design and relocation of assets.

3.3.6 Stormwater drainage

There are many areas throughout the Project area where the existing stormwater network will need to be modified and upgraded to accommodate the Project. There are also several existing Auckland Council stormwater outfalls within the Project area which will be retained, diverted or upgraded as part of the Project. The methodology for these works will be undertaken in accordance with Auckland Council Healthy Waters’ Network Discharge Consent.

EBA is in discussion with Healthy Waters regarding the design of proposed new stormwater assets and the impact of the Project works on the existing stormwater drainage assets (e.g. outfalls). Auckland Council will be involved in the detailed design of these assets. Stormwater drainage is described in the Stormwater Effects Assessment.

3.4 Construction Activities

3.4.1 Removal of buildings and other assets

Construction of the Project will involve the removal of houses, commercial buildings, and roadside furniture. Specialist subcontractors will carry out the asbestos survey in the area prior to work commencing.

Where possible existing houses will be uplifted and removed for re-use elsewhere, and where houses and buildings need to be de-constructed, professional contractors will be engaged to dismantle each structure in a way that enables the maximum recycling of materials, such as timber framing, roof framing, roofing (either tin or tile), windows (either timber or aluminium), weatherboards, concrete foundations (crushed and recycled), bricks (either re-used or crushed and recycled), downpipes and gutters etc.

Roadside furniture will be protected and relocated as directed by the construction methodology and sequencing, and where possible items will be saved and reused as directed within the detailed design.

Table 2 - Total number of buildings to be removed

De-construction / demolition items (Approx. Quantities)	EB3C
Residential Houses	42

Non-residential Buildings	3
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Should contaminated materials be identified pre or during de-construction, the material will be disposed of in accordance with the Contaminated Land Effects Assessment.

3.4.2 Earthworks

Construction of the Project will involve clearing of obstructions and vegetation and earthworks within the construction footprint. The Project construction footprint consists of approximately:

- 2 ha of land-based works
- 0.5 ha of coastal works.

For the purpose of this methodology, it has been assumed that any existing vegetation located within the Project footprint will be removed where required to facilitate construction (refer to section 4.2 Ecology). This is addressed in the Arboricultural and Ecology Effects Assessments.

Refer to Table 3 - below for a breakdown of estimated earthwork areas and earthwork volumes within EB3C.

Table 3 - Total cut and fill quantities for EB3C

Indicative Cut and fill volumes	EB3C Quantity (approx.)
Cut	15000 m ³
Fill	17550 m ³

The fill material required for the project will be imported from quarries with suitable material. Concrete and rebar required for structural components will be manufactured off-site. All other common components will be manufactured off-site and transported in as required, and may include amongst other things, precast components (such as culvert pipes, bridge beams, etc), surfacing materials (including bitumen), street furniture, and traffic services items (such as signage, lighting, signals, etc).

There is a possibility that basalt may be encountered within the alignment. This would most likely be removed using an excavator with a rock breaker attachment. In the unlikely event that the basalt is extensive, blasting may be considered to reduce the duration of impact to neighbouring residents.

An MSE embankment is proposed behind China Town to connect China Town Bridge to Burswood Drive. The embankment will have wick drains installed below the embankment to provide a passive drainage path to accelerate settlement of the existing ground.

3.4.3 Erosion and sediment controls

Erosion and sediment control measures will be implemented for the Project. The erosion and sediment control measures are discussed in further detail in the Erosion and Sediment Control Effects Assessment and in summary will include:

- Appropriate staging of the works, to ensure earthworks are carried out in a staged manner to limit the area of exposed earth open to the elements at any one point in time

- Perimeter controls (predominantly earth bunds and drains) to divert clean runoff away from the land disturbance area and divert sediment laden runoff to the sediment retention devices
- Cofferdams to isolate work areas below MHWS as required for retaining wall (RW304), and the embankment.
- Erosion protection, including but not limited to geotextiles, aggregate stabilisation, hay mulching, grassing
- Sediment control devices including , decanting earth bunds, container sediment units, sediment fences and silt socks.

3.4.4 Contaminated materials

There are locations along the alignment where there is the potential of encountering contaminated soil and groundwater during construction. The activities undertaken in areas with contaminated soil and groundwater and the handling of contaminated material requires management during construction in order to minimise potential risks to human health and the environment.

The location and nature of contaminated material and the measures to be adopted during construction are set out in the Contaminated Land Effects Assessment. The assessment details the following:

- Contaminant handling and disposal of contaminated soil during construction
- Discharges of dust generated by land disturbance activities
- Discharge of potentially contaminated sediment from land disturbance activities
- Potential human health risks for the construction workforce.

3.4.5 Civil works

Construction of the Project will involve the installation of new civil infrastructure throughout the alignment.

Installation of new civil infrastructure will also involve, but not be limited to:

- Stormwater drainage/outfalls
- Utilities relocation (water, wastewater, electrical, communication, gas etc.)
- Utilities protection (water, wastewater, electrical, communication, gas etc.)
- ITS ducting
- Street lighting
- Shared paths
- Traffic services
 - Barriers
 - Signals
 - Signage
 - Lighting
 - CCTV
- Bus stations
- Urban design
 - Artwork
 - Open spaces
 - Seating

- Landscaping
 - Planting and grassing

The construction activities will primarily occur within dedicated permanent work zones; however, some temporary activities/or permanent works within temporary occupation zones will need to occur under additional traffic management operations either through the day shift or at night. Those activities will involve but are not limited to:

- Streetlight pole installation
- Gantry / large signage
- Cranage needs for urban design items
- Connections to existing services located in live traffic.

Though construction sequencing and traffic management switches, temporary traffic diversions will be employed as per the Project's CTMP(s).

3.4.6 Pavement works

Construction of the Project will involve the construction of new pavements and the widening and upgrading of existing carriageways.

Where temporary traffic management is required to enable efficient construction of pavements including tying into existing pavements or surfacing overlays, provision for existing traffic movements will be maintained for all road users including general traffic, busses, heavy vehicles cyclists and pedestrians. Construction of new pavements will involve:

- Subgrade preparation, including subgrade improvement works after civils activities and site access use, plus final trimming ready for granular layers
- Installation of geogrids and or geotextiles
- Placement of the subbase granular layer
- Alternatively, placement of lean mix concrete as subbase layer
- Installation of pavement drains and kerbing
- Placement of the basecourse granular layer
- Membrane chip-seal sealing of the basecourse
- Placement of structural asphalt layers
- Construction of subsoil drainage.

Widening and upgrading of pavements will involve:

- Removal and reconstruction of edge kerbing and pavement drainage as required
- Construction of new widened pavement areas, as detailed above
- Removal of existing carriageway running surface, through use of a road planer (miller)
- Removal and replacement of existing carriageways structural asphalt, through 'mill & fill' operations.

Note, that traffic will traverse both the new and widened/upgraded carriageways on structural asphalt layers until the other related infrastructure works are completed following the construction sequences to deliver a full section of the Project with its final configuration.

Once each section completes the scope of non-pavement works, the final surfacing/line-marking works will be carried out (mostly during the night shift to minimise traffic disruption), including:

- Temporary traffic management setups
- Profile milling of the top of the structural asphalt layer to create a level surface to the required design shape
- Membrane seal / 'tack-coat' to the structural asphalt layer
- Placement of running course surface layer
- Line marking to the final lane configuration.

3.4.7 Structures

Construction of the project will involve the construction of two major structures, being:

- Ti Rākau Drive Bridge (Bridge A)
- China Town Bridge (Bridge B).

Each structure will be constructed from reinforced insitu and precast concrete components. Insitu decks will be poured on top of precast concrete girders, supported on in-situ concrete piers and columns, which will be positioned above reinforced concrete bored piles. Abutments will be mechanically stabilized earth walls (MSE) with deck end spans resting upon them.

Bridge construction will involve:

- Temporary traffic management, including changes to existing lane configurations and walking routes, plus safe entry and exit points into the work zone for construction traffic
- Relocation and / or protection of existing network utility services
- De-construction of existing structures, full or part thereof
- Temporary works, including amongst others, crane pads, temporary staging across the CMA
- Temporary staging will consist of temporary driven tubular piles and structural steel work with a precast concrete deck. This will be removed after completion of the bridges
- Mechanically stabilized earth walls (MSE), abutment and approach ramp construction
- Bored piles at each pier position
- Concrete pile caps, followed by columns and pier headstocks, constructed at each pier location, and abutment beams on top of each MSE abutment
- Bridge beam erection, one span at a time and possibly installed at night to allow for lane closures for beam delivery and crane positioning for lifting
- Insitu deck pours, followed by ancillary works, including amongst others, barriers, movement joints, drainage, services and surfacing works.

As space is constrained along the alignment, retaining walls are proposed to contain cut and / or fill batters. These retaining walls generally, but not limited to, fall into two categories:

- Mechanically stabilised earth walls (MSE), mainly for approach embankments to bridge structures
- L shaped walls, (e.g. precast segments), tending to retain small heights
- Gravity walls, (e.g. mass blocks or components of), tending to retain small heights.

3.4.8 Night works

Some activities are likely to require partial/full road closure, decreasing the number of lanes, or additional clearance for safety. Thus to minimise the impact on the public and traffic, these works will be undertaken at night. Any continuous night works in one single location with the same activity will occur for a maximum of one month. These works will be controlled by the Project's management plans³ as set out in the proposed conditions of consent. This may include (amongst others) the following construction activities:

- Temporary traffic management including installation of hard barrier lines
- Site investigation works within carriageway and roadside corridors
- Relocation of houses and buildings
- Tree removal
- Utilities cut-overs as required during periods of low operations
- Removal of street furniture and demolition of retaining walls within the road corridor
- Removal of grass and concrete medians and temporary pavement construction
- Traffic services (streetlights, signage, signals, road markings, ITS systems), investigations, protections, relocations and new installation works
- Delivery of bulk materials, plant, equipment and resources unable to be delivered, relocated or removed without effect on daytime public and traffic movements and flow
- Some aspects of widening works along Tī Rākau Drive and connecting side roads, including but not limited to, earthworks operations; retaining wall operations, drainage / ducting trenching works; pavement construction / upgrades; surfacing works and installation of street furniture.
- Some aspects of bridge construction along the proposed route, including but not limited to temporary works installation, relocations and removal; beam deliveries and installation; major concrete pours; precast barrier and component installations.

Major intersection works. With the objective of minimising disruption, works at these locations will be grouped and concentrated in specific periods such as long weekends or holidays.

³ These management plans include the Construction Noise and Vibration Management Plan (CNVMP) and associated site specific schedules.

3.5 Dis-Establishment

As a section of the works are completed, dis-establishment of construction support facilities will commence.

These activities include, but are not limited to:

- Dismantling and uplifting of site compounds, satellite offices and SAP egress points
- Making good temporary occupied land, through either landscape planting, grassing or agreed usage
- Re-installation of facilities and traffic services temporarily removed or relocated
- Uplifting and removal off-site, of construction plant and equipment, surplus materials and spoil, temporary works items and perimeter fencing, lighting and signage
- Uplifting, removal and making good temporary traffic management and pedestrian/cyclist deviations.

Where practicable these activities will be undertaken within dedicated works areas, but as dis-establishment works progress, activities will need to be undertaken within day and night-time lane and road closures.

3.6 Testing and Commissioning

Due to the complexity and length of the Project, opening of sections of roadway will be undertaken in stages over multiple, sometimes overlapping, timeframes. Refer to the construction summary programming **Error! Reference source not found.** for targeted timings. Opening of the fully commissioned busway will be at the completion of all stages across all project zones.

As each zone is ready to be opened, the following steps will be followed to ensure a safe and efficient opening:

- Commissioning and acceptance testing of all systems and components where required
- Confirmation and sign-off that the zonal scope of works have been completed as designed and specified
- Completion of an independent safety audit
- Completion of public / traffic notifications of the opening and new lane layouts
- Removal of all construction support facilities, plant & equipment, and surplus materials & spoil from the site, including, the dismantling and uplifting of compounds, satellite offices and SAP's.

Once completed and over a single nightshift road closure, the following opening night activities will be undertaken:

- Uplifting and removal of temporary traffic management
- Installation of final line marking, and signage required
- Switching on of traffic services for the new layout, (e.g. signals, lightings etc)
- Uplifting and removal of any temporary traffic services.

3.7 Construction Plant and Machinery

The following subsections provide an overview of the type of plant and heavy machinery that is anticipated to be required to undertake the construction activities described throughout this report (i.e. all stages).

3.7.1 Removal of buildings

Removal of buildings would include relocation, de-construction or demolition.

Where possible existing houses and buildings will be uplifted and relocated for further use. When doing so, a specialist house removal contractor will be engaged to undertake the operation.

Key plant & equipment will be:

- Plant and equipment to disconnect the structure from its foundations
 - 30t excavator with rock breaker attachments
 - Handheld concrete saws and chainsaws
 - Hydraulic jacks
- Specialist truck and trailer unit(s) to transport the structure off site (night operations)



Hydrant jacks



House on temporary bearers



Low loader house removal truck and trailer unit

Where relocation of a house or building is not possible, deconstruction operations will occur. This will involve the dismantling and removal of the structure's components off site, whilst salvaging and recycling as much as possible materials for reuse in the construction of the Project, i.e. hardfill for temporary accessways and timbers for formwork.

Key plant & equipment will be:

- 30t excavator
- 20t excavator
- 6-wheeler hiab truck
- 6-wheeler tip trucks
- Articulated truck and trailer units
- Rubbish skip trucks.

