Appendix 23

Air Quality Effects Assessment

Eastern Busway

EB3 Commercial and EB4 Link Road

Air Quality Effects Assessment

Document Number: EB-RP-3C4L-PL-000002

Eastern Busway

Quality Information

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List of Abbreviations and Definitions

Abbreviation and Definitions	Description
AAAQT	Auckland Ambient Air Quality Targets
AADT	Annual Average Daily Traffic
AEE	Assessment of Effects on the Environment
AMETI	Auckland Manukau Eastern Transport Initiative programme
AQMS	Air Quality Monitoring Station
AUP(OP)	Auckland Unitary Plan (Operative in Part) (Updated 20 July 2023)
AWS	Automatic Weather Station
BPO	Best Practicable Option
CAQMP	Construction Air Quality Management Plan
CEMP	Construction Environmental Management Plan
CLMP	Contaminated Land Management Plan
CO	Carbon Monoxide
CO_2	Carbon Dioxide
DRI	Dust Risk Index
EB1	Eastern Busway 1 (Panmure to Pakūranga)
EB2	Eastern Busway 2 (Pakūranga Town Centre)
EB3C	Eastern Busway 3 Commercial (Pakūranga Creek to Botany)
EB3R	Eastern Busway 3 Residential (SEART to Pakūranga Creek)
EB4L	Eastern Busway 4 Link Road (link between Tī Rākau Drive and Te Irirangi Drive)
EBA	Eastern Busway Alliance
ESCP	Erosion and Sediment Control Plan
GPG Dust	Good Practice Guide for Assessing and Managing Dust (MfE, 2016)
HCV	Heavy Commercial Vehicle
km	Kilometre(s)
km/h	Kilometres per hour
kPa	kiloPascals (unit of pressure)
m	Metre(s)
m/s	Metres per second
m^2	Square Metre(s)
m^3	Cubic Metre(s)
MfE	Ministry for the Environment
$\mu g/m^3$	Micrograms per cubic metre
µm	Micrometer (one millionth of one metre)
MSE Walls	Mechanically Stabilized Earth Walls
NES-AQ	Resource Management (National Environmental Standards for Air Quality) Regulations 2004
NO	Nitric Oxide
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides

NoR	Notice of Requirement
O_3	Ozone
$PM_{2.5}$	Particulate matter less than 2.5 micrometres equivalent aerodynamic diameter
$PM_{2.5-10}$	Fraction of PM_{10} that is greater than 2.5 micrometres equivalent aerodynamic diameter (less than 10 micrometres equivalent aerodynamic diameter)
PM_{10}	Particulate matter less than 10 micrometres equivalent aerodynamic diameter
RMA	Resource Management Act 1991
RRF	Reeves Road Flyover
RTN	Rapid Transit Network
SEART	South-Eastern Arterial
SO_2	Sulphur Dioxide
TSP	Total Suspended Particulate
VTNZ	Vehicle Testing New Zealand Ltd
Waka Kotahi Guide	Waka Kotahi Guide to Assessing Air Quality Impacts from State Highway Projects, Version 2.3, 2019.

Executive Summary

This report describes the assessment of air quality effects associated with the operation and construction of Eastern Busway 3 Commercial (EB3C) and Eastern Busway 4 Link Road (EB4L) sections of the Eastern Busway Project (the Project).

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

The proposed EB4L footprint traverses parts of Guys Reserve and Whaka Maumahara Reserve and includes road widening at the intersection of Te Irirangi and Town Centre Drive (Botany). Key elements of the proposed EB4L works include a bridge structure (Bridge C), retaining walls, stormwater drainage, and a new walking and cycling pathway.

This assessment includes a description of the existing environment, relevant meteorology and topography, applicable air pollutants, and discussion of relevant regional and national policies and guidance. Potential impacts on air quality during both construction and operation of the Project are considered.

Existing Environment

Receptors that are potentially sensitive to air discharges during Project construction such as residential dwellings, childcare centres, retail buildings, commercial premises and exercise facilities are located close to the proposed work areas and final Project elements for both EB3C and EB4L.

Wind directions are prevalent from the southwest for all wind speeds, and particularly dominant from this sector for higher hourly-average wind speeds. The next most prevalent wind direction is from the northeast. Topographical features of the existing environmental are not significant in the context of potential impacts of air emissions from the Project.

Assessment of Air Quality Effects – Construction

The Good Practice Guide for Assessing and Managing Dust published by Ministry for the Environment in 2016 (GPG Dust) states that management and control of larger dust size fractions with the potential to cause nuisance (amenity) impacts (deposited dust and total suspended particulates (TSP)) will, at the same time, manage and control smaller size fractions with the potential to cause health impacts (PM_{10} and $PM_{2.5}$). Therefore, the main air quality impact risk associated with the construction of EB3C and EB4L is the discharge of dust with associated amenity impacts.

The operation of trucks and heavy machinery during construction activities, as well as the use of mobile generators for power supply where needed, discharge products of diesel or fuel oil combustion into the air. However, these discharges are negligible in a regional context compared to regular emissions from the Auckland vehicle fleet using roads around the Project. In addition, there are no confined spaces where this machinery will operate, meaning that any emissions will disperse rapidly once discharged into the air. Therefore, no assessment of potential impacts from emissions of combustion-derived pollutants is necessary.

Therefore, while the assessment considers all potential effects on air quality due to the discharge of pollutants to air during construction, the focus of the assessment for air quality construction impacts is on avoiding or mitigating potential nuisance and amenity impacts from dust emissions. This is also consistent with the permitted activity standards in the Auckland Unitary Plan (AUP(OP)) for construction-related activities.

The assessment of the likelihood of dust emissions on sensitive receptors was conducted using the Dust Risk Index (DRI) approach recommended in the Waka Kotahi NZ Transport Agency (Waka Kotahi) *Guide to Assessing Air Quality Impacts from State Highway Projects* (the "Waka Kotahi Guide") which allows the risk of offensive or objectionable dust nuisance to be classified as low, medium or high at various sensitive receptor locations based on attributes of the existing environment and nearby construction activities.

The DRI calculation is conservative – i.e. predicting a higher degree and/or frequency of impact than is likely to eventuate. Notwithstanding, the DRI approach indicates the potential for some sensitive receptors near the EB3C construction areas to have a medium or medium-high risk of offensive or objectionable dust nuisance in the absence of adequate mitigation controls, and other locations to have a low risk. For EB4L, the DRI approach indicates the potential for some (mostly commercial) sensitive receptors near the EB4L construction areas to have a medium risk of offensive or objectionable dust nuisance in the absence of adequate mitigation controls, although residential receptors and the Piccolo Park Kindergarten are assessed to have a low risk.

In addition to controls to mitigate dust generation and dispersion, fenceline instrumental monitoring (via the project-wide Erosion and Sediment Control Plan (ESCP), updated to include the EB3C and EB4L aspects) will be required at the northeastern boundary of construction sites close to the medium and medium-high risk locations to measure dust concentrations in the air and provide feedback to site managers on the effectiveness of controls and whether there is a need to implement additional dust controls. This monitoring is proposed as an additional mitigation measure for the construction of both the EB3C and EB4L sections of the Project.

Monitoring for dust outside the construction site boundaries will comprise a combination of visual observations and stakeholder communications. No off-site instrumental monitoring for ambient air quality concentrations of fine particulates regulated under the National Environmental Standard for Air Quality Regulations 2004 (NES-AQ) is recommended for the EB3C and EB4L sections of the Project because no sensitive receptors are assessed as having a DRI that implies a high risk of dust impacts after mitigation has been implemented.

The implementation of the proposed Project-wide ESCP and adaptive management of mitigation measures in response to monitoring outcomes will reduce the risk of dust emissions as recommended in the Waka Kotahi Guide. Any residual impacts arising as a result of dust emissions from the construction of both EB3C and EB4L are considered to be low.

Assessment of Air Quality Effects – Operational

Daily average traffic volumes on Tī Rākau Drive along the segments encompassed by the alignment of EB3C and EB4L were compared for the current situation (based on 2017 traffic data) and the forecasted 2028 opening year. For the opening year, traffic volumes were compared for both the "Do Minimum option" (which assumes the Project does not proceed) and the "With Project option" (which assumes the Project is implemented).

Future traffic volumes on Tī Rākau Drive are forecast to reduce slightly "With Project" compared to the "Do Minimum" (without Project) option for both EB3C and EB4L. Traffic congestion is also predicted to reduce under the "With Project option", which is beneficial in reducing air discharges from vehicles. Therefore, implementing the EB3C and EB4L sections of the Project will result in lower rates of emissions of vehicle exhaust pollutants into air than with the "Do Minimum" option – imparting a beneficial impact to both local and regional air quality.

Some parts of the proposed busway alignment in EB3C and all of EB4L divert away from Tī Rākau Drive. Buses using the busway will therefore be closer to receptors near the alignment in these areas than if all buses were only using Tī Rākau Drive. If buses powered by fossil fuels are operated on the busway, this would result in additional air discharges over the length of the busway compared to the current situation due to potential pollutants in vehicle exhaust, and these emissions will be closer to some sensitive receptors than in the current situation where EB3C and EB4L create new roads. However, the emissions from the buses are expected to be negligible in the context of other vehicle movements in the surrounding area and have not been specifically assessed. It is expected that there will be no detectable increase in local air quality pollutant concentrations near the busway, and that overall, the beneficial impact to air quality of reducing traffic congestion on Tī Rākau Drive will be seen throughout the alignment area.

Mitigation – Construction

The ESCP required by the consent conditions will set out measures to minimise, so far as reasonably practicable, impacts on air quality due to dust emissions during construction. The ESCP will include requirements for:

- Dust control measures to maximise the mitigation of dust emissions
- Monitoring, including community, visual and fenceline instrumental monitoring and relevant triggers
- Adaptive management and proactive management to modify activities and mitigation measures based on forecasted wind conditions and in response to feedback from monitoring.

Mitigation – Operational

The operation of the EB3C and EB4L sections of the Project will have a beneficial impact on air quality. No mitigation measures are required for the operational phase of the Project.

1 Introduction

1.1 Overview of the Eastern Busway Project

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

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

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

The programme includes the following works which do not form part of the project:

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

The Project consists of the following packages:

- Early Works Consents – William Roberts Road (WRR) extension from Reeves Road to Tī Rākau Drive (LUC60401706); and Project Construction Yard at 169 – 173 Pakūranga Road (LUC60403744)
- Eastern Busway 2 (EB2) – Pakūranga Town Centre, including the Reeves Road Flyover (RRF) and Pakūranga Bus Station
- Eastern Busway 3 Residential (EB3R) – Tī Rākau Drive from the South-Eastern Arterial (SEART) to Pakūranga Creek, including Edgewater and Gossamer Intermediate Bus Stations
- Eastern Busway 3 Commercial (EB3C) – which commences from Riverhills Park along Tī Rākau Drive to Botany, including two new bridges, and an offline bus route through Burswood **(this Assessment)**
- Eastern Busway 4 Link Road (EB4L) – Guys Reserve to Botany Town Centre, including a link road through Guys and Whaka Maumahara Reserves to Te Irirangi Drive/Town Centre Drive intersection **(this Assessment)**.

The overall project is shown in Figure 1 below.

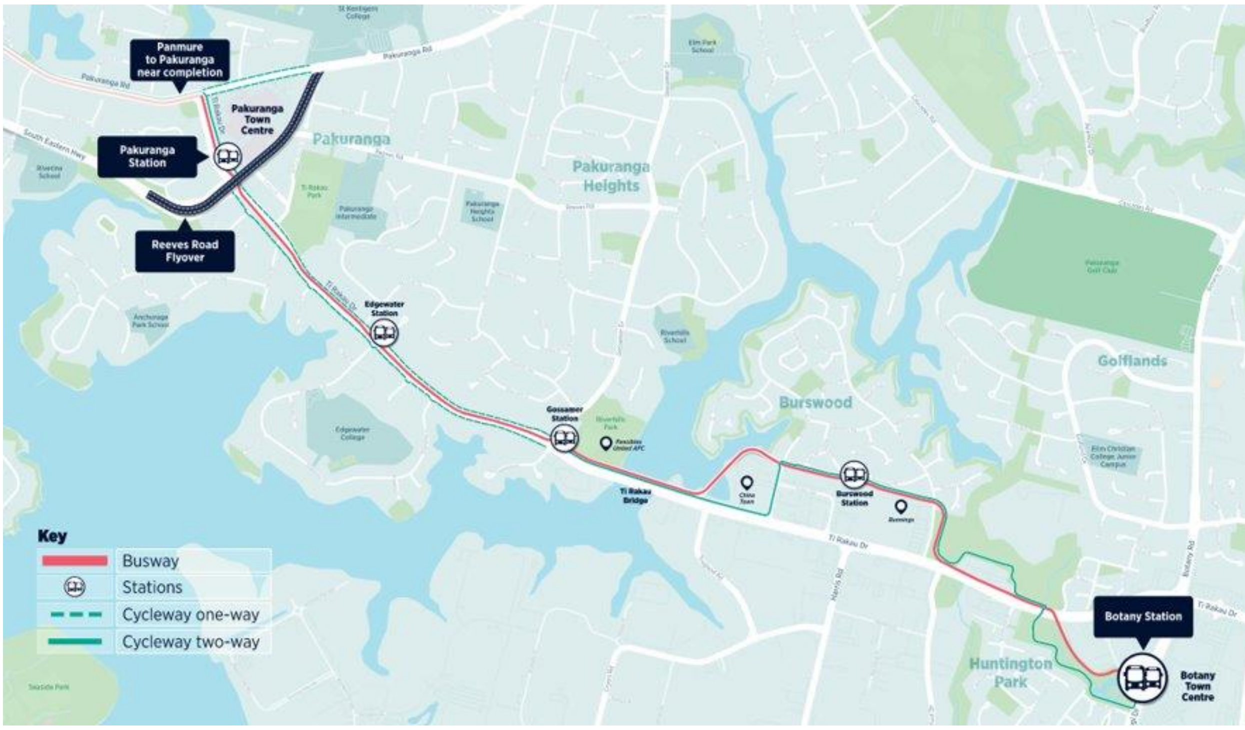

Figure 1. Project alignment

1.2 Project Objectives

The Project objectives are:

1. Provide a multimodal transport corridor that connects Pakuranga and Botany to the wider network and increases choice of transport options.
2. Provide transport infrastructure that integrates with existing land use and supports a quality, compact urban form.
3. Contribute to accessibility and place shaping by providing better transport connections between, within, and to the town centres.
4. Provide transport infrastructure that improves linkages, journey time and reliability of the public transport network.
5. Provide transport infrastructure that is safe for everyone.
6. “Provide or Safeguard future” transport infrastructure at (or in the vicinity of) Botany Town Centre to support the development of strategic public transport connection to Auckland Airport.

2 Proposal Description

The following sections provide a brief description of both EB3C and EB4L. These descriptions consist of the construction and operation of both EB3C and EB4L packages, with further details provided in the AEE and Notices of Requirement (NoRs). A full set of proposed plans is attached to the AEE.

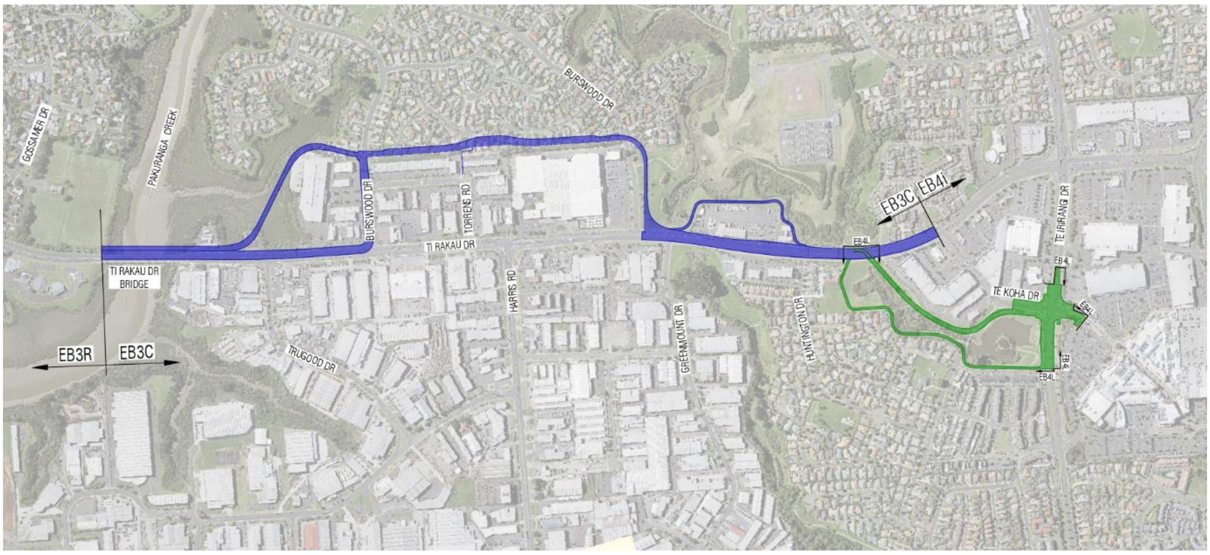

Figure 2. Eastern Busway 3 Commercial and 4 Link Road Project Extent

2.1 Eastern Busway 3 Commercial

The proposed EB3C works involve the establishment of an 'off-line' busway, cycleway, and associated stormwater upgrades. The proposed works will take place within existing road reserves, Council reserves[1] and privately held land within the proposed works footprint (refer Figure 2). The extent of works for EB3C runs between Riverhills Park (i.e., adjacent to the terminus of the earlier EB3R package) in the west to Guys Reserve in the east, through the suburbs of Burswood and East Tāmaki.

