construction), while rubbish removal will also be required during the same period. These actions are also required by AT's proposed Coastal Works Management Plan conditions (Appendix 5), which state the following:

"The CWMP must include details of…

d) Marine and banded rail/moho pererū habitat restoration works as shown on the LEAM plans listed in Condition 1, including:

i. Removal of pest plants from within an area of 5,740m^2 within the coastal margins of Pakuranga Creek followed by-planting of native coastal edge vegetation that provide suitable habitat for banded rail to nest in, such as rushes and sedges (e.g. oioi (Apodasmia similis), sea rush (Juncus krausii subsp. australiensis, Carex secta, Carex geminata, etc)) and coastal shrubs (e.g. saltmarsh ribbonwood (Plagianthus divaricatus);

ii. Removal of rubbish from the coastal environment of Pakuranga Creek (approximately 1,480m^2 of mangrove habitat and 5,740m^2 of coastal vegetation);

iii. Pest plant removal, native planting and rubbish removal described in this Condition 69(d)(i) and (ii) to occur annually for three years post-construction of Bridge A, Bridge B and related embankments;

iv. Following the completion of planting required by Condition 70(d), maintenance measures to occur for a period of three years."

" The landscaping required by Condition 70(d), (e) and (f) must be undertaken by the end of the first planting season following construction of the related coastal structures unless otherwise agreed to by Auckland Council".

Construction of the new stormwater assets will also require the removal of mangrove and coastal edge vegetation, as well as the disturbance of sediment and soil both landward and seaward of MHWS. This disturbance has the potential to affect coastal water quality, both from increasing the level of suspended solids in the water column and from remobilising trapped contaminants. As detailed in Section 9.4.4, land-based earthworks will be controlled through the Project-wide ESCP and associated ssESCPs. For works below MHWS (i.e., within the CMA), additional measures will be employed to control effects from sediment disturbance, such as coffer dams or bunds. These temporary structures will isolate the work areas from the surrounding coastal environment. Furthermore, the works will be undertaken during appropriate times during the tidal cycle and weather windows. These measures will limit the opportunity for any disturbed sediments to travel into the wider environment. The effects of coastal earthworks on ecological values will be low to very low.

Based on the above, the construction related effects on coastal ecology will be no more than minor.

9.4.8 Coastal Processes

A Coastal Processes Effects Assessment has been undertaken for EB3C (Appendix 29). The assessment has considered the construction phase effects on coastal processes arising from:

- Vegetation clearance
- Hydraulic changes associated with temporary construction structures.

Firstly, the assessment has identified that construction related vegetation clearance for outfalls, bridge construction and reclamation works has the potential to cause bank scour, failure and erosion. These effects could be aggravated by extreme tidal levels or flows in Pakuranga Creek during extreme storm

events (I.e., 1 in 50, 1 in 100 ARI events). Given this AT propose to undertake replanting post-construction to stabilise these coastal margins as part of the UDLP. This mitigation will minimise any potential scouring or erosion and has been shown on the LEAM plans (with the exception the planting for temporary bridge construction structures) and is also a requirement of the CWMP:

e) *"Coastal stabilization landscaping, as shown on the LEAM plans in Condition 1, including:*
   i. *300 m^2 for stormwater outfall structures (75 m^2 per each coastal outfall); and*
   ii. *70 m^2 for the temporary works associated with the retaining wall (RW304) supporting the reclamation.*

f) *Coastal stabilization landscaping plantings of 32 m^2 for temporary bridge construction structures (temporary piles for Bridges A and B) once those structures' locations have been identified by the Consent Holder;*

g) *The maintenance measures for coastal stabilization landscaping required by 70(e) and (f) for a period of five years post planting"*

In addition, these works will be subject to ssESCPs, which will also include stabilisation measures for affected coastal margins.

The assessment has considered the effects arising from the temporary bridge structures that will be employed to construct Bridge A given its location within the main channel of Pakuranga Creek. The assessment has identified that these structures will only have minor effects on the hydraulic characteristics of Pakuranga Creek, given the minimal footprint of piles, their driven depth (20m) and the low likelihood of storm events that could impact their stability. However, to ensure that such effects are minimised, AT has proposed the following as part of the CWMP:

b) *"Confirmation of the construction methodology, including:*
   i. *Installation of temporary structures*
   ii. *Details of the scour modelling undertaken and confirmation if scour protection is required around the piles of any bridge structures (and in particular, Tī Rākau Drive Bridge (Bridge A));*
   iii. *Plans and a methodology for scour protection if modelling determines it is required;*
   iv. *Plans (including dimensioned cross sections, elevations, and site plans) of any temporary structures in the CMA during the construction*
   v. *The piling methodology for the bridge;*
   vi. *A works methodology to upgrade existing and to construct any new stormwater outfalls;*
   vii. *Methods to remedy any disturbance resulting from works;*
   viii. *Methodology for removal of temporary piles associated with temporary access/support and any existing structures if required; and*
   ix. *Methods for the removal and disposal of mangroves."*

Given the Coastal Processes Effects Assessment and the mitigation proposed by AT, the construction phase effects on coastal processes will be minor.

9.4.9 Social Effects

A Social Impact Assessment (SIA) has been undertaken for EB3C (Appendix 26). While the overall social effects of the project are overwhelmingly positive, the SIA has identified a range of potential social effects during construction including:

- Loss of housing as a result of property acquisition for the project

- Severance from social infrastructure (e.g., medical facilities, open space, schools)
- Business disruption
- Reduction in amenity.

The SIA focuses, in part, on the acquisition of private properties and dislocation of current property owners and occupiers, with Table 9-8 highlighting the number of properties affected.

Table 9-8 Planned EB3C Property Acquisitions

Type of property	Full		Partial		Subtotal
	Under negotiation	Already acquired or agreement signed	Under negotiation	Already acquired or agreement signed	
Commercial	2	7	2	0	11
Residential	1	37	0	1	39
Total	3	44	2	1	50

There were some concerns from Burswood residential property owners directly affected by the proposed Project alignment and their ability to relocate during the 'housing crisis' in Auckland. Some responses expressed concern that people would not be able to find a suitable replacement home elsewhere and the lack of affordable alternatives in the East Auckland area. In response, AT implemented an early property acquisition strategy with most properties (one full acquisition is under negotiation) now being acquired. This strategy has reduced the scale of social impacts as it has provided certainty to residents and businesses.

AT has employed a "no surprises" approach to property acquisition and clearance. In a practical sense, this will include clear communication relating to property acquisitions and clearance, with additional warning time given to tenants/occupiers prior to their required departure (i.e., longer than 90 days) to enable them to find alternative accommodation. AT also proposes other mitigation, including providing contact points for housing advice and the provision of mental health support for those impacted by acquisition and displacement. AT is actively working with displaced businesses to find alternative sites.

As detailed above, the SIA also identifies that potential severance from social infrastructure (specifically Burswood Esplanade Reserve) during construction can cause adverse social effects. Section 9.4.1.6 has detailed how temporary access will be arranged for sites whose direct road access will be affected by construction activities. Furthermore, the CTMP will be required to include measures to allow continued access to all other sites in the work areas, including any temporary traffic diversions or pedestrian links. The CCP will require AT and EBA to consult directly with affected parties, as well as undertake clear communication with the wider community regarding access to social infrastructure during EB3C's construction.

The Burswood residential community have also raised concerns on the liveability of residential properties, including the ability of people to work from home, and usability of businesses and community facilities, near construction works. To mitigate these concerns the CNVMP will include:

- Identification of specific thresholds for sensitive receivers and measures such as adjusting construction times to avoid sensitive times where practicable
- Details of engagement and communication to allow the impacted community to plan ahead and to anticipate noisy works, and to set out sensitive times to inform construction times

- Details of training to ensure the construction team operate as a 'good neighbour' and are aware of potential impacts on neighbouring residential, businesses and community receivers during construction.

The potential reduction of amenity values from EB3C's construction activities (e.g. piling, dust generation), are also addressed in other specialist assessments at Sections 9.4.2, 9.4.3 and 9.4.14,. These matters will be addressed through the proposed management plans, which will be developed in recognition of local conditions and with the opportunity to work with directly affected parties, where appropriate.

The SIA also identifies business disruption as a potential adverse effect. This disruption could arise from the acquisition of land from which businesses operate, road disruptions, changes to access and general disruption from offensive construction activities. As with residential properties, AT proposes to also employ a "no surprises" approach with business owners/tenants to reduce stress associated with disruption. Similarly, the CCP requires AT to undertake timely and clear communication with affected business, while the CTMP requires the development of appropriate construction access arrangements. It should be noted that during consultation, businesses expressed concern with construction impacts if an option along Tī Rākau Drive was selected. The current alignment avoids going through Tī Rākau Drive (between Chinatown and Bunnings), therefore avoiding more substantial and direct impacts on businesses along Tī Rākau Drive where the majority of commercial property is located within EB3C.

Given the above, the social effects arising from construction will be minor.

9.4.10 Management of Contaminated Soils

The locations and types of potential contaminants has been previously described in Section 6.15 and the Contaminated Land Effects Assessment (Appendix 16). Land disturbance will be undertaken in proximity of HAIL sites at 242 Tī Rākau Drive, which is occupied by a Mobil branded service station, and 386 Tī Rākau Drive, which is occupied by a Gull branded service station. Other potential general sources of contamination include asbestos and lead from building demolition/deconstruction.

The CLMP will be implemented during the land disturbance activities for EB3C, as required by the proposed condition set. CLMPs are an industry standardised approach to the management of contaminated site works. Furthermore, the Contaminated Land Effects Assessment has not found any types or concentrations of contaminants which would require a more bespoke or site-specific management approach.

In addition to the CLMP and ESCP, the following contamination specific controls are proposed by AT's proposed condition set (Appendix 5):

- Controls regarding the dewatering and disposal of any disturbed contaminated groundwater
- Record keeping of the disposal location of any excess spoil
- Requiring any imported fill to meet Ministry for the Environment guidelines on "cleanfill".

The proposed conditions require submission of a Site Completion report (SCR) within three months of the completion of earthworks. The SCR will include:

- A summary of the works undertaken, including a statement confirming whether excavations on the route has been completed in accordance with the application reports
- The location and dimensions of the excavations carried out, including a relevant site plan

- A summary of any testing undertaken, including tabulated analytical results, and interpretation of the results in the context of the contaminated land rules in the AUP(OP)
- Copies of the disposal dockets for the material removed from the route
- Evidence that all imported fill material complies with the definition of 'cleanfill', in accordance with the 'Guide to the Management of Cleanfills', Ministry for the Environment (2002)
- Records of any unexpected contamination encountered during the works, if applicable
- Details regarding any complaints and/or breaches of the procedures set out in the CLMP and/or the conditions of consent.

Dust generation has also been highlighted by the Erosion and Sediment Control Effects Assessment, the SIA and Air Quality Effects Assessment. Given the potential for dust effects associated with HAIL sites, the proposed condition set includes requirements to manage and monitor dust generation. This will include minimising the opened area of earthworks (at any one time) and wetting earthworks/demolition/deconstruction as needed. It is anticipated that standard dust management practices will suitably address potential contamination effects associated with dust generation.

Given the various measures proposed by conditions of consent, as well as the likely contaminant types and concentrations present, the effects of contaminated land disturbance will be minor.

9.4.11 Tree Works

As detailed in the Arboricultural Effects Assessment (Appendix 18) and Section 4.3.12 there are 213 trees within the EB3C project footprint, or with canopies/rootzones that extend into the footprint. 110 trees are to be retained and 26 trees are to be moved to another location within the project footprint. Out of the 213 trees within the footprint, 77 trees are to be removed, 40 of which would ordinarily trigger requirements for resource consent under the AUP(OP). These works are required given the need to provide for the construction and safe operation of EB3C. Other tree works, including the removal of trees on residential sites and within business zoned sites are permitted activities and can be undertaken without resource consent or mitigation. No works to notable trees is proposed.

Given the brownfield location of works and age of urban development, mature trees of varying native and exotic species are present. While existing vegetation contributes to the overall amenity and biodiversity values of the EB3C area, contributions of individual trees vary depending on their wellbeing, location and maturity. Where practical, the Project has sought to retain vegetation but given the scale of works proposed some removal is unavoidable. The Arboricultural Effects Assessment has reviewed the construction methodology and proposed plans, utilising those documents to detail the potential adverse effects on trees during EB3C's construction.

AT proposes to undertake mitigation plantings to address these tree removals. This mitigation will be based on the LEAM drawings provided (Appendix 9) and the UDLP as detailed in the proposed conditions (Appendix 5). As highlighted in Section 4.3.12, the mitigation planting will include a mix of trees, shrubs and groundcover. This landscaping will also provide for a more comprehensive and cohesive approach to street tree and open space landscaping within EB3C's footprint and surrounding environment.

An arboricultural methodology has also been developed for works to and around any trees which are to remain. This methodology has been incorporated into the proposed conditions as requirements of the TPMP. The TPMP will include:

- A site walkover by the Project Arborist with construction crews to confirm if any trees marked for removal can actually be retained
- Tree protection measures for trees to be retained
- Tree pruning measures
- How the demarcation of temporary construction access and storage areas outside the permeable dripline and / or rootzone areas of retained trees will be undertaken
- Where and what type of protective barrier fencing will be employed
- The procedures for working within the dripline/rootzone of any retained tree, including appointment of a qualified Council approved arborist ("appointed arborist") to oversee directly all works within the dripline and rootzone of the trees located in the designated areas of work for the duration of the site works
- Specific bio-security removal restrictions that will apply to all elms (*Ulmus* sp.) and kauri (*Agathis australis*), to avoid the risk of spread of Dutch elm disease or kauri dieback
- The measures used to clearly mark all tree removals prior to implementation of each stage of the works.

These measures are consistent to those proposed for EB2 and EB3R and have been employed during the construction of EB1.

Based on the scale of works, mitigation planting and the use of the TPMP, the tree works will have minor effects. Further to this, no notable trees are affected.

9.4.12 Cultural Values

AT has been working with mana whenua during the development of the Project's design and construction of EB1 (i.e., Panmure to Pakuranga). Through this engagement, AT has developed a deeper understanding of the EB3C area's cultural values and the measures which should be employed to address potential cultural effects.

It is considered that site clearance, earthworks, works in the CMA and vegetation clearance all have the potential to generate adverse cultural effects. These effects would arise through:

- The discharge of sediment into watercourses and the CMA
- Loss of habitat due to vegetation loss, with resulting biodiversity reduction
- Disturbance of archaeological material
- Changes to landform
- Discharge of contaminants in the air, land and water.

These effects of construction activities have been minimised wherever possible and will be governed by management plans, including the ESCP, CEMP and CLMP. One purpose of those plans is to minimise construction effects on cultural values and this purpose is detailed within the proposed conditions (Appendix 5). In addition, AT have proposed ecological related conditions to address both habitat loss and direct effects on native fauna. This will help address the Project area's existing compromised biodiversity values.

Furthermore, AT have undertaken an Archaeological Effects Assessment (Appendix 25) of the Project area to determine what, if any, known archaeological sites may be affected. The assessment notes that there are 14 archaeological sites and one cultural heritage index site within 200 m of EB3C's alignment. Given this, AT have sought an archaeological authority for EB3C from Heritage New Zealand Pouhere Taonga (HNZPT).

In addition, a Historic Heritage Management Plan (HHMP) will be employed during construction. The HHMP will include protocols for when cultural material and/or items is uncovered and the appropriate mana whenua representatives to contact.

9.4.13 Historic Heritage

As detailed in Sections 6, there is a known archaeological site present within the footprint and immediate surrounds of EB3C, being the McCallum Wharf and Quarry[95]. The Archaeological Effects Assessment (Appendix 25), notes that while Bridge B works will avoid modifications to that feature the works will encroach in the AUP (OP) historic heritage scheduled extent of place for the site.

It is noted that a small area of reclamation for Bridge B (approx. 12m^2) will also sit within the scheduled extent of the quarry but will not impact on any of the identified features associated with the quarry, as shown in the General Arrangement Drawings (Appendix 7).