Prior to any relocation and / or deconstruction activities, existing house / building surveys will be undertaken to determine what option should be used, and whether asbestos and / or any other hazardous substance is present. If a hazardous substance is identified, a specialist subcontractor will be engaged to develop a specific method statement and to manage and remove the substance in accordance with Auckland Council standards. Any specific plant and machinery requirement would be indicated within those method statements.

Any decommissioning of services might require localised earthworks (trenching or removal of overhead assets) as well as temporary utility diversions.

3.7.2 Earthworks

Normal construction plant will be required for earthworks activities, including excavators, trucks, and compactors. Cut material to be removed from site will be loaded by excavators into trucks while imported fill will be delivered by trucks, spread out into layers by excavator or graders and compacted with rollers and compactors.

Key plant & equipment will be:

- Concrete saws
- Excavators of various sizes – including track and rubber tyre machines
- Excavator mounted rock breakers
- Skid loaders
- 4-wheeler & 6-wheeler trucks
- Truck and trailer tip trucks
- Articulated truck and trailer units
- Rollers & compactors of various sizes
- Towable light towers
- Mobile compressors
- Portable generators
- Light vehicles and small site trucks.

3.7.3 Pavements

It is anticipated that graders, trucks, and compactors will be required for granular pavement layers. Ready mix concrete trucks and concrete placing plant will be used for the lean-mix concrete sub-base layer, while pavers and compactors will be required for the asphalt pavement layers and surfacing. Works associated with the paving and surfacing may also require removal or shaping existing pavements using an asphalt miller.

Key plant & equipment will be:

- Excavators – including track and rubber tyre machines
- 4-wheeler & 6-wheeler watercarts
- 6-wheeler tip trucks, concrete trucks, bitumen sprayers
- 8-wheeler bitumen sprayers
- Truck and trailer tip trucks
- Articulated truck and trailer units
- Graders
- Road miller
- Asphalt pavers
- Loaders
- towable light tower
- Plate compactors & rollers
- 4-wheeler road sweeper trucks
- Light vehicles and 3t site trucks.

3.7.4 Other specialised plant

Truck-mounted attenuators will be utilised throughout the duration of the works to deploy traffic management equipment and act as shadow vehicles when required. Traffic management barriers will be deployed and shifted with the use of truck mounted hi-ab cranes and flat deck trucks.

Hydro excavation and/or high air pressure excavation plant will be used for pilot holes and when working around services.

Key plant and equipment will be:

- 4-wheeler transporter truck
- Truck and trailer transporter
- 6-wheeler truck mount hiab
- 8-wheeler truck mount hiab
- Trombone semi-trailer hiab truck
- 4-wheeler traffic attenuator trucks
- 8-wheeler hydro excavation trucks
- Mobile cranes.

3.8 Anticipated Construction Programme

The indicative construction programme for EB3C is approximately for 42 months and commencing late 2024, subject to obtaining the required RMA approvals and land acquisition. Multiple aspects of the project will likely occur concurrently or sequentially during construction. It is anticipated that EB3C will be completed by 2027.

The figure below shows the approximate timing of the proposed works and how the different elements may progress within the EBA construction timeframe. It is important to note, there are some dependencies between construction elements, the specific staging and phasing of the work which will be dependent on the methods of procurement, land acquisition, and the availability of resources (such as construction materials and equipment).

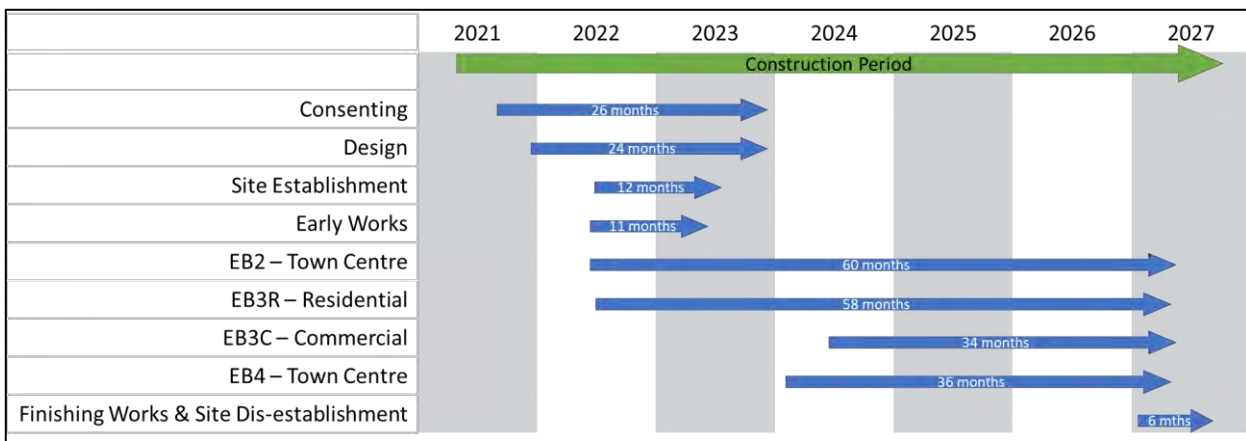


Figure 13 - Indicative construction timing

3.9 Development of Construction Methodology

The construction methodology and activities outlined in this section have been developed through an iterative process by the EBA that has involved several rounds of multidisciplinary reviews and workshops. The intention of this methodology is to balance the cost, programme implications and likely adverse impacts of various construction activities to achieve a methodology that, as far as practical, avoids or where avoidance is not possible, minimises construction impacts. This includes consideration of the following:

- The location and extent of construction compounds, satellite offices, laydown areas and construction egress points
- Minimise disturbance and vegetation clearance where possible
- Minimisation of land acquisition and adverse construction impacts on neighbouring properties
- Construction programme and timing of particular activities to take advantage of seasonal weather conditions
- AT’s construction guidelines and standards relevant to the avoidance and minimisation of adverse effects on the environment.

While aiming to avoid adverse construction impacts and taking into consideration social, environmental and cultural constraints, the methodology aims to maximise flexibility so as not to unduly restrict or constrain construction activities. The construction methodology will be further refined and developed during the detailed design phase of the Project and this document will be updated as construction progresses. This will be undertaken with consideration of the designation and resource consent conditions, environmental management plans, as well as balancing cost and programme, environmental and social outcomes.

4. Specialist Assessment

4.1 Works within the CMA

Works are proposed in CMA across the Tamaki River (for Bridge A) and within tributaries of the Tamaki Estuary (for Bridge B). This includes;

Construction of permanent stormwater outfalls (refer Appendix A – Details of Stormwater Infrastructure Works)

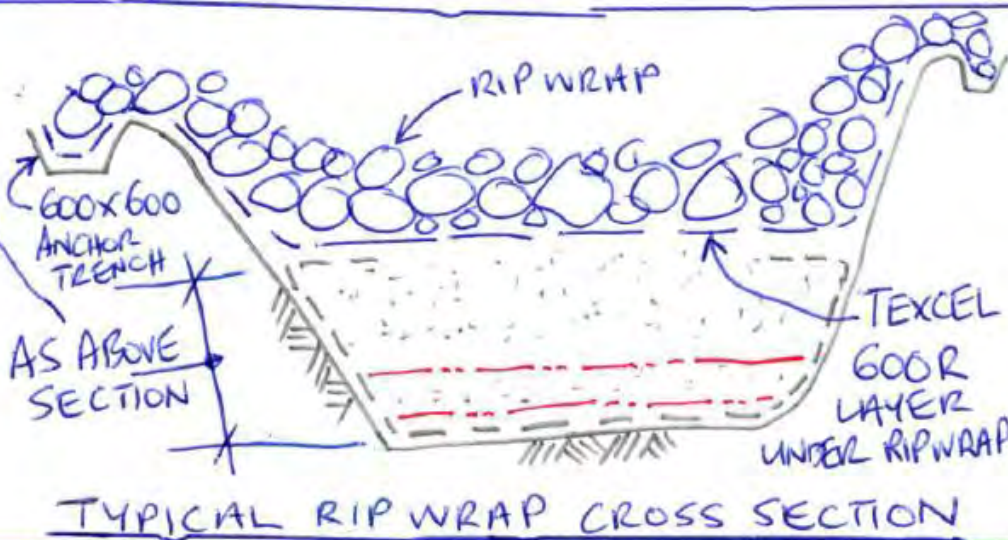
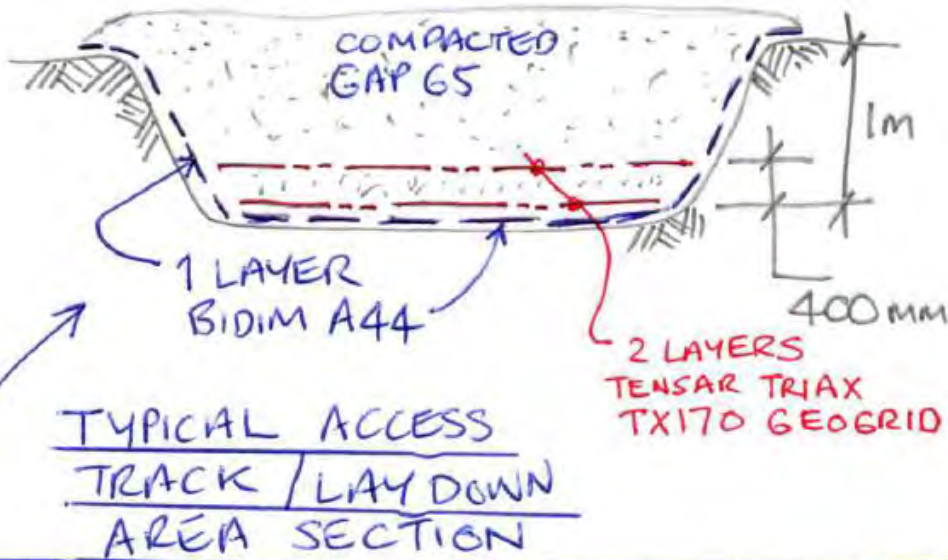
EB3C Stormwater Infrastructure (new and upgrades including scour protection)			
Outfall Reference Number	New or existing outfall	Location	Description of works
New Outfall (01A-1)	New	CMA	This new outfall will tie into eastern abutment scour protection for Bridge A. This new outfall is located in the CMA.
Existing outfall MCC_108479 (SAP ID 2000029871)	Upgrade	CMA	This existing outfall is proposed to be replaced and upgraded to accommodate the new busway network (including Bridge A and B). The upgraded outfall and scour protection are located in the CMA.
New Outfall 09-1	New	CMA	<p>This new outfall and pipe (pipeline 09) are proposed to be constructed approximately 56 m to the northwest of MCC_108480.</p> <p>The new outfall is located approximately 15 m landward of the CMA boundary. However, the scour protection (being rock riprap) is located in the CMA.</p>
Existing Outfall MCC_108409 (SAP ID 2000893599)	Existing	CMA	This existing outfall will be upgraded. A new pipeline (pipeline 10) will be constructed to the existing upgraded outfall. This existing outfall is located approximately 3m landward of the CMA boundary. However, the scour protection is located in the CMA.
Existing Outfall MCC_108482 (SAP ID - 2000380606)	Existing	Freshwater/terrestrial Environment	This existing outfall will be upgraded. A new pipeline will be constructed to the upgraded outfall to accommodate the existing and new networks (pipeline 43). This upgraded

			outfall is located within the Burswood Reserve.
Removal of Existing Outfall MCC_496129 (SAP ID 2000507038) and new outfall 53-1	New	Freshwater/terrestrial Environment	This existing outfall will be removed. A new outfall (53-1) will be constructed to accommodate the cycleway. The new outfall is located within the Burswood Reserve.
Existing Outfall MCC_988531 (SAP ID 2000295186)	Existing	Freshwater/terrestrial Environment	The existing outfall will be upgraded. A new pipeline will be constructed to the upgraded outfall to accommodate the new network (pipeline 47). The upgraded outfall is located in the Burswood Reserve.