The busway will current Tī Rākau Drive corridor, first crossing Pakūranga Creek by way of a new two-lane bridge (Bridge A) including abutments[2] and scour protection. It will then cross a coastal headland at 242 Tī Rākau Drive (a Mobil branded service station), and then an embayment within which a retaining wall, and a $4m^2$ coastal reclamation will be constructed. The busway will cross a second headland at 254 Tī Rākau Drive (currently occupied by a pet store), before crossing a mangrove filled bay to the west of 262 Tī Rākau Drive (the 'Chinatown' retail business) via a second bridge (Bridge B). Bridge B will include two abutments with scour protection. Bridge B will require construction of a reinforced embankment at its northern end which includes imported fill, rip rap and permanent wick drains, and $549m^2$ coastal reclamation. In parallel, a retaining wall will be constructed to the eastern side of the embankment. Following this, the busway runs between the commercial area and residential area north of Tī Rākau Drive, crossing several residential sites. The busway also crosses Burswood Drive twice, with raised signalised crossings established to control both the busway and road traffic.

A new 'intermediate' style bus station will be established at Burswood, before the busway then crosses over Burswood Esplanade Reserve and onto a widened Tī Rākau Drive (by the Howick and Eastern bus

[1] Including Burswood Esplanade Reserve and Bard Place Reserve
[2] The western abutment and associated scour protection was included in the EB3R consenting package

depot). The busway will then run beside the eastbound lanes of Tī Rākau Drive, before crossing over Tī Rākau Drive to connect with EB4L at Guys Reserve.

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

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

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

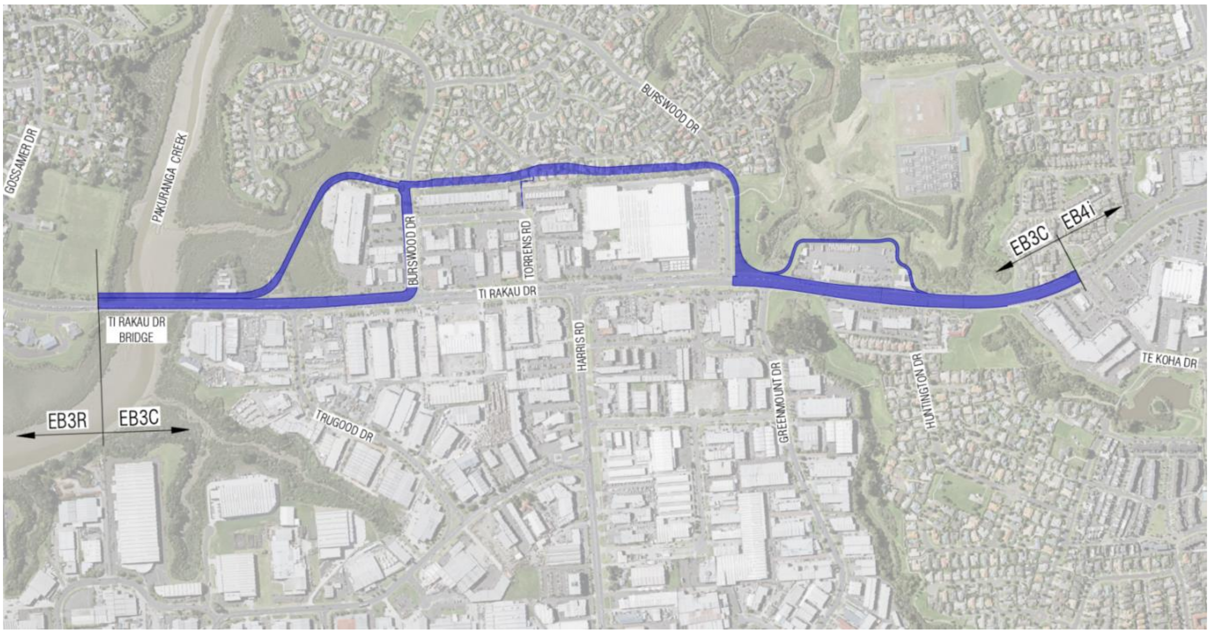

Figure 3. Eastern Busway 3 Commercial Project Area

2.2 Eastern Busway 4 Link Road

The EB4L works will involve the establishment of a dedicated two-way busway, shared pathway and stormwater upgrades. These works will take place in Guys Reserve, Whaka Maumahara Reserve, existing road reserve and Botany Town Centre land for the intersection improvements on Town Centre Drive.

EB4L commences south of Tī Rākau Drive, crossing through Guys Reserve, Whaka Maumahara Reserve and ending at the intersection of Te Irirangi Drive/Town Centre Drive.

The works will primarily involve the construction of a new two-way busway corridor which will run along the eastern side of Guys Reserve and Whaka Maumahara Reserve to provide access for bus services between Pakūranga and Botany. The two-way busway is designed to integrate with EB3C and be a continuation of the EB3C busway.

This section of the busway will feature a bridge (Bridge C) approximately 350m long. This bridge is needed due to the sloping topography of the Reserves.

The busway will then connect to Te Irirangi Drive, following alterations to the existing Te Irirangi Drive/Town Centre Drive intersection.

A shared pathway and minor retaining walls will also be constructed along the southern and western boundaries of Guys Reserve and Whaka Maumahara Reserve. The shared pathway will connect to existing walkways and will terminate at Te Irirangi Drive.

A new shared pathway and retaining wall will also be constructed along the western boundary of Te Irirangi Drive and is partially located within the Whaka Maumahara Reserve.

A new stormwater outfall (including riprap) will be constructed within Guys Reserve. The outfall will discharge stormwater over scour protection prior to its entry into a tributary of Pakūranga Creek. Additionally, a new stormwater connection will be constructed in Whaka Maumahara Reserve, adjacent to Te Irirangi Drive. This new connection will discharge via an existing outfall into the existing stormwater pond within the Reserve.

A construction laydown area will also be established within Guys Reserve, adjacent to Tī Rākau Drive and 47C Huntington Drive. A second laydown area will be established in Whaka Maumahara Reserve, between the existing stormwater pond and Te Irirangi Drive. Construction access will also be gained from Te Koha Road beside VTNZ's vehicle inspection premise located at 451 Tī Rākau Drive.

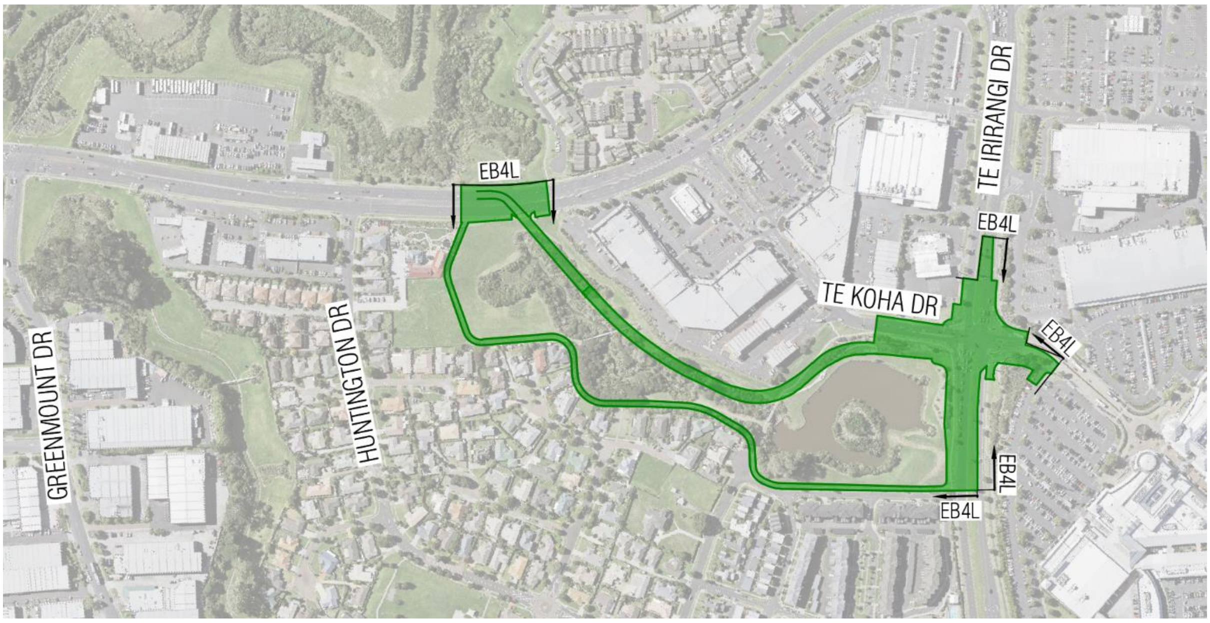

Figure 4. Eastern Busway 4 Link Road Project Area

3 Specialist Assessment

Chapter Summary
• *This chapter describes the assessment of air quality effects associated with the operation and construction of EB3C and EB4L sections of the Project* • *This air quality assessment includes identification of the existing environment, relevant meteorology and topography, applicable air pollutants, and discussion of relevant regional and national policies and guidance.*

3.1 Assessment Content

This report describes the assessment of air quality effects associated with the operation and construction of EB3C and EB4L sections of the Project.

Its purpose is to:

- Inform the AEE relating to the Notice of Requirement, and required regional consents for EB3C and EB4L
- Identify the ways in which any adverse effects will be appropriately managed.

This air quality assessment includes identification of the existing environment, relevant meteorology and topography, applicable air pollutants, and discussion of relevant district, regional and national policies and guidance including plan provisions (AUP(OP)). Potential impacts during both construction and operation of the project are considered, using the following approaches:

- For construction impacts, an assessment of the potential impacts from dust during construction of EB3C and EB4L is presented
- For operational impacts, a qualitative assessment of the potential impact on ambient air quality for EB3C and EB4L is conducted by consideration of projected traffic volumes and vehicle emission factors.

There are locations along the alignment where there is the potential of encountering contaminated soil during construction. The activities undertaken in areas with contaminated soil and the handling of contaminated material requires management during construction in order to minimise potential risks to human health and the environment. The location and nature of contaminated material and the measures to be adopted during construction are set out in the Contaminated Land Effects Assessment. That assessment details the following:

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

With the exception of odour, the handling of contaminated soil and the assessment of potential effects associated with that activity are therefore not considered further in this air discharge assessment.

3.2 Specific Project Elements

3.2.1 Construction of EB3C

Construction of EB3C will take approximately 3 years including site establishment and enabling works, although this duration is dependent on funding processes and property acquisition.

Key elements of EB3C include two major structures – the Tī Rākau Drive Bridge (Bridge A) and a bridge adjacent to Chinatown (Bridge B). Each structure will be constructed from reinforced in-situ and precast concrete components. In-situ decks will be poured on top of precast concrete girders, supported on in-situ concrete piers and columns, which will be positioned above reinforced concrete bored piles. Abutments will be mechanically stabilized earth walls (MSE) walls with deck end spans resting upon them. The construction of these abutments will require ground improvement followed by filling to create the ramps and is therefore an activity with higher potential for dust emissions over an extended period of time than other aspects of the EB3C construction programme.

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

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

Construction of EB3C will involve the following activities with potential for dust emissions:

- Removal of acquired buildings, pavements, drainage and curbs where required
- Protection or relocation of existing services
- Establishment and use of work sites and laydown areas
- Establishment and operation of aggregate yards (see also Section 3.2.2)
- Modifications to existing roads and connections:
    - Removal of existing pavements and kerb and channel
    - Earthworks for levelling, drainage works, and foundation preparation including import and spreading of engineered fill (which is expected to comprise mostly low-silt gravels)
    - Spoil handling and stockpiling or removal.
- Construction of Burswood station:
    - Earthworks and foundation preparation
    - Preparation of pavements, site rehabilitation and landscaping.
- Construction of retaining walls
- Construction of bridges:
    - Earthworks and foundation preparation for piles, columns and crane pads
    - Retaining walls and engineered fill for MSE for abutments (approach embankments/ramps).

The proposed construction methodology for EB3C includes the following approaches that are relevant to the generation and mitigation of dust emissions:

- Security fencing will be constructed around each works area and compound, to provide a physical barrier between the works and public
- Wheel wash facilities will be provided at works areas where appropriate to minimise the track out of soil to local road.

- Erosion and sediment control measures will be implemented for the proposed EB3C works, as discussed in the Erosion and Sediment Control Technical Report and required to be included in the updated Project ESCP. Aspects of these measures are also beneficial for minimisation of potential for dust emissions. These measures will include:
    - Appropriate staging of the works, to ensure earthworks are carried out in a staged manner to limit the area of exposed earth open to the elements at any one point in time
    - Erosion protection by stabilisation of surfaces, including but not limited to geotextiles, aggregate stabilisation, hay mulching, grassing
    - Use of a "cut and cover" erosion and sediment control methodology wherever possible and practical. This method promotes progressively undertaking construction works, stripping topsoil and any unsuitable subsoils (to achieve suitable ground conditions) and then immediately backfilling with aggregate to the final required level
    - Use of stabilised construction entrance ways - either a sealed entrance or a stabilised pad of aggregate placed on a filter cloth base and located where construction traffic will exit or enter a construction site. Stabilised construction entranceways help to prevent site entry and exit points from becoming a source of sediment and also help to reduce dust generation and disturbance along public roads
    - No vehicles will be allowed to leave the construction site unless tyres are clean, so that construction vehicles will not contribute to sediment deposition on public road surfaces outside the works area.

- Earthworks will include the following measures:
    - Construction of the project will involve clearing of obstructions and vegetation and earthworks within the construction footprint
    - After de-construction operations, where possible existing house and business foundations and driveways will be uplifted and processed to create hardfill products and reused as temporary access routes. Topsoil will be salvaged, stockpiled and reused as part of landscaping operations
    - Existing soils will be cut and reused as general fill if suitable and where not appropriate for re-use, cut material will be removed offsite to an approved facility. Fill will comprise of recycled cut soils and materials as approved and imported soils and rock materials as designed. These works will be also governed by the measures required under the Contaminated Land Management Plan (CLMP)
    - Normal construction plant will be required for earthworks activities, including excavators, trucks, and compactors. Cut material to be removed from site will be loaded by excavators into trucks while imported fill will be delivered by trucks, spread out into layers by excavator or graders and compacted with rollers and compactors.

3.2.2 Construction compounds for EB3C

Two areas within the EB3C footprint have been identified as key construction compounds/project offices – these are at Burswood Esplanade Reserve and 242 Tī Rākau Drive. A description of the construction compounds and satellite offices is set out in Table 1. These two locations were selected after considering their proximity to the works, possible access routes to and from them and the distance away from residential areas to minimise noise and disruption to residents. Other smaller site facilities for worker welfare will also be set up as works progress along the alignment.

Table 1 Temporary site compounds for EB3C

Compound	Location	Compound specific activities	Approx. start date	Approx. duration of use
Compound 1 – Satellite Office / Carparking	Burswood Esplanade Reserve	Satellite office and transfer station for the construction of EB3C. Access will be off Burswood Drive. Temporary buildings (portacoms) will be installed on site for the duration of construction	Mid-late 2024	42 months
Compound 2 – Satellite Office / Carparking	242 Tī Rākau Drive ("Mobil")	Satellite office / lunchroom for the construction of Bridge A and Bridge B and western Civil works. Access will be off Tī Rākau Drive, utilising the existing driveway crossing as the entry point.	Mid-late 2024	42 months

Bulk deliveries of construction materials and the export of waste will predominantly be via one of the two construction laydown yards. Materials will be transferred between site specific locations and the construction compounds in trucks throughout the Project duration.

Relevant features of these areas include:

- The construction compounds and satellite areas may contain the following (or similar) activities commonly associated with construction:
    - Temporary site buildings – workers' facilities, site offices and meeting rooms
    - Plant and equipment maintenance facilities
    - Fuel storage and minor refuelling facilities
    - Material laydown areas including stockpiling of materials and spoil
    - 10ft, 20ft & 40ft material storage containers
    - Wheel washing and cleaning facilities
    - Lighting / fencing / security temporary mesh panels 1.8m high/ hoarding
    - Vehicle parking
    - Plant and equipment parking.
- In addition to these compounds, typical construction activities (such as stockpile, laydown and assembly areas, plant and equipment storage, amongst others) will occur throughout the construction footprint
- Site establishment activities for the construction compounds and satellite office areas will include site clearance, ground preparation and establishing erosion and sediment control measures prior to any construction activities occurring. Upon completion of the relevant works the construction compounds and satellite offices will be dis-established
- When materials are stored on site and/or in laydown yards, they are to be either stored in clearly marked 'bins' or stockpiles, stacked in an orderly fashion to a safe height and size, housed in secure and/or specialist containers/drip trays and covered and protected from the elements as specified by the manufacturer.

An indicative layout for the Burswood Esplanade Reserve Compound is shown in Figure 5.