The works that will encroach into the scheduled extent consist of a Mechanically Stabilised Earth (MSE) embankment. The embankment is approximately 3000m^2 in total ground coverage, approximately 415m^2 of which will be within the scheduled site. Approximately 12m^2 of reclamation for the embankment will sit within the scheduled site. These works will require ground disturbance up to 2m deep that will be then rebuilt with hardfill. The extent of the embankment will require wicks installed at 800- and 1200-mm centres to a depth of 8m to promote drainage and assist its settlement. Therefore, works will occur across the extent of the embankment and within the area located within the scheduled extent for Donnelly's Quarry.

A retaining wall has been designed for the embankment to minimise the ground disturbance near the recorded features of the quarry. This has kept the extent of works outside the recorded extent of the northernmost stockpile of stone. The retaining wall will be built using driven sheet piles and will form part of the northern abutment of Bridge B.

A small area of reclamation (12m^2) will sit within the scheduled extent of the quarry but will not impact on any of the identified features associated with the quarry.

Beyond the Bridge B works there is still a possibility that previously unrecorded sites may be present, both from pre- and post-colonisation periods. Given this, an archaeological authority from HNZPT has been sought, while a HHMP will be employed for the duration of EB3C's construction. As detailed in the proposed conditions, the HHMP will include the following:

As a minimum the following will be included in the HHMP:

- Guidelines for the management of construction works within the historic heritage extent of place associated with Donnelly' Quarry (HHEP item 2114);
- Construction management procedures including pre-start requirements, during earthworks, analysis and reporting;
- Methods for recording in-ground historic heritage material not covered by another statutory authority;
- Methods for documentation and potential reuse of items of moveable historic heritage;
- Roles and responsibilities of the historic heritage team, the Requiring Authority, Mana Whenua representatives(s), contractors and subcontractors in relation to historic heritage material, consistent with any other statutory authorities;
- Protocols for the discovery of previously unrecorded archaeological or historic heritage sites, taonga, kōiwi or material of Māori cultural origin,

[95] AUP(OP) Reference: 2114.

- Training procedures for all contractors, to be undertaken in advance of construction, regarding the possible presence of historic heritage sites or material, what these sites or materials may look like, and the relevant statutory requirements if any sites or materials are discovered.

Based on the above, the historic heritage effects of EB3C's construction will be minor with implementation of the HHMP.

9.4.14 Air Quality

An Air Quality Effects Assessment has been undertaken for EB3C (Appendix 23). The assessment considered potential air contaminant sources, local weather conditions and the sensitivity of existing land uses.

The assessment has identified that construction generated dust is the principal air quality issue. To prevent and/or minimise dust related effects on the surrounding area, dust management measures will be an integral part of the ESCP, ssESCPs and the CLMP. These measures form part of the proposed condition set (Appendix 5) including:

- Minimising extent of exposed dry dusty surfaces
- Hardstand surfacing for frequently travelled access routes
- Availability of water carts for dry periods
- Construction vehicle speed restrictions
- Semi-porous or solid boundary fencing to provide shelter
- Minimisation of double handling of spoil or fill materials
- Minimisation of drop heights when transferring spoil or fill to stockpiles or trucks
- Avoiding frequently used stockpiles close to sensitive receivers.

In addition, AT have proposed a specific air quality condition for EB3C's resource consents, with the condition stating:

"Discharges of dust must not cause offensive or objectionable effects at any location beyond the boundary of the Site, in the opinion of an enforcement officer when assessed in accordance with the "Good Practice Guide for Assessing and Managing Dust" (Ministry for the Environment, 2016). The Consent Holder must ensure that dust management during the works generally complies with the recommendations of this Good Practice Guide and minimises dust generation as far as practicable. This includes having sufficient water to dampen exposed soil and unsealed areas, and/or other dust suppressing measures detailed by the ESCP, available as necessary."

In addition to controls to mitigate dust generation and dispersion, fence line instrumental monitoring (via the project-wide Erosion and Sediment Control Plan (ESCP) will be undertaken to measure dust concentration in the air and provide feedback to site managers on the effectiveness of controls, as well as whether there is a need to implement additional dust controls. This monitoring is proposed as an additional mitigation measure for the construction of EB3C sections of the Project and is required by AT's proposed conditions as detailed in Section 9.4.4.

Monitoring for dust outside the construction site boundaries will comprise a combination of visual observations and stakeholder communications. However, no off-site instrumental monitoring for ambient air quality concentrations of fine particulates is required by the National Environmental Standard for Air Quality Regulations 2004 (NES-AQ) as no sensitive receptors have been identified as having a high risk of dust impacts after mitigation has been implemented.

Based on the above measures, EB3C's effects on air quality will be minor.

9.4.15 Land Stability and Groundwater

A Groundwater Effects Assessment has been undertaken for EB3C (Appendix 24). The assessment has not identified any groundwater risks associated with EB3C, in part due to the limited cuts required for construction, as well as the underlying geological conditions.

The deepest works are largely restricted to piling when constructing both bridges. These piles will be driven under hydrostatic pressure, with the use of proprietary gels to minimise the inflow of any groundwater into pile excavations. This approach avoids the need to divert groundwater or undertake significant dewatering of the piles, thereby reducing the possibility of ground settlement. This methodology avoids impacts on historic heritage, even while piling will be undertaken within 10m of the historic heritage extent of place.

Wick drains will also be installed for the Bridge B embankment. Wick drains are prefabricated geotextile plastic strips which are driven down into the soil and provide a preferential pathway for groundwater to escape under the applied vertical stress from embankment fill. The addition of wick drains only accelerates the natural process of consolidation which would occur regardless. The embankment stability is also improved by adding wick drains as they generate accelerated rates of settlement and increase the undrained shear strength at a faster rate. Wick drains do not permanently change the natural groundwater level, but rather alleviate excess pore water pressure generated from loading. The installation of wick drains will not adversely affect groundwater or features within the historic extent of place.

Given these factors, no land stability or groundwater related effects are anticipated by EB3C's construction.

9.4.16 Visual and Landscape Effects

The temporary visual and landscape effects associated with EB3C's construction are detailed in the Natural Character, Landscape and Visual Effects Assessment (Appendix 22). It is noted that the construction of EB3C will be visible from numerous public spaces, reserves and private sites, including:

- Riverhills Reserve
- Burswood Esplanade Reserve
- Pakuranga Creek
- Guys Reserve.

These effects include the disruption of users/occupiers' appreciation of existing visual amenity values, shadowing and dominance impacts, as well as a general decrease in local visual amenity values of these reserves. However, it should be acknowledged that these effects are occurring within a brownfield location, with significant infrastructure assets like Tī Rākau Drive Bridge and Watercare's pipe bridge already present. While these reserves retain some natural features and views, such as towards Pakuranga Creek, the wider backdrop is urban development of varying visual quality. In addition, the construction effects at these reserves will be temporary, with replanting and other urban design improvements providing a long-term positive contribution to the amenity values of these locations.

Another viewing audience will be persons travelling to, from and through the area. The construction of EB3C will be visible from public roads in several directions, most notably for persons travelling along Tī Rākau Drive. However, such views will be transient given that any viewers will be moving through the construction area. As such, the effects on the travelling audience will be minimal.

A further viewing audience will be workers and visitors to commercial sites within the Project area (e.g., Chinatown). However, these sites are generally inwards focused, with activities occurring within existing buildings rather than reliance on outdoor amenity areas. In general, these commercial sites feature vehicle parking, goods delivery and rubbish storage areas that adjoin EB3C's corridor and/or the CMA. As such, effects on these viewers are considered to be low.

Lastly, EB3C's construction will be viewable from residential sites, including those from elevated positions (e.g., Riverhills Avenue) and adjoining EB3C's corridor (e.g., Burswood Drive). Construction activities, such as house removals, installation of hoardings and vegetation clearance have the potential to affect the outlook from these residential sites. Construction activities at these locations may be highly visible, in part due to the removal of intervening structures and vegetation that would otherwise obscure construction. These views of construction activities would also have longer durations, given the scale of works proposed and time needed to construct the larger elements of EB3C.

The Natural Character, Landscape and Visual Effects Assessment (Appendix 22) considers that the greatest visual effects will be for those at low elevation positions near the Project works and such effects are considered to be High. These include those along Davington Way, Ifield Court and Wanaka Place (who will view the bridge structures), as well as those along Burswood Drive, Tullis Place, Dulwich Place, Heathridge Place and Midvale Place.

Travelling viewing audiences will experience up to low adverse effects during the construction of the project, noting that this effect will be short term (and temporary) as the viewing audience passes through the site and location of works. Occupational viewing audiences would experience low adverse effects during construction noting that most business activities operate within buildings.

However, it is noted that infrastructure construction is not an uncommon activity in an urban environment and there is the potential to provide ground level screening to minimise views into active construction areas. In addition, there are no AUP(OP) landscape or character overlays present within these residential areas. Given the temporary nature of the construction activities, the potential for screening via the CEMP and the lack of any character/landscape AUP(OP) overlays, the effects on these residential sites are considered to be acceptable.

In terms of landscape values, it should be noted that changes to landform will be mainly due to grading for the proposed road levels and surfaces. These landform changes will be occurring within a modified residential environment with low landform values. Similarly, landscape values are already compromised at the locations of Bridge A and B (the area with the highest landscape values within EB3C) due to the existing Tī Rākau Drive Bridge and commercial activities, noting that the unmodified coastal embankments, intertidal areas and the creek bed are considered to have high landscape values.

Works near the tributaries of Pakuranga Creek, within Burswood Esplanade Reserve, will include the construction of retaining walls to limit earthworks. The works within the tributary margins will have moderate impacts. Vegetation removal for EB3C will be of a moderate level, largely due to the removal of mangroves within Pakuranga Creek, riparian vegetation (only some of which is indigenous) and native trees in Burswood Esplanade Reserve.

It is also noted that exotic and pest plants will be removed from residential zoned sites. The Project also affects the interconnectivity of open spaces between Bard Place Reserve and Burswood Esplanade Reserve, as well as reducing available open space area. This results in moderate-high impacts particularly on interconnectedness and legibility.

With respect to natural character, the biggest impact arising from EB3C's construction are associated with the construction of Bridges A and B over Pakuranga Creek, the embankment reclamation and the reclamation of 4m^2 of CMA between the Mobil service station site and the Pet Stop site. However, both

these locations are already heavily modified from historic urbanisation and poor management of pest plant species.

Finally, to mitigate these landscape, natural character and visual amenity effects, AT has sought to limit the extent of work areas, clearance of native vegetation and earthworks. In addition, hoardings will be employed at active construction sites (where practicable). Based on EB3C's design and the mitigation proposed by AT, the construction related visual and landscape effects will be minor.

9.4.17 Effects on Open Space

As detailed in the Open Space Effects Assessment (Appendix 10), EB3C's construction will require the occupation of large areas of Burswood Esplanade Reserve, including for a CSA. This occupation of open space land has the potential to generate adverse effects from:

- The loss of use of open space for passive recreation
- Loss of walking connections through the reserve
- Loss of general amenity values
- Restrictions on park maintenance, such as lawn mowing.

Given these potential effects, AT has been in ongoing discussions with AC Community Facilities and the Howick Local Board regarding the Project's construction. These discussions have covered AC's requirements as landowner, as well as mitigation required to address the Project's open space effects.

In particular, AT has been working with AC in regard to park improvements that can be undertaken prior to the commencement of works within Burswood Esplanade Reserve. These discussions have identified the potential for improvements to be undertaken to Burswood Park (170R Burswood Drive and 33R Fernbrook Close). Burswood Park is relatively central to the wider Burswood area and has underdeveloped areas that could be improved with:

- Shade and or shelter
- Improved play elements to cater for all abilities and ages
- Better planned space for the community.

These improvements will require further discussions with AC and the wider community. Given this, further engagement with mana whenua is proposed as part of the mana whenua framework, as well as the community via the CCP. These improvements will be implemented by AT as part of the landowner approval with AC and any asset owner approval(s).

Beyond these improvements, general construction activities within open space land will be subject to the construction phase management plans and conditions. This includes the CEMP, CTMP, CNVMP and ESCP. These management plans and associated conditions will assist managing amenity impacts on Burswood Esplanade Reserve and other open space while EB3C undergoes construction. These management plans will be subject to certification by AC, as well as any requirements imposed through landowner approval(s).

Following construction, AT will remove all construction equipment and materials, as well as replant any affected grassed or vegetated areas. This will ensure that longer term amenity values associated with these open spaces are maintained. Other open space improvements will be undertaken, most notable is the addition of a pump track, outdoor seating, pathway improvements, improved wayfinding and landscaping as detailed in section 4.2.4 of this AEE. Lastly, the open space improvements at Burswood Esplanade Reserve will be controlled through the UDLP, which again will require certification by AC prior to its implementation.

Given the above, and with mitigation measures implemented, the construction of EB3C will have no more than minor construction effects on open space values.

9.4.18 Summary of EB3C Construction Effects

AT and EBA have worked to develop a construction methodology, design and conditions set that address all actual and potential environment effects arising from EB3C's construction. This includes a broad suite of management plans which give both stakeholders and AC confidence that the construction phase effects are appropriately addressed, with construction undertaken in a way that minimises disruption to the local community as far as practicable. The proposed conditions also require clear and timely consultation with the community and key stakeholders, while the continuation of the kaitiaki forum maintains the involvement of mana whenua through the Project's delivery.

AT's proposed mitigation and management practices, as required by the proposed conditions, also address EB3C's construction effects on coastal process and ecological values. In particular, AT propose to undertake habitat restoration for the banded rail, given the disturbance of the CMA during the construction of Bridge A, Bridge B and the busway reclamations. Further replanting is proposed to minimise the erosion of coastal banksides and effects on coastal processes. Similarly, AT have proposed to undertake terrestrial habitat restoration for native herpetofauna, while a suite of measures like a NFCRP will also be employed to protect freshwater ecology values.

Based on the above-mentioned measures and technical reporting undertaken, EB3C's construction effects will be no more than minor.

9.5 Operational Effects

Consideration has been given to the operational effects of EB3C once construction is complete. Given the scale of EB3C and its potential to reshape the surrounding urban form, the following operational effects are detailed in the following sub-sections:

- Transport effects
- Visual and landscape effects
- Open space effects
- Cultural effects
- Noise effects
- Stormwater effects
- Coastal ecology
- Freshwater ecology
- Coastal processes.

9.5.1 Transport Effects

9.5.1.1 General Transport Benefits

The primary driver for EB3C is to improve the overall functioning of southeast Tāmaki Makaurau/Auckland's transport network especially for public transport and active modes. While the positive effects of the wider Project and EB3C are detailed in Section 9.3, the ITA (Appendix 14) has undertaken a detailed analysis of how local transport networks will operate once construction is complete. Key transport benefits identified by the ITA include:

- Better connections and sustainable travel options for pedestrians, cyclists, motorists, bus and train customers
- A reliable 40-minute bus and train trip between Botany Town Centre and Waitematā (saving 20-minutes)
- Increase in public transport trips from 3,700 to 18,000 per day by 2028
- Increase in public transport mode share from 7% to 25% by 2028
- 24,000 more people with access to a rapid transit bus station within 1 km from home
- 5 km of busway between Pakuranga and Botany fully separated from other traffic
- 5 new bus stations with quality facilities
- 12 km of safe and separated walking and cycling infrastructure
- Reductions in vehicle congestion around Pakuranga Town Centre
- Accommodates electric buses, a key part of AT's low-emission vehicle fleet by 2040.

9.5.1.2 General Transport Effects

The ITA has modelled the expected AM and PM peak hour traffic volumes of the do-minimum scenario and with the entire project (EB2, EB3R, EB3C and EB4i/EB4L) implemented. These results are summarised below in Table 9-9.