4.2 Typical Cross-section (Reference Design)

SUBJECT: EBA-AMETI DATE: 28/3/22

PAKURANGA TO BOTANY
MARINE OUTFALL WORKS



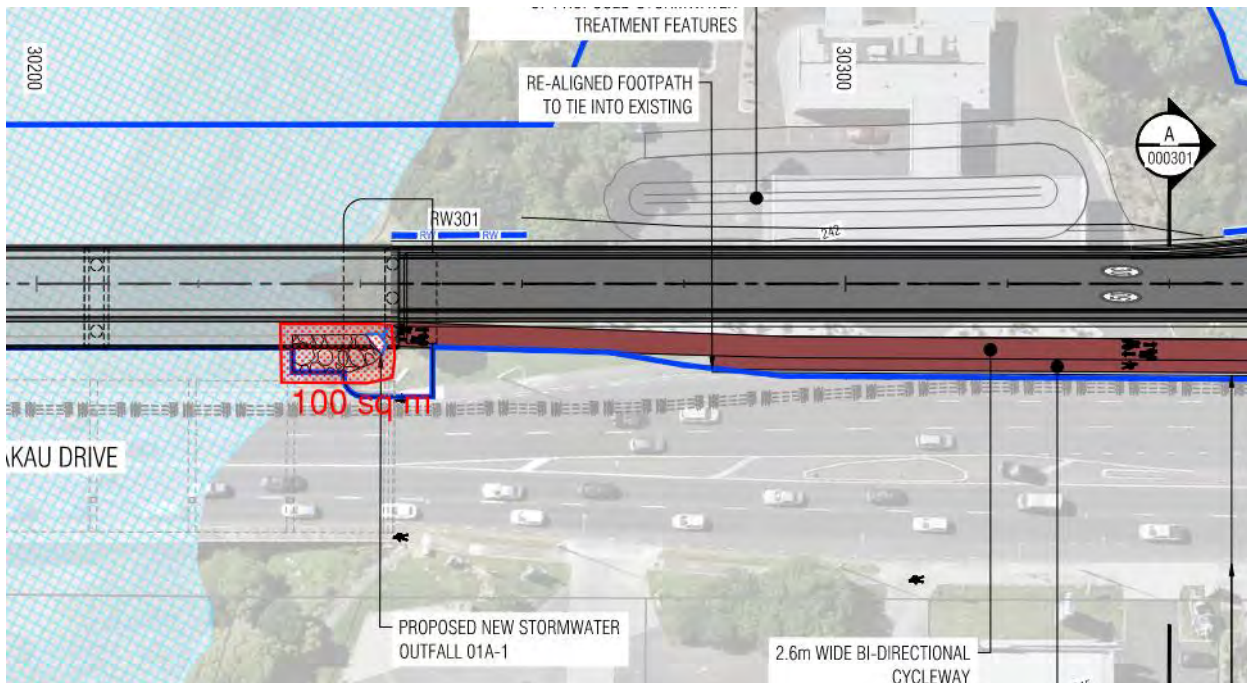
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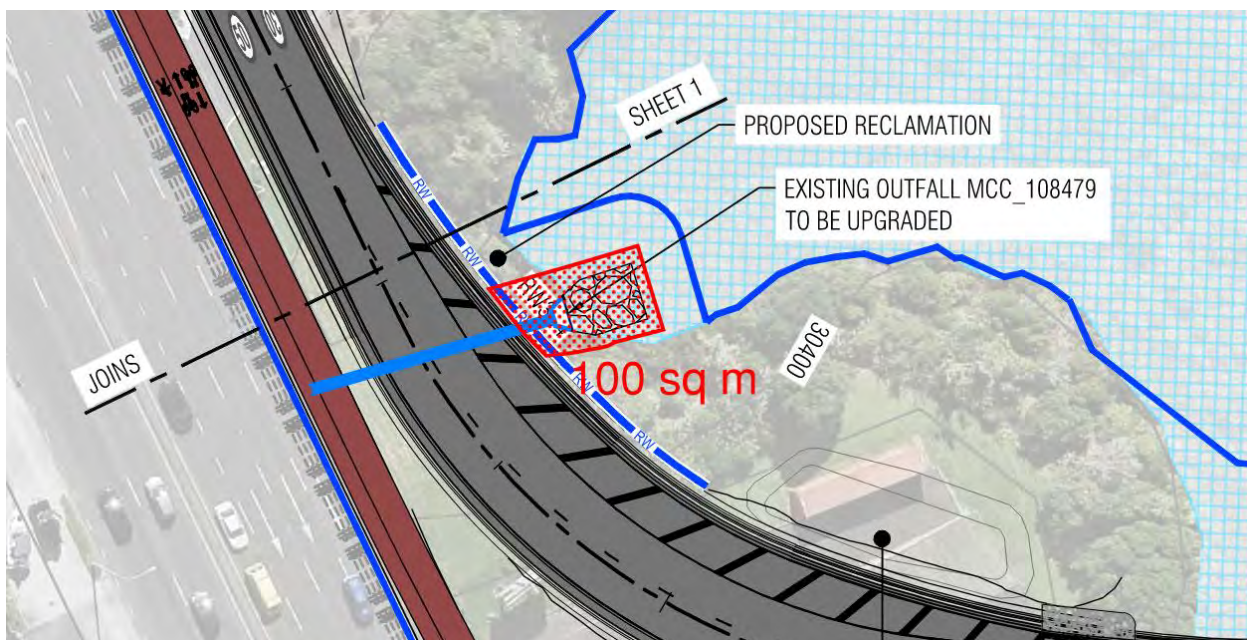
4.3 The Approximate Construction Footprint Area Required for the EB3C Stormwater Outfalls (new and upgrades including scour protection)

Works within the CMA

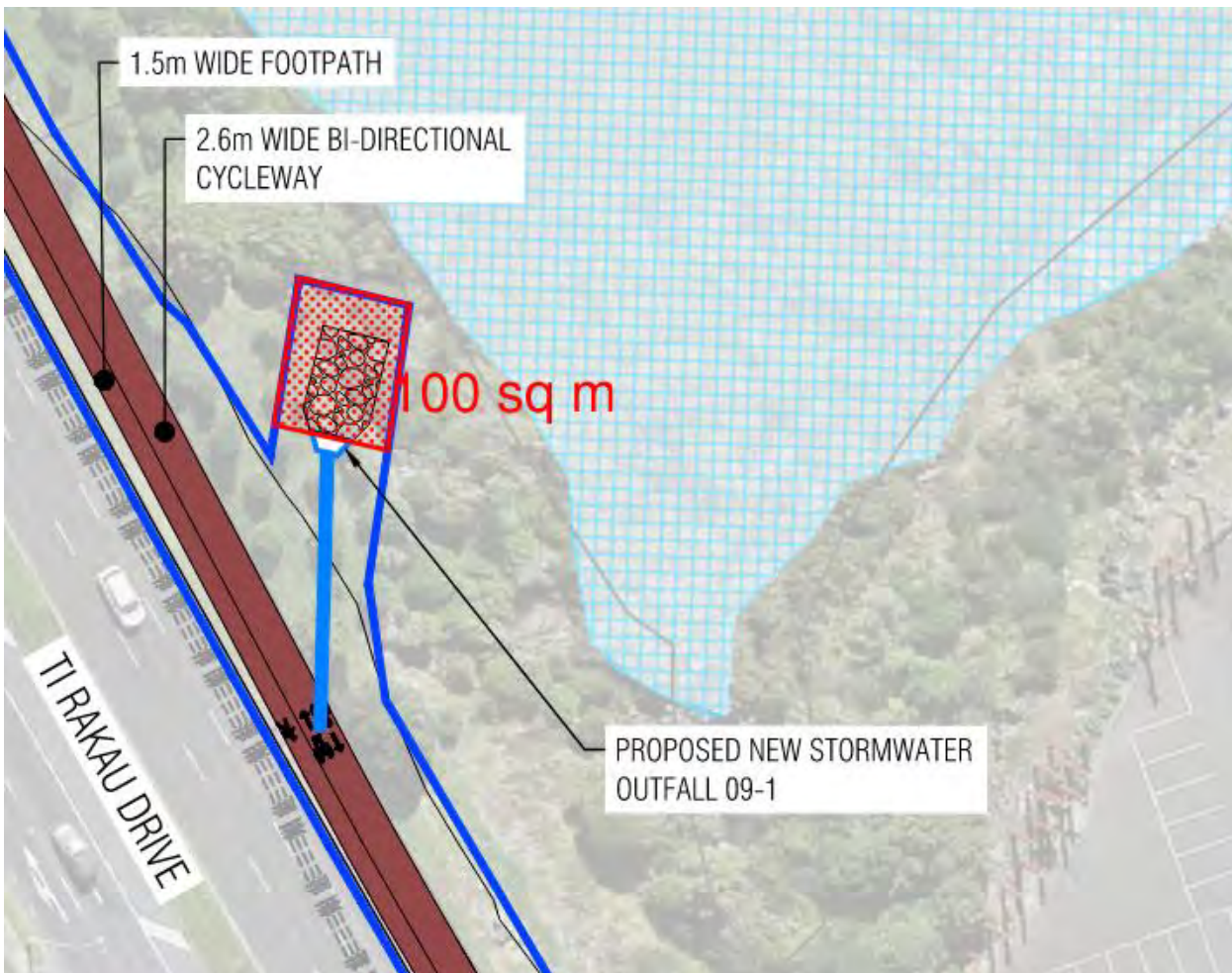
4.3.1 The approximate construction area required for the new outfall 01A-1



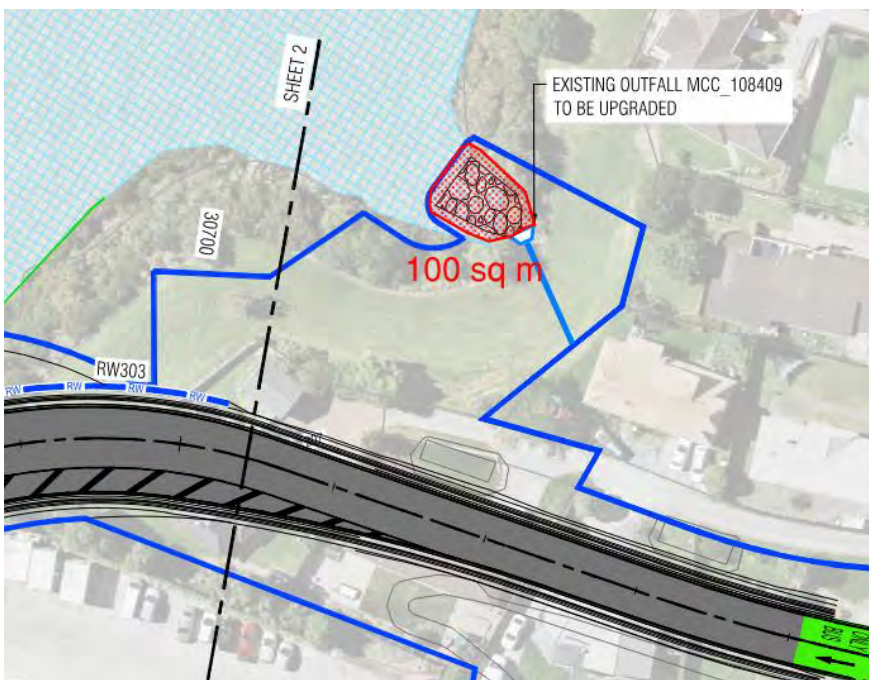
4.3.2 The approximate construction area required for the upgrade to the existing outfall MCC_108479 (SAP ID 200029871)