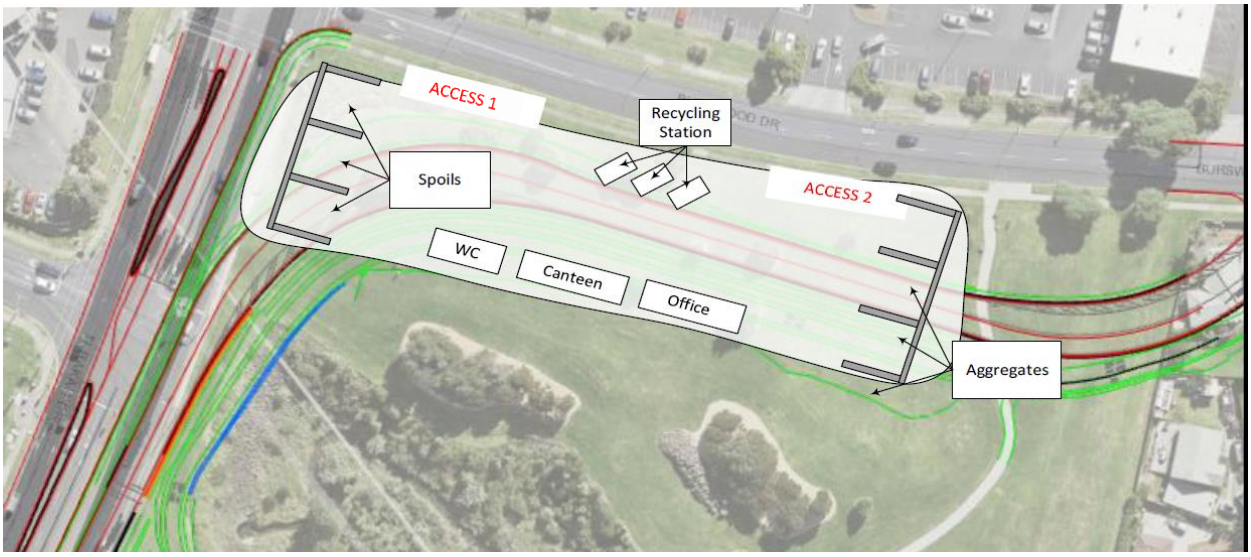

Figure 5. Burswood Esplanade Reserve compound indicative layout

The final construction compound and satellite office locations and activities may change depending on the final construction methodology and will be confirmed once properties are made available to the Project. The final location of construction compounds and satellite offices and the activities undertaken within each area will be confirmed in the proposed Construction Environment Management Plan (CEMP).

3.2.3 Construction of EB4L

EB4L begins south of the proposed signalized intersection in Tī Rākau Drive, extends south through Guys Reserve and Whaka Maumahara Reserve and ends at the intersection of Te Irirangi Drive and Botany Town Drive, including improvements to that intersection. The proposed busway through Guys Reserve and Whaka Maumahara Reserve includes a retaining wall along the western embankment (nearest Tī Rākau Road), then a bridge alongside The Hub retail precinct. It is estimated that works in Guys Reserve and Whaka Maumahara Reserve for EB4L will take approximately 24 months to complete.

The proposed construction works for EB4L involve the following specific works with potential for dust emissions:

- Modification of the EB4L intersection in Tī Rākau Drive
- Improvements to the Te Irirangi Drive/Botany Town Drive intersection
- Segregated two-way busway through Guys Reserve and Whaka Maumahara Reserve
- Bridge with two abutments (each abutment has two piles) and 14 piers. The total length of the bridge is approximately 350 metres
- A retaining wall along the west embankment which will be filled to create a flat space for the busway. The retaining wall will be approximately 90 metres in length with a maximum height of 3.5 metres
- New walking and cycling path on the southern boundary of the Reserve, which may include minor retaining walls
- Other ancillary works required for the construction including site clearance, drainage, road pavements, traffic islands, kerb/channel, barriers, and site offices and laydown areas.

To facilitate the construction of the EB4L busway, a temporary access track will be required to provide personnel and machinery with access to the site. One potential route for this track is illustrated in Figure

6. The access track will likely involve the construction of a temporary embankment and some retaining walls, the exact design of which will be determined through detailed planning. The access track is expected to be built progressively over a 6-month period, comprise approximately 17,000 cubic meters of fill, and will be finished with a low-silt hardstand compacted surface. Once the link road is completed, the temporary works will be removed from above ground level, and the affected area will be remediated.

3.2.4 Construction compounds for EB4L

Two temporary site compounds will be provided within the proposed designation footprint. The main construction laydown area will be established within Guys Reserve, adjacent to Tī Rākau Drive and 47C Huntington Drive. A second laydown area will be established in Whaka Maumahara Reserve between the existing stormwater pond and Te Irirangi Drive. Construction access will also be gained from Te Koha Road near the Vehicle Testing New Zealand Ltd (VTNZ) vehicle inspection premise.

The construction compounds will contain a range of activities typically associated with construction, such as

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

Indicative layouts for the two compounds are shown in Figure 7 and Figure 8. The final location of construction compounds and the activities undertaken within each area will be confirmed in the CEMP.

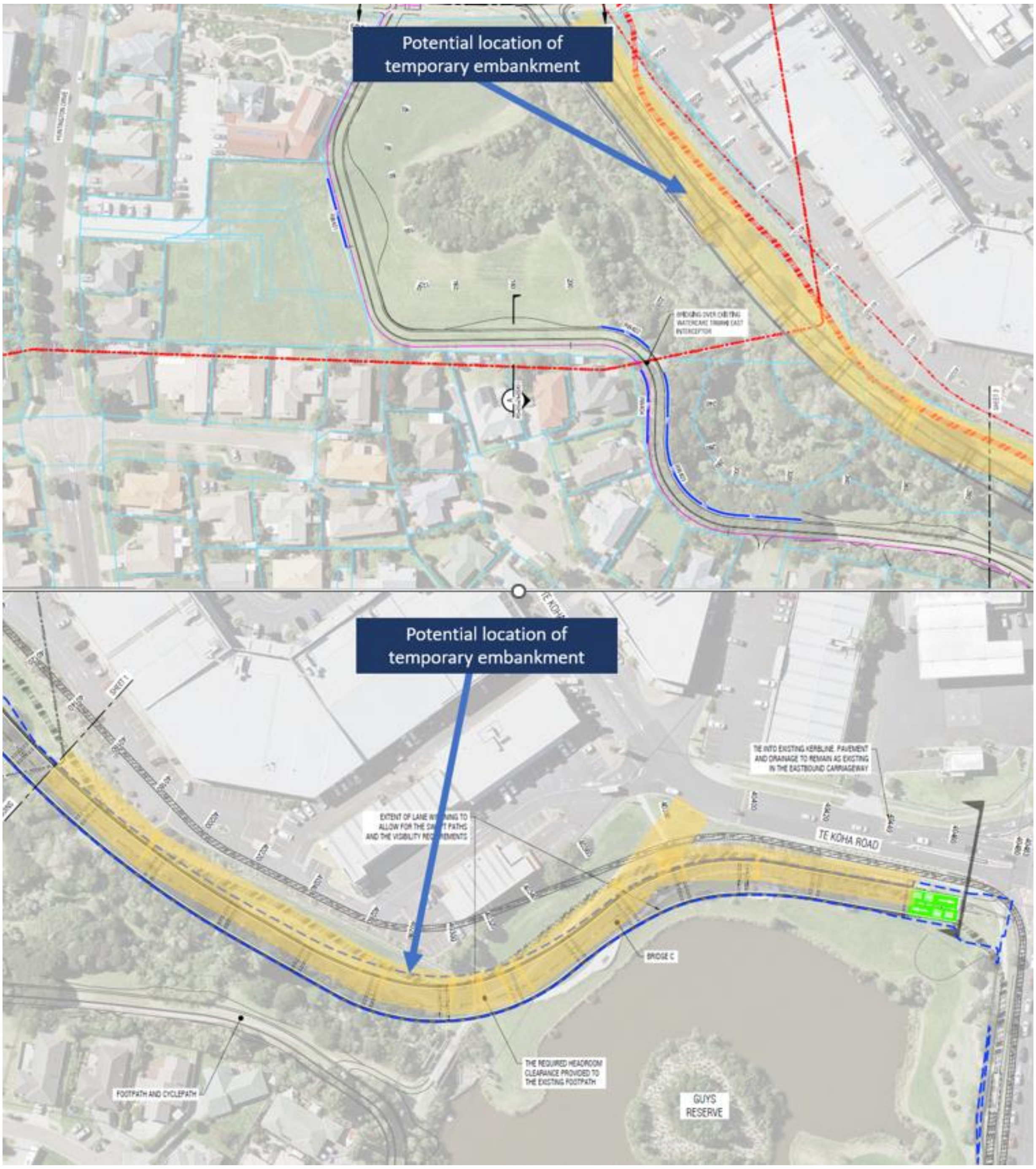

Figure 6. Potential location of the temporary access track for construction of EB4L busway. Upper image – western half of EB4L, lower image – eastern half of EB4L

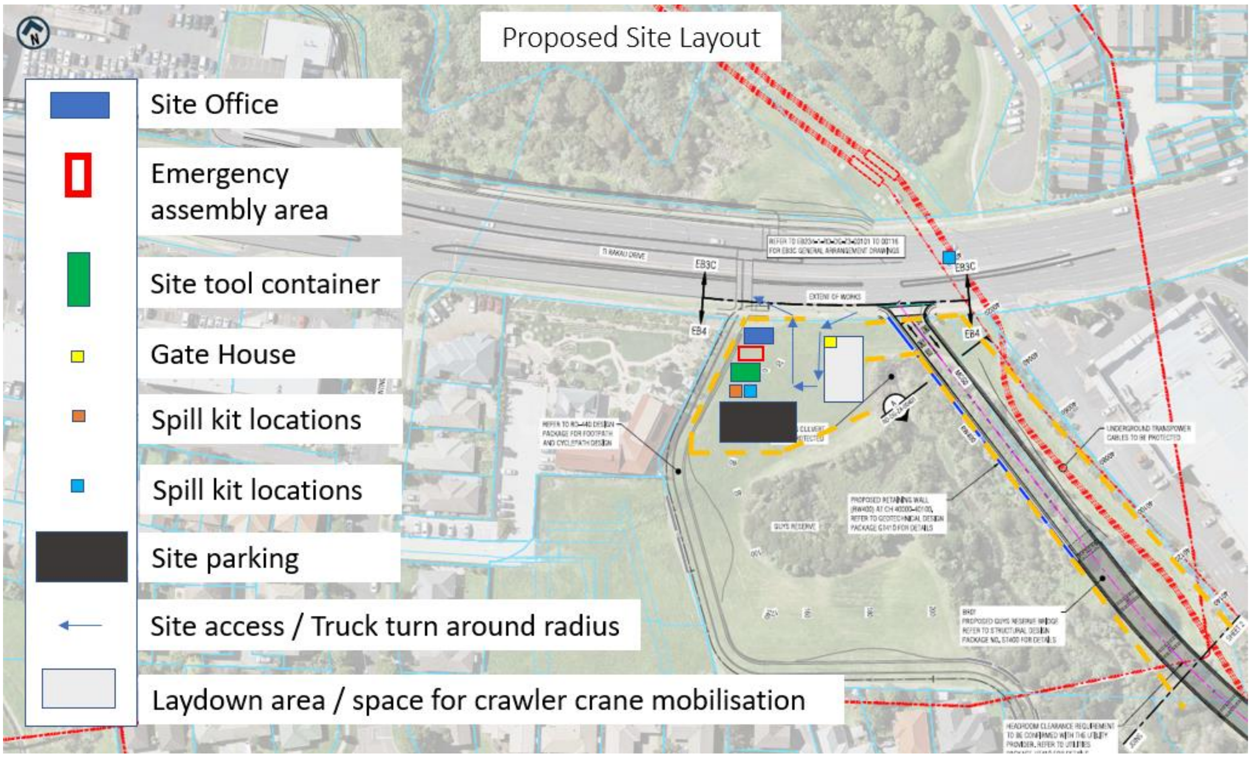

Figure 7. Indicative potential layout of EB4L construction compound near Tī Rākau Drive

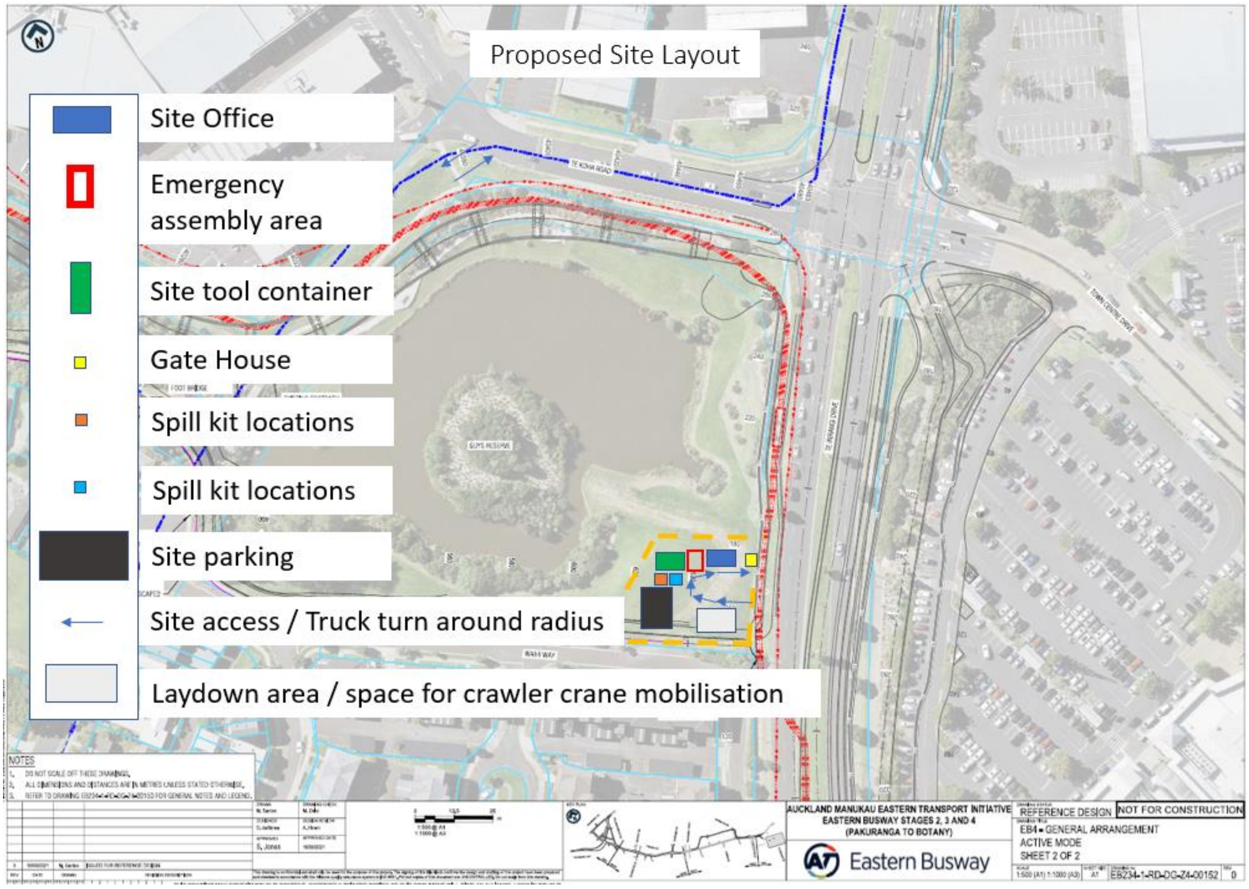

Figure 8. Indicative potential layout of EB4L construction compound near Te Irirangi Dr

3.3 Reasons for Consent

Consent matters are set out in the EB3C and EB4L AEE. Consent matters relevant to this assessment relate to air discharges from construction-generated dust.

3.4 Assessment Matters

3.4.1 National Environmental Standards for Air Quality

The Ministry for the Environment (MfE) promulgated the National Environmental Standards for Air Quality (NES-AQ) as regulations under the RMA on 6 September 2004 and amended it on 1 June 2011.

The NES-AQ applies standards to five air pollutants: fine particulate (expressed as PM_{10}, see Section 4.1.2 for definitions), carbon monoxide (CO), nitrogen dioxide (NO_2), sulphur dioxide (SO_2) and ozone (O_3). The NES-AQ also places restrictions on home heating appliances and hazardous waste combustion, but these are not relevant to this assessment.

Whilst vehicles using the roads within the EB3C and EB4L sections of the Project discharge pollutants to air due to engine exhausts which are covered by the NES-AQ, details of concentration values and averaging periods within the NES-AQ are not relevant because of the qualitative assessment approach adopted for operational impacts in this assessment.

3.4.2 Auckland Council Unitary Plan Operative (AUP(OP))

3.4.2.1 Chapter E12 (Land Disturbance – District)

Chapter E12 (Land disturbance – District) of the AUP(OP) is relevant to the air quality assessment. Earthworks of the proposed scale would ordinarily require resource consent as a restricted discretionary activity under Table E12.4.1 of the AUP(OP), however in this case consent is not being sought for EB3C or EB4L because the proposed activities are within the scope of the Notices of Requirement being sought for the Project.

3.4.2.2 Chapter E14 (Air Quality) Rules

The air quality rules in Chapter E14 (Air Quality) of the AUP(OP) applicable to the proposed works for EB3C and EB4L during construction or operation are summarised in Table 2. These activities have a permitted activity status, although activities covered by rules A82 and A83 are required to meet a list of conditions known as “permitted activity standards”, otherwise the rule defaults to a restricted discretionary status. The permitted activity standards are defined in Chapter E14.6.1 of the AUP(OP) and include the following relevant standards:

(1) The discharge must not cause, or be likely to cause, adverse effects on human health, property or ecosystems beyond the boundary of the premises where the activity takes place

(2) The discharge must not cause noxious, dangerous, offensive or objectionable odour, dust, particulate, smoke or ash beyond the boundary of the premises where the activity takes place

(3) There must be no dangerous, offensive or objectionable visible emissions.