Table 9-9 Do-Minimum and EB2/EB3R/EB3C/EB4 (post construction) traffic volumes (2028 scenario)

Location	Direction	AM Peak		PM Peak	
		Do-Minimum [veh/h]	EB2/EB3/EB4 [veh/h]	Do-Minimum [veh/h]	EB2/EB3/EB4 [veh/h]
Pakuranga Road (West of the RRF)[96]	Westbound	2,246	968	1,337	1,093
	Eastbound	1,548	907	2,725	1,169
Pakuranga Road (East of the RRF)[97]	Westbound	2,304	2,915	1,331	1,494
	Eastbound	1,491	1,352	2,794	2,643
William Roberts Road (Tī Rākau Drive – Reeves Road)[98]	Northbound	35	318	42	354
	Southbound	35	220	75	244
Reeves Road (West of William Roberts Road)	Westbound	526	259	256	77
	Eastbound	240	84	791	211
Reeves Road (East of William Roberts Road)	Westbound	348	394	175	119
	Eastbound	310	247	607	500
RRF	Northbound	-	848	-	1,696
	Southbound	-	2,349	-	1,069
SEART (West of ramps)	Westbound	2,934	3,364	1,622	1,930
	Eastbound	1,387	1,868	3,135	3,183
Tī Rākau Drive (Pakuranga Road – Reeves Road)	Westbound	1,261	1,093	2,094	1,131
	Eastbound	1,319	689	958	804

[96] Relates to the section of Pakuranga Road west of William Roberts Road in the Do-Minimum scenario.
[97] The section of Pakuranga Road east of William Roberts Road in the Do-Minimum scenario.
[98] The section of William Roberts Road south of Reeves Road, prior to the completion of the extension, in the Do-Minimum scenario.

Location	Direction	AM Peak		PM Peak	
		Do-Minimum [veh/h]	EB2/EB3/EB4 [veh/h]	Do-Minimum [veh/h]	EB2/EB3/EB4 [veh/h]
Tī Rākau Drive (Reeves R Road – William Roberts Road)	Westbound	2,062	1,724	1,524	1,628
	Eastbound	738	1,471	1,447	1,662
Tī Rākau Drive (William Roberts Road – Edgewater Drive (west))	Westbound	1,962	1,554	1,582	1,693
	Eastbound	740	1,323	1,446	1,551
Tī Rākau Drive (Edgewater Drive (west) – Gossamer Drive)	Westbound	1,600	1,644	1,652	1,832
	Eastbound	920	1,516	1,178	1,565
Gossamer Drive (At Tī Rākau Drive)	Northbound	359	434	697	483
	Southbound	1,224	753	499	314
Tī Rākau Drive (Gossamer Drive – Burswood Drive west)	Westbound	1,786	1,858	2,238	2,064
	Eastbound	1,613	2,038	1,565	1,647
Tī Rākau Drive (Burswood Drive (west) – Harris Road)	Westbound	1,246	1,515	1,662	1,606
	Eastbound	1,547	1,722	1,468	1,633
Harris Road (At Tī Rākau Drive)	Northbound	688	810	1,442	1,321
	Southbound	1,720	1,695	570	899
Tī Rākau Drive (Harris Rd – Burswood Drive (east))	Westbound	1,514	1,326	952	995
	Eastbound	730	631	1,624	1601
Tī Rākau Drive (Burswood Drive east – Huntington Drive)	Westbound	1,614	1,288	1,020	953
	Eastbound	850	685	2,245	1,721
Huntington Drive (At Tī Rākau Drive)	Northbound	351	208	113	62
	Southbound	90	68	404	120
Tī Rākau Drive (Huntington Drive – Te Koha Road)	Westbound	1,597	1,437	953	823
	Eastbound	849	684	1,920	2,103
Tī Rākau Drive (Te Koha Road – Te Irirangi Drive)	Westbound	1,450	1,363	801	626
	Eastbound	826	853	1,758	2,203
Te Irirangi Drive (Tī Rākau Drive – Te Koha Road)	Northbound	1,094	799	2,317	1,073
	Southbound	1,261	1,267	1,024	1,320

Traffic volumes are expected to remain roughly similar for all sections once the Project as a whole is completed, with the exception being the eastbound direction along Tī Rākau Drive between SEART and Gossamer Drive. This will likely be due to Trugood Drive, in addition to Harris Road, drawing more demand southbound. This trend is observed in both the modelling results for the AM and PM peaks.

Traffic volumes are predicted to increase in the eastbound direction on Tī Rākau Drive, between Gossamer Drive and Harris Road during both the AM and PM peaks. This is likely due to the increased capacity of the SEART off-ramp, as a result of the additional right-turn lane further west. The westbound direction is predicted to experience small variations in traffic volumes.

Tī Rākau Drive between Harris Road and Huntington Drive is predicted to experience a reduction in traffic volumes in both directions during the AM and PM peaks. This is due to Tī Rākau Drive section reducing from three lanes to two lanes in both directions and the operation of the Huntington Drive intersection.

Tī Rākau Drive between Huntington Drive and Te Irirangi Drive is expected to experience reduced traffic volumes in the westbound direction during the AM and PM peaks. However, the eastbound traffic volumes are predicted to increase during the PM peak. This is likely due to Tī Rākau Drive expanding back to three lanes at Guys Reserve and cyclical traffic patterns heading outbound from Panmure in the PM peak.

In terms of the side roads off Tī Rākau Drive, Harris Road is expected to experience an increase in traffic volumes northbound in the AM peak, and southbound in the PM peak. This is likely due to the construction of the RRF, where some traffic entering/exiting from SH1 is rerouted from the Highbrook and East Tāmaki onramps/offramps to the Reeves Road Flyover.

Finally, Huntington Drive is expected to experience a reduction in traffic volumes in all directions during the peak periods. This is likely due to the capacity reduction of Tī Rākau Drive between Burswood Drive (east) and Guys Reserve, hence reducing the traffic volumes accessing/exiting from Huntington Drive.

9.5.1.3 Intersection Performance

When considering intersection performance with the completion of the Project, it is important to consider that an objective of the Project is to promote the uptake of public transport. To accommodate this objective, bus services will be accommodated on dedicated bus lanes and with dedicated phasing at signalised intersections. This reprioritisation of intersection operations will require reductions in green signal phasing for general road traffic. This does result in some increased queuing and delay of general traffic, decreasing the average performance of some intersections. Furthermore, some general traffic carriageway space in EB3C will be reallocated to the busway. This will also increase queueing and delays of some general traffic movements.

During the AM peak, all existing and new intersections in EB2 and EB3R are expected to operate with acceptable LOS, DOS and delay, with the exception of the Pakuranga Road/Brampton Court and Tī Rākau Drive/Gossamer Drive intersections. The southern approach at the Pakuranga Road/Brampton Court intersection is expected to be saturated in the AM peak. However, the approach is already saturated in the Do-Minimum scenario and traffic volumes on Pakuranga Road will be reduced in the future.

The Tī Rākau Drive/Gossamer Drive intersection is expected to operate at capacity, similar to the existing environment. The eastbound approach is the critical approach at the intersection. The trade-off is that all bus movements are expected to operate at LOS C, with significant travel time improvements predicted for the Botany to Pakuranga and SEART routes. The performance of this intersection requires the balancing all the competing modes within in a constrained corridor. Different intersection layouts, phasing and cycle times have been investigated and assessed to balance the competing modes. The only alternative to improve LOS would be to provide additional lanes. The intersection DOS < 1.2 is however still within the Transport Minimum Requirements (TMR) for the overall intersection performance guiding the design of the Project.

All the new and existing intersections in the EB3C project area are expected to operate with acceptable LOS and delays. Slight increases in delay are expected at the Tī Rākau Drive/Burswood Drive (east) intersection, although this intersection is still expected to operate with spare capacity. It is also

anticipated that the Bunnings Warehouse's loading access can be incorporated into the Burswood Drive (east)/Busway intersection and will operate with only a low delay.

To manage the heavy westbound demand (1,500 veh/h on average at the intersections listed below) coupled with the reduced capacity along Tī Rākau Drive in the AM peak, the ITA recommends that signal coordination be implemented. These fixed time cycles and appropriate offsets are recommended at the following intersections:

- Tī Rākau Drive/Huntington Drive – reference intersection
- Tī Rākau Drive/Howick and Eeastern Bus Depot eastern entrance
- Tī Rākau Drive/Greenmount Drive/Burswood Drive (east).

During the PM peak, all of the new and existing intersections in EB2 and EB3R are expected to operate with acceptable LOS and delay. The exceptions are the Pakuranga Road/Brampton Court and Tī Rākau Drive/Gossamer Drive intersections. Although the DOS at the Pakuranga Road/Brampton Court intersection is expected to improve, a slight increase in the average delay is expected. Again, the southern approach is the most critical approach. However, traffic volumes on Pakuranga Road will be reduced when compared to the Do-Minimum scenario and the ITA considers that this level of average delay is acceptable.

As above, The Tī Rākau Drive/Gossamer Drive intersection is expected to operate at capacity in the PM peak. Again, the eastbound approach is the critical approach, with the trade-off being that buses are expected to operate at LOS C. The performance of this intersection is a balance between all the competing modes. The only alternative to improve LOS would be to provide additional lanes. The intersection DOS < 1.2 is however still within the TMRs for the overall intersection performance guiding the design of the Project.

All the new intersections in EB3C are expected to operate with acceptable LOS and delay in the PM peak as well. Also, the Bunnings Warehouse's loading access can be incorporated into Burswood Drive (east)/Busway intersection and operate with low delay (25 sec). While The Tī Rākau Drive/Burswood Drive (east) intersection is expected to experience some increase in delay, it is still expected to operate at an acceptable LOS and with an average delay.

Similar to the AM peak, the ITA recommends that signal coordination is employed to manage the heavy eastbound demand (1,997 veh/h on average) and capacity reduction along Tī Rākau Drive in the PM peak. This will include fixed time cycles and appropriate offsets at following intersections:

- Tī Rākau Drive/Greenmount Drive / Burswood Drive east – reference intersection
- Tī Rākau Drive/Howick and Eastern Bus Depot eastern entrance
- Tī Rākau Drive/Huntington Drive
- Tī Rākau Drive/Guys Reserve
- Tī Rākau Drive/Te Koha Road.

Overall, these measures are expected to improve roading operations, reduce congestion for general traffic across the network and improve bus movements in the Project area. The use of these measures will be subject to AT's day-to-day management of the regional roading network. As such, the imposition of conditions for these measures is considered inappropriate.

9.5.1.4 General travel times

In order to assess route travel times, the ITA utilised an AIMSUN model with a 2028 horizon year. Overall, the ITA determined that further travel time improvements are expected in nearly all of the routes, particularly in the eastbound direction, as a result of the completion of EB3C, EB4i and EB4L.

During the AM peak period westbound (citybound) movements are prioritised along the transport network upon completion of the full project (EB2, EB3 and EB4). Along with the completion of the RRF, this is predicted to lead to significant improvements in travel times from Botany to SEART and Pakuranga, as well as from Howick to SEART. The route from Howick to Pakuranga is predicted to experience a negligible increase, as it is treated as a minor movement at the Pakuranga Road/RRF intersection. All eastbound routes are predicted to experience small improvements in the AM peak.

Similarly, in the PM peak eastbound movements are prioritised. This is predicted to lead to significant improvements in travel times from Pakuranga and SEART towards Botany. The eastbound routes from Pakuranga and SEART towards Howick are predicted to experience negligible increases in travel time. All westbound routes are also predicted to experience improvements in the PM peak.

9.5.1.5 Effects on Bus Services

The ITA has undertaken an assessment of the operational effects on bus services, using headway as a measure of these effects[99] and as summarised in Table 9-10. Service headways of the 70 service and the 352 service will improve significantly during all periods of the day. This will help support an uptake in public transport patronage, especially during the peak periods.

Headways for the 351 service will be halved during the AM and PM peak periods in the future, whereas headways for the 353 are expected to remain the same during all periods, with the capacity to be improved if required. It is also expected that the new 705 and 706 services will at first run at 15-minute intervals, and only in the peak directions (AM = inbound, PM = outbound), with further improvements to these services possible.

These increased bus service frequencies will encourage more road users to use buses as there will be less waiting time in between services, subsequently leading to increased public transport mode share on the network. This will not only reduce congestion but will also support reductions in Auckland's transport related greenhouse gas emissions.

Table 9-10 Service Headways – Existing Environment vs EB3C/EB4 (2028)

Service Description	Direction	Existing Environment			EB2/EB3/EB4 2028		
		AM Headway [min]	IP Headway [min]	PM Headway [min]	AM Headway [min]	IP Headway [min]	PM Headway [min]
70 – Botany to Auckland CBD	Inbound	8	10	10	5	7	7
	Outbound	10	7	7	7	7	5
351 – Botany to Ōtāhuhu Station	Inbound	20	30	20	10	30	10
	Outbound	20	30	20	10	30	10
	Inbound	20	20	20	12	12	12

[99] Headway is the average time interval between buses arriving at a bus stop on a regular service.

Service Description	Direction	Existing Environment			EB2/EB3/EB4 2028		
		AM Headway [min]	IP Headway [min]	PM Headway [min]	AM Headway [min]	IP Headway [min]	PM Headway [min]
352 – Manukau to Panmure	Outbound	20	20	20	12	12	12
353 – Manukau to Botany Town Centre	Inbound	30	30	30	30	30	30
	Outbound	30	30	30	30	30	30
705 – Meadowlands to Panmure **(new route)**	Inbound	-	-	-	15	-	-
	Outbound	-	-	-	-	-	15
706 – Flatbush to Panmure **(new route)**	Inbound	-	-	-	15	-	-
	Outbound	-	-	-	-	-	15

The ITA has also considered EB3C's effects on bus overall travel times, which are summarised in Table 9-11. The table shows that when comparing the Do-Minimum to the Base scenario, the travel time for the 70 westbound service increased in the AM peak. The ITA details that while some travel time benefits for that route would have been gained by the completion of EB1, these were likely offset by increased congestion on the rest of the route. In the eastbound direction some travel time improvements were still gained because of EB1.

Some improvements were also observed in the PM peak. In the AM peak, the 70 service is predicted to experience a significant improvement (17 minutes) in travel time in the westbound direction, (the peak travel direction) when comparing the Do-Minimum and Project scenarios. The service will travel along the offline busway for the full length of the Tī Rākau Drive corridor, taking full benefit from the Project. The 70 eastbound service is predicted to experience a small improvement, with an overall travel time similar to that of the opposite direction. In the PM peak, the 70 service is also expected to experience a significant improvement in travel times in both directions.

It should be noted that the route extents of the 351 and 353 services within the models are the same, which results in the similar data is presented in Table 9-11. When comparing the Do-Minimum to the Base scenario, the travel time for both services increased for both directions in the AM peak, and the westbound direction in the PM peak. Roughly similar travel times were produced for the 351 and 353 services for the eastbound direction in the PM peak.

Both services are predicted to experience significant travel time improvements in the peak directions (AM = westbound, PM = eastbound) upon the Project's completion. In the off-peak directions, both services are predicted to experience moderate to marginal increases in travel times (AM = 2.6 minutes eastbound, and PM = 0.3 minutes westbound, respectively). This is likely due to their longer routes, the four additional intersections these services must pass through and the operation of the already congested Tī Rākau Drive/Harris Road intersection.

Travel time increases were observed for the 352 westbound service in the AM peak, when comparing the Base and Do-Minimum scenarios, despite the completion of EB1. However, the travel times for the eastbound direction in the AM peak and both directions in the PM peak were observed to improve.

Once the Project is completed, the 352 service is predicted to experience moderate to significant travel time improvements in the westbound direction during both AM and PM peaks. Similarly, an increase in travel time is expected for the eastbound direction in both peaks, with a more significant increase in the PM peak. These increases are likely due its longer route, the two additional intersections, as well as the operation of the Tī Rākau Drive/Burswood Drive/Greenmount Drive intersection[100]. This intersection will be required to provide more green time to movements along Tī Rākau Drive (less side road green time) due to the capacity reduction further east.

The new 705 and 706 services will in future also run on the offline busway for the entire length of Tī Rākau Drive. As such, these services are predicted to experience roughly similar travel times compared to the 70 service in the peak travel directions in which they will operate.