4.3.3 The approximate construction area required for the new outfall 09-1 located at 262 Tī Rākau Drive

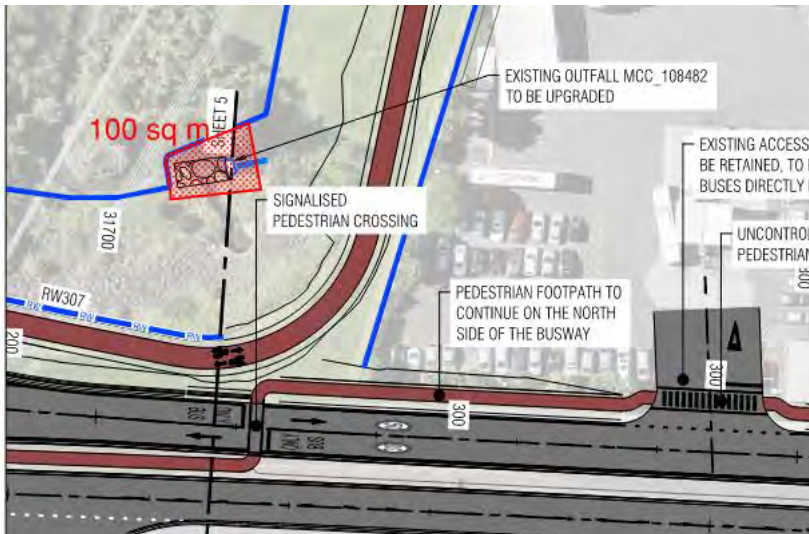


4.3.4 The approximate construction area required for the upgrade to the existing outfall MCC_108409

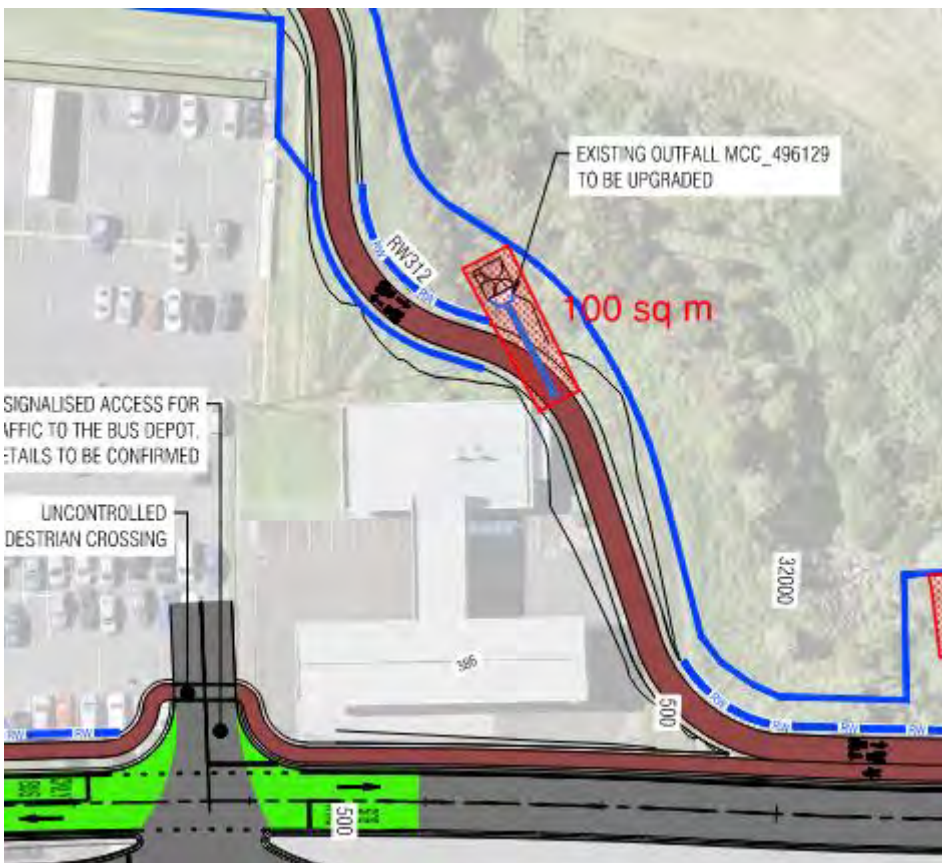


Works in stream/wetland environment

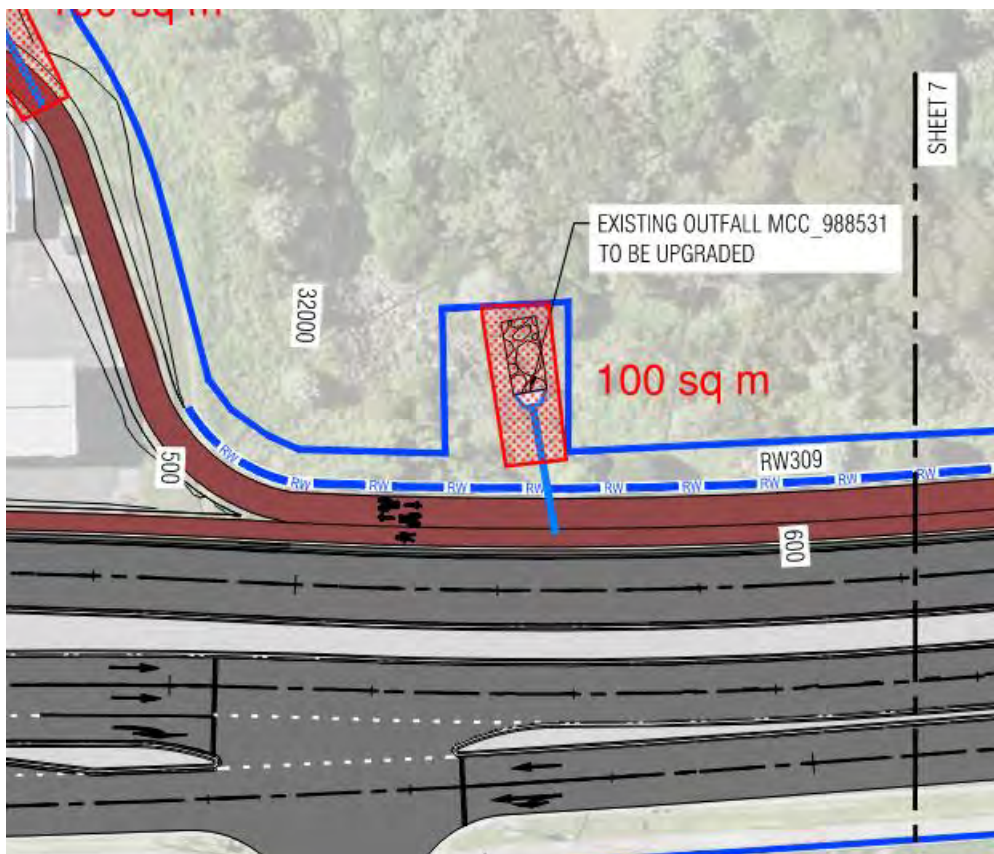
4.3.5 The approximate construction area required for the upgrade to the existing outfall MCC_108482 (SAP ID - 2000380606)



4.3.6 The approximate construction area required for the removal and replacement of the existing outfall MCC_496129 with a new outfall 53-1.



4.3.7 The approximate construction area required for the upgrade to the existing outfall MCC_988531 (SAP ID 2000295186)



- The approximate construction area required for (extent of works). The outfalls will likely include an area of rip rap to prevent erosion.
- Construction of a permanent retaining wall between 242 & 254 Tī Rākau Drive (RW304) (refer to Figure 14)
 - The section of the retaining wall within the CMA is approximately 2m long and is 2m from the boundary of the CMA (i.e the total horizontal area of the wall within the CMA is approximately 4m²).
 - The retaining wall is vertical with a concrete face and approximately 2m high
 - There is approximately 4 m³ of fill behind the retaining wall that will be required in the CMA
- Construction of MSE embankment at the northern end of Bridge B behind China Town which will partially fall within the CMA. The embankment will have wick drains installed below the embankment to provide a passive drainage path to accelerate settlement of the existing ground
- Construction of bridge foundations
 - 8no, 1.5m diameter Bridge A piles
 - 3no, 1.8m diameter Bridge B piles
 - Scour protection around the bridge piles (to be confirmed at the detailed design stage)
 - Part of the scour protection to the eastern abutment of Bridge A falls within the CMA (to be confirmed at the detailed design stage)
 - Part of the scour protection to the northern abutment of Bridge B falls within the CMA

- Installation of temporary staging (which consists of temporary piles, structural steel work and precast concrete deck panels) to provide access to build the bridges
 - Approx 30no 700mm diameter temporary piles for Bridge B. Approximate driven length is 20m.
 - Approx 60no 700mm diameter temporary piles for Bridge A. Approximate driven length is 20m.

To allow construction of the retaining wall it is anticipated to drive sheetpiles to a shallow depth to create a temporary wall and a dry area to build the base of the retaining wall. Once construction of the wall is complete the sheetpiles will be removed.

For the proposed works in the CMA, refer to the Marine Ecology and Coastal Avifauna Effects Assessment and the Coastal Process Effects Assessment.

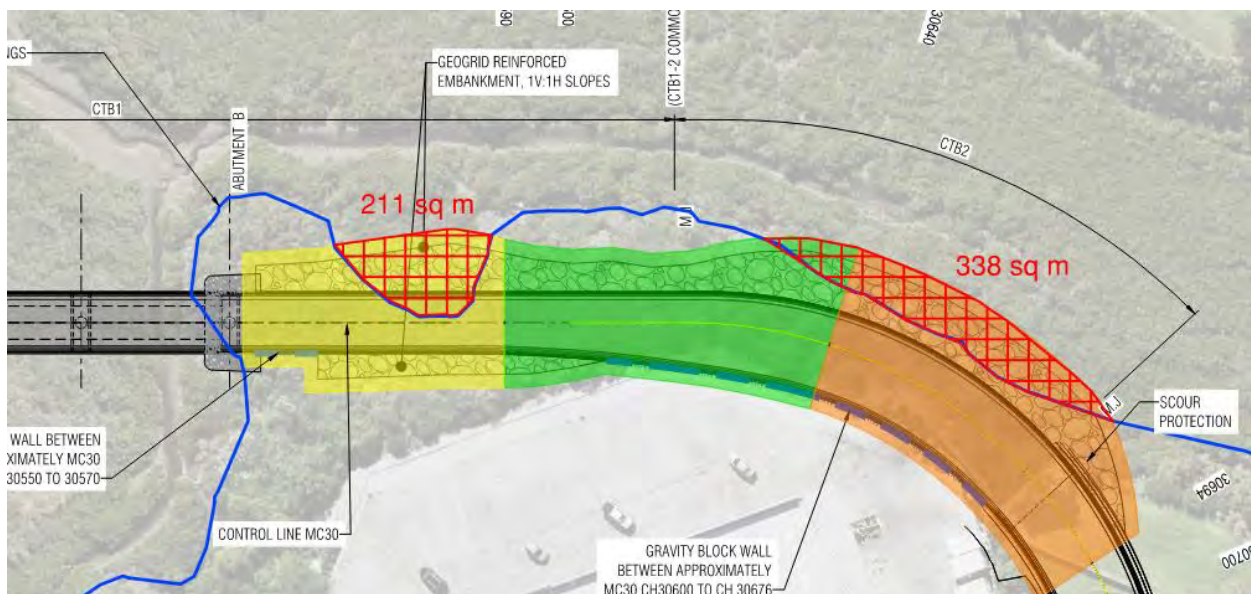


Figure 14 – area of reclamation shown in red hatch

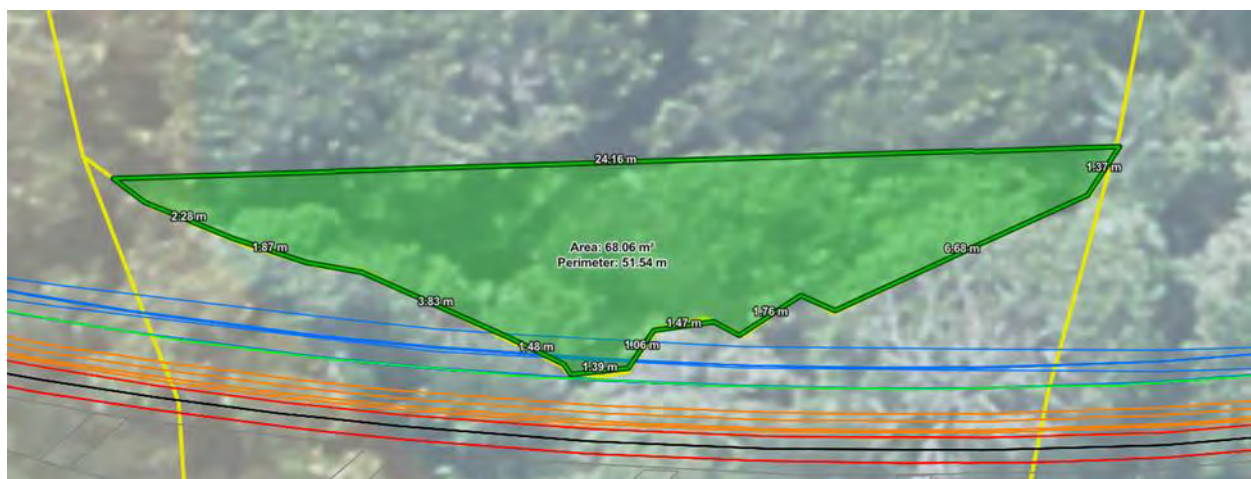


Figure 15 - Temporary area of occupation for construction of RW304. Yellow line is the extent of the CMA. Blue line is the retaining wall

There are also outfalls and rip rap proposed to be constructed in the stream environments. Details of the construction methodology and footprint is provided in Appendix B.

For the proposed works in the terrestrial and freshwater environments, refer to the Terrestrial and Freshwater Ecological Effects Assessment.

Location	Permanent Occupation for Structures within CMA (m ²)	Temporary Occupation for Structures within CMA (m ²)	Vegetation Clearance for permanent and temporary structures within CMA (m ²)	Footprint of deck over the mangroves (m ²)
Ti Rākau Drive Bridge (Bridge A)				
Bridge A permanent piles	14 (8 piles)	0	7 (4 piles)	0
Bridge A permanent scour protection (if required)	147 (4 piles)	0	0	0
Bridge A permanent eastern abutment (including scour protection)	30	0	50	0
Footprint of permanent Bridge A deck over the existing mangroves (refer to Figure 16 and Figure 17)- Ti Rākau Bridge West	0	0	0	830
Bridge A temporary (during construction) staging piles	0	23	10	0
Footprint of the temporary construction staging platforms (excluding the temporary staging piles) for Bridge A over the existing mangroves	0	0	0	360
Total for Bridge A	191	23	67	1190

China Town Bridge (Bridge B)				
Bridge B permanent piles	8 (3 piles)	0	8	0
Bridge B permanent rip rap abutment B	64	0	64	0
Footprint of Permanent Bridge B deck over the existing mangroves	0	0	0	903
Bridge B temporary (during construction) staging piles	0	22	22	0
Footprint of the temporary construction staging platforms (excluding the temporary staging piles) for the Bridge B over the existing mangroves	0	0	0	800
Total for Bridge B	72	22	94	1703
Bridge B Permanent embankment (reclamation) at the northern end of 262 Tī Rākau Drive				
Area of permanent reclamation required within the CMA (refer to Figure 14 – area of reclamation shown in red hatch Figure 14)	549	0	549	0
Permanent retaining wall (reclamation) between 242 & 254 Tī Rākau Drive (RW304)				
Retaining wall (RW304) ⁴	4	70	70	0
Stormwater Infrastructure (new or upgraded)				
New Outfall 01-A-1	25	100	100	0
Existing Outfall MCC_108479 (SAP ID 200029871)	25	100	100	0

⁴ Construction of the permanent retaining wall RW304 is between 242 & 254 Tī Rakau Drive

New Outfall 09-1	25	100	100	0
Existing Outfall MCC_108409	25	100	100	0
Total for Stormwater Infrastructure	100	400	400	0
Overall Total for EB3C CMA Permanent and Temporary Works	916	515	1180	2893

Table 4 - Summary of temporary and permanent works within the CMA

Further details of outfall locations and the areas of disturbance can be found in Appendix A – Details of Stormwater Infrastructure Works