Table 2 Applicable air quality rules in AUP(OP) Chapter E14 (Air Quality)

Rule	Type of activity covered by the rule	Activities in the Project	Is the activity required to meet permitted activity standards?	Status of activity if the permitted activity standards are not met
A82	Demolition of buildings	Demolition of buildings	Yes	Restricted discretionary
A83	Earthworks and the construction, maintenance and repair of public roads and railways	Earthworks and Project construction	Yes	Restricted discretionary
A114	Discharges to air from the engines of motor vehicles, or from aircraft, trains, vessels (including boats) and mobile sources not otherwise specified (such as lawnmowers), including those on industrial or trade premises (excluding tunnels)	Vehicles, heavy machinery and temporary generators used during construction Vehicles using the roads comprising EB2 and EB3R during operation	No	Not applicable

The chapter also notes that:

> *"when making a determination of adverse effects in relation to odour and dust, the FIDOL factors (frequency, intensity, duration, offensiveness and location) should be used. The use of the FIDOL factors provides a framework for making an objective and consistent assessment in relation to the degree of effects. The nature of the zone, predominant types of activities within any given area and amenity provisions for each zone, precinct or overlay will be taken into account when undertaking the assessment of effects on the environment."*

The FIDOL factors are also identified in the MfE publication "Good Practice Guide for Assessing and Managing Dust", herein referred to as the "GPG Dust" (MfE, 2016). Further discussion on the FIDOL factors is provided in Section 4.2.1.3.

4 Methodology and Analysis

Chapter Summary
• *Particles (dust) will be the key pollutant generated and emitted into air during construction of the Project. These emissions will occur from a variety of sources and activities. Dust emitted into the air causes potential nuisance and amenity impacts and presents a risk of causing a range of impacts to human health and the environment. The focus of the assessment for air quality construction impacts is on avoiding or mitigating potential nuisance and amenity impacts from dust emissions, as the GPG Dust states that this will also mitigate the potential for adverse impacts to human health during construction* • *For construction dust impacts, the DRI approach recommended in the Waka Kotahi Guide has been used. The DRI method enables the risk of offensive or objectionable dust nuisance to be classified as low, medium or high at various sensitive receptor locations based on attributes of the existing environment and nearby construction activities* • *For operational impacts, the potential impact on ambient air quality due to Project operation will be assessed qualitatively, by considering the projected traffic volumes and pollutant emission factors for vehicles using the roads with and without the Project*

4.1 Methodology for Assessment

4.1.1 Construction Impacts

The assessment of potential impacts during construction involved the following:

- Review of the Project description and construction information
- Review of planning zone maps and aerial photographs to identify receptors that are potentially sensitive to air quality discharges from the Project
- Analysis of representative meteorological data to contextualise the risk of downwind receptors being exposed to air pollutants from the Project during construction
- Identification of potential air quality effects from discharges associated with construction of each element along the Project alignment and recommendation of appropriate mitigation measures to minimise the risk of air quality impacts to sensitive receptors.

4.1.2 Operational Impacts

The ambient air quality at sensitive receptors near the existing roads within the EB3C and EB4L footprints is a combination of background air quality and existing vehicle exhaust pollutants. Vehicle emissions will continue to be present on the local roads with or without the implementation of the Project.

New Zealand's database of vehicle emissions is Auckland Council's and Waka Kotahi's Vehicle Emission Prediction Model (VEPM). The VEPM is updated regularly in response to changes to vehicle emission standards and testing data, the composition and age of the New Zealand vehicle fleet, changes to vehicle emission reduction usage such as catalytic converters, and government policy changes. The latest version of VEPM, version 6.3, was released in early 2022 (Metcalfe J & Peeters S, 2022).

In each update to the VEPM, the emission factors fluctuate slightly, either increasing or decreasing from version to version. Consistently, the VEPM forecasts large reductions in vehicle emission factors from current year until 2050 which would offset increases in traffic flows. This reduction in vehicle emissions is likely to be even larger when the government's current policy for electric vehicle usage is incorporated into the model.

A qualitative assessment of the potential impact on ambient air quality due to Project operation was conducted by considering the projected traffic volumes and pollutant emission factors for vehicles using the roads with and without the Project. These potential operational air quality effects are addressed at section 6.2 of this report. Following this qualitative assessment, no further detailed assessment was necessary.

4.2 Review of Potential Pollutants

Air quality impacts can include impacts on human health (such as concentrations of respirable airborne pollutants) and impacts on amenity (such as dust deposition or odour).

4.2.1 Particulate Matter / Dust

4.2.1.1 Sources

The key air pollutant relevant to construction of the project is particulate matter. Particulate matter in the atmosphere refers to a range of particle types and sizes. The particles may be emitted from natural sources such as windblown dust, sea spray and pollens; or from anthropogenic sources such as combustion of fuels, power generation, industrial activities, excavation works, unpaved roads, and the crushing and handling of materials.

Particles will be the key pollutant generated and emitted into air during construction of the project. These emissions will occur from a variety of sources and activities including:

- Mechanical disturbance of soil material (bulldozing, scraping, digging)
- Excavation, handling and stockpiling of spoil
- Demolition of existing structures
- Formation of access tracks
- Construction of foundations
- Construction of retaining walls and engineered fill
- Movement of plant and equipment across exposed, unsealed ground
- Driving trucks and light vehicles on unsealed roads
- Wind erosion of uncovered stockpiles of spoil, topsoil and/or construction and demolition materials
- High wind speeds moving across unsealed surfaces
- Vehicle and generator exhaust fumes.

Another potential dust source during construction is track-out - vehicles leaving construction sites and spreading dirt on roads around the construction site, which is then dried and crushed by ongoing wheel movements and eventually entrained in air eddies and dispersed. However, this dust source is small for the Project as all site exits will have wheel wash facilities if necessary so that construction vehicles will not contribute to sediment deposition on public road surfaces outside the works area. The ESCP will include tasks for regular inspection and cleaning of exits and local roads to monitor this (see also Section 7.2.2).

4.2.1.2 Potential Health Effects

Dust emitted into the air presents a risk of causing a range of impacts to human health and the environment. Dust can impact human respiratory and cardiovascular health and ecosystem health. In addition, dust can cause nuisance and amenity issues through soiling of surfaces.

The health effects of particles are strongly influenced by the size of the particles. Particulates are therefore classified according to their size. Particulate matter includes total suspended particulates (TSP), which can be considered as anything smaller than 100 micrometres (µm) in diameter. In practice, the large particles (i.e. greater than 20-30 µm) do not last long in the atmosphere, as they tend to fall out rapidly and settle. Particles deposited on a surface will only become individually visible at about 50 µm (MfE, 2016).

When dust particles are released into the air, they tend to fall back to ground at a rate proportional to their size. This is called the settling velocity. For a particle 10 µm in diameter, the settling velocity is about 0.5 cm/sec, while for a particle 100 µm in diameter it is about 45 cm/sec in still air. In a 10-knot wind (5 m/sec), the 100 µm particles would only be blown about 10 metres away from the source while the 10 µm particles have the potential to travel about a kilometre. Fine particles can therefore be widely dispersed, while the larger particles simply settle out in the immediate vicinity of the source.

Two size categories for fine particles are recognised internationally as having the greatest potential to cause health problems due to their inhalation potential:

- PM_{10} (particles with an equivalent aerodynamic diameter of 10 µm or less): these particles are small enough to pass through the throat and nose and enter the lungs. Once inhaled, these particles can affect the heart and lungs and cause serious health effects
- $PM_{2.5}$ (particles with an equivalent aerodynamic diameter of 2.5 µm or less): these particles are so small they can get deep into the lungs and into the bloodstream. The PM_{10} category includes the $PM_{2.5}$ size range.

By way of comparison, a human hair is about 100 µm in width, so roughly 40 particles of diameter 2.5 µm could be placed on its width.

4.2.1.3 Potential Amenity Effects

Typical nuisance and amenity issues caused by dust may include visible dust suspended in the air outside the construction site, and the settling of dust on surfaces such as parked cars, windows or laundry.

Assessing the environmental effects of dust can be difficult given the subjective nature of these effects. People may be annoyed by dust fallout on their property, and some may find it objectionable or offensive.

The GPG Dust guide provides information on how to assess and manage dust emissions from sources such as quarrying, aggregate crushing, abrasive blasting, sealed and unsealed surfaces, and material stockpiles.

The GPG Dust states that nuisance effects of dust emissions are influenced by the nature of the source, sensitivity of the receiving environment and on individual perception. For example, the level of tolerance to dust deposition can vary considerably between individuals. Individual responses can also be affected by the perceived value of the activity producing the dust. For example, people living in rural areas may have a high level of tolerance for the dust produced by activities such as ploughing or top-dressing, but a lower tolerance level for dust from quarries.

The GPG Dust refers to a group of factors known collectively as the "FIDOL" factors to characterise the potential for nuisance dust to cause an offensive or objectionable effect. These FIDOL factors are also widely used in assessing odour nuisance risk. Whether a dust event has an objectionable or offensive effect depends on the frequency (F), intensity (I), duration (D), offensiveness/character (O) and location (L) of the dust event. These FIDOL factors are described in

.

Table 3 Description of the FIDOL Factors for Nuisance Dust (from MfE (2016))

Factor	Description
Frequency	How often an individual is exposed to the dust
Intensity	The concentration of the dust
Duration	The length of exposure
Offensiveness/character	The type of dust
Location	The type of land use and nature of human activities in the vicinity of the dust source.

Different combinations of these factors can result in adverse effects. Location is particularly important as this relates to sensitivity of the receiving environment.

Depending on the severity of the dust event, one single occurrence may be sufficient to consider that an adverse effect has occurred. In other situations, the event may be short enough, and the impact on neighbours sufficiently small, that the events would need to be happening more frequently for an adverse effect to be deemed to have occurred.

4.2.1.4 Focus of this Assessment

The GPG Dust states that management and control of larger dust size fractions (i.e., deposited dust and TSP) will, at the same time, manage and control smaller size fractions (i.e., PM_{10} and $PM_{2.5}$). The guide states that this is supported by case studies that repeatedly show that effective control of visible dust helps maintain ambient levels of PM_{10} below the NES-AQ levels. In particular, the GPG Dust cites a case study of dust management in Ngāpuna (Rotorua) where the Bay of Plenty Regional Council developed a Dust Reduction Operational Plan for the area after high concentrations of PM_{10} were recorded at the Ngāpuna monitoring site which were thought to be associated with dust emissions from area. Following implementation of the plan, no further breaches of PM_{10} standards were recorded at the monitoring site (from November 2011 until at least the time of publication of the GPG Dust in 2016).

Therefore, the focus of the assessment for air quality construction impacts is on avoiding, remedying or mitigating potential nuisance and amenity impacts from dust emissions.

4.2.2 Products of Combustion

The operation of trucks and heavy machinery during construction activities, and the use of mobile generators for power supply where needed, are activities that discharge products of diesel or fuel oil combustion into the air that are potential air quality pollutants. These potential pollutants include nitrogen oxides, nitrogen dioxide, carbon monoxide, sulphur dioxide, and fine particulates.

These same potential pollutants are also discharged to air by vehicles powered by fossil fuel combustion using the roads and Busway after the project becomes operational. Therefore, these emissions from the Project are negligible in a regional context when compared to regular emissions from Auckland's vehicle fleet using roads around the Project. In addition, there are no confined spaces where this machinery will operate meaning that any emissions will disperse rapidly once discharged into the air. Therefore, no further assessment of potential impacts from emissions of combustion-derived pollutants is necessary.

4.2.3 Odour

Odour is a known chemical or a mixture of chemicals that interact to produce a smell (that can be either pleasant or unpleasant).

Current and historical land uses can potentially leave a legacy of contamination. During excavation and earthworks activities, contaminated soil, rock and groundwater can be encountered, giving rise to odour and fumes which may affect amenity. Odour can also be emitted from soils containing naturally occurring chemicals, such as sulphides that when exposed to the air produce an unpleasant gas (hydrogen sulphide).

The potential for disturbance of such soils has been considered in the Contaminated Land Effects Assessment. That report concluded that there is a potential for disturbance of contaminated soils and groundwater during construction of EB3C and EB4L that could release contaminants, dust and odour to air. However, any effects can be appropriately managed via the CLMP used in conjunction with the CEMP and the ESCP. The CLMP will include specific management procedures developed for construction earthworks to manage dust and odour, and contingency measures in the event of accidental or unexpected discovery of odours.

As no potentially relevant odour sources have been identified for the Project, no further assessment of potential impacts from odour is provided in this report.

4.3 Definition of Significance Criteria

The significance of air quality impact assessment results is dictated largely by the magnitude and severity of the predicted impacts. The categories for gauging severity in this assessment are described in Table 4. For dust, the relevant air quality criteria are taken to be the permitted activity standards (2) and (3) in Chapter A14.6.1 of the AUP(OP) as introduced in Section 3.4.2.2.

The categories include consideration of both cumulative impacts and incremental impacts which are defined as follows:

- Cumulative impact: The combined impact from EB3C/EB4L-related emissions plus other Project sections (EB2, EB3R) and existing/background air quality

- Incremental impact: The impact from EB3C/EB4L-related emissions alone without considering other Project sections or existing/background air quality.

Table 4 Air Quality Impact Significance Criteria

Impact severity	Description	Comments
Beneficial	Reduction in incremental or cumulative air quality impacts at local scale for parameter ‘x’.	• Changes to cumulative air quality are likely to be measurable • Targeted off-site instrumental monitoring of key air pollutants is not required
Very low	Negligible cumulative air quality impacts at local scale determined by assessment parameter ‘x’. No detectable change in environment amenity values due to settling dust at sensitive receptors.	• Changes to cumulative air quality are likely to be undetectable or only just detected • Targeted off-site instrumental monitoring of key air pollutants is not required
Low	Small air quality impacts at local scale. Short term, reversible changes to local environment amenity values due to settling dust at sensitive receptors.	• Incremental impacts may be higher than the “very low” severity rating, but cumulative impacts are well below the relevant air quality criteria • Targeted off-site instrumental monitoring of key air pollutants is unlikely to be required
Medium	Small risk of cumulative air quality impacts exceeding relevant air quality criteria for discrete (sensitive) receptors. Long term but limited changes to local environment amenity values due to settling dust at sensitive receptors.	• The Project has a detrimental effect on air quality, but small risk of exceeding relevant air quality criteria at sensitive receptors • Targeted off-site instrumental monitoring of key air pollutants may be required, depending on specific locations and magnitudes of impacts that are likely
High	Cumulative air quality impacts at local scale determined by assessment parameter ‘x’ approximately greater than or equal to 100 per cent of relevant air quality criteria for discrete (sensitive) receptors. Long term, major changes to local environment amenity values due to settling dust at sensitive receptors.	• Exceedances of relevant air quality criteria as a result of Project • Ongoing off-site instrumental monitoring, reporting and air quality studies would be necessary to quantify and minimise impacts
Very high	Major cumulative air quality impact on a regional scale determined by assessment parameter ‘x’ being well in excess of 100% of relevant air quality criteria for discrete (sensitive) receptors. Irreversible, major changes resulting in widespread risks to environmental amenity values due to settling dust at sensitive receptors.	• Large exceedances of relevant air quality criteria as a result of Project • Risk assessment includes consideration of existing air quality – i.e. cumulative impact • Ongoing off-site instrumental monitoring, reporting and regular air quality studies would be necessary to quantify and minimise impacts

4.4 Dust Risk Index Method for Construction Dust Impact Assessment

The Waka Kotahi Guide provides a method of classifying the construction air quality risk as low, medium or high, by calculating a Dust Risk Index (DRI). The DRI generates a number that identifies the risk of dust generation during construction. The greater the DRI, the higher the likelihood of dust related issues.

The DRI is calculated using the following formula:

$$DRI = (E+P+T+WS+D+A) \times M \times WD$$

Where:

E = surface exposure	D = distance to nearest receiver
P = exposure period	A = construction activity
T = time of year	M = mitigation
WS = wind speed	WD = wind direction

The assignment of values to each of these factors depends on site-specific attributes and is described in detail in the Waka Kotahi Guide.

Once the DRI has been calculated for a particular location, it needs to be assigned to a risk value using the classifications in Table 12 of the Waka Kotahi Guide (reproduced in Table 5). Management Plan recommendations in the Waka Kotahi Guide arising from the dust risk assessment are also summarised in Table 5.

For this Project, instead of a separate Construction Air Quality Management Plan (CAQMP), specific measures for dust mitigation and management are included within a section of the ESCP required by consent conditions because of the extent of overlap between the dust management and erosion and sediment control management. Equivalent measures for any high air quality risks are proposed to be incorporated through the required ESCP and site-specific ESCPs.

The DRI method will be used to evaluate dust impact risks for various sensitive receivers close to the EB3C and EB4L sections of the Project.

Table 5 Relationship between DRI and dust risk, from Waka Kotahi (2019)

DRI Value	Risk	Implication
0 to 100	Low	Construction impacts will most likely be able to be managed by generic dust and odour clauses within a construction environmental and social management plan
100 to 200	Medium	A separate CAQMP should be prepared
200 to 300	High	A separate CAQMP should be prepared. In addition, the CAQMP will require independent peer review and include a comprehensive risk-based quality assurance/quality control programme to ensure risks are appropriately managed

5 Existing Environment

Chapter Summary
• *Land neighbouring the EB3C section of the Project is zoned and characterised by urban residential land uses to the north and light industrial land uses to the south, with some open space zones at the eastern end of the alignment* • *Land neighbouring the EB4L section of the Project is zoned and characterised by urban residential land uses to the south and west, and business land uses to the north and east of the alignment* • *Sensitive receivers are located close to the proposed work areas and permanent Project elements such as the bridges and busway road verges* • *Wind directions are prevalent from the southwest for all wind speeds, and particularly dominant from this sector for higher hourly-average wind speeds. The next most prevalent wind direction is from the northeast. Winds from the northwest and southeast sectors are uncommon* • *Low wind speeds can arise from any direction, but tend to be more frequent from the north or northeast, and the south or southwest* • *Ground elevations are slightly variable over the EB3C section of the Project, and the EB4L section traverses Guys Reserve which comprises a gully. However, the topographical features are not considered to be significant in the context of potential impacts of air emissions from the Project.*

5.1 Sensitive Receptors

Sensitive land uses that can be present in urban areas that may be relevant to the air quality assessment for the Project include:

- Residential dwellings
- Assisted-living centres
- Childcare centres
- Hospitals and medical centres
- Schools, Colleges and University Campuses
- Community facilities – halls, gyms, churches
- Outdoor exercise and recreational facilities
- Retail – particularly in high density retail strips and open malls
- Food preparation outlets, cafes and restaurants.