To provide buses with a LOS of C or better, as per the TMRs, the following measures have been included in the traffic signal design of EB3C and EB4L:

- Some form of priority is provided for buses, to balance the delays to vehicles and pedestrians
- Extending the current bus phase to enable an approaching bus to pass through the intersection
- Allowing the bus phase to interrupt once per cycle when a bus is on approach to the intersection
- Bus priority added in the form of approach and departure loops following review of traffic modelling
- Managing bus priority through SCATS using advance calls and departure loop inputs at each site
- Queue detection loops are provided on an as-needed basis only and in collaboration with AT.

The above measures have been designed to adjust bus priority to suit traffic conditions and flow patterns, as well as to avoid blockages to busway movements and to operate intersections efficiently. Therefore, the modelled average delay to buses at intersections within the Project could potentially be reduced, further improving bus travel times.

Overall, bus travel times are predicted to improve across the network during the AM and PM peaks upon the Project's completion. The combination of improved travel times and higher service frequencies will lead to faster and more reliable public transport trips. In the rare cases where bus services are not expected to experience improvements in travel times, these services will still be improved in the form of the new bus stations, improved reliability and efficiency, and increased service frequencies.

Table 9-11 Bus travel times – Do-Minimum vs EB2/EB3R/EB3C/EB4 (2028)

AM Peak						
Route Description	Westbound			Eastbound		
	Do Minimum [min]	EB3C/EB4 Final [min]	Difference [min]	Do Minimum [min]	EB3C/EB4 Final [min]	Difference [min]
70 – Botany Bus Station to Ellerslie Panmure Highway / Clare Place	42.3	25.3	-17.0	26.9	25.5	-1.4
351 – Botany Bus Station to Tī Rākau Drive / Harris Road	16.2	7.2	-9.0	5.3	7.9	2.6
352 – Tī Rākau Drive / Harris Road to Panmure Station	27.5	20.0	-7.5	18.7	21.0	2.3
353 – Botany Bus Station to Tī Rākau Drive / Harris Road	16.2	7.2	-9.0	5.3	7.9	2.6

[100] It is worth noting the Tī Rākau Drive/Burswood Drive (east)/Greenmount Drive traffic signals are operated as a common control group, i.e., as a single set of coordinate signals.

705 – Botany Road / Golfland Drive to Panmure Station	-	26.8				
706 – Botany Bus Station to Panmure Station	-	21.8				

PM Peak						
Route Description	**Westbound**			**Eastbound**		
	Do Minimum [min]	**EB3C/EB4 Final [min]**	**Difference [min]**	**Do Minimum [min]**	**EB3C/EB4 Final [min]**	**Difference [min]**
70 – Botany Bus station to Ellerslie Panmure Highway / Clare Place	35.7	25.4	-10.3	38.1	27.0	-11.1
Route Description	**Westbound**			**Eastbound**		
351 – Botany Bus Station to Tī Rākau Drive/ Harris Road	8.2	8.5	0.3	15.3	9.0	-6.3
352 – Tī Rākau Drive / Harris Road to Panmure Station	24.1	20.8	-3.3	20.9	28.0	7.1
353 – Botany Bus Station to Tī Rākau Drive / Harris Road	8.2	8.5	0.3	15.3	9.0	-6.3
705 – Botany Road / Golfland Drive to Panmure Station	-	-	-	-	27.5	-
706 – Botany Bus Station to Panmure Station	-	32.3	-1.1	-	23.0	-

Lastly, the Burswood Bus Station will also accommodate school bus services, including those for Sacred Heart College and Sancta Maria College. Similar benefits to those detailed for public bus services are anticipated.

9.5.1.6 Effects on Pedestrians and Cyclists

EB3C will provide dedicated footpaths and cycleways to improve pedestrian and cyclist amenity and safety to, from and across the wider area. These connections will also improve accessibility to bus services, which will be provided from Burswood Bus Station.

EB3C will provide dedicated cycle lanes, which will connect to the EB3R and EB4L cycle lanes. These separated cycle lanes will provide for a safer journey for cyclists, reducing the need for cyclists to travel on open road lanes.

Improved footpaths and pedestrian crossings will be provided throughout EB3C. These connections will also be provided for movements across the wider Project area, including crossings over Burswood Drive and Tī Rākau Drive.

9.5.1.7 Summary of Transport Effects

Overall, the ITA (Appendix 14) demonstrates the significant benefits that EB3C and the wider Project will deliver with regard to the operation of the Tāmaki Makaurau/Auckland's transport network. In particular, the functioning of the region's bus services will experience a positive transformation, with the ability to provide increased services, reduced journey times and improvements in the ability to transfer between services. The passenger experience will also benefit from the provision of new bus shelters, real time

information and general safety. EB3C also delivers improvements to walking and cycling transport modes, with dedicated and improved infrastructure. This will allow for safer journeys and better connectivity to local activities.

These benefits are delivered in a manner which also avoids significant disruptions to general traffic. While some intersections will experience minor delays, these are offset by the improved performance by other components of the transport network. In addition, these delays are further offset by the modal shift towards public and active transport modes.

Given the above, EB3C will deliver significant transport benefits.

9.5.2 Visual and Landscape Effects

As detailed in the Natural Character, Landscape and Visual Effects Assessment (Appendix 22); the operative effects of EB3C can be broken into respective landscape elements.

The assessment considers that landscape effects can be further categorised as:

- Landform
- Vegetation
- Open space
- Key landscape features
- Landscape character.

EB3C will require some change to the underlying landform, principally associated with the Pakuranga Creek bridges and works within Burswood Esplanade Reserve. These changes are visible from multiple viewpoints, including residential streets within Burswood (e.g., Davington Way) and Golflands (Tiger Drive). However, the Project is located within a brownfield location, with numerous large commercial buildings and infrastructure assets visible within an urban context. As such, EB3C is not out of keeping with the developed character of the wider area.

The operational effects associated with Bridge A and B over Pakuranga Creek and its tributaries are considered to be low. This is due to historic modification through the presence of Tī Rākau Drive Bridge and the removal of construction related equipment such as piling rigs, staging bridges and cranes, as well as the new planting that is proposed under the UDLP along the riparian margins of the Pakuranga Creek and its tributaries. This replanting will assist in reinforcing the tributary's natural amenity values.

As noted in Sections 9.4.11 and 9.4.5, vegetation clearance is required within AC reserve land, privately owned sites and road corridors. While this vegetation clearance will be immediately apparent during the construction phase it will be mitigated in the medium to long term through the UDLP, as demonstrated by the proposed LEAM drawings (Appendix 9). The UDLP will provide for a consistent planting scheme across EB3C, with a focus on species which would have been present prior to the human occupation (i.e., natives). This new vegetation will contribute to a sense of place, while acting to soften the harder structural elements of the Project. It will also have broader ecological functions, including mitigation for the removal of (potential) lizard habitat.

Some effects are anticipated on public reserves. However, outside the Busway itself, most of the remaining infrastructure within reserves will be underground or mostly screened from public view by plantings. The Busway itself will also be landscaped to soften its boundaries and better integrate it into the landscape. Lastly, no works are proposed within any AUP(OP) natural character or landscape overlays.

EB3C's effects on the area's natural character are limited given the existing urbanised landform, combined with the limited works in public reserves.

To summarise, the mitigation to address EB3C's operational visual landscape effects will be via the use of the ULDP. The ULDP will include the following:

- Urban design details for works (e.g., station layout)
- Landscape design details for works in public reserves and road corridors
- Type, number and location of replacement tree planting
- Lighting, signage and street furniture details
- The location of property accessways required to service affected properties and where those properties are located in the Project footprint
- The measures to achieve a safe level of transition for cycling and walking modes, including providing advanced warning and signage to cyclists and pedestrians, and safe and convenient cycling transitions at the ends of the Project
- The design features and methods for cultural expression and in order to reflect outcomes agreed through mana whenua engagement
- Design features associated with the management of stormwater, including both hard and soft landscaping
- A maintenance plan and establishment requirements over a three-year period for landscaping and five years for specimen trees following planting and reinstatement/construction of road verges, and including:
    - Vegetation maintenance policies for the proposed planting, in particular details of maintenance methodology and dates / frequencies
    - Details of watering, weeding, trimming, cultivation, pest and disease control, checking stakes and ties, pruning and other accepted horticultural operations to ensure normal and healthy plant establishment and growth
    - Details of a maintenance programme for any other green asset and/ or parks infrastructure including vandalism eradication policies
    - An agreed reporting mechanism for annual inspections of all new plantings to ensure the plants are healthy and are being maintained to the Monitoring officer's(s) standards.
- Measures to minimise clearing work to preserve soil and any indigenous vegetation
- Measures to ensure the appropriate disposal of any clearance of invasive/noxious weeds
- Local sourcing of 'new' tree stock (within the Auckland Region).

In a practical sense, the mitigation detailed in the UDLP will include both hard and soft landscape elements, with design details focusing on the following key areas:

- Burswood Bus Station's design and location
- Tī Rākau Drive
- Bridges A and B
- Works in Council Reserves.

Each of these areas will have their own individual design responses. Significant landscaping across EB3C is planned, while walking, cycling and public transport infrastructure has been designed at a human scale. The Project's approach to its design elements will positively contribute to local amenity values.

The UDLP will be developed with input from EB3C's ecologist, arborist, open space specialist and mana whenua. This is due to the importance of incorporating cultural values into the final design, as well as the cross-over of the UDLP with mitigation for EB3C's other environmental effects.

Given the above assessments and mitigation, the visual and landscape effects of EB3C will be minor.

9.5.3 Cultural Effects

As previously discussed in Section 9.4.12, AT has been working with mana whenua throughout the development of the Project. AT is cognisant of the importance in incorporating cultural values into EB3C's long-term elements. As such, opportunities will be provided for mana whenua to contribute to the UDLP and via the proposed conditions.

9.5.4 Noise and Vibration Effects

The Operational Noise and Vibration Effects Assessment (Appendix 12) details noise and vibration effects associated with the operation of the busway[101]. This assessment outlines existing ambient noise within the EB3C corridor. The assessment highlights the key sources of operational noise from the Busway and identifies impacted receivers, which are mostly residential sites within Burswood. Noise modelling has been undertaken to predict future noise levels, for the design year which is 2048 for the purposes of operational noise and vibration. The design year has been selected due to the availability of traffic modelling data.

Standard E25.6.33 of the AUP(OP) requires that all new roads and altered roads that are within the scope of *New Zealand Standard NZS 6806: 2010 Acoustics – Road Traffic Noise – New and Altered Roads* must comply with the requirements of this standard. However, this standard does not apply to any section of EB3C as:

- The EB3C, Bridge A section (outlined in red) Figure 9-5 will be greater than 100m from any Protected Premises and Facilities (PPF) such as dwellings, marae and childcare centres
- EB3C Burswood Section (outlined in green) Figure 9-5 will have less than 2000 Annual Average Daily Traffic (AADT) movements
- The EB3C Tī Rākau Drive section that is between Burswood Esplanade Reserve and Guys Reserve, will be within 100m of PPF's and there is a change in the horizontal alignment of the road.

Furthermore, it does not meet the definition of an 'altered road' under NZS 6806 because:

- Project as built (do-minimum noise environment) will not increase traffic by more than 3 dB $L_{Aeq(24h)}$ or more at the design year (2048) when compared with the Do-Nothing noise environment (assuming the project is not built by 2048). This is applicable at PPF's where the noise levels will be greater than or equal to 64 dB $L_{Aeq(24h)}$ if the project is built
- There are no PPF's in the Do-Nothing and Do-Minimum scenarios where noise levels will be equal to or greater than 68 dB $L_{Aeq(24h)}$.

[101] Traffic vibration from new or upgraded roading projects is not generally expected to create issues. A key factor with new roads is the uniformity of the basecourse/pavement and the absence of near surface services. This is due to new or upgraded roads being designed to be smooth and even and avoiding vibration generated from passing traffic over uneven surfaces. Therefore, traffic vibration effects arising from operation of EB3C and EB4L were not assessed further by the Operational Noise and Vibration Assessment.

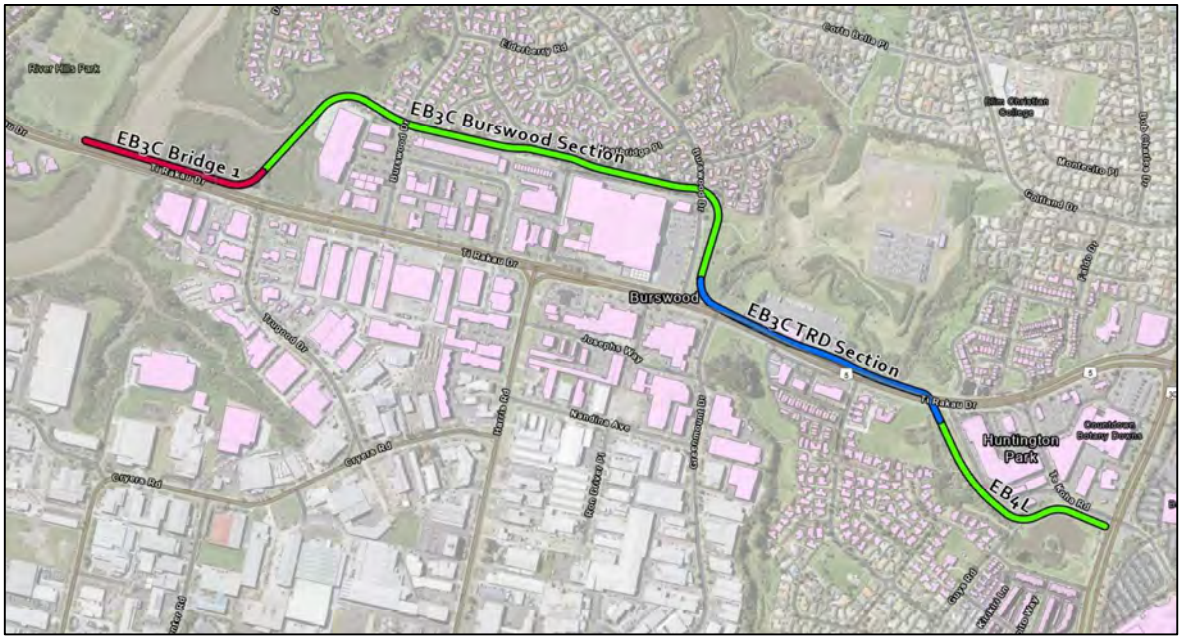

Figure 9-5 EB3C and EB4L sections of assessment[102]

In order to establish existing baseline noise levels in the suburban areas, site surveys were undertaken to measure the existing noise environment. Measurements were taken at:

- 200 Burswood Drive from the 22nd to the 29th of February 2023
- 29 Dulwich Place from the 22nd to the 29th of February 2023

The existing ambient noise levels within EB3C are as follows:

Table 9-12 Noise Measurement Results from EB3C – Current Early Morning Noise Levels

Time (15-minute period)	200 Burswood Drive (by existing Burswood Drive)		29 Dulwich Place (near future Burswood Station)	
	dB $L_{Aeq(15min)}$	L_{AFmax}	dB $L_{Aeq(15min)}$	L_{Afmax}
6:30 am	54	75	50	70
6:45 am	57	79	49	69
7:00 am	57	75	48	76

Noise modelling to predict noise levels for the design year (2048) for the do-minimum scenario (assuming the project is built) was undertaken. This modelling identified that noise from idling buses, buses pulling away from Burswood Station and bus movements along the busway were deemed to generate the loudest operational noise levels. The modelling also assumed the worst-case scenario and included the following assumptions:

- Diesel buses would still be in use in 2048
- A noise barrier 2.4m in height is constructed along the northern part of the busway within Burswood as shown in yellow in Figure 9-6 below
- Four buses idling for five minutes at Burswood Station and
- Buses pulling away from the station lasting 10 seconds.

[102] "Bridge 1" on Figure 9-5 refers to Bridge A.