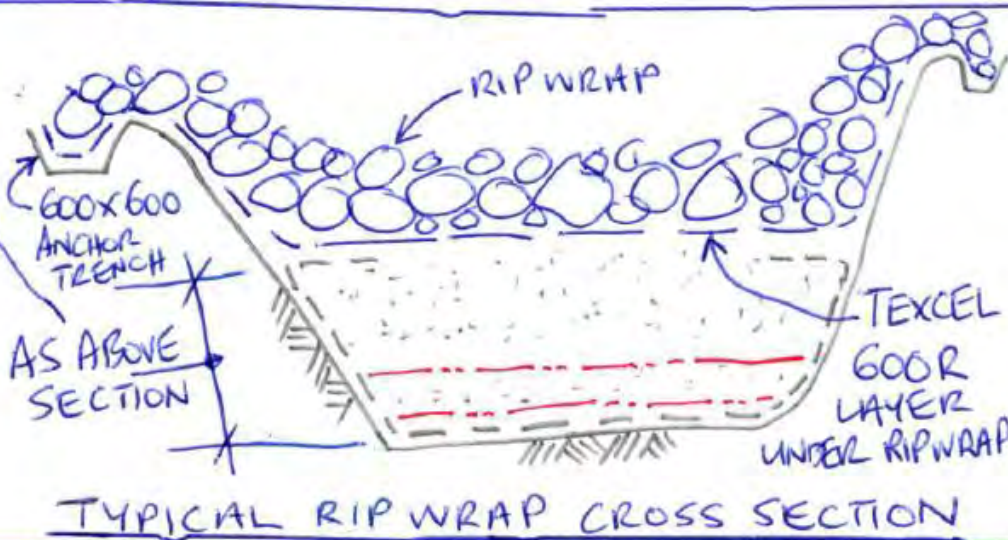
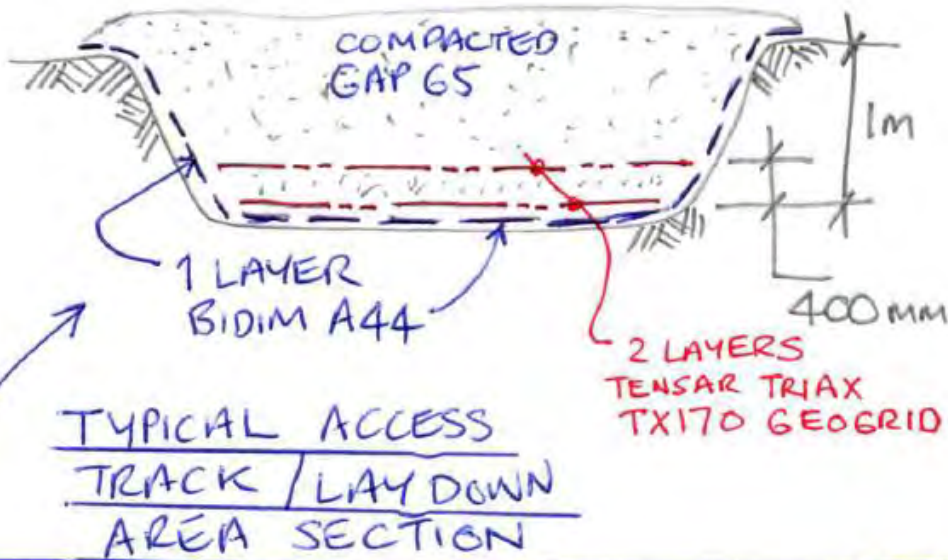
EB3C Stormwater Infrastructure (new and upgrades including scour protection)			
Outfall Reference Number	New or existing outfall	Location	Description of works
New Outfall (01A-1)	New	CMA	This new outfall will tie into eastern abutment scour protection for Bridge A. This new outfall is located in the CMA.
Existing outfall MCC_108479 (SAP ID 2000029871)	Upgrade	CMA	This existing outfall is proposed to be replaced and upgraded to accommodate the new busway network (including Bridge A and B). The upgraded outfall and scour protection are located in the CMA.
New Outfall 09-1	New	CMA	<p>This new outfall and pipe (pipeline 09) are proposed to be constructed approximately 56 m to the northwest of MCC_108480.</p> <p>The new outfall is located approximately 15 m landward of the CMA boundary. However, the scour protection (being rock riprap) is located in the CMA.</p>
Existing Outfall MCC_108409 (SAP ID 2000893599)	Existing	CMA	This existing outfall will be upgraded. A new pipeline (pipeline 10) will be constructed to the existing upgraded outfall. This existing outfall is located approximately 3m landward of the CMA boundary. However, the scour protection is located in the CMA.
Existing Outfall MCC_108482 (SAP ID - 2000380606)	Existing	Freshwater/terrestrial Environment	This existing outfall will be upgraded. A new pipeline will be constructed to the upgraded outfall to accommodate the existing and new networks (pipeline 43). This upgraded

			outfall is located within the Burswood Reserve.
Removal of Existing Outfall MCC_496129 (SAP ID 2000507038) and new outfall 53-1	New	Freshwater/terrestrial Environment	This existing outfall will be removed. A new outfall (53-1) will be constructed to accommodate the cycleway. The new outfall is located within the Burswood Reserve.
Existing Outfall MCC_988531 (SAP ID 2000295186)	Existing	Freshwater/terrestrial Environment	The existing outfall will be upgraded. A new pipeline will be constructed to the upgraded outfall to accommodate the new network (pipeline 47). The upgraded outfall is located in the Burswood Reserve.

4.4 Typical Cross-section (Reference Design)

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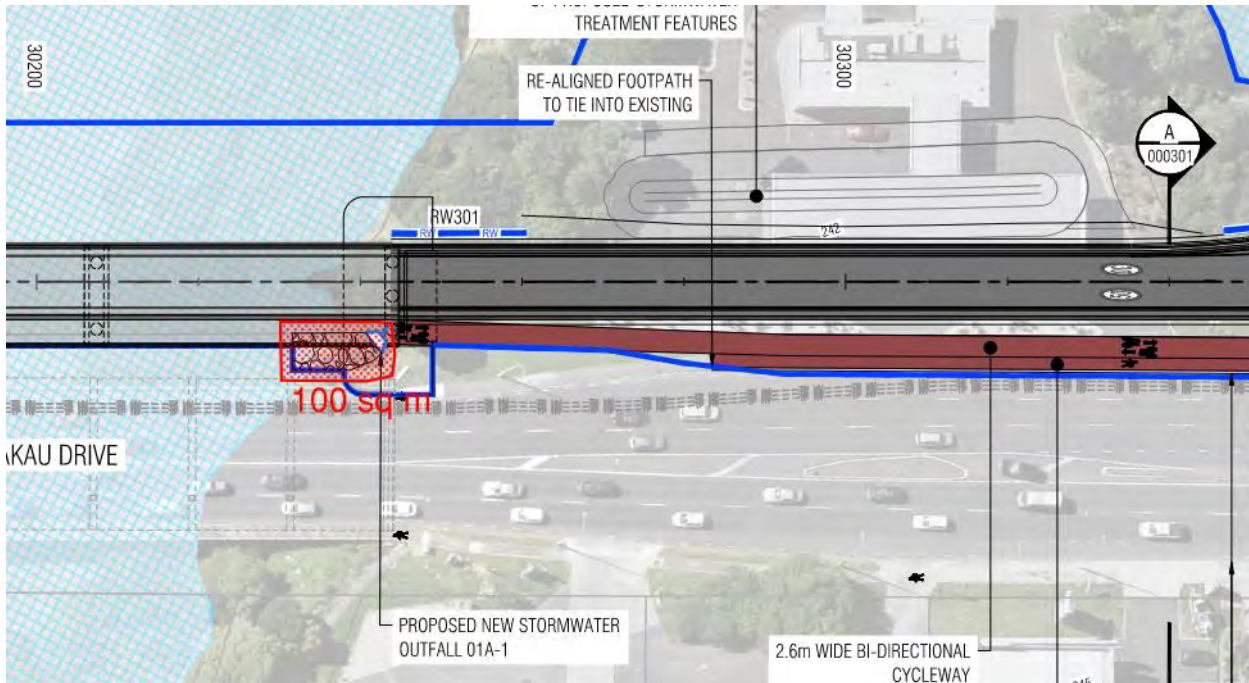
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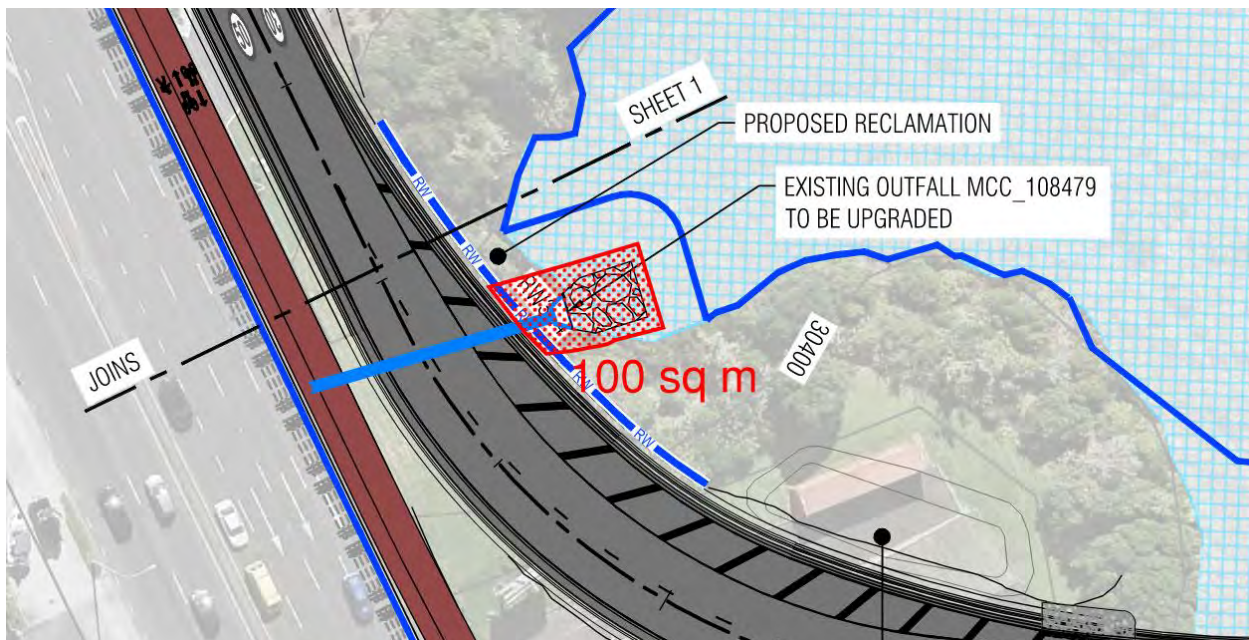
4.5 The Approximate Construction Footprint Area Required for the EB3C Stormwater Outfalls (new and upgrades including scour protection)

Works within the CMA

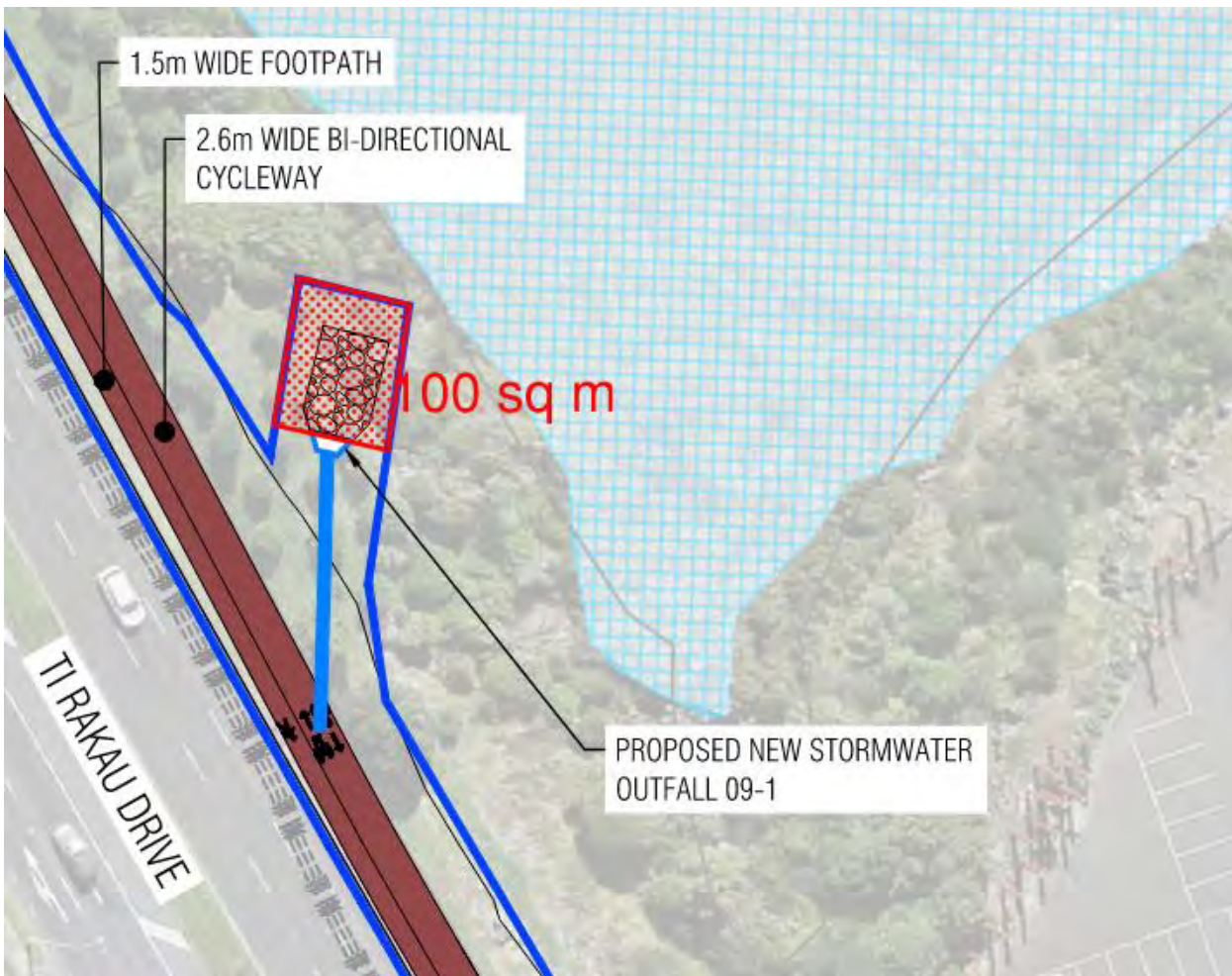
4.5.1 The approximate construction area required for the new outfall 01A-1