This list is not exhaustive but indicates the types of land uses that are potentially sensitive to airborne or settleable particulate matter and other ambient air quality pollutants.

Whether these presence types of land uses are close to the construction sites for each Project element was identified through review of a range of data sources including:

- Planning zone maps
- Site visit (conducted 16 May 2023)
- Aerial photographs from both Google Earth and the project Graphical Information System (GIS)
- Google Street View images, accessed through Google Earth
- List of social infrastructure provided in the Social Impact Assessment for the Project.

Figure 9 shows the planning zones around the EB3C boundaries. The neighbouring zones are characterised by urban residential land uses to the north and light industrial land uses to the south, with some open space zones at the eastern end of the alignment.

Figure 10 shows the planning zones around the EB4L boundaries. The neighbouring zones are characterised by residential land uses to the south and west of the alignment, and business zone land uses to the north and east of the alignment.

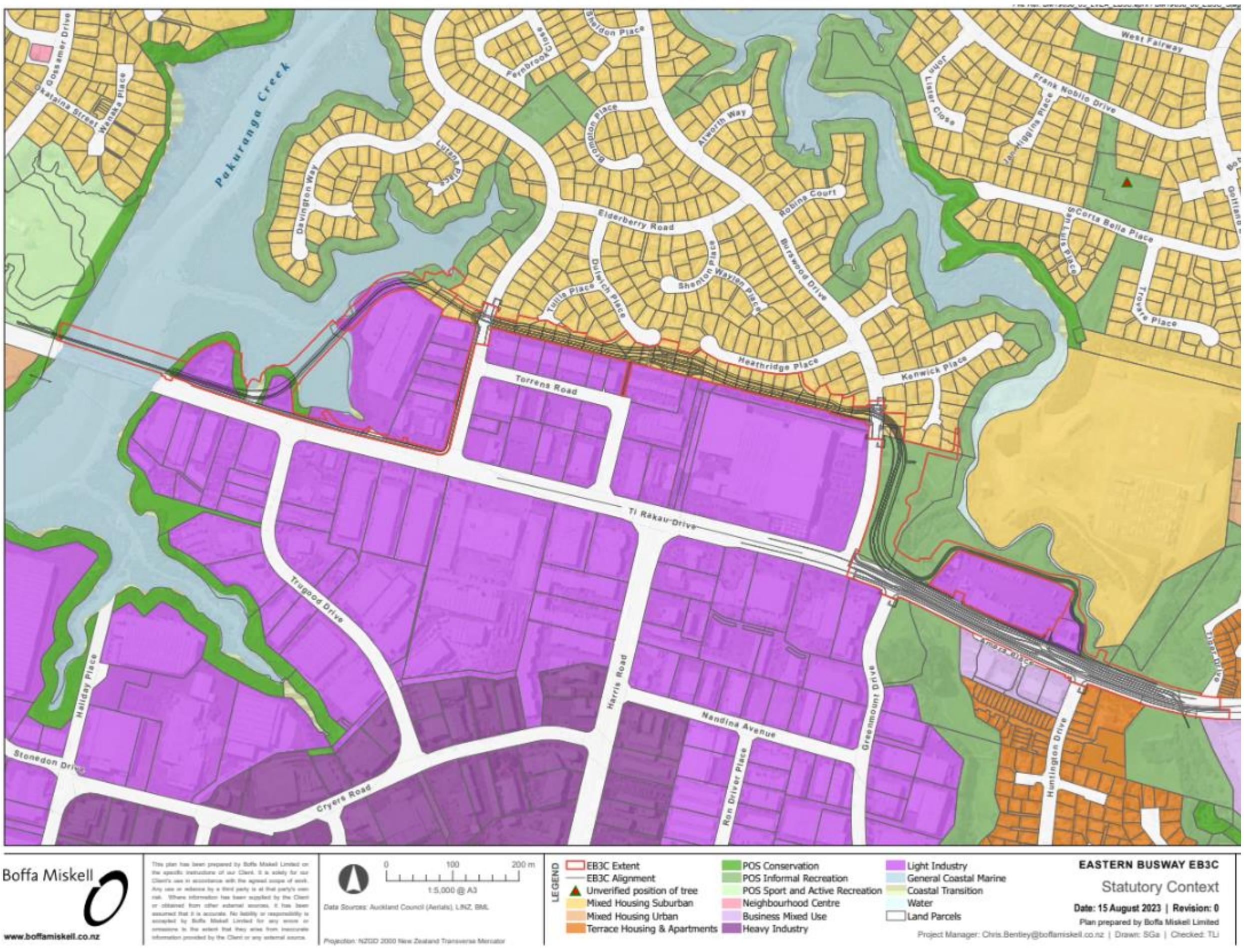

Figure 9. AUP(OP) Planning zones around EB3C section of Project, and indicative construction boundaries.

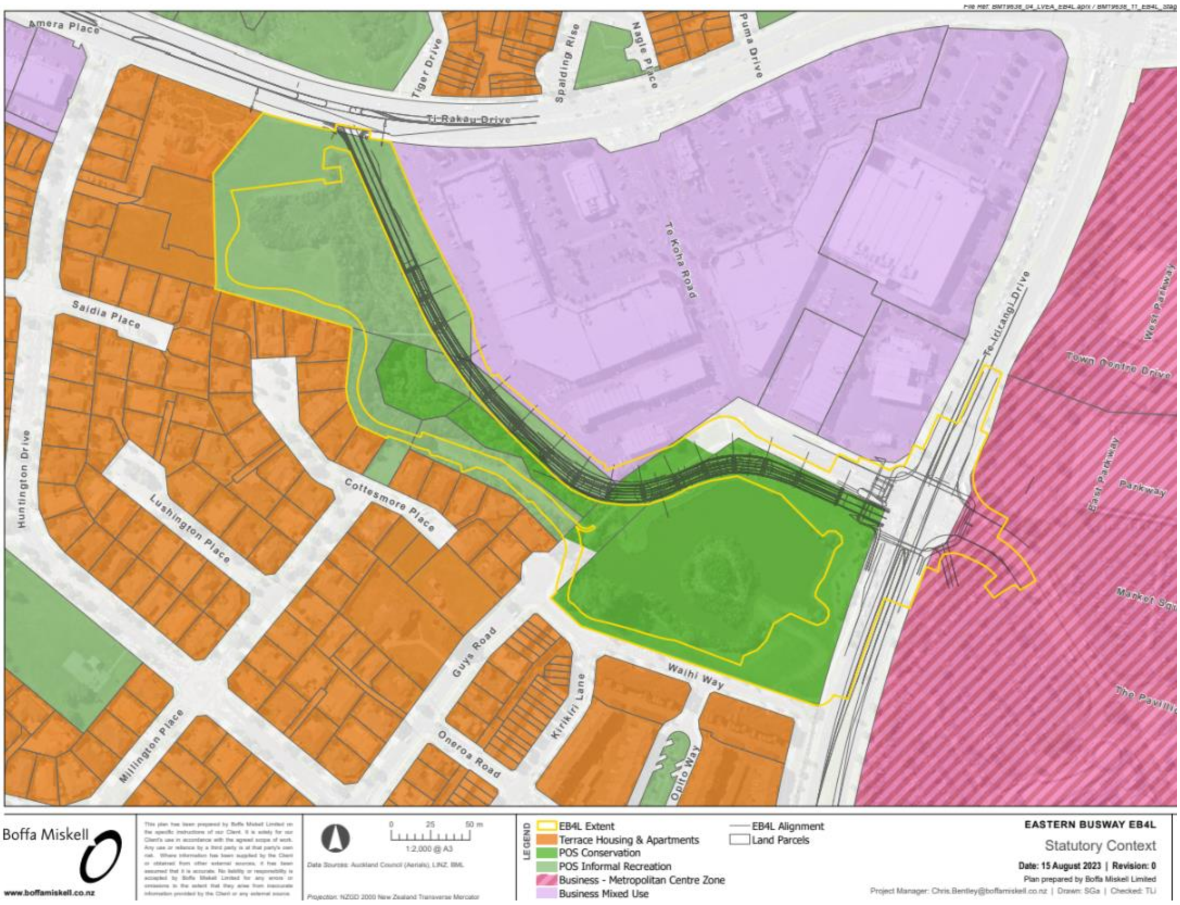

Figure 10. AUP(OP) Planning zones around EB4L section of Project, and indicative construction boundaries

5.2 Meteorology

5.2.1 Role in Impact Assessment

Meteorological conditions are important for determining the direction and rate at which emissions from a source would disperse. For dust emissions from construction activities such as those likely during construction of EB3C and EB4L, high wind speed conditions are important. The critical wind speed for pickup of dust from surfaces is 5 m/s (18 km/h), and above 10 m/s (36 km/h) pickup increases rapidly (AWMA, 2000). Higher wind speeds also increase dust release during handling/movement of dusty materials (such as loading spoil onto a truck using a front-end loader).

Low wind speeds during construction are also important as under such conditions the rate of dispersion of any released dust is slowest. During operation, low wind speeds are also a factor as the rate of dispersion of vehicle exhaust emissions is also slowest during such times.

5.2.2 Data Sources

The nearest relevant meteorological monitoring sites to the Project alignment were operated by Auckland Regional Council and then Auckland Council from 2002 to mid-2017 at Pakūranga and Penrose. The location of these two automatic weather stations (AWS) are shown on Figure 11. Both sites are sufficiently close to the Project to be assessed as representative of meteorological conditions in the vicinity of EB3C and EB4L for the purpose of this air quality assessment.

Data for hourly average wind speed and direction, and hourly wind gust speeds, was downloaded from the National Climate Database (https://cliflo.niwa.co.nz) for these two AWS.

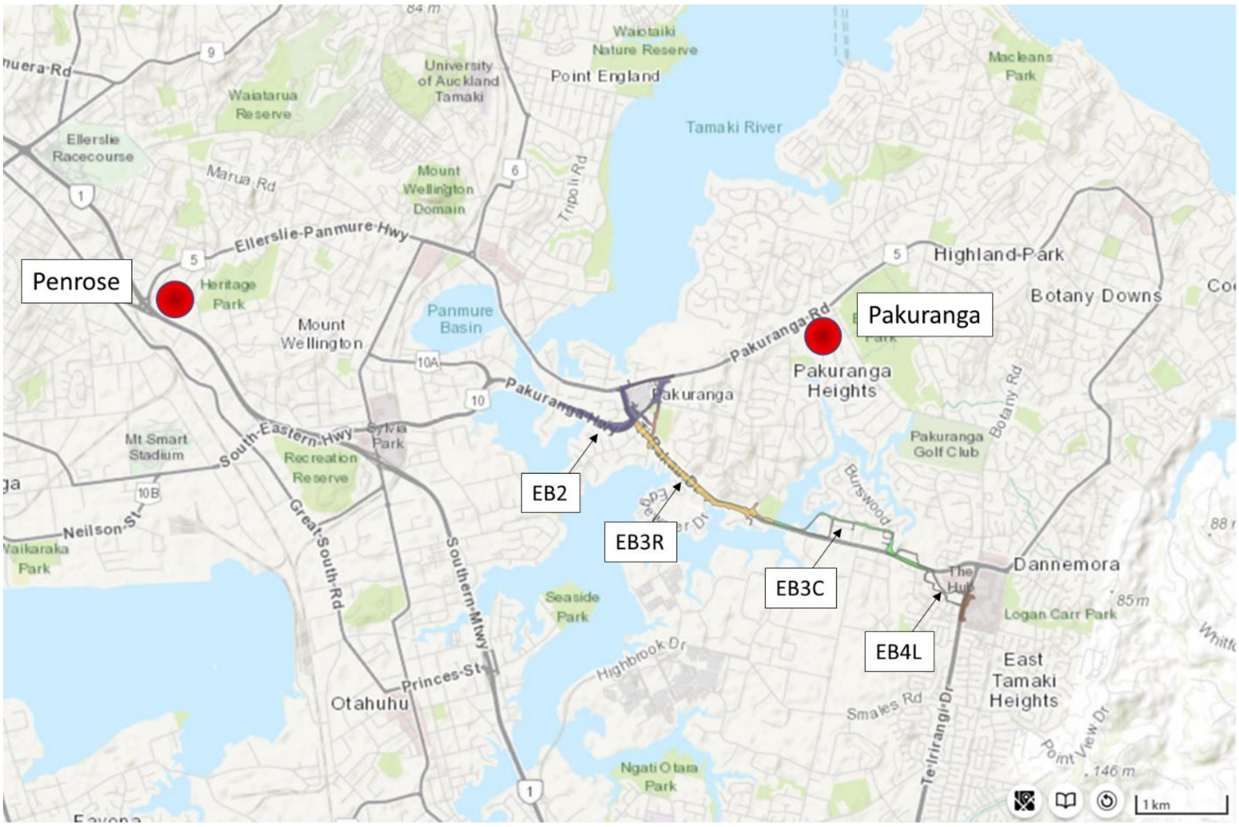

Figure 11. Meteorological monitoring station locations at Penrose and Pakūranga operated by Auckland Regional Council/Auckland Council, 2002-2016, near the Project.

5.2.3 Wind Frequency Distributions

Windroses showing the distribution of hourly-averaged wind speeds and directions over all hours of the day and all hours of the year are shown in Figure 12 and Figure 13 for the Pakūranga and Penrose AWS. The hourly-averaged wind speed distribution statistics for each AWS are summarised in

Table 6.

Table 6 Hourly-average wind speed distributions for Pakūranga and Penrose AWS, January 2002 – December 2016

Wind speed category	Pakūranga	Penrose
	Percentage of Hourly-Average Records Less Than Category	
<3.6 km/h (<1 m/s)	46.2%	19.1%
3.6-10.8 km/h (1-3 m/s)	43.9%	51.1%
10.8-18 km/h (3-5 m/s)	9.1%	25.6%
18-28.8 km/h (5-8 m/s)	0.7%	4.1%
28.8-36 km/h (8-10 m/s)	0.0%	0.1%
	Percentage of Hourly-Average Records Greater Than Category	
≥18 km/h (≥5 m/s)	0.8%	4.2%
≥28.8 km/h (≥8 m/s)	0.1%	0.1%
≥36 km/h (≥10 m/s)	0.0%	0.0%

The Pakūranga AWS site shows a greater percentage of lower wind speeds than the Penrose site. This may be due to the Pakūranga AWS being less exposed to wind than the Penrose site or some other difference in measurement methodology.

Despite the difference in wind speed distributions between the two sites, both AWS show a prevalence of winds from the southwest for all wind speeds, and winds are particularly dominant from this sector for higher hourly-average wind speeds. The next most prevalent wind direction is from the northeast, although this is much less dominant than winds from the southwest. Winds from the northwest and southeast sectors are uncommon. Low wind speeds can arise from any direction but tend to be more frequent from the north or northeast, and the south or southwest.

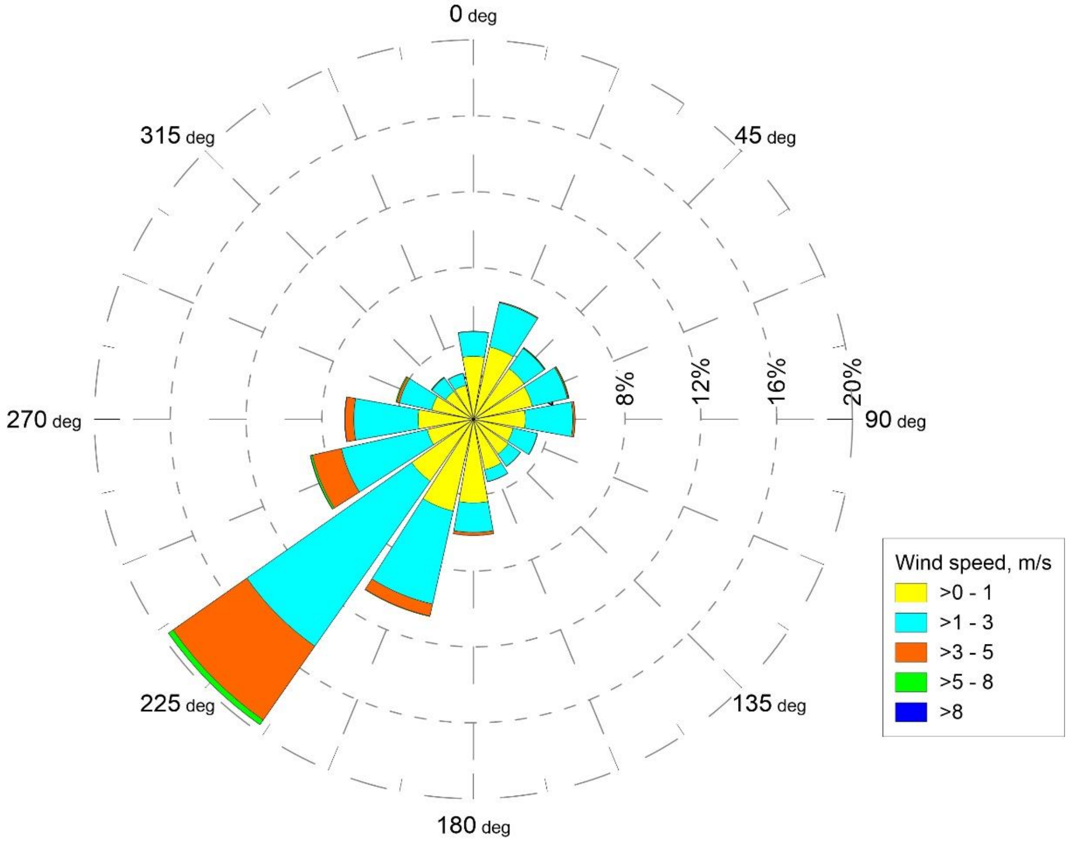

Figure 12. Windrose for Pakūranga AWS showing hourly-average wind speed and direction for all hours, January 2002 – December 2016; data source – https://cliflo.niwa.co.nz.