Figure 9-6 Noise barrier that is 2.4m in height to be constructed within Burswood (Yellow Line)

The noise predictions employed in the assessment are considered to be applicable across the entire period over which the bus fleet is anticipated to electrify as above a speed of 50 km/h, tyre and wind noise dominates over engine noise. This means that that diesel and electric buses generate the same amount of noise at and above 50 km/h. Given this, the only difference between diesel and electric bus noise occurs when buses are idling and pulling away from bus stations.

When considering the above factors, the Operational Noise and Vibration Effects Assessment (Appendix 12) found that noise levels at 28 Torrens Road, from buses travelling along the busway, were predicted to comply with the 65 dB L_{Aeq} noise criterion for the Business – Light Industry Zone [103]at all times. Field measurements of existing ambient noise levels measured during the early morning at 200 Burswood Drive, found that noise levels already reach approximately 57 dB $L_{Aeq(15min)}$. This noise level is similar to the" worst-case" noise levels predicted from buses driving on the busway.

The Operational Noise and Vibration Effects Assessment identified that PPFs that are set back from Burswood Drive and Tī Rākau Drive currently experience lower ambient noise levels in the early morning than those generally predicted from traffic noise along the busway in the future, as shown through the measurement of 49 dB $L_{Aeq(15min)}$ at 29 Dulwich Place.

Where PPFs currently front towards Burswood Drive, noise levels from the busway are predicted to be similar or less than existing ambient noise levels. For example, noise levels at 28 Burswood Drive are predicted to reach 58 dB LAeq during the early morning period (the highest predicted noise level from the busway), which is only 1 dB higher than the noise level measured at 200 Burswood Drive. A noise level change of 1 dB would not be perceived. Noise levels at all other PPFs facing Burswood Drive are predicted to be 55 dB L_{Aeq} or below.

Where PPFs are set back from Burswood Drive, noise levels from the busway could be up to 3 dB higher than existing ambient noise levels (as measured in the early morning at 29 Dulwich Place). For example, modelled noise levels at 18 Heathridge Place and 21 Dulwich Place are predicted to reach 51 dB $L_{Aeq(15\ min)}$

[103] 28 Torrens Road consists of residential units above business units and is located within a Business – Light Industry Zone.

in the AM peak. These predicted noise levels are the highest of PPFs that do not already front towards Burswood Drive. Where there would be a predicted noise level increase, this is predicted to be in the order of only 3-4 dB at most, which would be perceived as only a slight increase in noise level.

Noise levels from the Tī Rākau Drive section of EB3C are predicted to reach up to 53 dB $L_{Aeq(15min)}$ during the AM peak at 53 Huntington Drive. This is 5-13 dB below the noise levels of 58-66 dB $L_{Aeq(15min)}$ measured at Bard Place Reserve in the 2018 noise survey. Given this, the Operational Noise and Vibration Effects Assessment determined that noise from the busway will be dominated by existing noise from Tī Rākau Drive and could therefore only change the noise environment at PPFs near the Tī Rākau Drive section of EB3C by a negligible margin.

For noise from buses idling and pulling away from Burswood Bus Station, the ambient noise level measured in the area near the Burswood station was 49 dB $L_{aeq(15min)}$ on average across the monitoring period. The highest noise level predicted from diesel buses idling is 47 dB $L_{Aeq(10min)}$ at 38 Heathridge Place, and the noise level during the 10-second window during which a bus would pull away was 51 dB $L_{Aeq(10sec)}$ at the same address. Therefore, noise from buses idling and pulling away is predicted to be reasonable in the context of the existing noise environment and no further noise mitigation (beyond the noise wall and low noise road surface specified in the reference design) is proposed.

Furthermore, as the bus fleet electrifies, noise levels from buses idling and pulling away will reduce further. Once the bus fleet is fully electric, the Operational Noise and Vibration Effects Assessment considers that all noise from the bus stop will be negligible when compared to the ambient noise environment at the time of operation of the busway.

In summary, it is considered that noise from buses idling and pulling away from the bus station will be reasonable.

Finally, it is not expected that traffic vibration will be generated once EB3C is operational, principally due to the uniformity of the basecourse/pavement. A low noise road surface such as asphaltic concrete will be used across EB3C, which avoids significant vibration generation from passing traffic or uneven road surfaces. The use of this type of road surface is required under the following conditions:

- *"Noise barriers of 2.4m in height above ground level, as shown on the approved general arrangement drawings designation plans listed in Condition 1, must be installed between the busway and residential receivers to the north of the Burswood Section prior to Eastern Busway Project (Package EB3C) being operational, so far is reasonably practicable. The noise barrier required by this condition must be maintained so that it retains its designed noise reduction performance.*
- *The Requiring Authority must ensure that all roads are paved with Dense-Graded 14mm asphalt (or other low-noise road surface(s) with equal or better noise reduction performance) on all sections of the Project except where a higher friction (for safety) or stronger surface is required.*
- *In the event that the Requiring Authority proposes a different road pavement to that specified in Condition 62 above at any time, it must provide documentation from a suitably qualified and experienced acoustics specialist to the Council demonstrating that Condition 62 will continue to be complied with.*
- *The road surfaces must be maintained so that they retain their noise reduction performance as far as practicable."*

Based on the above detailed mitigation, the operational noise effects of EB3C will be minor.

9.5.5 Open Space Effects

As detailed in the Open Space Effects Assessment (Appendix 10), EB3C requires the permanent occupation of land within Burswood Esplanade Reserve for sections of the Busway, as well as for stormwater infrastructure and active transport links. The assessment has identified the following potential sources of operational open space effects:

- The fragmentation of Burswood Esplanade Reserve by the busway corridor
- Loss of road frontage and a resulting decrease in visibility from Burswood Drive and Tī Rākau Drive
- Permanent loss of 7,470m^2 of open space zoned land from the Park.

In order to address these effects, AT has engaged with AC Community Facilities and other stakeholders in the forms of operational phase mitigation that could be provided as part of the Project. This mitigation is detailed in section 4.2.4 of this AEE. To summarise, key mitigation includes:

- A new pump track
- Wayfinding
- Improved pathways
- Landscaping.

Additional mitigation will be provided by the proposed open space improvements to Burswood Park, as detailed in section 9.4.17 of the AEE.

However, it is noted that these mitigation works are still subject to further engagement with AC, as well as other stakeholders. This engagement is also a requirement of both the mana whenua framework and CCP as detailed in the proposed conditions (Appendix 5). This engagement is vital to ensure that the finalised open space mitigation meets community needs and contributes to the improve functioning of the wider open space network. The finalised open space mitigation package will be subject to asset owner approval from Auckland Council.

It is also noted that the Project provides the opportunity to provide improved community access to open space, particularly as the surrounding area intensifies. This improved access is provided by the busway itself, as well as both by proposed cycling and pedestrian infrastructure. Burswood Esplanade Reserve will be within walking distance of Burswood Station, while it will have improved walking and cycling connections to the surrounding residential suburbs.

Given the above, the construction of EB3C will have no more than minor effects on open space values.

9.5.6 Air Quality Effects

The Air Quality Effects Assessment (Appendix 23) has considered the operational air quality effects of EB3C, noting that discharges from motor vehicles are a permitted activity under the AUP(OP)[104]. Regardless, a full modelling exercise was undertaken to ascertain what, if any, effects would be generated from the completed Project.

[104] See Rule E14.4.1(A114).

This modelling included consideration of road alignment, air contaminant types, particulate matter sizes, rate of electric vehicle uptake and general traffic data. Based on Ministry for the Environment's guidance, the modelling found that there would be negligible impacts on air quality.

As such, the operational air quality effects of EB3C will be less than minor.

9.5.7 Stormwater Effects

As detailed in both the Stormwater Effects Assessment (Appendix 11) and Section 4.2.3, EB3C will involve the upgrading of existing and construction of new stormwater infrastructure. This design philosophy was developed to also incorporate the aspirations of mana whenua and Council's Healthy Waters. With this philosophy in mind, AT have developed a stormwater design to address the attenuation and water quality issues associated with EB3C and the existing environment. Also underpinning the stormwater design is a "maintenance-led" approach, which seeks to protect worker safety and reduce the maintenance and operational expenditure to AT and Aucklanders.

In accordance with the design philosophy and in recognition of the existing flooding issues, the longitudinal drainage for EB3C will provide new stormwater networks. The new networks, where feasible, will themselves connect to existing networks close to their outfalls with the existing pipe between the connection point and the outfall, including the outfall and upstream network being upgraded where necessary.

The proposed stormwater treatment in the design reduces the existing total contaminant load from all roads discharging to EB3C outfalls. The predicted overall reductions are 21% for Total Suspended Solids (TSS), 9% for zinc (based on total zinc), 11% for copper (based on total copper) and 14% for total petroleum hydrocarbons (TPH). No additional mitigation is proposed for water quality, as the Project improves overall water quality in that it reduces the total combined existing contaminant loads discharged from all roads within outfall catchments.

The EB3C stormwater design and Project works will have no flood impacts on private property and parks during the 10 and 100-year ARI events when the proposed mitigation (pipe size increases and geometric design changes) is implemented during detailed design. Instead, because of the proposed mitigation, EB3C will result in reduced flooding over large areas of the wider catchment.

There are some reduced overland flow path capacities because of the EB3C works, as the EB3C stormwater network design has not provided enough additional pipe capacity to replace the reduced overland flow path capacity. Given this some mitigation will be required to address residual effects on private property at two locations. The mitigation involves appropriate pipe size upgrades and some small localised geometric design changes to the ground surface levels. All potential impacts have been confirmed by updated flood modelling results to have been mitigated with no residual impacts.

In summary, the Project will have a positive impact on flooding and water quality. The EB3C design treats all the stormwater from the Project's roads and busway and a large amount of the existing roads outside of the Project area that are not currently treated. This achieves an overall decrease in contaminants discharged to the receiving environment across EB3C from that currently discharged from roads. The EB3C design also avoids generating flooding and overland flow impacts on private property and parks when the proposed mitigation is implemented and reduces flooding over large areas of the wider catchment within which EB3C is located.

Figure 9-7 EB3C design case 10-year flood depth difference

Figure 9-8: EB3C design case 100-year flood depth difference

Given the above, the operational stormwater effects of EB3C are positive.

9.5.8 Coastal Ecology Effects

As previously stated, a Marine Ecology and Coastal Avifauna Effects Assessment has been prepared for EB3C (Appendix 28). The assessment has considered the following effects associated with the operation of EB3C:

- Shading of mangroves by bridge structures
- Water quality resulting from stormwater discharges
- Cumulative effects of operation.

Firstly, with regard to mangrove shading, the area of mangroves beneath permanent Bridges A and B that will be shaded is approximately 830m^2 and 903m^2 respectively. The shaded mangroves are likely to not thrive due to reduced light. These impacts have been assessed as being very low by the Marine Ecology and Coastal Avifauna Effects Assessment (Appendix 28).

The other source of operational effects is stormwater discharges into the coastal environment. As detailed in Section 6 of this AEE, Pakuranga Creek and its tributaries have experienced some historical environmental degradation as a result of urbanisation and related stormwater discharges. However, the Project's stormwater design philosophy has sought to improve stormwater discharge quality. This approach has resulted in modelled improved stormwater discharge quality at the majority of EB3C's outfalls (Table 9-14), with a cumulative improvement across the entire Project. The predicted overall reductions for EB3C are 21% for Total Suspended Solids (TSS), 9% for zinc (based on total zinc), 11% for copper (based on total copper) and 14% for total petroleum hydrocarbons (TPH).

Table 9-13 Summary of EB3C predicted change in contaminant loads

Outfall	TSS[1]	Zinc[1]	Copper[1]	TPH
Existing Tī Rākau Bridge	0%	0%	0%	0%
MCC_108479 (Line 4)	17%	2%	2%	1%
MCC_108480	-38%	-11%	-13%	-18%
MCC_108409 (Line 10)	-57%	-40%	-45%	-52%
MCC_108481 (Line 36)	-20%	-20%	-22%	-25%
CULVERT 127B	-24%	-21%	-21%	-21%
MCC_108482 (Line 43)	154%	215%	208%	187%
MCC_988531 (Line 47)	-20%	7%	0%	-12%
MCC_496129 (Line 53)	-100%	-100%	-100%	-100%
CULVERT 127A	-47%	-47%	-47%	-47%
Total EB3C change	-23%	-10%	-11%	-14%

Table 9-14 Cumulative Stormwater Quality Improvements across the entire Project

Outfall	TSS	Zinc	Copper	TPH
EB2	-35%	-22%	-25%	-31%
EB3R	-60%	-57%	-60%	-65%
EB3C	-23%	-10%	-11%	-14%
EB4L	-1%	-1%	0%	0%
Total Across Project	-34%	-24%	-26%	-30%

Stormwater treatment for the Project is primarily provided by way of gross pollutant traps and raingardens. Some of the existing stormwater outfalls currently receive no treatment prior to discharge (e.g. existing Tī Rākau Bridge). Discharge from the new busway bridge (Bridge A) is incorporated in the

calculations of discharges from MCC_108479 (Stormwater Effects Assessment). At many of the stormwater discharge points, existing outfalls have been combined and include catchment areas that are not part of the Project.

CLM indicates at outfall PC_MCC_108479 a 17% increase in TSS is predicted, plus a 2% increase in zinc and copper, and a 1% increase whereas all other stormwater outlets that discharge to the CMA are predicted to have a decrease in TSS and contaminants (Table 9-13).

The Marine Ecology and Coastal Avifauna Effects Assessment (Appendix 28) determined that all EB3C stormwater outfall locations in the CMA have low marine ecological values and would have a very low overall effect on marine ecological values. The same assessment did identify that there would be some residual effects on avifauna due to the accumulation of contaminants in foraging habitat. However, given the small area of foraging habitat that will be impacted relative to the large quantity of alternative foraging habitat available in the wider foraging area / network, the assessment determined that the potential reduced prey item availability and potential prey contaminant body burden as a result of stormwater contaminants will have a negligible magnitude of effect on coastal avifauna.

Due to the positive effects from improved stormwater treatment and low ecological values present, the Marine and Coastal Avifauna Effects Assessment (Appendix 28) confirmed that no specific mitigation is required for operational effects. Given the above, the operational effects of EB3C on coastal ecological values will be less than minor given the improvements to stormwater discharging to the environment.

9.5.9 Freshwater Ecology Effects

The operational freshwater ecology effects of EB3C have been considered by the Terrestrial and Freshwater Ecological Effects Assessment (Appendix 27). The assessment has identified potential effects on both wetlands and streams.

It is acknowledged that potential effects could be generated by both the volume and quality of stormwater discharged from EB3C into these freshwater environments. As detailed in Section 4 the Project has sought to improve the environmental performance of stormwater management within the Project area. The Terrestrial and Freshwater Ecological Effects Assessment has noted that wetlands and local streams are subject to natural variations in hydrological circumstances (e.g., stream flow dynamics, high rainfalls and drought). As noted within the Terrestrial and Freshwater Ecological Effects Assessment (Appendix 27), none of the outfalls within EB3C will result in changes to the water level range. They will also not change the hydrological functioning of any natural inland wetlands within 100m of the Zone of Influence of the Project. Furthermore, the provision of improved scour protection will minimise potential erosion from the outfalls at these locations. The Project will also benefit the local environment given the improved stormwater quality values presented in Table 9-14.

Lastly, it should be noted that the lizard habitat restoration planting proposed as mitigation for construction clearance is largely proposed around riparian margins, including within Burswood Esplanade Reserve. This replanting will also provide long-term benefits to waterbodies given the bank stabilisation, shading and additional habitat that it will provide for freshwater species.

Based on the above, the operational freshwater ecological effects of EB3C will be minor.

9.5.10 Coastal Processes Effects

The effects of the occupation of the CMA by the permanent bridges and reclamation are detailed in the Coastal Processes Effects assessment (Appendix 29). The assessment considered potential operational effects based on local hydraulic conditions (i.e., tides, waves), sediment transportation, erosion and projected sea level rise (SLR).