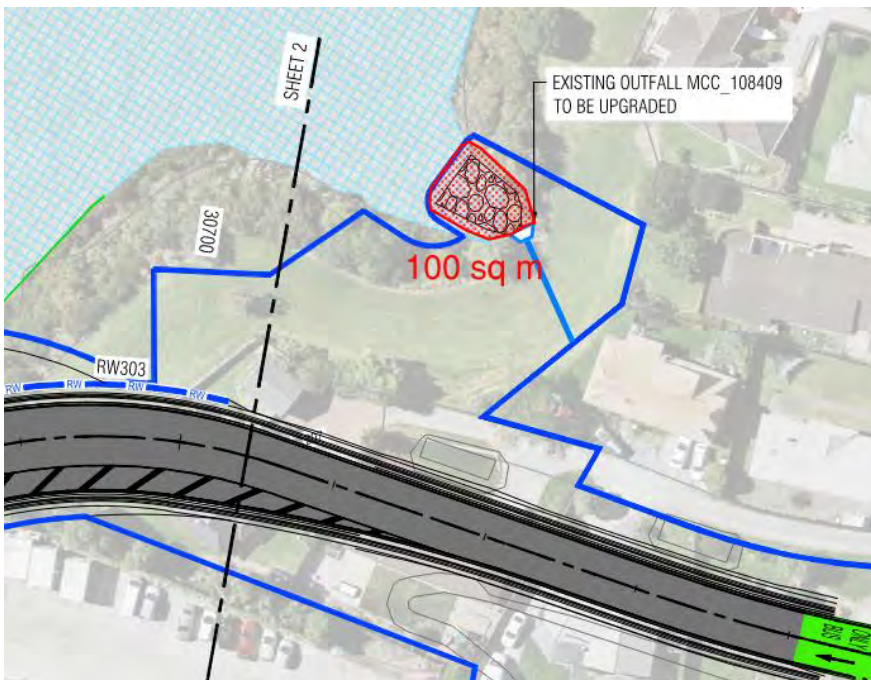
4.5.2 The approximate construction area required for the upgrade to the existing outfall MCC_108479 (SAP ID 200029871)



4.5.3 The approximate construction area required for the new outfall 09-1 located at 262 Tī Rākau Drive

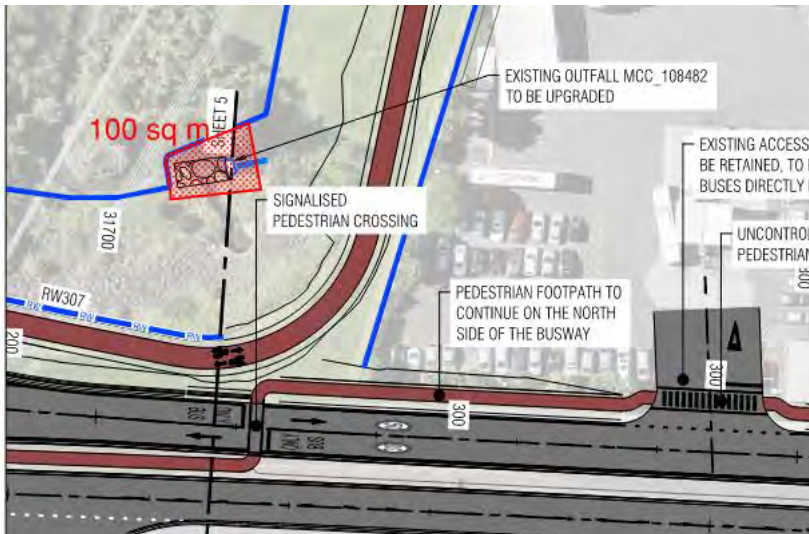


4.5.4 The approximate construction area required for the upgrade to the existing outfall MCC_108409

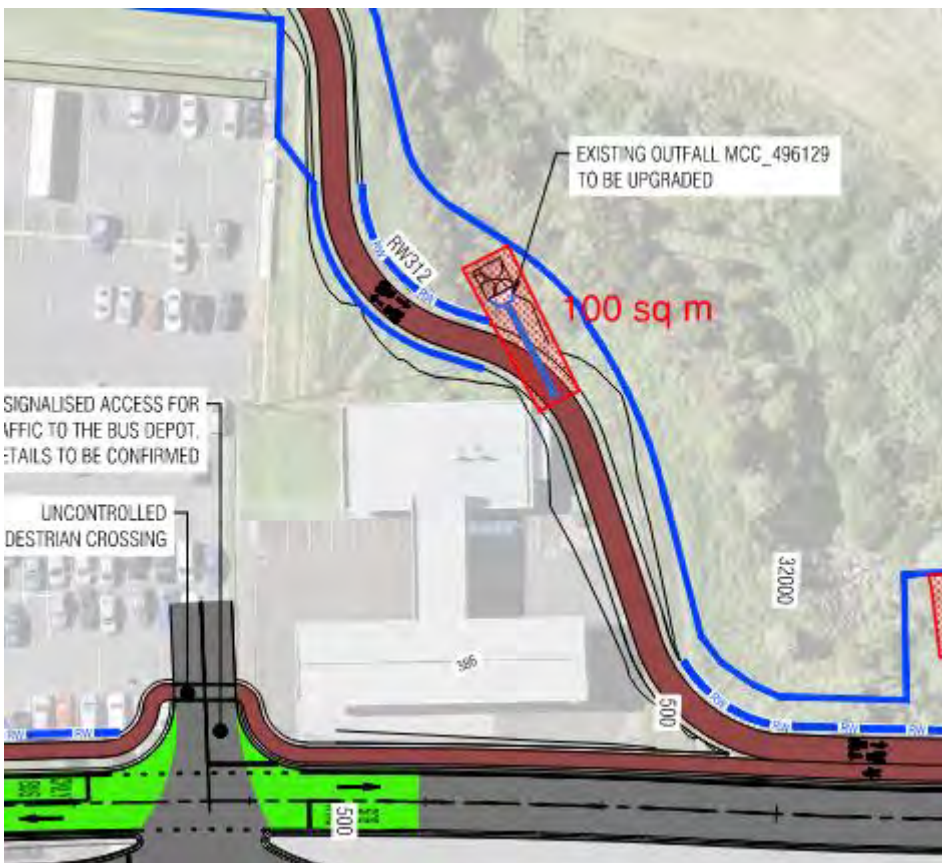


Works in stream/wetland environment

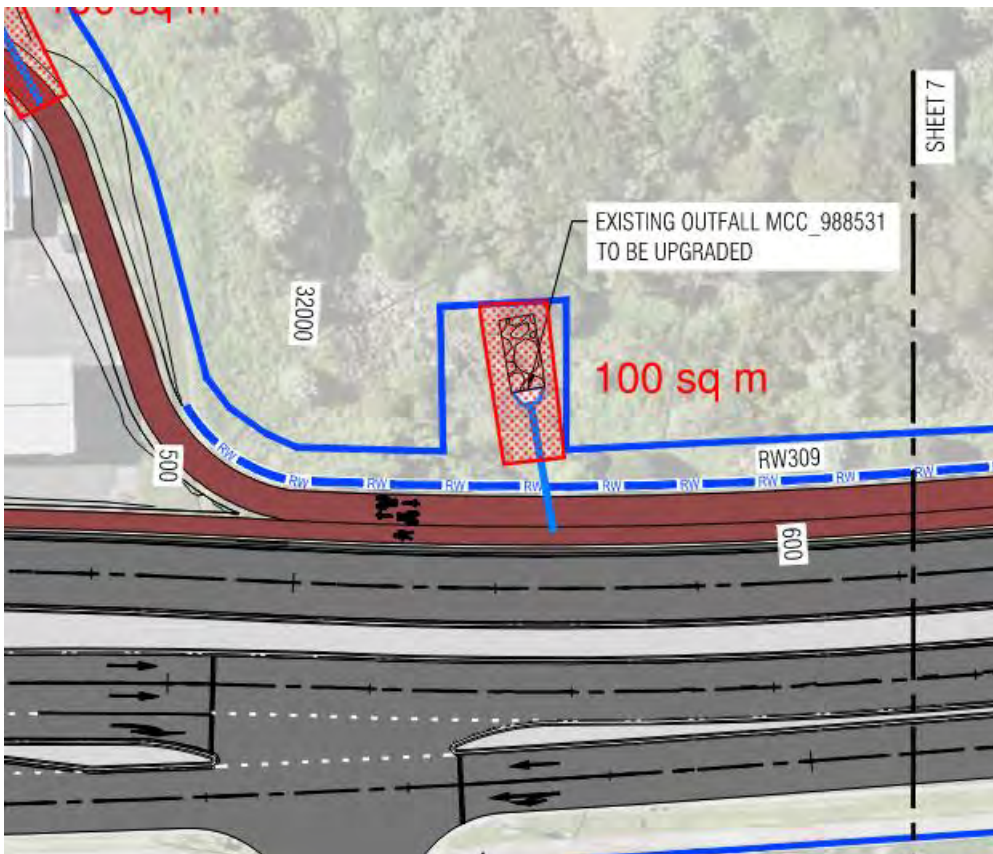
4.5.5 The approximate construction area required for the upgrade to the existing outfall MCC_108482 (SAP ID - 2000380606)



4.5.6 The approximate construction area required for the removal and replacement of the existing outfall MCC_496129 with a new outfall 53-1.



4.5.7 The approximate construction area required for the upgrade to the existing outfall MCC_988531 (SAP ID 2000295186)



The approximate construction area required for /stream environments.