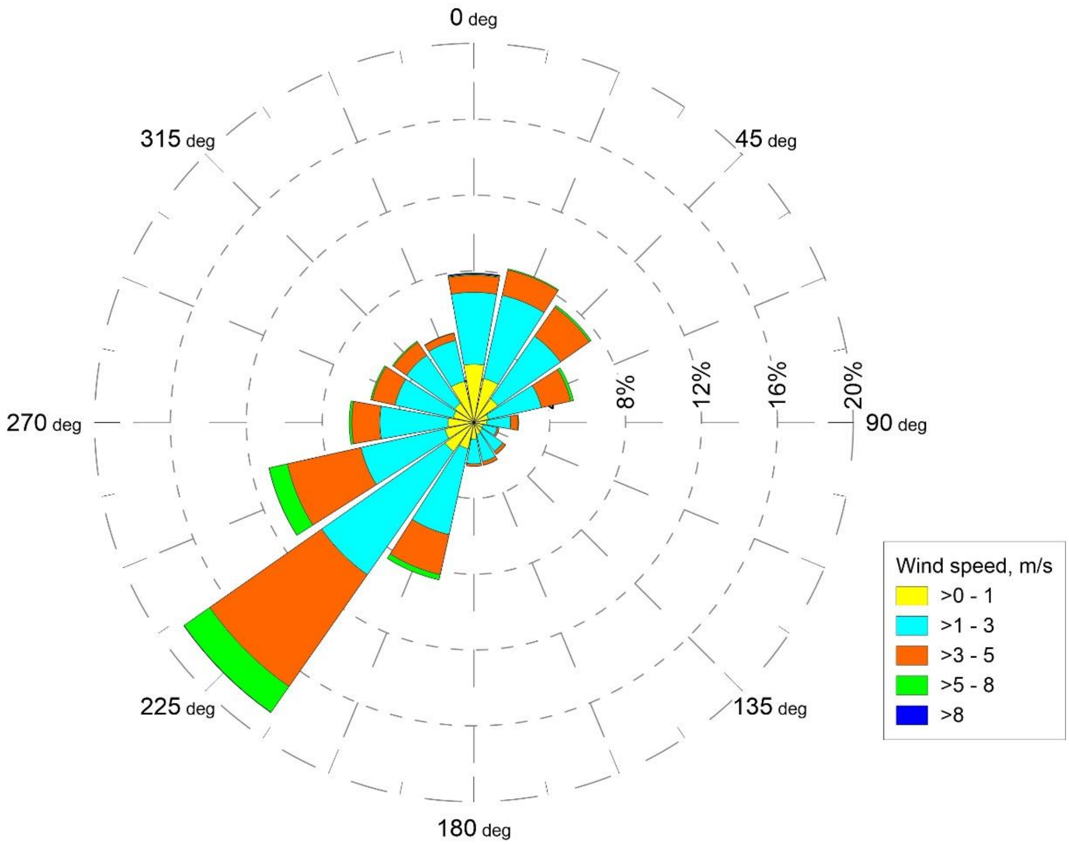

Figure 13. Windrose for Penrose AWS showing hourly-average wind speed and direction for all hours, January 2002 – December 2016; data source – https://cliflo.niwa.co.nz.

5.2.4 Interpretation

Considering the frequency and speed of winds at the Pakūranga and Penrose AWS, sensitive receptors at highest risk of exposure to windblown dust during construction would be those situated to the northeast of the various Project construction sites, and to a lesser extent those to the southwest of the construction sites.

However, some dust emissions from earthmoving vehicles can occur regardless of the wind speed. Dust emissions arising from these activities disperse most slowly under low wind speeds (especially less than about 3 m/s, the yellow and aqua-blue segments in the windroses in Figure 12 and Figure 13). This behaviour also applies to the dispersion of vehicle exhaust emissions during operation of the Project. Wind directions under these low wind speeds can be highly variable depending on local terrain and buildings.

5.3 Topography

Local topographical variations can affect localised wind flows (speed and direction) and thus dispersion of air pollutants.

Project GIS imagery and Google Streetview imagery was used to identify changes in topography that may influence air quality and the dispersion of Project emissions that need to be considered in the impact assessment.

Figure 14 and Figure 15 show topographic contours at 5 metre elevation increments in and near the EB3C and EB4L sections of the Project. For EB3C, topographical variations around the alignment are minor, except for localised variations in topography around the coastal areas and waterways. For EB4L, the gully terrain that defines Guys Reserve and runs parallel with the busway alignment may create some localised wind flows and sheltering within Guys Reserve and Whaka Maumahara Reserve under light wind speeds, but these would be infrequent because of the orientation of the gully compared to the prevailing wind directions. Any such localised wind flows are not relevant for the air quality assessment because stronger wind speeds (typically exceeding 5 m/s) are more relevant for wind-driven dust generation and dispersion, and also because the distances to sensitive receivers are greater along the length of the gully than for wind blowing across the gully.

The topographical features described above are not considered to be relevant in the context of assessment of potential air quality impacts from EB3C and EB4L.

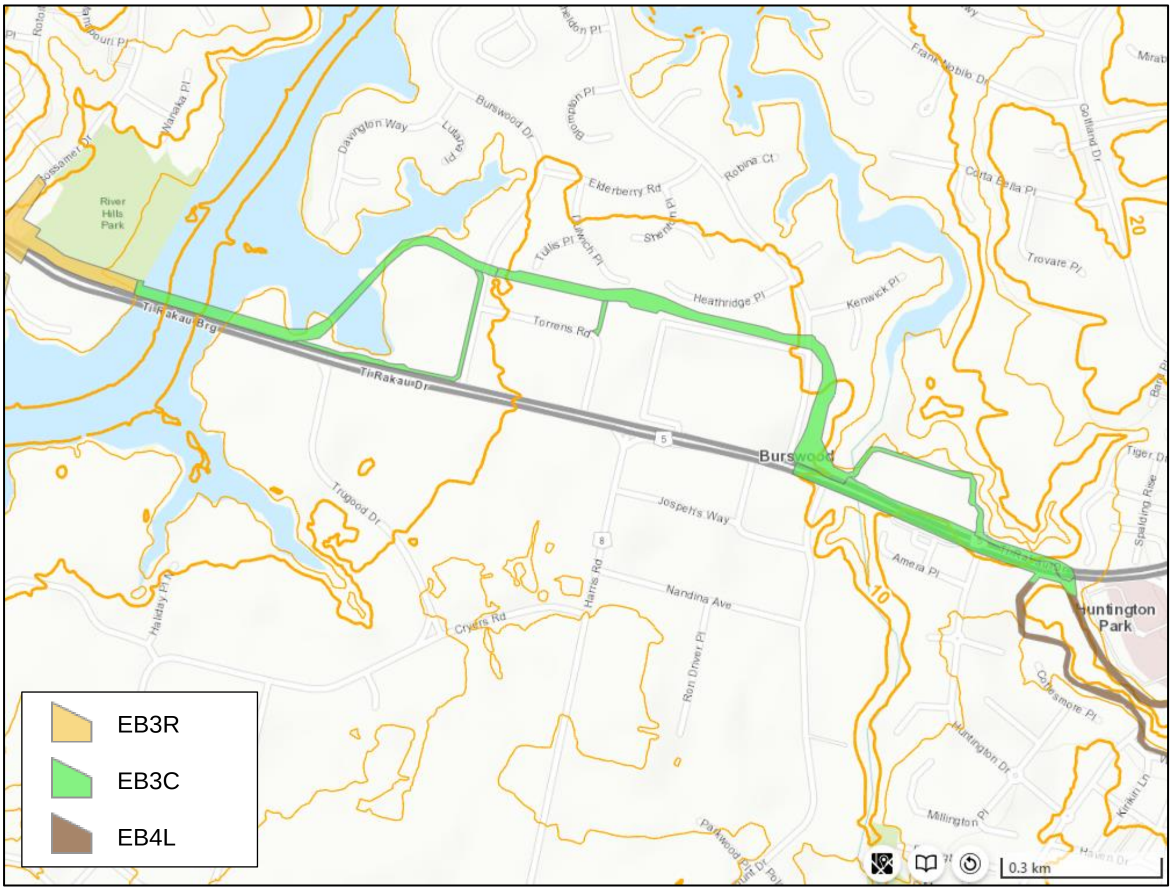

Figure 14. Topographic contours in and near EB3C, 5 m elevation intervals. Source: Project GIS.

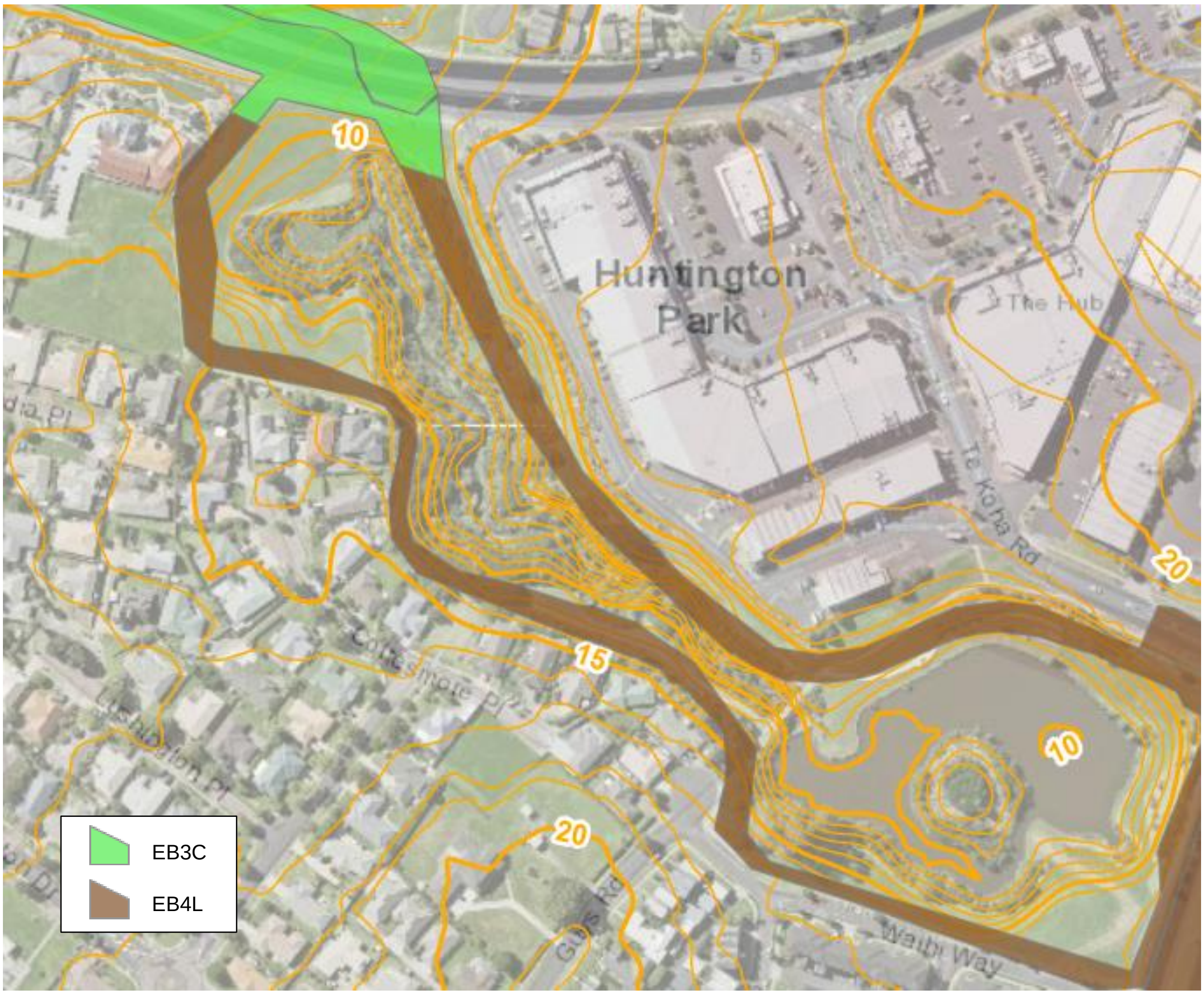

Figure 15. Topographic contours in and near EB4L, 5 m elevation intervals. Source: Project GIS.

6 Assessment of Air Quality Effects

Chapter Summary
• *Construction Effects* o *The assessment of the likelihood of post-mitigation residual emissions impacting on sensitive receptors is conducted using the Dust Risk Index (DRI) approach recommended in the Waka Kotahi Guide. The risk of offensive or objectionable dust nuisance is classified as low, medium or high at various sensitive receiver locations based on receiving environment attributes and nearby construction activities* o *The Waka Kotahi Guide recommends that under a medium or high-risk profile, a separate construction air quality management plan (CAQMP) should be prepared. Under the high-risk profile, the CAQMP requires independent peer review and close attention to management of the risks* o *For this Project, instead of a separate CAQMP, specific measures for dust mitigation and management will be included within a section of the ESCP because of the extent of overlap between the dust management and erosion and sediment control management* o *The DRI calculation is conservative – i.e. predicting a higher degree and/or frequency of impact than is likely to eventuate. Notwithstanding, the DRI approach indicates the potential for some sensitive receivers near the EB3C construction areas to have a medium or medium-high risk of offensive or objectionable dust nuisance, and other locations to have a low risk* o *In addition, the DRI approach also indicates the potential for some (mostly commercial) sensitive receptors near the EB4L construction areas to have a medium risk of offensive or objectionable dust nuisance, although residential receptors and the Piccolo Park Kindergarten are assessed to have a low risk because they are upwind of the construction sites under the prevailing south-westerly wind* o *Attention to mitigation and monitoring will be required in the medium and medium-high risk locations to manage offensive or objectionable dust impacts via the ESCP* o *The implementation of the ESCP and adaptive management of mitigation measures in response to monitoring outcomes will reduce the risk of dust emissions as recommended in the Waka Kotahi Guide. Any residual impacts arising as a result of dust emissions from the construction of EB3C and EB4L are considered to be of low magnitude.* • *Operational Effects* o *For both EB3C and EB4L, traffic volumes and congestion on Tī Rākau Drive will be reduced slightly due to the implementation of the Project. Implementing the EB3C and EB4L sections of the Project will result in slightly lower rates of emissions of vehicle exhaust pollutants into air from traffic using Tī Rākau Drive over the length impacted by EB3C and EB4L than with the "Do Minimum" option – imparting a beneficial impact to both local and regional air quality.*

6.1 Construction

6.1.1 EB3C

6.1.1.1 Sensitivity of Neighbouring Properties

EB3C contains a variety of construction elements, including road widening/relocation and construction of the two bridges. The risk of dust emissions therefore varies throughout this section of the Project. The property acquisitions are shown in

Figure 16. Acquired properties are not considered as sensitive receivers for dust emissions during construction.

Residential and commercial properties are located in close proximity to some parts of the construction areas. Locations annotated A to H on

Figure 16 are highlighted due to the proximity of these locations to construction areas:

A - Buildings occupied by Target Furniture and Bunnings provide shelter to the proposed Project work areas from the prevailing south-westerly wind. The north-facing walls of these buildings have a low sensitivity to potential dust emissions from the Project due to their design and function (see Figure 17)

B - Business Park at 28 Torrens Drive – with dual residential (upstairs) / commercial (downstairs) units. The residential upper floors feature access to north-facing balconies (see Figure 18)

C - Business units at 2-20 Torrens Road along the southern boundary of the alignment which include various activities that can be sensitive to dust emissions such as retail outlets, a gymnasium and a swim school (Figure 19). These buildings provide shelter to the proposed work areas from the prevailing south-westerly wind. The north-facing walls of these commercial buildings feature some windows that can be opened (Figure 20)

D – Wonderkids Childcare and Preschool within the Business Zone (Light Industrial) at 2 Torrens Road, which is at the corner of Burswood Drive and Torrens Road (Figure 21)

E1 - Houses to the north of the alignment between Burswood Drive (west) and Burswood Drive (east) which are downwind of the busway alignment under the prevailing south-westerly wind, although the buildings in the Business Zone will provide shelter to reduce the potential for dust pickup by wind erosion

E2 - Houses near the northern end of Bridge B, which are close to and downwind of the construction site for the bridge embankment and abutment under the prevailing south-westerly wind

F - Houses in this area off Burswood Drive (in particular Midvale Place, the south side of Kenwick Place, and 25-30 Burswood Drive) (see Figure 22) are downwind of the proposed Burswood Esplanade Reserve construction compound under the prevailing south-westerly wind, and are also downwind of the long section of the EB3C alignment under west-south-westerly and westerly winds

G - East City Wesleyan Church and Chinatown – including retail and eateries (Figure 23)

H - Medical services at 316 Tī Rākau Drive co-located within one building, including Doctors clinic, Dentist, Physiotherapy, Pharmacy, and Radiology services (Figure 24). Whilst this land use is potentially sensitive to dust emissions from Project construction, it is sufficiently distant from the works area to not be a high risk for receiving dust emissions, and in addition will be afforded some protection from dust dispersion due to the sheltering provided by the Bunnings and Target buildings at location A, the buildings in the Torrens Business Park at location B, and the Honda Sales and Service building in between locations B and H. Any mitigation measures required to protect sensitive receptors that are closer to the works sites will also minimise the risk of offensive or objectionable dust effects at H.