The assessment notes that there will be no to negligible changes on flow depths and velocities through Pakuranga Creek because of Bridge A. Bridge B will have no effects on tidal conditions given its position outside any active channels within the CMA. Similarly, the reclamation for the busway is not anticipated to have any effects on tidal flows and conditions give their location outside the main channel of Pakuranga Creek. Furthermore, EB3C's permanent structures are not expected to have any related sediment transport effects within Pakuranga Creek.

Consideration has also been given to coastal flooding, both as result of sea level rise and tsunami. The MHWS contour with the highest relative SLR scenario (i.e., SSP8.5+ combined with VLM) is projected to be around the elevation of the top of the western bank of Pakuranga Creek at Tī Rākau Drive by 2130. This suggests that very frequent inundation of Riverhills Park could occur from this time on or could occur before 2100 for 100-year return period storm tides and soon after 2100 for 10-year return period storm tides. While this may affect the land adjacent to the EB3C corridor, the elevation of the EB3C corridor in these areas is a minimum of 6.45 m RL, in the order of 2.45 m above the 2130 projected 100-year storm tide levels under the highest SLR. Any flood effects on the corridor embankment and western Bridge A abutments can be mitigated in the future by engineered methods, should they be required.

The projected SLR till 2130 will not cause inundation issues for the land between Bridge A and Bridge B, or for the northern abutment of Bridge B. The elevation of the EB3C corridor in these areas is a minimum of 6.45 m RL, in the order of 2.45 m above the 2130 projected 100-year storm tide levels under the highest SLR scenario.

The assessment notes that there is very unlikely to be any inundation risk from tsunami with current sea levels or events occurring over the next 100 years even when considering the effects of SLR.

Lastly, the Coastal Processes Effects Assessment (Appendix 29) has considered potential erosion and deposition effects. Previous modelling has shown that the maximum potential scour depths (for a bridge crossing of Pakuranga Creek) occurred around the middle piers with a MLWS downstream boundary condition. Total scour depths (local pier scour + contraction) were similar to the existing Tī Rākau Drive Bridge, being 3.48 m and 3.67 m for 100-year and 1000-year ARI's respectively. Debris rafts increased the local pier scour by 1.26 m and 1.42 m for these two ARI events respectively. Although scour protection to counter these projected scour depths are not currently proposed, they will be the subject of further scour modelling in final design involving the modelling of flood flows with this degree of pre-existing scour. Should this additional modelling indicate that pile instability or failure from scour is a possibility, the final design will include rock riprap protection around the piles of Bridge A. Any such placement of rip rap will only result in small localised additional effects on coastal processes.

Given the need for further design refinement and modelling, AT have proposed a requirement for further modelling as part of the CWMP that is detailed by Section 9.4.8 of this AEE.

In addition, scour protection has been provided for, through hard structures associated with outfalls to slow water discharge speeds, as well as planting around coastal margins.

Given the above, the operational effects of EB3C associated with coastal processes will be no more than minor.

9.6 Construction Phase Effects – EB4L

Given the scale of the works proposed and the existing urban environment, a range of construction effects have been considered and assessed for EB4L. The following sub-sections of the AEE address the following construction effects:

- Construction transport effects
- Noise and vibration effects
- Erosion and sediment control
- Effects on terrestrial and freshwater ecological values
- Social effects
- Management of contaminated soils
- Effects from tree works
- Cultural effects
- Historic heritage effects
- Visual and landscape effects.

Where relevant, cross-referencing will be provided to the discussion of operational phase effects.

9.6.1 Construction Transport Effects

The ITA (Appendix 14) provides details of the anticipated transport effects of EB4L during its construction, as well as how works will be phased within the existing active road corridor[105]. The key construction traffic considerations given by the ITA include:

- Construction Support Areas, generation, timing and routing of heavy vehicles
- Construction effects on road traffic
- Construction parking requirements
- Effects on pedestrians and cyclists
- Effects on bus services
- Effects on site access and parking
- Effects to safety performance.

To provide context to the following discussion of construction traffic effects, it is important to consider the overarching construction traffic management method proposed by AT. This involves the use of a CTMP, as well as site-specific conditions relating to access and parking. The CTMP, as required by the proposed conditions, must contain the following information:

- Methods to manage the effects of temporary traffic management activities on traffic
- Measures to ensure the safety of all transport users
- The estimated numbers, frequencies, routes and timing of traffic movements, including any specific non-working or non-movement hours to manage vehicular and pedestrian traffic near educational facilities and childcare facilities or to manage traffic congestion
- Details of public transport route detours or temporary relocation of bus stops and consultation with nearby educational facilities/ministry of education
- Details of wayfinding signage for motor vehicle users, public transport users, cyclists and pedestrians

[105] Section 4.2 of the ITA.

- Site access routes and access points for heavy vehicles, the size and location of parking areas for plant, construction vehicles and the vehicles of workers and visitors
- Identification of detour routes and other methods to ensure the safe management and maintenance of traffic flows, including pedestrians and cyclists on existing roads
- Methods to maintain vehicle access to property and/or private roads where practicable, or to provide alternative access arrangements when it will not be practicable
- Methods to provide for access to commercial sites, including access to those sites' loading/unloading areas
- The management approach to loads on heavy vehicles, including covering loads of fine material, the use of wheel-wash facilities at site exit points and the timely removal of any material deposited or spilled on public roads outside active construction areas
- methods that will be undertaken to communicate traffic management measures to affected road users (e.g. residents /public /stakeholders /emergency services) as required by the CCP
- Records of CTMP related consultation with residents /public /stakeholders /emergency services, including any changes to the CTMP undertaken in response to that consultation and as detailed in the CCP
- Auditing, monitoring and reporting requirements relating to traffic management activities must be undertaken in accordance with the New Zealand Guide to Temporary Traffic Management or any subsequent version
- Details of minimum network performance parameters during the construction phase, including any measures to monitor compliance with the performance parameters
- Details of any Travel Demand Management (TDM) measures proposed to be implemented in the event of identified thresholds being exceeded.

9.6.1.1 Effects from Construction Support Areas, generation, timing and routing of heavy vehicles

There is expected to be two construction laydown yards and SAPs for EB4L (CSA 1 and CSA 2). These are located at the north-western corner of Guys Reserve (adjacent to Tī Rākau Drive and 47C Huntington Drive) and at the eastern frontage of Whaka Maumahara with Te Irirangi Drive, as shown in Figure 9-9 and Figure 9-10 below. The CSAs and related SAPs have been selected due to the proximity to the planned works, possible access routes and distance away from residential areas.

Figure 9-9 Indicative location of CSA and SAP at the north-western corner of Guys Reserve in EB4L (red outline)

Both CSAs will be used as satellite offices, with on-site parking and construction staging areas. Access is proposed from Tī Rākau Drive for CSA 1 and from Te Irirangi Drive for CSA 2. The CSAs will be occupied for approximately 24 months. As with EB3C, parking on side streets by construction staff will be

discouraged and monitored to ensure minimum disruption to the community. The final location of construction compounds / satellite offices and the activities undertaken within each area will be confirmed in a future outline plan of works.

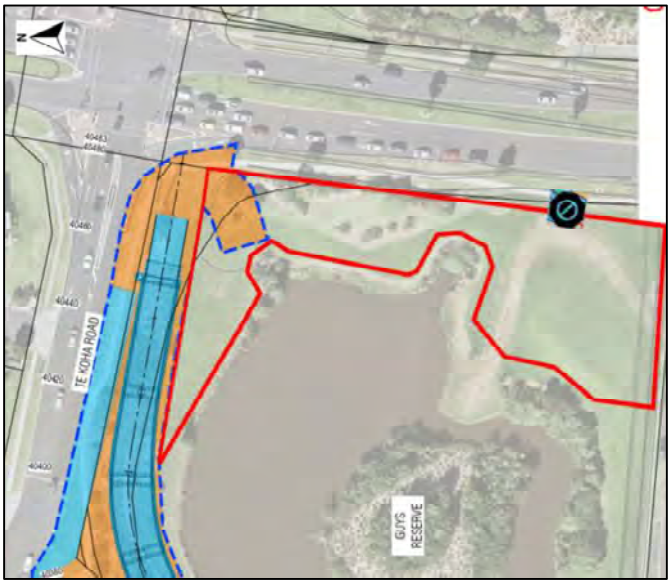

Figure 9-10 Indicative location of CSA and SAP towards the eastern frontage of Whaka Maumahara with Te Irirangi Drive (red outline)

As with EB3C, the delivery of bulk construction materials and removal of waste will be largely restricted to arterial corridors, including Tī Rākau Drive, Te Irirangi Drive, SEART and Harris Road. These arterial focused routes are shown in Figure 9-11.

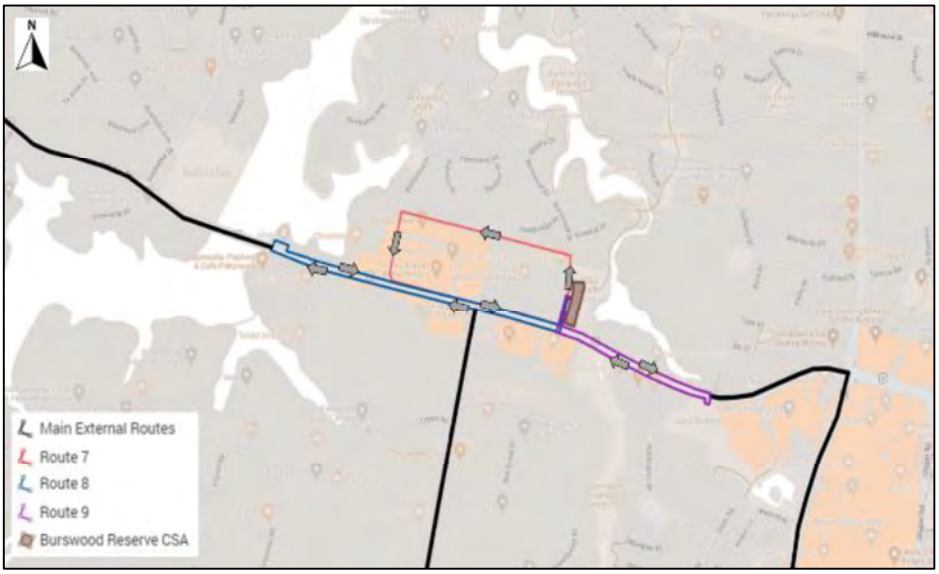

Figure 9-11 Construction Heavy Vehicle Routes

9.6.1.2 Construction effects on road traffic

The ITA notes that most of the main road works in EB4L will be offline. From a traffic modelling perspective, these offline works can be undertaken at any time as these works are not expected to affect the transport network. Any online works (for example road markings and intersection modifications) are

considerably less extensive and shorter in duration. A conservative assumption was made in the ITA that EB4L construction would be undertaken concurrently with EB3C to allow for an assessment of cumulative effects. Should this not be the case, for example EB4L is constructed at a later date, materials for Bridge C, retaining walls and other construction works would be carted directly to the proposed CSAs in EB4L. Therefore, construction Route 9 (Figure 9-11) would not be required.

The ITA notes that construction traffic for EB4L will predominantly use Tī Rākau Drive, Te Irirangi Drive, SEART and Harris Road. As such, The ITA expects that these arterials will carry an additional 2 veh/h in both directions. It should be noted that no pedestrian crossing facilities are currently provided along this section, except at the Burswood Drive (east) and Te Koha Road intersections. These will be maintained during construction. The ITA considers that Tī Rākau Drive, Ti Irirangi Drive, SEART and Harris Road are well-suited to larger sized vehicles as regional routes. Therefore, based on the above assumptions, the temporary effects are negligible to very low.

Nonetheless, to mitigate construction traffic effects public communication will occur in accordance with the proposed CCP and the CTMP.

9.6.1.3 Construction Parking for Support Sites

Sufficient parking for construction staff will be provided within the EB4L SAPs. Parking on side streets by construction staff will be discouraged and monitored to ensure minimum disruption to the community.

9.6.1.4 Effects on Pedestrians and Cyclists

Consideration of the construction work's effects on pedestrians and cyclists have also been considered by the ITA within the EB4L area. It should be noted that a new shared pathway (walking and cycling facility) will be constructed along the southern and western boundaries of Guys Reserve and Whaka Maumahara to connect Tī Rākau Drive with Te Irirangi Drive. The pedestrian and cycle facilities have been designed to avoid piers associated with Bridge C at Guys Reserve and Whaka Maumahara.

In instances where access to the pedestrian footpath within Guys Reserve and Whaka Maumahara is temporarily disrupted during construction, facilities will be provided to ensure pedestrian and cycling connectivity. This will be ensured through the CTMP as previously detailed.

9.6.1.5 Effects on Bus Services

The ITA outlines the results from modelling undertaken to determine bus route travel times during both AM and PM peak periods going in both directions. The same routes as outlined in Section 9.4.1 were assessed and the model accounted for the fact that works associated with EB4L would be occurring simultaneously with works associated with EB2 and EB3R.

The results of this modelling on bus travel times are discussed in Section 9.4.1 and includes works in EB2, EB3R, EB3C and EB4L. The results are therefore not repeated under this section. However, most works associated with the construction of EB4L will be offline avoiding impacts on the transport network during the construction phase.

As with EB3C, a CTMP will be developed and implemented to manage changes in travel behaviour to reduce the impact of construction related travel time delays, while further opportunities to improve bus travel times will be explored as part of the CTMP. Public communication and advance warning of the planned works, as required by the CCP, will be undertaken prior to the works being initiated. Public

communication and signage will also be provided during construction informing road users of the works and potential delays, which could lead to changes in travel behaviour. Measures such as advising of alternative routes may help divert traffic flows from bus routes and reduce the impact of bus travel time delays.

9.6.1.6 Site Access

The proposed works under EB4L are not expected to affect private property access and parking.

9.6.1.7 Effects to safety performance

The safety and protection of the public, traffic and construction team is paramount, and all site operations will be focused on zero harm to all involved, associated and traveling through the project areas. This will be achieved through the following:

- Traffic management that separates the public / traffic operations as well as managing and maintaining public and traffic flow entering and exiting the construction operations within the EB4L area
- Active communications with the local community and public travelling through the construction work zones to ensure they will be regularly updated on temporary traffic management operations
- Before each work zone is ready to be opened following construction, an independent safety audit will be completed, and public notifications of the opening and new layouts will be made available.

Safety measures will be in place during construction, as required by the CTMP.

9.6.1.8 Summary of Construction Transport Effects

The ITA notes that most of the main road works in EB4L will be offline. From a traffic modelling perspective, these offline works can be undertaken at any time as these works are not expected to affect the transport network. Any online works (for example road markings and intersection modifications) are considerably less extensive and shorter in duration.

The safety of all road users, pedestrians and cyclists has been a key consideration of all construction activities. In response to this issue, road safety will be at the forefront of the CTMP's development and implementation. This requirement is explicitly stated in the CTMP's stated objective and related proposed conditions. The ITA has highlighted that construction effects cannot be avoided but can be managed and mitigated by standard practices. This will include clear and timely communication to the community regarding temporary road closures, diversions, and potential delays via the CCP and CTMP.

Based on these measures and the other controls required by the CTMP and CCP, the construction related transport effects of EB4L will be no more than minor.

9.6.2 Noise

A Construction Noise and Vibration Effects Assessment has been undertaken for EB4L (Appendix 15). The assessment has included fieldwork, modelling, and consideration of the proposed construction methodology (Appendix 30). The EBA construction team have advised that typical plant items for construction of EB4L will include a bored piling rig for construction of Bridge C and use of excavators during construction of the shared path.

Table 9-15 below summarises where exceedances of the AUP (OP) daytime noise criteria (70 dB L_{Aeq}) are predicted during the EB4L main works for Bridge C. The predictions include noise barriers for use of the excavator, but do not include noise barriers for use of the bored piling rig.

Table 9-15 Construction noise modelling results for Bridge C – EB4L

Address	Name	Use	Noise Level, dB L_{Aeq}
451 Tī Rākau Drive	VTNZ	Commercial	90
451 Tī Rākau Drive	Tyre City	Commercial	81
451 Tī Rākau Drive	The Hub (rear access for loading)	Commercial	74
5 Te Koha Road	Botany Hunting and Fishing New Zealand	Commercial	71
451 Tī Rākau Drive	Repco	Commercial	71

Construction noise levels at all other receivers are predicted to comply with the daytime construction noise criterion during all other bridge construction works.