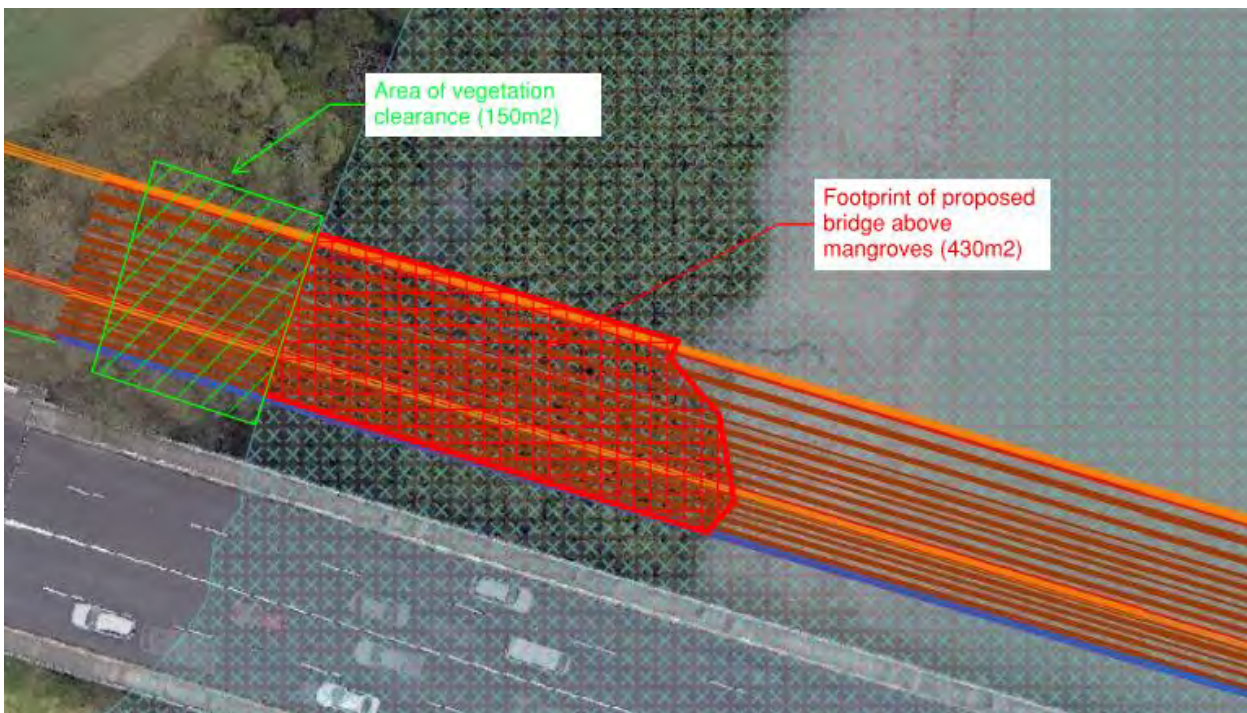


Figure 16 - Tī Rākau Bridge West

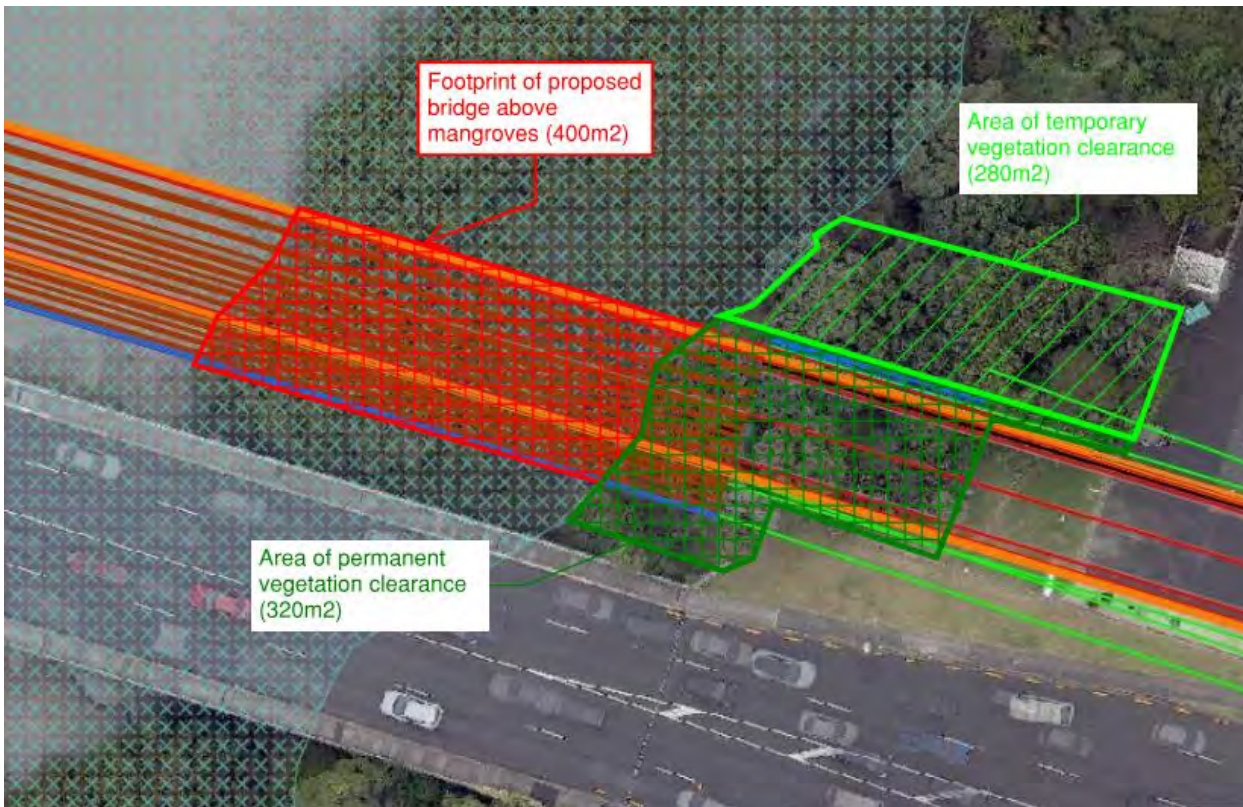


Figure 17 - Tī Rākau Bridge – East

4.6 Ecology – Above MHWS

Vegetation clearance (above MHWS) is required for the EB3C alignment and to allow construction of the cycleway within the Burswood Reserve as detailed in **Error! Reference source not found.** below. The EB3C works will result in approximately **0.372 ha** of permanent vegetation loss under the EB3C alignment and **0.421 ha** of temporary vegetation clearance under the construction footprint. **Error! Reference source not found.** below details the anticipated loss of vegetation associated with the EB3C Project works.

Vegetation will also be cleared (in addition to the areas identified in **Error! Reference source not found.**) to allow construction of Bridge A and Bridge B as shown in the figures below. Vegetation will be cleared by hand, using hand tools/chainsaws etc –no vehicles will access the CMA.

Refer to the Terrestrial and Freshwater Ecology Effects Assessment for the ecological effects relating to permanent and vegetation loss in **Error! Reference source not found.** below.

Location	Area of Permanent Vegetation loss (m ²)	Area of Temporary Vegetation Clearance ⁵ (m ²)
EB3C		

⁵ Temporary vegetation clearance is the area of vegetation that will be replaced post construction

EB3C Alignment (including bridge works and cycleway within Burswood Reserve)	3643	3910
Stormwater Infrastructure		
Existing Outfall MCC_108482 (SAP ID 2000380606)	25	75
Existing Outfall MCC_496129 (SAP ID 2000507038)	25	75
Existing Outfall MCC_988531 (SAP ID 2000295186)	25	75
New network (pipeline 36) proposed to connect upstream to the existing manhole (MCC_71866)	0	75
Total	3718	4210

Table 5 - Areas of permanent and temporary vegetation clearance outside the CMA (e.g. landward of the CMA boundary)

4.7 Traffic

The safety and protection of the public, traffic, and construction team is paramount, and all site operations are focused on zero harm to all involved, associated with travelling through this Project. This essential to the Project.

Traffic management is a key component in achieving zero harm, as it allows the public and traffic to be separated from construction operations, by managing/maintaining the public and traffic flow entering, travelling through, and exiting the construction zones within the Project area.

During construction, communication and consultation will be undertaken with the community and public, as detailed within the Communication and Consultation Plan (CCP) on temporary traffic management measures and indicative timeframes.

Temporary traffic management measures may include, but are not limited to:

- Footpath closures / deviations / detours
- Pedestrian crossing closures / deviations / detours
- Cycle lane and / or path closures / deviations / detours
- Bus diversions/temporary bus stops
- Property access closures / deviations /detours
- Parking closures (off-street and on-street)
- Shoulder and lane closures / deviations
- Road closures / detours
- Site access arrangements
- Temporary speed limits
- Temporary traffic services, including line markings, signals, streetlights and signage
- Wider network performance - communications to encourage alternative routes.

4.7.1 Burswood intersections

The new busway alignment intersects Burswood Drive at two locations where long-term access is required to build the raised table crossing points for the busway.

The proposed methodology is to close each connection point one at a time to enable access through the alternate connection point. The connection of Elderberry Rd provides a short detour route for residents on the same side as the road closure, while residents at the far end north of the peninsula can travel similar distances to exit onto Tī Rākau Dr.

4.7.2 Pedestrian access

During construction through the Burswood Reserve access to the existing pedestrian path will be maintained by creating a secure corridor through the construction work zone. This corridor can be shifted as works progress to allow completion of all the works.

4.7.3 Workforce parking

Sufficient car parking will be provided at each of the site compounds to allow staff and workforce to park off the surrounding locals roads. On road parking will be strongly discouraged.

4.7.4 Traffic volumes

Estimated traffic volumes for construction vehicles are provided below in **Error! Reference source not found.**

Type of Vehicle	Approximate No vehicles / day	Approximate No movements / day	Approximate Duration (in months)	Approximate Timeframe
Burswood Compound				
Truck & trailer	2	4	30	Jul 24 - Dec 26
6w truck	6	12	30	Jul 24 - Dec 26
LV	10	40	30	Jul 24 - Dec 26
Mobil/242 Tī Rākau Drive				
Truck & trailer	4	4	4	Sept 24 - Dec 25
Truck & trailer	4	4	9	Feb 26 – Nov 26
Oversize deliveries (bridge beams)	3	6	2	Oct 25 - Nov 25
6w truck	5	10	36	Jul 24 - Jul 27
LV	10	40	36	Jul 24 - Jul 27

Table 6 - Estimated vehicle movements at Site Compounds

4.8 Groundwater

4.8.1 Groundwater diversion

Trenching will be staged and isolated from surrounding works. If required, dewatering associated with residual surface water will be undertaken in accordance with the Project ESCP and the relevant SDESCP. Water pumped from trenches will not be discharged from the site unless it meets a minimum standard of 100mm visual clarity. Alternative options will be available via tankering water off-site in the event that the clarity standard cannot be met. Experience in similar projects suggests that the 100mm standard will be able to be met.

Consequently, the works required for service installation, including trenching, can be managed to ensure that any residual discharge of sediment from the works is minimised to an acceptable level within and surrounding the excavation.

4.8.2 Utility diversions

Trenches for network utilities will be progressively opened and closed and stabilised to ensure they are not open for longer than 10 days and not exceed 120m in length.

Appendix A – Details of Stormwater Infrastructure Works

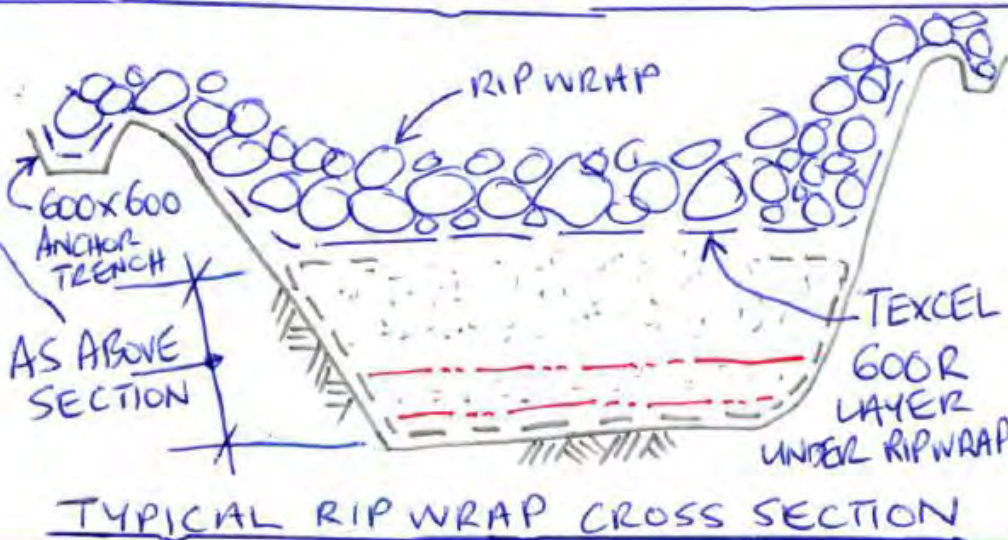
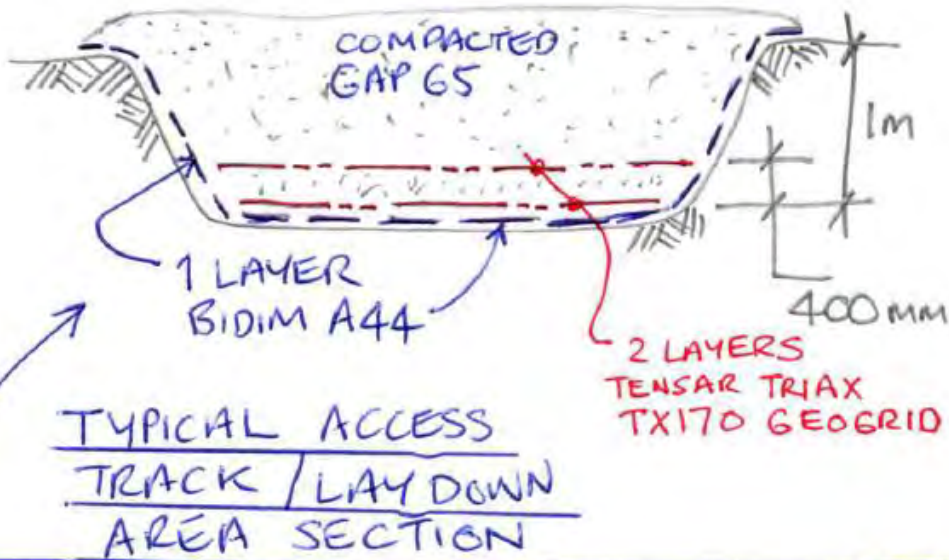
EB3C Stormwater Infrastructure (new and upgrades including scour protection)			
Outfall Reference Number	New or existing outfall	Location	Description of works
New Outfall (01A-1)	New	CMA	This new outfall will tie into eastern abutment scour protection for Bridge A. This new outfall is located in the CMA.
Existing outfall MCC_108479 (SAP ID 2000029871)	Upgrade	CMA	This existing outfall is proposed to be replaced and upgraded to accommodate the new busway network (including Bridge A and B). The upgraded outfall and scour protection are located in the CMA.
New Outfall 09-1	New	CMA	<p>This new outfall and pipe (pipeline 09) are proposed to be constructed approximately 56 m to the northwest of MCC_108480.</p> <p>The new outfall is located approximately 15 m landward of the CMA boundary. However, the scour protection (being rock riprap) is located in the CMA.</p>
Existing Outfall MCC_108409 (SAP ID 2000893599)	Existing	CMA	This existing outfall will be upgraded. A new pipeline (pipeline 10) will be constructed to the existing upgraded outfall. This existing outfall is located approximately 3m landward of the CMA boundary. However, the scour protection is located in the CMA.
Existing Outfall MCC_108482 (SAP ID - 2000380606)	Existing	Freshwater/terrestrial Environment	This existing outfall will be upgraded. A new pipeline will be constructed to the upgraded outfall to accommodate the existing and new networks (pipeline 43). This upgraded

			outfall is located within the Burswood Reserve.
Removal of Existing Outfall MCC_496129 (SAP ID 2000507038) and new outfall 53-1	New	Freshwater/terrestrial Environment	This existing outfall will be removed. A new outfall (53-1) will be constructed to accommodate the cycleway. The new outfall is located within the Burswood Reserve.
Existing Outfall MCC_988531 (SAP ID 2000295186)	Existing	Freshwater/terrestrial Environment	The existing outfall will be upgraded. A new pipeline will be constructed to the upgraded outfall to accommodate the new network (pipeline 47). The upgraded outfall is located in the Burswood Reserve.