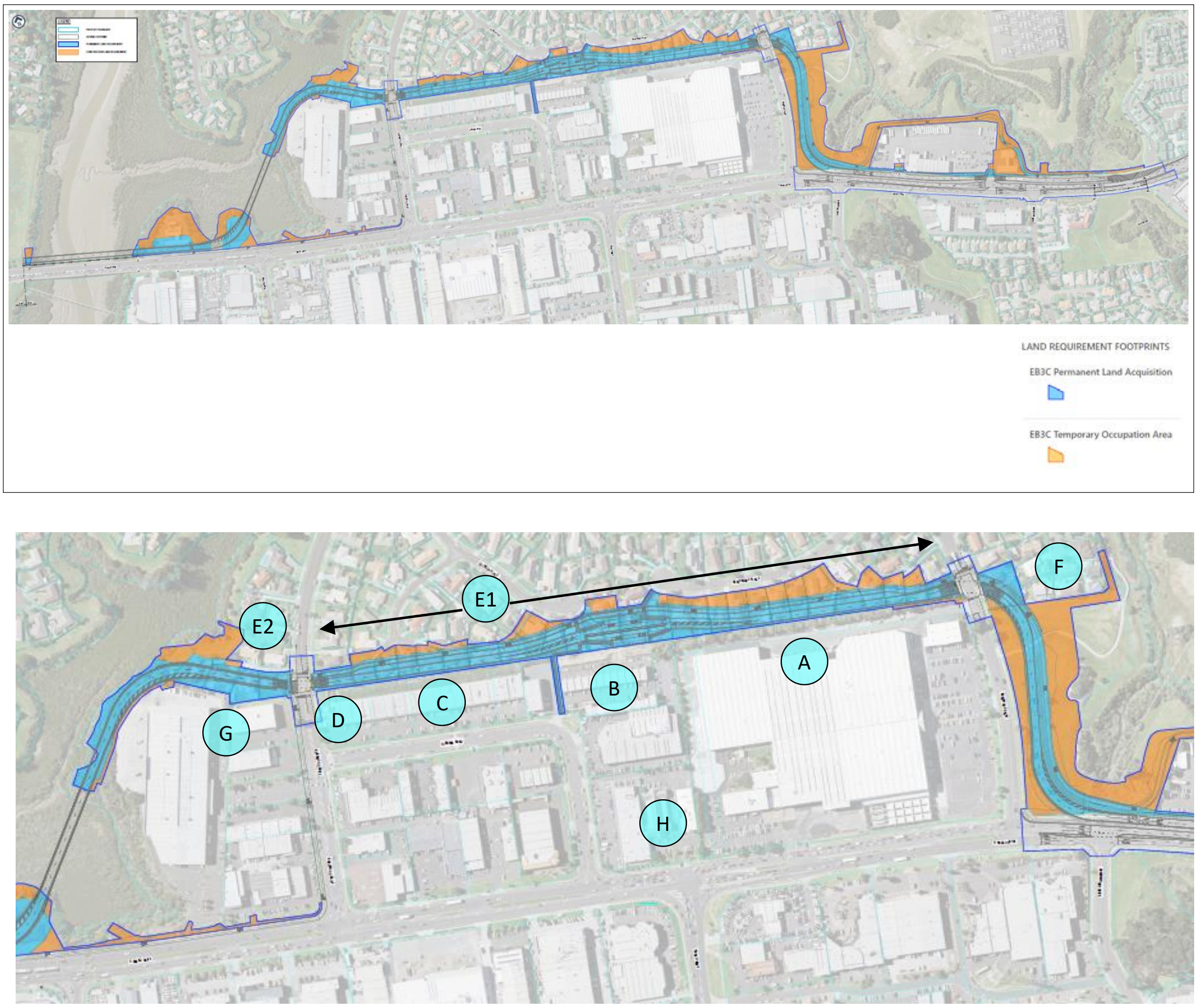

Figure 16. EB3C section of the Project and Property Acquisitions. For description of locations annotated A-H, see text.

Figure 17. Location A – rear (north-facing) walls of Bunnings (upper image) and Target Furniture (lower image); photos taken 16 May 2023.

Figure 18. Location B – 28 Torrens Business Park (commercial/residential units). Upper image – north-facing profile. Lower image – south-facing profile; photos taken 16 May 2023.

Figure 19. Business units at 2-20 Torrens Road (location C) and Childcare Centre (location D, left of picture), south facing exteriors; photo taken 16 May 2023.

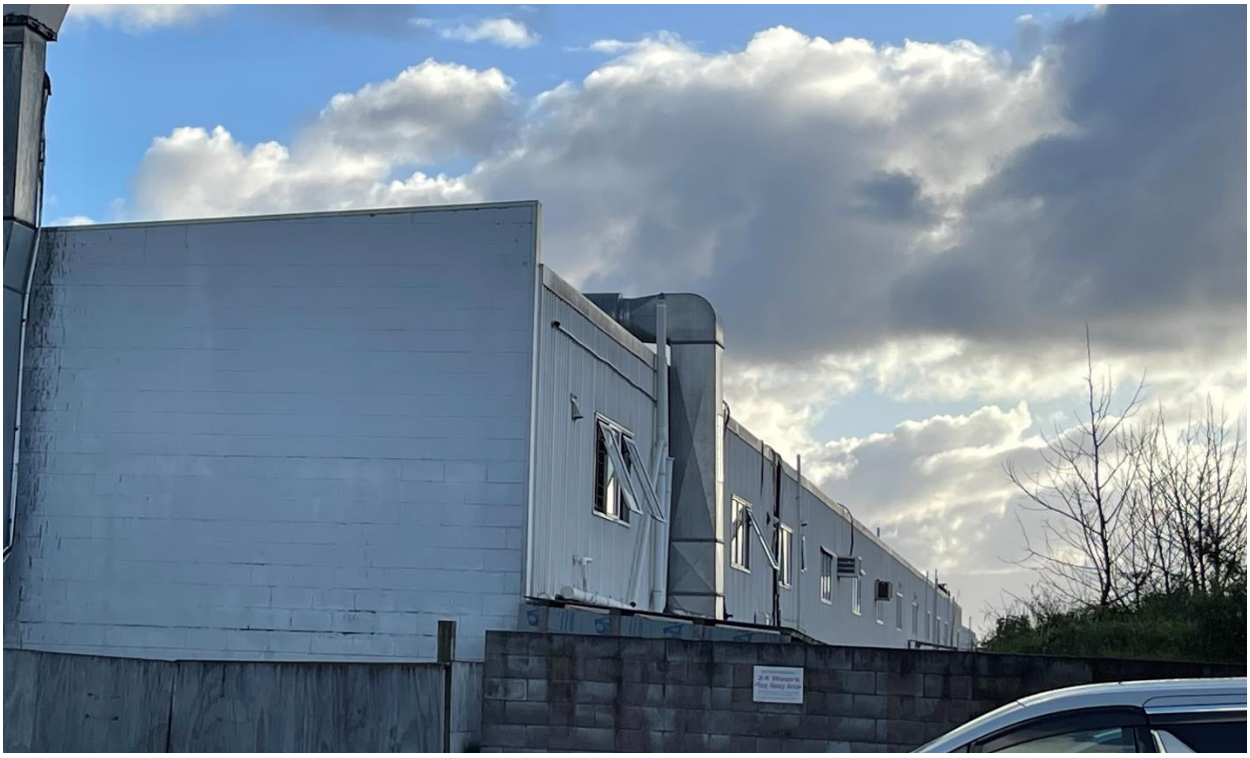

Figure 20. North-facing walls of commercial buildings at 2-202 Torrens Road (location C); photo taken from east end of buildings looking west, 16 May 2023.

Figure 21. North and west-facing walls of Wonderkids Childcare and Preschool (location D); imagery from Google Maps Street View looking east from 200 Burswood Drive, photo taken 16 May 2023.

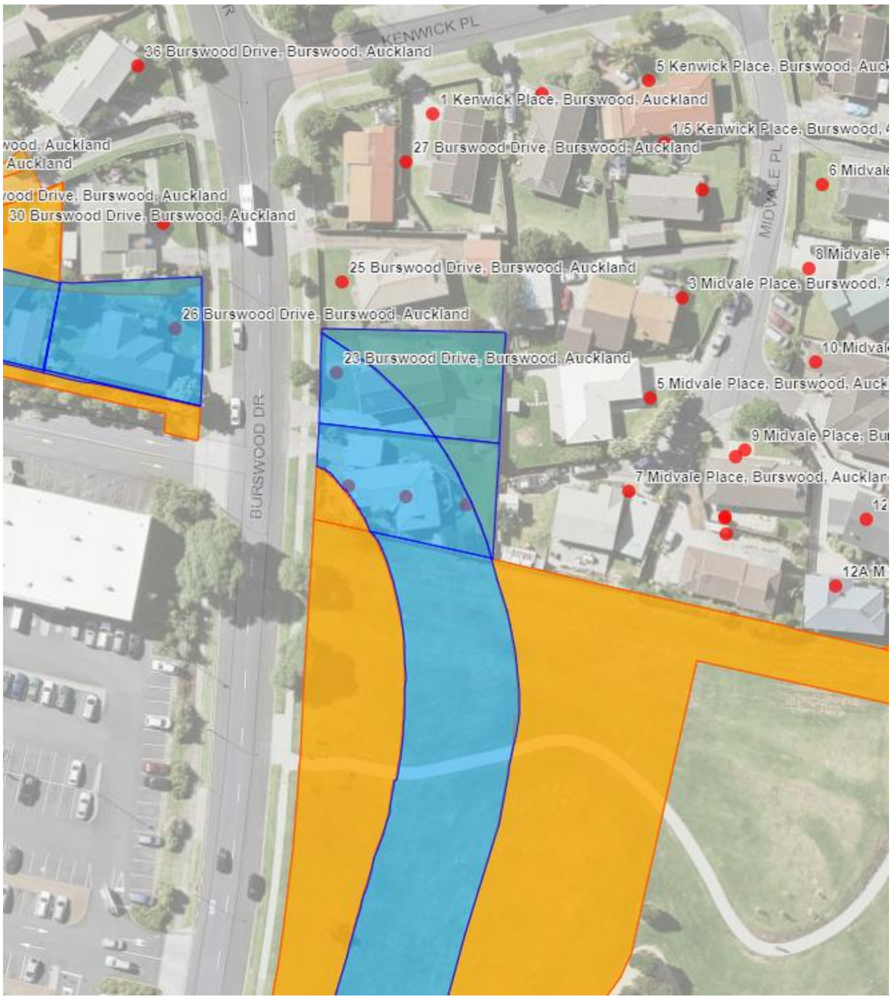

Figure 22. Location F, showing street property numbers; image taken from Project GIS.

Figure 23. Location G – East City Wesleyan Church Burswood Road frontage (upper photo) and Chinatown (lower photo); photos taken 16 May 2023.

Figure 24. Medical Centre at 316 Tī Rākau Drive, south-facing Tī Rākau Drive frontage (upper photo) and north-facing rear entrance (lower photo); photos taken 16 May 2023.

6.1.1.2 Dust Risk Index

Table 7 details the calculation of the DRI for EB3C, for the potentially sensitive receiving environments annotated B, D, E1, E2, F and G described in Section 6.1.1.1.

The DRI calculation is conservative – i.e., predicting a higher degree and/or frequency of impact than is likely to eventuate, because the values for the index calculation reflect:

(a) The value adopted for the wind speed factor is indicated in the Waka Kotahi Guide for “Project in moderately exposed location”, but that is probably too high for the location of

EB3C because the area is not especially exposed due to the extent of urban development and mature trees.

(b) The types of construction activities at any one location will vary from week to week, day to day and hour to hour, however factors were selected representing construction activities based on the worst case expected at each work site.

(c) A mitigation factor was selected which represents 50-90% of dust control, even though the proposed mitigation is likely to be towards the higher (better) end of this range and the risk of dust impacts is lower with 90% dust emission reduction compared to 50% reduction.

Acknowledging the conservative nature of the DRI estimation process, the DRI calculated for the receptors annotated E2 and F are close to 200, indicating an elevated risk of offensive or objectionable dust nuisance (from Table 5). Attention to mitigation and monitoring will be required in these locations to avoid offensive or objectionable dust impacts. At the houses represented by location E1, the DRI of 160 indicates a medium risk of offensive or objectionable dust. At all other locations, the dust risk is rated as low because the DRI is lower than 100 – this is driven primarily by the location of these receptors being upwind of the Project under the prevailing south-westerly wind.

Table 7 Calculation of DRI for EB3C (see Waka Kotahi Guide for definition and range of values to select).

Factor	Commentary	Value selected at specified location					
		B	**D**	**E1**	**E2**	**F**	**G**
Surface exposure (E)	Only a small portion of the EB3C surface will be upwind of most sensitive receptors. Therefore, a value of 1 is appropriate in most circumstances. A value of 5 is selected for locations E2, F and G, given the larger scale of construction-related activity around these locations and/or the potential for wind to blow parallel with long orientation of the alignment towards these receptors.	1	1	1	5	5	5
Exposure period (P)	The overall construction duration is more than 1 year, however with the exception of locations E2, F and G, individual sensitive receptors will be close to exposed areas and active construction zones for much shorter periods.	10	10	10	20	20	20
Time of year (T)	The construction activities could occur at any time of year.	10	10	10	10	10	10
Wind speed (WS)	The project area is not especially exposed, due to the extent of urban development and mature trees around the Project Area. Therefore, a factor of 50 is considered to be appropriate generally, but probably conservative (i.e. high). Location F is likely to be a bit more exposed than other locations but this can be mitigated through the use of shelter fences, and Location E1 more sheltered due to the commercial buildings on the south side of the alignment.	50	50	30	50	60	50
Distance to the nearest potentially sensitive receptor (D)	Sensitive receptors are typically less than 50m from the work areas, so a value of 100 is appropriate	100	100	100	100	100	100
Construction activity (A)	Construction activities will vary over the course of the construction period and at different locations. The construction activities anticipated in working areas closest to the receptors	50	50	50	50	50	50

Factor	Commentary	Value selected at specified location					
	and/or upwind of the sensitive receptors under prevailing southwesterly winds has been used to select the activity factor.						
Mitigation (M)	It is assumed that mitigation will control between 50-90% of the dust, and therefore a value of 0.8 is appropriate.	0.8	0.8	0.8	0.8	0.8	0.8
Wind direction (WD)	Some sensitive receptors may be downwind of the construction area under prevailing wind conditions. Where receptors are located to the south of the works, a factor of 0.5 is adopted	0.5	0.5	1	1	1	0.5
Calculated DRI	DRI = (E+P+T+WS+D+A) x M x WD	88	88	160	188	196	94

6.1.1.3 Potential for Residual Impacts

Mitigation and monitoring methods for dust emission control during construction of EB3C will be included in the proposed ESCP. This is discussed further in Section 7. The ESCP will include requirements for:

- Dust control measures to maximise the mitigation of dust emissions
- Monitoring
- Adaptive management and proactive management to modify activities and mitigation measures based on forecasted wind conditions and in response to feedback from monitoring.

The implementation of the ESCP and adaptive management of mitigation measures in response to monitoring outcomes will reduce the risk of dust emissions as recommended in the Waka Kotahi Guide. With reference to Table 4, any residual impacts arising as a result of dust emissions from the construction of EB3C are considered to be low.

6.1.2 EB4L

6.1.2.1 Sensitivity of Neighbouring Properties

EB4L also contains a variety of construction elements, as described in Section 3.2.3. The risk of dust emissions varies across the proposed works footprint depending on the extent of earthworks and ground disturbance required. It is understood that, apart from open space, no permanent property acquisitions are required for EB4L.

Residential and commercial properties are located in close proximity to some parts of the construction areas. Locations annotated I to Q on Figure 25 are highlighted due to the proximity of these locations to construction areas:

I - Retail showroom (Hunting & Fishing), Anytime Fitness gymnasium, and public carparking (Figure 26). This area is potentially sensitive to nuisance from suspended or settling dust, is downwind of the proposed works area on the VTNZ site under the prevailing wind direction and is also close to the location of the eastern abutment for Bridge C.

J1 - VTNZ vehicle testing station. This location is potentially sensitive to dust emissions, including potential impacts on customers and staff as well as the potential for deposited dust to affect testing equipment.

J2 - Building comprising Repco retail premises in the eastern half and two vehicle servicing workshops (Pit Stop and Bridgestone Tyre Centre) in the western half (Figure 28). These locations are potentially sensitive to suspended or settling dust.

K - Rear walls of workshop and retail buildings, facing the proposed construction area for the Guys Reserve bridge (Figure 29). This area is not considered to be sensitive to dust emissions due to the lack of openings in the walls, and the buildings will provide shelter to reduce the potential for dust dispersion towards the public-facing areas of The Hub on the other side of these buildings.

L - Rear walls of retail buildings of The Hub, facing the proposed construction area for the Guys Reserve bridge (Figure 30). These walls contain no windows or doors other than roller doors for loading access, and this area is not considered to be sensitive to dust emissions.

M - Restaurant at northwest corner of The Hub, closest to Tī Rākau Drive (Figure 31). This location is potentially sensitive to dust emissions from the construction site.