Works associated with the shared path and laydown area are predicted to exceed the daytime AUP(OP) noise criteria at 5 receivers:

- 415 Tī Rākau Drive (Piccolo Park Early Learning Centre)
- 34 Cottesmore Place
- 26 Cottesmore Place
- 32 Cottesmore Place
- 175 Guys Road.

The assessment notes that these levels are predicted while works take place at the closest possible location at each receiver. However, in practice these noise levels will quickly reduce as works progress in a linear fashion and high noise generating activities are completed. Noise at these levels can typically be tolerated provided that prior notification is given before high noise generating activities take place.

With implementation of the mitigation measures included in the proposed consent conditions, the Assessment considers that noise levels are predicted to comply with the 70 dB L_{Aeq} noise criterion at surrounding receivers for most construction works. Where the noise criteria are predicted to be exceeded, the effects will be mitigated and managed through the CNVMP. During early consultation, Piccolo Park (415 Tī Rākau Drive) raised that they are subject to the licensing criteria for centre based ECE services. These standards require that "*all practicable steps are taken to ensure that noise levels do not unduly interfere with normal speech and/or communication or cause any child attending distress or harm*".

They also state "*Beware of environmental noise from outside the service such as roadworks or construction nearby and try to ensure that the negative effect is reduced where possible.*" These requirements will be considered in the preparation of the CNVMP and any relevant schedules.

Noise levels are also predicted to exceed the night-time AUP(OP) criteria of 45 dB LAeq during early morning bridge construction works (concrete pours) at 154 residential properties (as identified in Appendix D of the Construction Noise and Vibration Effects Assessment). All affected receivers are located in the Huntington Park and Golflands suburbs.

Although a large number of exceedances of the night-time noise criteria are predicted at receivers, the location, duration and management of the works must also be considered when assessing noise effects. All the predictions assume that the works are taking place at the closest possible location within the site footprint for each receiver. In practice, noise levels will reduce as the works progress along the Busway's corridor.

Furthermore, these predictions have been taken along the façades that are closest to the works. However, some parts of any given dwelling will be less sensitive to noise than others. For example, garages fronting towards the road and unoccupied living rooms are less sensitive than bedrooms.

Predictions are for noise on the external façade of the building since this is where the night-time noise criteria are applicable. However, it is internal noise that will be of most concern to residents during night-time hours. The extent of the reduction of noise from outside to inside will depend on a range of factors, including the construction of the façade, the amount of glazing, and whether windows are left open or shut.

Possible effects that may arise from night works include disturbance, annoyance, and disruption of sleep. The extent of adverse effects will depend on the proximity of the works to each receiver on the night, the scheduling and duration of the works, and the plant items used on the night.

Scheduling of activities will be undertaken to manage noise effects at residential receivers during the night-time period. If noisy activities must take place during the night-time beyond 10pm, and if screening does not provide sufficient attenuation to meet the night-time noise criteria, and no other mitigation measures are practicable, it may be necessary to offer temporary relocation to affected residents. Temporary relocation will be considered on a case-by-case basis through consultation with the affected parties during production of any Schedules and will be employed as a last resort.

It is important to note that the predictions that have been carried out for the "worst-case" night works are in terms of the L_{Aeq} noise descriptor, which effectively quantifies the average noise received in a given time period. For typical works during the night-time, it is more likely that residents will be disturbed by short-term peaks in noise from site, such as metal being dropped from a height. Noise of this type is dependent on factors that are difficult to predict, including the specific activity at the time and the way that equipment is operated. It is therefore important that the noise management measures around site operations set out in the CNVMP will be briefed to all construction staff during inductions, site meetings and other construction related meetings.

Management measures set out in the CNVMP that will be employed during EB4L's construction include:

- Managing times of activities to avoid night works and other sensitive times
- Liaising with neighbours so they can work around specific activities
- Selecting equipment and methodologies to restrict noise

- Using screening/enclosures/barriers
- Temporary noise barriers
- Employing additional measures and consultation for any night works.

The noise mitigation measures proposed for EB4L have been incorporated into the proposed conditions set and will be addressed in the CNVMP and associated schedules.

Given the above assessment, the proposed mitigation and further engagement planned, the temporary construction noise effects of EB4L will be no more than minor.

9.6.3 Construction Vibration

The Construction Noise and Vibration Effects Assessment (Appendix 15) details the relevant AUP(OP) vibration standards as they apply to both amenity and building damage and these have been applied to the assessment of EB4L in the same manner as EB3C.

To summarise, the AUP(OP) under Standard E25.6.30.(1) allows for any works generating vibration for three days or less between the hours of 7am to 6pm to exceed the limits in the AUP(OP), as previously detailed in Table 9-6. This standard imposes a limit of 5 mm/s peak particle velocity in any axis when measured in the corner of the floor of the storey of interest for multi-storey buildings, or within 500mm of ground floor level at the foundation of a single storey building, is not exceeded. In such circumstances, AT is required to advise all occupied buildings within 50m of the extent of the works generating vibration in writing no less than three days prior to the vibration-generating works commencing.

Further to the AUP(OP) vibration limits and standards, the Construction Noise and Vibration Effects Assessment has also considered German Standard *"DIN 4150-3:1999 – Structural Vibrations: Effects of Vibrations on Structures"*, British Standard *"(BS) 5228-2: 2009 "Code of practice for noise and vibration control on construction and open sites"* and AT's *"Construction Vibration Criteria*". The assessment has applied them to the proposed construction methodology (Appendix 30).

Modelling undertaken for the Project and based on the methodology/effects above, indicates that two residential type dwellings (34 Cottesmore Place and 415 Tī Rākau Drive) may experience vibration levels of 2 mm/s if the 7T roller compactor is used on the construction boundary for the shared path in the closest position. Once the compactor is 5m away from the buildings the relevant vibration criteria will be met. The Construction Noise and Vibration Assessment also found that no commercial buildings may experience vibration levels above 20 mm/s PPV, exceeding the DIN 4150 commercial building criterion, if a roller compactor is used within 2m of the building. Lastly, all piling has been modelled to show compliance with exceedances of DIN 4150's commercial and residential vibration criteria.

However, to address these potential construction vibration effects, AT propose the following measures:

- Managing times of activities to avoid night works and other sensitive times
- Liaising with neighbours so they can work around specific activities
- Operating vibration generating equipment as far from sensitive sites as possible
- Selecting equipment and methodologies to minimise vibration
- Undertaking pre and post works building inspections at properties where the 2 mm/s limit may be exceeded.

These measures have been incorporated into the proposed conditions as part of the CNVMP, site specific schedules and the CCP's engagement requirements (Appendix 6).

Given the above assessment, the proposed mitigation and further engagement planned, the construction vibration effects of EB4L will be no more than minor.

9.6.4 Erosion and Sediment Management

EB4L will require earthworks of approximately 1,150m^3 of cut to fill over a footprint of approximately 0.9ha as detailed in the Erosion and Sediment Control Effects Assessment (Appendix 17). In addition, approximately 21,330m^3 of hardfill is proposed to construct retaining walls, the site yards and site access, with an additional construction footprint of approximately 1.5ha. The works are to occur on generally flat to sloping existing site contours through Guys Reserve and Whaka Maumahara Reserve.

The earthworks are predominantly a fill operation either side of the proposed Guys Reserve Bridge (Bridge C) to form the new busway. Any cut material will be excavated and removed directly off site. The imported fill material will be primarily aggregate (regarded as a stabilised product), ensuring exposed (erodible) areas are minimised at any given time. The fill operation primarily occurs at the northern end of the works area just south of Tī Rākau Drive and is associated with the retaining wall structure. A small quantity of earthworks is required to form the footpath and cycle path located through Guys Reserve and Whaka Maumahara Reserve.

To facilitate the construction of EB4L and Bridge C, a temporary access track will be required to provide personnel and machinery with access to the site. The access track will likely involve the construction of a temporary embankment and some retaining walls constructed from imported hardfill. The exact design of which will be determined through detailed planning and is subject to feasibility assessments. Once the link road is completed, the temporary works will be removed from above ground level, and the affected area will be remediated.

Land disturbance will occur during the following construction activities:

- Site clearance (e.g., vegetation removal)
- Reworking of existing road and hard stand areas
- Construction of new road surfaces
- Construction of Bridge C
- Installation of utilities via trenching
- Stormwater outfall construction.

As with EB3C, the Erosion and Sediment Control Effects Assessment (Appendix 17) has identified that there is limited environmental risks associated with the planned land disturbance. Similarly, all land disturbance will be undertaken in accordance with GD05. This includes the preparation of an ESCP detailing the specific erosion and sediment control works for each relevant stage (location, dimensions, capacity) in accordance with industry best practice, as well as GD05:

- Supporting calculations and design drawings
- Details of construction methods
- Monitoring and maintenance requirements
- Catchment boundaries and contour information
- Details relating to the management of exposed areas (e.g., grassing, mulch).

Chemical treatment will be employed, where appropriate and require the preparation of a chemical treatment management plan (ChTMP). This management plan will be required to detail the chemical treatment set up, as well as include all relevant batch dosing information as part of dewatering

operations. Similarly, any related decanting earth bunds (DEB)s will be required to be chemically treated in accordance with that management plan.

In addition, a site-specific ESCP(s) (ssESCP) will also be prepared, where required as previously detailed for EB3C. Furthermore, other earthworks related measures will be employed. This includes the use of a CLMP to address potential soil contamination (see Section 9.4.10). An Archaeological Authority will also be sought from HNZ, while a HHMP will also be employed to address potential effects on any disturbed heritage items.

Based on the above measures and AT's proposed conditions, the effects of land disturbance associated with EB4L will be less than minor.

9.6.5 Effects on Terrestrial and Freshwater Ecological Values

The Terrestrial and Freshwater Ecological Effects Assessment (Appendix 27) notes that terrestrial habitats within the EB4L area are comprised of maintained amenity areas, mixed native and exotic roadside shelterbelts and native plantings within the riparian zones of Guys Reserve. There are also areas of naturally regenerating exotic trees and scrubland within Guys Reserve.

A new stormwater outfall (referenced as 1-1) is proposed within EB4L to ensure stormwater infrastructure maintains the new flow capacities modelled for the Project. The proposed outfall is located within the riparian zone of the Pakuranga Tributary within Guys Reserve and will discharge downstream of two wetlands and will occur within 10 m of another wetland.

This wetland is hydrologically maintained by both natural fluctuations of the Pakuranga tributary within Guys Reserve and the existing discharges occurring from the current stormwater network. The outfall is located downstream of the wetland and the construction and operation of the outfall will not change the water level range or hydrological function of this wetland.

The proposed outfall will also require works located on the stream bank and/or stream bed. There is no proposed extension of the outfall pipe or concrete structure (or impermeable surfaces) into the stream bed. However, erosion protection consisting of permeable rock riprap will extend into the 'stream bed' by approximately 4.1 m. Works within the stream bed may give rise to adverse effects on native fish species.

Approximately 9,000m^2 of vegetation will be cleared (temporary and permanent) for the construction of EB4L.

While the area adjoining EB4L does not have any native bats nor significant numbers of at-risk native birds within a 5 km radius, the ecological assessment has identified the high likelihood that native lizards will be present.

Construction will result in the permanent loss of approximately 0.25 ha of lizard habitat. Removal of habitat will permanently reduce foraging and breeding habitat for "At Risk-Declining" lizards that are assumed to be present in the Project area. The permanent loss of habitat is likely to reduce overall resources available to the population. In order to address the potential effects on native lizards, a LMP will be prepared and will be implemented during construction (as detailed in the assessment of EB3C) and a Habitat Restoration Plan (HRP) will also be developed to detail the restoration required to compensate for the loss of lizard habitat. The LEAM plans in Appendix 9 show extensive lizard habitat replanting to compensate for the loss of lizard habitat in both EB3C and EB4L.

Similarly, vegetation clearance will be undertaken in a manner to minimise potential effects on native birds, such as undertaking nesting bird surveys during roosting months. Other ecological measures include

fish relocation and the use of an ESCP. These measures have been included in the proposed conditions for EB4L (Appendix 6).

Based on the above measures and the proposed construction methodology, the construction effects on terrestrial and freshwater ecology will be no more than minor.

9.6.6 Social Effects

A Social Impact Assessment (SIA) has been undertaken for EB4L (Appendix 26). The SIA has identified a range of potential social effects during construction, including:

- Severance from open space
- Business disruption
- Reductions in amenity.

It is important to note that the construction and operation of EB4L does not require residential or commercial property acquisition. Land will be required for construction, but only on a temporary basis, from "The Hub" (a small area of landscaped land behind the VTNZ) and from AMP/Dexus for the construction of the Ti Irirangi Drive/Town Centre Drive intersection.

9.6.6.1 Consultation

Unlike EB3C, construction of EB4L may not be immediately progressed once the necessary statutory approvals have been obtained. Instead, the proposed NoR and resource consent applications are intended to provide route protection for the EB4L corridor so that it can be delivered once the necessary funding has been secured.

High-level consultation was carried out on EB4L during the early stages of the Project and more specific consultation and engagement on EB4L proposals took place between August and September 2023. AT propose to continue this throughout the planning, design and construction phases.

An engagement plan has been prepared to inform neighbouring residents and business owners/tenants of the proposed alignment and designation boundary for EB4L. The engagement strategy includes:

- Face-to-face meeting with property owners in 'the Hub' commercial development
- Letter drop to residents and businesses in the area
- Information session held at 'the Hub' commercial development for business owners
- Pop-in information sessions for the wider community held in the local area
- One-on-one meetings as requested by stakeholders

Specific engagement for the local community study area for EB4L in relation to the requirements and impacts of this community is currently underway and will be ongoing throughout the project lifecycle. To date the project team have met with Huntington Park Residents and Ratepayers Association, AMP / Dexus (Botany Town Centre) and Piccolo Park (an adjacent ECE).

Given the area's demographic profile (high proportion of residents identifying as Asian ethnicity) all communication will be translated into Simplified Chinese, and translators will be available for all in-person meetings.

Following consultation EBA will report back to the community through their consultation outcomes report which will be publicly available on the EBA website. EBA will also identify ways in which feedback can be addressed, and opportunities realised through the next stage of the design, and the conditions.

The SIA recognises that engagement has also been undertaken on a project wide basis including drop-in sessions and virtual consultation which has been widely advertised and available for those impacted by all sections of the project including EB4L.

The Huntington Park Residents and Ratepayers Association responded positively to being engaged early in the process and requested to continue to be engaged throughout the planning, design and construction phases. In particular, requests were made for EBA to attend future meetings and community events held by the Association to provide further information on the Project.

AMP / Dexus raised concern about the impacts on the road layout during construction and operation and the impact this would have for customers including delay and frustration in accessing the centre. AMP / Dexus raised specific concerns for loss of unrestricted left hand turns into the Botany Town Centre site and the impact this might have on traffic movements[106]. AMP / Dexus were concerned about the impacts to businesses during peak trading periods such as Christmas and requested disruptive works avoid October to January. Their preferred timing was February and March.

Piccolo Park located at 415 Tī Rākau Drive, Huntington Park, raised concerns around noise generated during construction. Specific questions were around the levels of noise to be expected and what kind of mitigation would be in place to reduce these impacts. For example, whether there would be noise barriers in place and how these would function. The centre has internal and external noise criteria in place as part of the Ministry of Education's licensing criteria for centre based ECE services which need to be met.

There were also issues raised around safety and security. Specifically, how the busway will be designed in a way that provides natural surveillance and considers lighting and security cameras. The centre was concerned about the ability of footpath and shared path users to see into the centre and the safety issues this could create.