4.9 Typical Cross-section (Reference Design)

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MARINE OUTFALL WORKS



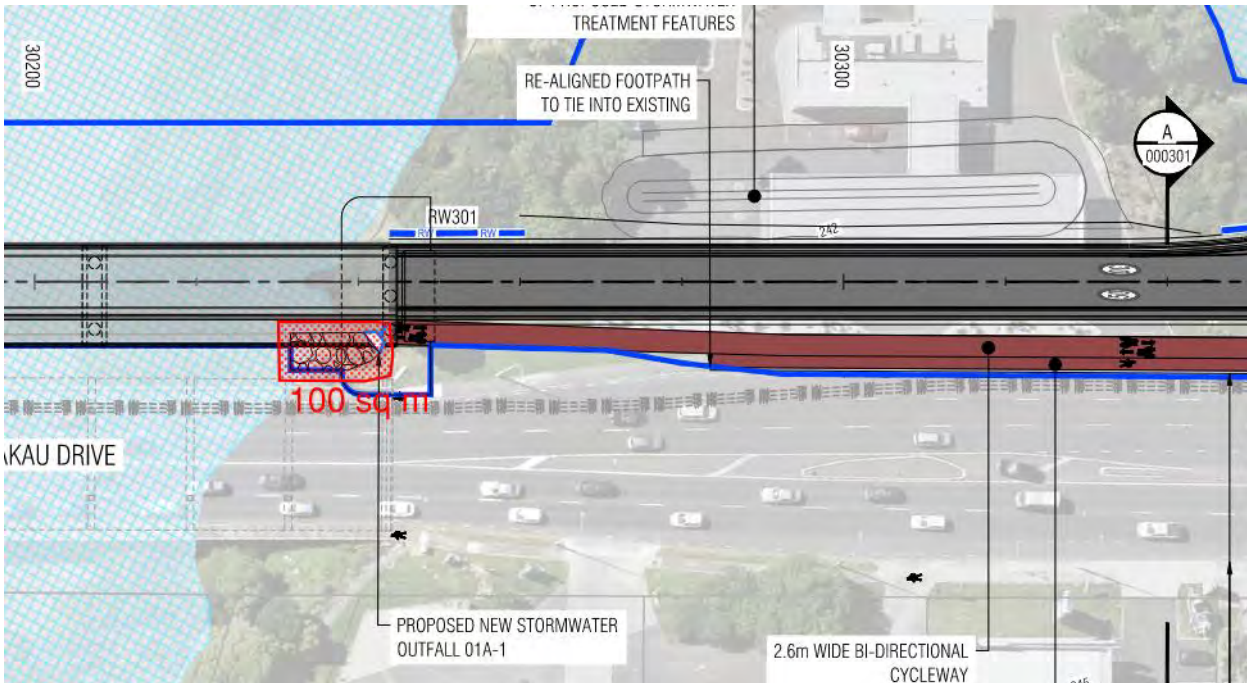
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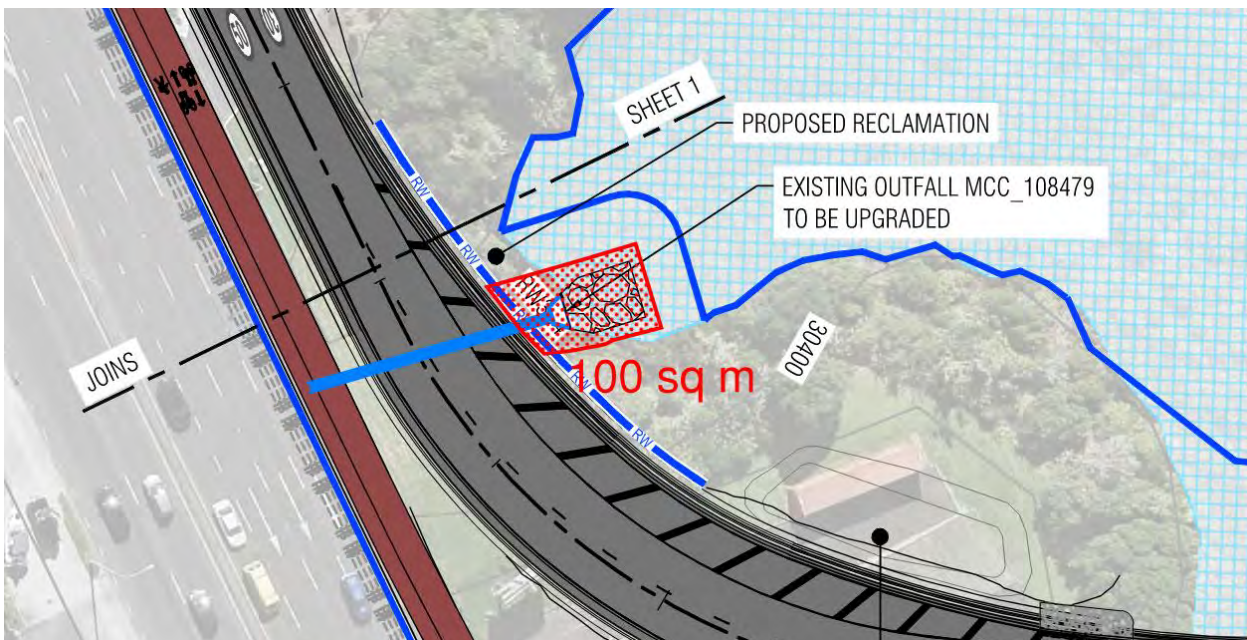
4.10 The Approximate Construction Footprint Area Required for the EB3C Stormwater Outfalls (new and upgrades including scour protection)

Works within the CMA

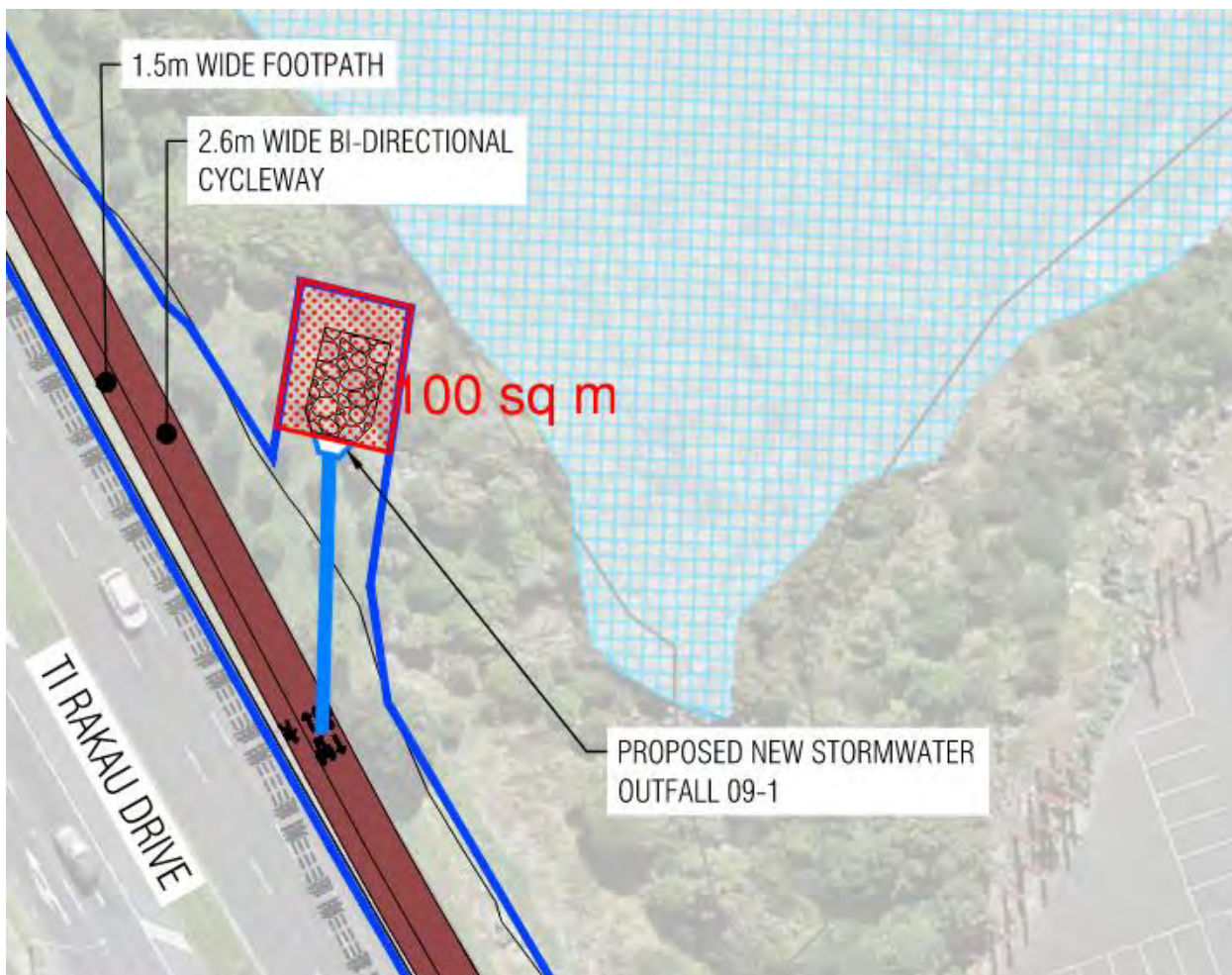
4.10.1 The approximate construction area required for the new outfall 01A-1



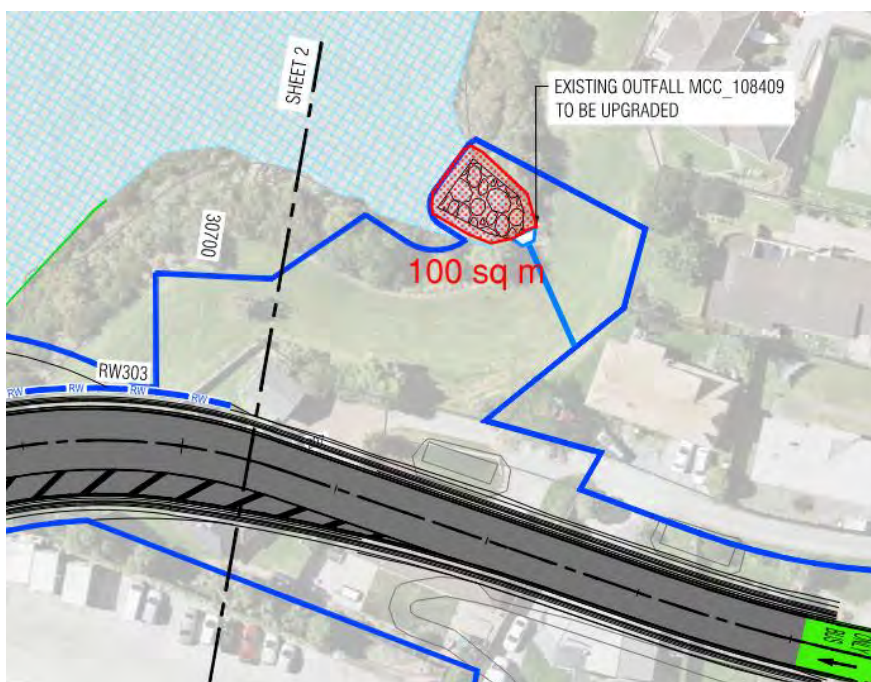
4.10.2 The approximate construction area required for the upgrade to the existing outfall MCC_108479 (SAP ID 200029871)



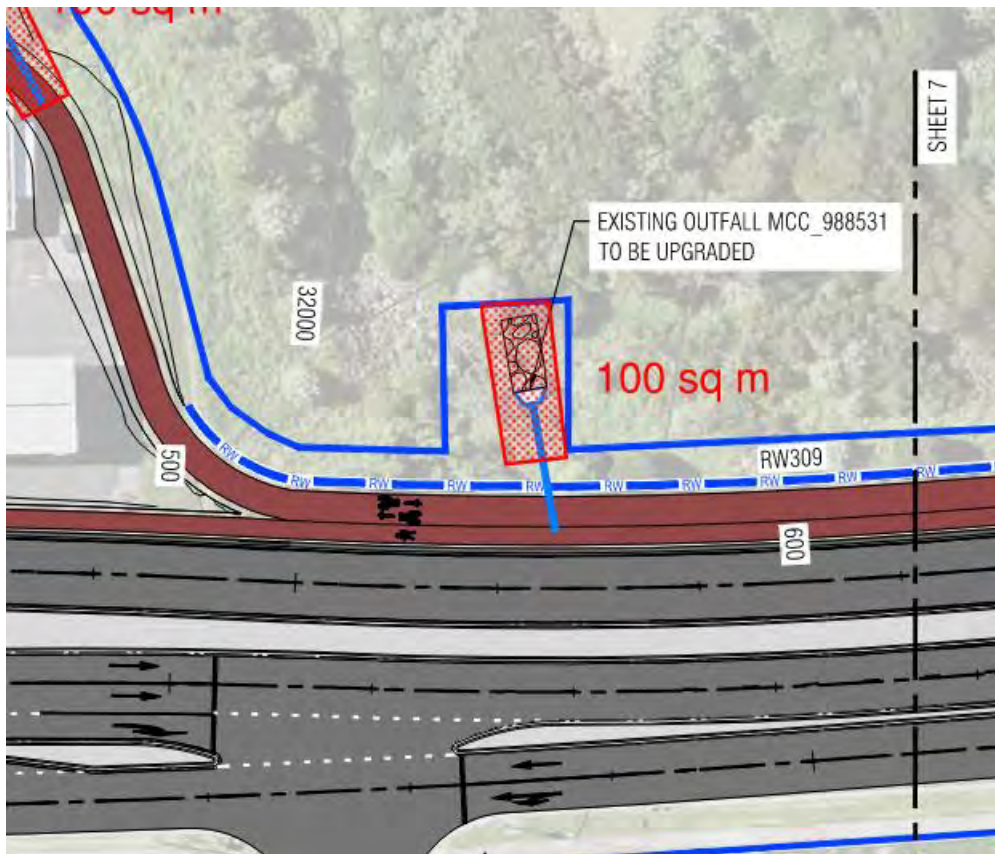
4.10.3 The approximate construction area required for the new outfall 09-1 located at 262 Tī Rākau Drive



4.10.4 The approximate construction area required for the upgrade to the existing outfall MCC_108409



4.10.7 The approximate construction area required for the upgrade to the existing outfall MCC_988531 (SAP ID 2000295186)



4.10.8 The approximate construction area required for for the new network (pipeline 36) connecting upstream to existing manhole MCC_71866) adjacent to the Burswood Reserve.