Mana whenua are project partners. A separate engagement process has been undertaken with mana whenua and will continue throughout the course of the project. Regular engagement with mana whenua partners has taken place through the AT and mana whenua Southern Forum. The forum includes representatives from Ngāti Whanaunga, Ngāi Tai ki Tāmaki, Te Akitai Waiohua, Ngāti Maru, Ngāti Tamaoho, Te Patukikkiri, Ngāti Paoa, Ngāti Paoa Trust, Ngāti Te Ata Waiohua, Te Ahiwaru, and Ngāti Tamaterā.

Mana whenua have played a key and valued role in the development of the design of both EB3C and EB4L, including urban design and landscape, stormwater management, construction methodologies and sustainability and procurement strategies and policies.

9.6.6.2 Positive social effects

Having regard to positive social effects, the busway and active mode facilities will result in more reliable transport connections to and from local and regional areas. As a result, there will be a positive social impact associated with better connectivity for residents, businesses, and social infrastructure in proximity to the Project. This will increase access to additional employment, educational and social opportunities for the local community. The wider, and to an extent regional community, will also be able to access businesses within East Tāmaki with greater ease and convenience.

[106] The Te Irirangi/Town Centre Drive intersection has been redesigned following this feedback.

Improving accessibility to public transport and active modes enables people, including vulnerable groups, to travel more sustainably, regularly and for less cost. This can promote greater social inclusion (and travel equity) for the community. Particularly, it will have benefits to those on lower incomes and from areas identified in the NZDEP 2018 as being more deprived.

In EB4L, a new shared pathway (walking and cycling facilities) will also be constructed in the Guys Reserve and Whaka Maumahara Reserve to provide access from Tī Rākau Drive to Te Irirangi Drive. The existing pedestrian pathway in the reserves will be realigned to avoid the piers for the EB4L Bridge C and to maintain access for residents at Cottesmore Place and Kirikiri Lane. The impact of the new walking and cycling connections will be positive.

9.6.6.3 Construction effects

While construction impacts are temporary, EB4L's construction duration means that works may occur over several years.

Construction of the new busway will transect Guys Reserve including the existing footpath which connects Guys Road, Cottesmore Place, Waihi Way and surrounding streets (Opito Way, Oneroa Road, Kirikiri Lane, Lushington Place) to Botany Town Centre. During construction the footpath will not be passable and will require local detours to reduce severance effects.

The construction works may result in severance effects if equipment is viewed as a barrier by the community due to its size and location. In addition, if temporary paths are unsuitable this may result in adverse impacts for those with a disability, young children and parents with prams and older people who may struggle to navigate temporary arrangements. However, requirements for accessibility have been considered through engagement with AT Capital Projects Accessibility Group and is a requirement in the CTMP as detailed in the proposed conditions.

The SIA also identifies that potential severance from social infrastructure (specifically Guys Reserve) during construction may cause adverse social effects. These changes to open space access during EB4L's construction will be communicated to the community in accordance with the CCP. It is noted that AT has been actively engaging with AC Community Facilities in regard to the Project's impacts on open space sites. As part of those discussions and the process of obtaining landowner approval from AC, improvements to other reserves have been identified. For EB4L, two other reserves have been identified as potential mitigation locations:

- Haven Park (34R Haven Drive)
- Huntington Park (30R Huntington Drive).

Both of these reserves are located within walking distance of both Guys Reserve and Whaka Maumahara. As identified by the Open Space Effects Assessment (Appendix 10), the potential mitigation at these reserves could include:

- Haven Park (34R Haven Drive)
    - Outdoor seating/tables
- Huntington Park
    - Improved play elements to cater for all abilities and ages
    - A better planned, welcoming space for the community
    - Upgrading of the 3 on 3 basketball court
    - Wayfinding.

The SIA also identifies business disruption as a potential adverse effect. This disruption could arise from road disruptions and general disruption from construction activities. AT proposes to maintain clear communication with neighbouring businesses via the CCP, while the CTMP requires the development of appropriate construction transport arrangements for surrounding sites.

The effects of construction activities on amenity can also negatively impact people's environment this includes noise and dust emissions from excavations, plant, equipment and trucks. These matters will be addressed through the various proposed management plans. These management plans will be developed in recognition of local conditions, with the opportunity to work with directly affected parties, where appropriate. Engagement in accordance with those management plans is also required as part of the Project's CCP and the mana whenua framework, ensuring that the plans are developed and implemented to address issues raised by directly affected parties and other relevant stakeholders in an appropriate manner.

Mitigation for social effects includes measures for managing changed road conditions and detours for road and footpath users under the CTMP, the requirements for community engagement as part of the CCP, and development response measures incorporated into the proposed CEMP. These plans are required to be prepared and implemented under AT's proposed conditions.

Given the above, the social effects arising from construction will be no more than minor.

9.6.7 Management of Contaminated Soils

The locations and types of potential contaminants has been previously described in Section 6.15 and the Contaminated Land Effects Assessment (Appendix 16).

There are two sites within 200 m of EB4L where HAIL activities were identified: 550 Te Irirangi Drive and 451 Tī Rākau Drive. At 550 Te Irirangi Drive and 451 Tī Rākau Drive, no soil disturbance activities will take place as part of work within EB4L. However, local topography slopes toward the EB4L footprint and potential shallow groundwater contamination (if present) could migrate to the proposed areas of soil disturbance. The Contaminated Land Effects Assessment notes that it is reasonable to assume contamination is likely present within areas of proposed soil disturbance.

The assessment also considers that it is more likely than not that during the course of the works, unexpected discoveries of impact in soils will be encountered across EB4L. For example, this could include hazardous building materials from demolition work/fly tipping, visual observations of staining or the presence of odours.

The assessment considers that any effects can be appropriately managed via implementation of the required CLMP in conjunction with the Construction Environmental Management Plan (CEMP) and the Erosion and Sediment Control Plan (ESCP) (all required by the consent conditions).

The CLMP should be prepared by a suitably qualified environmental practitioner (SQEP) and will require updating as the Project progresses, as further information becomes available and includes:

- Summary of information and overview of the proposed alignment construction methodology
- Summary of any soil sampling works undertaken
- Roles and responsibilities and contact details for the parties involved in the land disturbance activities, including the SQEP
- Identify potential and known hazards arising from contamination (if present)
- Identify specific management procedures developed for construction earthworks including:

  - On-site soil management practices
  - Off-site soil transport and disposal
  - Erosion and sediment control
  - Management of dust and odour

- Contingency measures in the event of accidental/unexpected discovery (asbestos, unknown fill, odours, staining etc.)
- Post development controls (if required).

The contractor will need to manage its health and safety obligations with respect to risks relating to contaminated land. Measures to protect the health of workers, the public and the surrounding environment will need to be incorporated into any health and safety plan that relates to work on sites where potential or known hazards have been identified in the AEE.

Given the above mitigation, the contamination effects associated with EB4L's construction will be less than minor.

9.6.8 Tree Works

As detailed in the the Arboricultural Effects Assessment (Appendix 18) and section 4.6.10, the construction of EB4L will require the removal of vegetation of which the majority is native revegetation plantings rather than specimen trees. There are also exotic species present, and landscaping associated with the Botany Town Centre.

The overarching principles of the Project will be to retain mature trees where possible. For EB4L, there are 76 trees within the project footprint. 23 trees are to be retained and 6 are to be moved to another location within the project footprint. Of the 76 trees within the footprint, 47 trees are to be removed, 32 of which would ordinarily trigger requirements for resource consent under the AUP(OP).

Other tree works, including the removal of trees on business zoned sites are permitted activities and can be undertaken without resource consent or mitigation.

LEAM plans (Appendix 9) showing proposed mitigation planting have been prepared as part of the application and a comprehensive Urban Design and Landscaping Plan (UDLP) and a Landscaping Plan for Town Centre Drive is required by the proposed conditions. Matters covered in this documentation include:

- Species selected
- Plant sizes
- Planting locations
- Number of specimen trees planted
- Maintenance requirements and timeframes.

The landscaping carried out as part of EB1 provides an example of the streetscape that can be provided for the busway alignment through EB4L. In addition, space exists within the esplanade reserves and Burswood Reserve, within the Project boundaries for additional tree planting.

While the planted trees will not initially provide the scale of some of the removed trees, they will gradually become mature specimens themselves. It is also acknowledged that the species proposed for planting will primarily be native, ensuring that the biodiversity values of the Project area will be enhanced by the mature landscaping. While the replacement trees will take time to establish, the arboricultural values of will be improved once the trees mature.

Based on the scale of works, mitigation planting and the use of the TPMP, the tree works will be no more than minor.

9.6.9 Cultural Values

AT has been working with mana whenua during the development of the Project's design and construction of EB1 to EB4L. Through this engagement, AT has developed a deeper understanding of the EB4L area's cultural values and the measures which should be employed to address potential cultural effects.

It is considered that site clearance, earthworks and vegetation clearance all have the potential to generate adverse cultural effects. These effects would arise through:

- The discharge of sediment into watercourses and ultimately the CMA
- Loss of habitat due to vegetation loss, with resulting biodiversity reduction
- Disturbance of archaeological material
- Changes to landform
- Discharge of contaminants into the air, land and water.

These effects of construction activities have been minimised wherever possible and will be governed by a number of management plans including the ESCP, CEMP and CLMP. One purpose of those plans is to minimise construction effects on cultural values and this purpose is detailed within the proposed conditions (Appendix 6). In addition, AT have proposed ecological related conditions to address both habitat loss and direct effects on native fauna. This will help address the Project area's already compromised biodiversity values.

Furthermore, AT have undertaken an Archaeological Effects Assessment (Appendix 25) of the Project area to determine what, if any, known archaeological sites may be affected. The assessment notes the extensive history of Māori occupation and there are known archaeological sites within the wider area. Given this, an Archaeological Authority will be sought from HNZ, while HHMP will also be employed.

9.6.10 Historic Heritage

As detailed previously, there are no known archaeological sites within EB4L's footprint. However, there is a risk that previously unrecorded sites may be present, both from pre- and post-colonisation periods. As with EB3C, an Archaeological Authority will be sought from HNZ, while earthworks will be managed through the use of a HHMP.

Based on the above, the historic heritage effects of EB4L's construction will be less than minor.

9.6.11 Air Quality

An Air Quality Effects Assessment has been undertaken for EB4L (Appendix 23). As with EB3C, the principal air quality issue for EB4L is construction generated dust. In order to prevent and/or minimise dust related effects, dust management measures will be an integral part of the ESCP, ssESCPs and the CLMP as required by the proposed conditions (Appendix 6). Furthermore, a specific dust management condition has been proposed by AT. These measures that are likely to be employed during construction include:

- Minimising extent of exposed dry dusty surfaces
- Hardstand surfacing for frequently travelled access routes
- Availability of water carts for dry periods
- Construction vehicle speed restrictions
- Semi-porous or solid boundary fencing to provide shelter

- Minimisation of double handling of spoil or fill materials
- Minimisation of drop heights when transferring spoil or fill to stockpiles or trucks
- Avoiding frequently used stockpiles close to sensitive receivers.

AT also proposes to undertake off-site monitoring for dust outside the construction site boundaries, comprised of a combination of visual observations and stakeholder communications, with these measures incorporated into the ESCP. No off-site instrumental monitoring for ambient air quality concentrations of PM_{10} is recommended for EB4L because no sensitive receptors are assessed as having a DRI that implies a high risk of dust impacts after mitigation has been implemented.

However, given the overall assessed sensitivity of the receiving environment, the Air Quality Assessment considers it would be good practice for the construction sites to install instrumental monitoring of total suspended dust (such as with DustTrak or SiteHive technology) at the northeast boundary of the main construction zones to monitor dust moving off-site and the effectiveness of controls. As with EB3C, air quality monitoring conditions will be imposed during construction (Section 9.4.14).

Given the above mitigation, the air quality effects of EB4L are considered to be no more than minor.

9.6.12 Land Stability and Groundwater

A Groundwater Effects Assessment has been undertaken for EB4L (Appendix 24). The assessment has not identified any groundwater risks nor dewatering/diversion required for EB4L.

Open trenching will be used for the installation and relocation of underground services and utilities (e.g., for stormwater). Trenches for network utilities will be progressively opened, closed and stabilised to ensure they are not open for longer than 10 days.

Based on the design, the anticipated permanent retaining walls will be a combination of gravity block walls and a post and panel wall. These walls are anticipated to reach a maximum retained height of approximately 3.5 m. The post and panel walls are anticipated to have piles with an external diameter of less than 1.5 m and are therefore considered a permitted activity as per AUP (OP) Standard E7.6.1.10 (1)(c).

The proposed Bridge C is expected to have piers with an external diameter of 1.5 m. The piling specification (EB-2-D-0-ST-SP-100003) details the methodology for concreting under water. The tremie method will be applied where a dry excavation cannot be achieved. No dewatering or diversion will be required under this method, while earthworks are only anticipated to involve areas of fill and no large areas of cut are anticipated.

It is note that gravity block walls rely solely on their own weight to retain the ground behind. These blocks may require some embedment (<0.5 m), but they are not anticipated to extend more than 2 m below the natural groundwater level. Therefore, they are expected to meet the AUP (OP) permitted activity criteria.

Given these factors, no groundwater or land stability related effects are anticipated by EB4L's construction.

9.6.13 Visual and Landscape Effects

The temporary visual and landscape effects associated with EB4L's construction are detailed in the Natural Character, Landscape and Visual Effects Assessment (Appendix 22). It is noted that the

construction of EB4L will be visible from public roads, the adjoining residential and commercial sites, as well as from within Guys Reserve and Whaka Maumahara.

Effects include the disruption of users/occupiers appreciation of existing visual amenity values, shadowing and dominance impacts, as well as a general decrease in local visual amenity values of these reserves.

Guys Reserve and Whaka Maumahara provides a public open space for the local community. However, the reserve is also ringed by urban development, not least the rear service areas of The Hub. Infrastructure is also present, including a pipe bridge and adjacent arterial roads. In addition, the construction effects at these reserves will be temporary, with replanting and other urban design improvements (e.g., seating) providing a longer-term positive contribution to the amenity values of these locations.

Another viewing audience will be persons travelling to, from and through the area. The construction of EB4L will be visible from public roads, most notably for persons travelling along Tī Rākau Drive and Te Irirangi Drive. However, such views will be transient given that any viewers will be moving through the construction area. As such, the effects on the travelling audience will be minimal.

A further viewing audience will be workers and visitors to commercial sites within the Project area (e.g., The Hub). However, these sites are generally inwards focused, with activities occurring within existing buildings rather than reliance on outdoor amenity areas. In general, these commercial sites feature vehicle parking, goods delivery and rubbish storage areas that adjoin Guys Reserve. As such, effects on these viewers are considered to be low.

Lastly, EB4L's construction will be viewable from residential sites to the south and southwest. Construction activities, such as vegetation clearance have the potential to affect the outlook from these residential sites. Construction activities at these locations may be highly visible given the lack of screening vegetation. These views of construction activities would also have long durations, given the scale of works proposed and time needed to construct the larger elements of EB4L.

However, it is noted that infrastructure construction is not an uncommon activity in an urban environment and there is the potential to provide ground level screening to minimise views into active construction areas. In addition, there are no AUP(OP) landscape or character overlays present within these residential areas. Given the temporary nature of the construction activities, the potential for screening and the lack of any character/landscape AUP(OP) overlays, the effects on these residential sites are considered to be acceptable.

With respect to landscape values, the main change to landform will be associated with earthworks for the construction of Bridge C as well as cycleway and footpath works. These works will occur along the edges of the reserves with landform features remaining visible and legible so construction effects on landform will be low. Vegetation removal will not occur within a SEA, with this vegetation clearance including the removal of exotic and pest species. Natural character will also be preserved during construction given the alignment of EB4L being situated as north as possible, towards the edges of Guys Reserve.

Given the above factors, the construction visual and landscape effects will be no more than minor.

9.6.14 Effects on Open Space

As detailed in the Open Space Effects Assessment (Appendix 10), the construction of EB4L requires the occupation of open space, including for two of its construction laydown yards. The assessment has identified that given the footprint required in the Guys Reserve and Whaka Maumahara, the two reserves will not be available for public use during EB4L's construction. This is a potential time period of 32 months where alternative open space facilities will be required by the public.