N - Houses on north side of Tī Rākau Drive opposite The Hub (Figure 32). This location is potentially sensitive to dust emissions from the construction site and is downwind of the northern end of EB4L under the prevailing wind direction.

O1 - Piccolo Park Kindergarten, adjacent to proposed temporary occupation area within Guys Reserve for construction compound (Figure 33).

O2 - Houses overlooking Guys Reserve from the western side of the reserve (Figure 33), close to the proposed temporary occupation area within Guys Reserve for construction compound.

P1/P2 - Houses adjacent to Guys Reserve from the southwestern side of the reserve (Figure 34).

Q - Houses adjacent to Whaka Maumahara Reserve on the southern side of the reserve near Te Irirangi Drive (Figure 35).

R1/R2 - Southwestern corner of Briscoes and Rebel Sport retail building (Figure 36) and carparking at Botany Town Centre close to Te Irirangi Drive (Figure 37).

The land uses identified at locations O, P and Q are all potentially sensitive to dust emissions from the EB4L construction sites, and while these locations are not directly adjacent to the proposed Busway alignment, they are close to the proposed works site and the location for the cycle and walking path which circuits the south and west boundaries of Guys Reserve and Whaka Maumahara Reserve.

For locations R1/R2, land uses involving customer car parking in retail settings generally have a low sensitivity to dust impacts due to the short lengths of time that cars are parked and the low level of harm that is usually associated with dust settling on a car. The longer a car is parked at a location near the construction site, the greater the risk of the car being there at the same time as dust generation activities and wind conditions coincide to be the worst case for dust deposition on the car. In these R1/R2 locations, parking duration is limited to 4 hours (as noted during the site visit from the P240 signs around the carpark). This precludes the use of these carparks for long periods such as staff parking or park-and-ride commuting, and therefore the carparking activity is not considered to be highly sensitive to dust emissions.

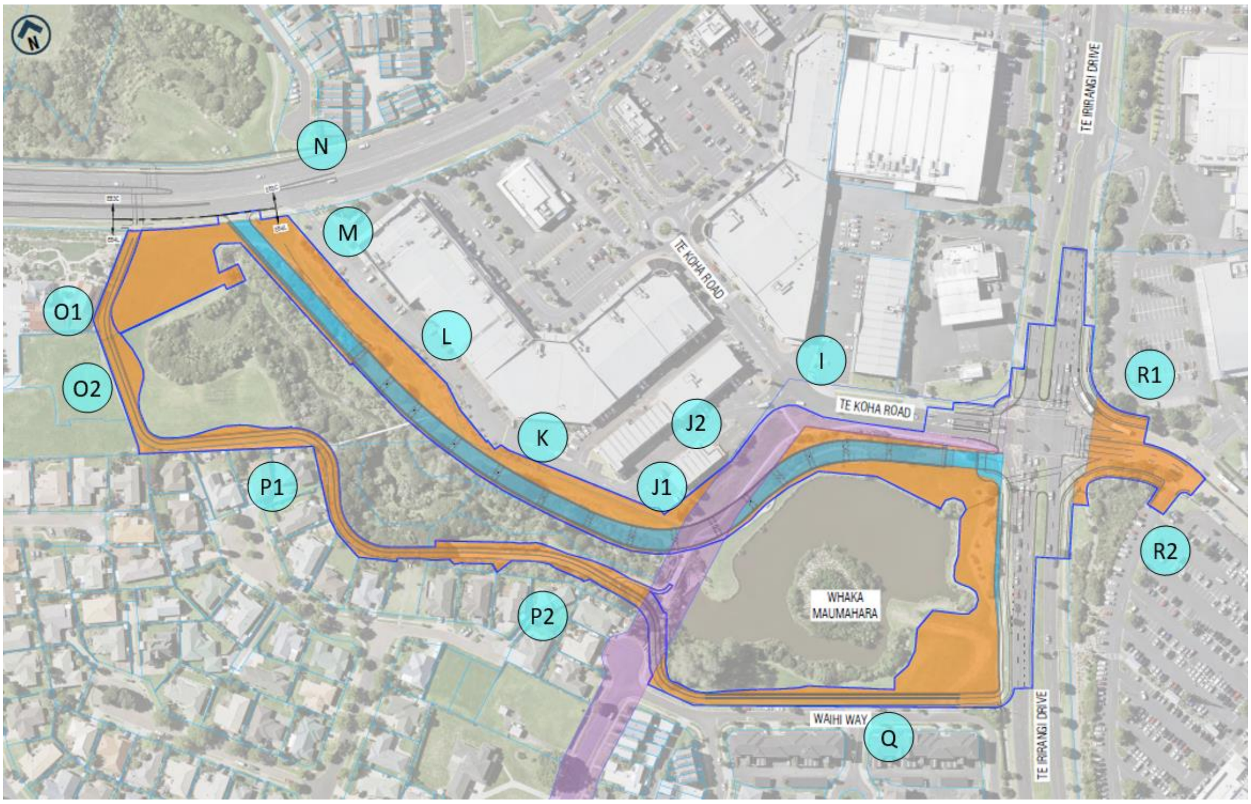

Figure 25. EB4L section of the Project and locations potentially sensitive to air discharges from EB4L construction. For description of locations annotated I-Q, see text.

Figure 26. Location I –Hunting & Fishing and Anytime Fitness; photo taken 16 May 2023.

Figure 27. Location J1 – VTNZ testing station adjacent to Guys Reserve; photo taken 16 May 2023.

Figure 28. Location J2 – Repco retail premises and vehicle servicing workshops (Pit Stop and Bridgestone Tyre Centre); photo taken 16 May 2023.

Figure 29. Location K –west-facing walls of tyre workshop (centre) and other retail buildings in The Hub (left). Image looking south, Guys Reserve shown at right of image; imagery from Google Maps Street View, image taken July 2022.

Figure 30. Location L –west-facing walls of retail buildings in The Hub. Photo taken looking north, 16 May 2023.

Figure 31. Location M –restaurant at northwest corner of The Hub. Image looking south from Tī Rākau Drive, Guys Reserve shown at right of image; photo taken 16 May 2023.

Figure 32. Location N –houses on north side of Tī Rākau Drive opposite The Hub; imagery from Google Maps Street View; photo taken 16 May 2023.

Figure 33. Houses at Location O2 (left and centre of image) and Piccolo Park Kindergarten (Location O1, right of image) overlooking Guys Reserve from western side of the gully; photo taken from Tī Rākau Drive, 16 May 2023.

Figure 34. Location P –houses on southwest side of Guys Reserve, photos taken 16 May 2023 from Tī Rākau Drive (upper photo) and from location M (lower photo).

Figure 35. Location Q –houses on south side of Whaka Maumahara Reserve at eastern end of EB4L, image looking west from Te Irirangi Drive with Whaka Maumahara Reserve on the right of picture; photo taken 16 May 2023.

Figure 36. Location R1 –carparking and corner of Briscoes and Rebel Sport building in Botany Town Centre; photo taken 16 May 2023.

Figure 37. Location R2 –carparking at Botany Town Centre; photo taken 16 May 2023.

6.1.2.2 Dust Risk Index

Table 8 details the calculation of the DRI for EB4L, for the potentially sensitive receiving environments represented by annotations I, J1/J2, M, N, O1, O2, P, Q and R1 described in Section 6.1.2.1.

As explained in Section 6.1.1.2, the DRI calculation is conservative. Notwithstanding the conservative nature of the DRI estimation process, at the houses represented by location N and the retail/service locations represented by I, J1/J2 and M, the DRI of 150-160 indicates a medium risk of offensive or objectionable dust (from

). Mitigation and monitoring will be required to minimise the risk of offensive or objectionable dust impacts. At the Briscoes/Rebel Sport building represented by receptor R1, the DRI is 113 which indicates a medium risk of offensive or objectionable dust, but a lower risk than the locations represented by I, J1/J2 and M.

At the sensitive locations on the west and south side of Guys Reserve represented by O1, O2 and P, including the Piccolo Park Kindergarten, the dust risk is rated as low because the DRI is lower than 100. This DRI is driven primarily by the wind direction, because the receptors are not downwind of the construction sites under the prevailing south-westerly wind which includes most of the high wind speed occurrences. In addition, the nature of construction-related activities close to these receptors is limited to the construction of the shared path and the operation of the construction compound. Therefore, there is a lower risk of dust discharges from these activities compared to the areas where the main busway alignment will be built.

6.1.2.3 Potential for Residual Impacts

Mitigation and monitoring methods for dust emission control during construction of EB4L will be included in the ESCP. This is discussed further in Section 7. The ESCP will include requirements for:

- Dust control measures to maximise the mitigation of dust emissions
- Monitoring
- Adaptive management and proactive management to modify activities and mitigation measures based on forecasted wind conditions and in response to feedback from monitoring.

Table 8 Calculation of DRI for EB4L (see Waka Kotahi Guide for definition and range of values to select).

Factor	Commentary	Value selected at specified location								
		I	**J1/J2**	**M**	**N**	**O1**	**O2**	**P**	**Q**	**R1**
Surface exposure (E)	Only a small portion of the EB4L surface will be upwind of each sensitive receptor, and the areas proposed for works laydown areas are much less than 1 hectare. Therefore, a value of 1 is appropriate in each case.	1	1	1	1	1	1	1	1	1
Exposure period (P)	The overall construction duration is more than 1 year; however some potentially dust-generating activities will take less time (such as access track and retaining wall construction), and also some individual receptors (such as Q) will be close to exposed areas and active construction zones for shorter periods.	20	20	10	20	20	20	10	10	10
Time of year (T)	The construction activities could occur at any time of year.	10	10	10	10	10	10	10	10	10
Wind speed (WS)	The project area is not especially exposed, due to the extent of urban development and mature trees around the Project Area. Therefore, a factor of 50 is considered to be appropriate generally, but probably conservative (i.e. high).	50	50	50	50	50	50	50	50	50
Distance to the nearest potentially sensitive receptor (D)	The distance has been referenced to the busway construction zone (rather than the cycle and walking path which has limited dust emission magnitude and duration). However, for all receptors except Q and R1 the separation distance is still within the 0-50m range	100	100	100	100	100	100	100	10	50
Construction activity (A)	Construction activities will vary over the course of the construction period and at different locations but are largely confined to earthworks with excavators, piling operations, and pavement construction.	20	20	20	20	20	20	20	20	20
Mitigation (M)	It is assumed that mitigation will control between 50-90% of the dust, and therefore a value of 0.8 is appropriate.	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Wind direction (WD)	Some sensitive receptors may be downwind of the construction area under prevailing wind conditions. Where receptors are located to the southwest of the works, a factor of 0.5 is adopted, and where receptors are located to the northwest or southeast of the works, a factor of 0.25 is adopted.	1	1	1	1	0.5	0.5	0.5	0.25	1

Factor	Commentary	Value selected at specified location								
Calculated DRI	DRI = (E+P+T+WS+D+A) ´ M ´ WD	160	160	152	160	80	80	76	20	113

The implementation of the ESCP and adaptive management of mitigation measures in response to monitoring outcomes will reduce the risk of dust emissions as recommended in the Waka Kotahi Guide. With reference to Table 4, any residual impacts arising as a result of dust emissions from the construction of EB4L are considered to be low.

6.2 Operation

6.2.1 Traffic Volumes

6.2.1.1 EB3C

Current and projected opening year traffic volumes on Tī Rākau Drive along the segments encompassed by the alignment of EB3C were provided by the Project's traffic engineers and are summarised in Table 9. The table provides traffic volume estimates expressed as annual average daily traffic (AADT – vehicles per day averaged over a year) for three scenarios:

- Current situation – based on traffic data from 2017
- Opening Year (2028) Do Minimum – assumes the Project does not proceed
- Opening Year (2028) With Project – the Project is implemented.

At opening year, AADT with Project is forecast to be 2% less than the current situation and the Do Minimum scenario. The AADT under the Do Minimum scenario is forecast to be essentially the same as the current situation.

Table 9 Comparison of AADT for current situation and 2028 scenarios – EB3C

EB3C		Combined Eastbound and Westbound AADT*		
Start of section	**End of section**	**Current situation (2017)**	**Do Minimum (without Project) Opening Year 2028**	**With Project Opening Year 2028**
Gossamer Drive	Trugood Drive	47,850	51,500	50,763
Trugood Drive	Burswood Drive West	41,900	41,300	42,341
Burswood Drive West	Harris Road	42,000	40,300	41,148
Harris Road	Burswood Drive East	40,000	39,800	38,400
Burswood Drive East	Huntington Drive	41,400	40,100	36,742
Totals		213,150	213,000	209,394
Percentage of current situation			99.9%	98%
Percentage of Opening Year Do Minimum				98%

*	AADT – annual average daily traffic (vehicles per day averaged over a year)

6.2.1.2 EB4L

EB4L comprises a new link for bus movements only connecting Tī Rākau Drive and Te Irirangi Drive. As such, there is no direct comparison available of current and projected opening year traffic volumes. However, the Project's traffic engineers have estimated the changes to traffic volumes on Tī Rākau Drive between Huntington Drive and Te Irirangi Drive due to the implementation of EB4L, and this is summarised in Table 10.

At opening year, AADT even under the Do Minimum scenario is forecast to be 3.4% lower than the current situation, however with the implementation of the Project the reduction in traffic compared to the current situation is forecast to be greater, to 7.8%.

Table 10 Comparison of AADT for current situation and 2028 scenarios – EB4L-related

EB4L		Combined Eastbound and Westbound AADT*		
Start of section	**End of section**	**Current situation**	**Do Minimum (without Project) Opening Year 2028**	**With Project Opening Year 2028**
Huntington Drive	Te Koha Rd	40,800	39,734	36,482
Te Koha Rd	Te Irirangi Dr	37,300	36,504	35,497
Totals		78,100	76,238	71,979
Percentage of current situation			97.6%	92.2%
Percentage of Opening Year Do Minimum				94.4%

*	AADT – annual average daily traffic (vehicles per day averaged over a year)

6.2.2 Vehicle emissions

The VEPM was used to assess the likely changes in vehicle emissions for modifications in road design that result in changes to average vehicle speeds. Vehicles emit more pollutants per kilometre of travel at lower speeds than at higher speeds. This is exacerbated in congested conditions when travel is stop-start. Table 11 illustrates the improvements in pollutant emissions forecast by VEPM for 2028 for average speeds of 20-50 kilometres per hour. Increasing average vehicle speeds results in lower emissions of pollutants to air in the vehicle exhaust, as well as lower emissions of fine particles from brake and tyre wear, lower fuel consumption rates, and lower rates of emission of carbon dioxide.

Modelling of detailed emission rates for the Do Minimum and Project scenarios is beyond the scope of a qualitative assessment. Notwithstanding, it is apparent that any modification to road design that reduces congestion and increases average vehicle travel speeds, such as would be achieved by the Project, will result in a reduction in the discharge of air pollutants from vehicles.

Table 11 Comparison of fleet weighted emission factors for vehicle operation as a function of average vehicle speed - forecast from VEPM 6.3 for 2028

Average speed, kilometres per hour	Pollutants in vehicle exhaust, grams per kilometre Year - 2028						Fuel consumption, litres per kilometre	PM_{10}* from brake and tyre wear, grams per kilometre
	CO*	VOC*	NO_x*	NO_2*	CO_2*	$PM_{2.5}$*		
20	0.78	0.044	0.90	0.16	323	0.022	13.1	0.028
30	0.64	0.034	0.70	0.13	266	0.017	10.8	0.028
40	0.64	0.031	0.58	0.12	235	0.014	9.5	0.028
50	0.62	0.028	0.51	0.11	216	0.013	8.8	0.025

* CO – carbon monoxide

CO_2 – carbon dioxide

NO_x – nitrogen oxides

NO_2 – nitrogen dioxide

VOC – volatile organic compounds

$PM_{2.5}$ – particulate matter with aerodynamic diameter less than 2.5 microns

PM_{10} - particulate matter with aerodynamic diameter less than 10 microns

It is also noted that VEPM forecasts substantial reductions in vehicle emissions per kilometre travelled in the future, even without yet factoring in likely increases in proportion of EV in the Auckland fleet in the future due to recent government policy announcements – VEPM version 6.3 assumes fleet electric vehicle composition of 2% for cars, 0.22% for light commercial vehicles, 0.02% for heavy commercial vehicles, and 0.05% for buses. This means with the passing of time, vehicle emissions from traffic using Tī Rākau Drive over the length impacted by EB3C and EB4L will continue to reduce even more than currently predicted by VEPM.

6.2.3 Background air quality and cumulative impacts

Vehicle emissions throughout Auckland are a substantial contributor to ambient air quality in the Auckland region (Auckland Council, 2019). As a consequence of the reduction in vehicle emissions predicted by VEPM, air quality in the Auckland region is likely to gradually improve over the coming decades. This means that background air quality experienced by sensitive receptors close to Tī Rākau Drive over the length impacted by EB3C and EB4L will also gradually improve, meaning that cumulative impacts of the Project will also reduce over time.

6.2.4 Discussion and Conclusion

With both traffic volumes and congestion reducing slightly on Tī Rākau Drive over the length impacted by EB3C and EB4L due to the implementation of the Project, it is concluded that implementing the EB3C and EB4L sections of the Project will result in lower rates of emissions of vehicle exhaust pollutants into air than with the “Do Minimum” option – imparting a beneficial impact to both local and regional air quality.

Some parts of the proposed busway alignment in EB3C and all of EB4L divert away from Tī Rākau Drive. Buses using the busway will therefore be closer to receptors near the alignment in these areas than if all buses were only using Tī Rākau Drive. If buses powered by fossil fuels are operated on the busway, this would result in additional air discharges over the length of the busway compared to the current situation due to potential pollutants in vehicle exhaust, and these emissions will be closer to some sensitive receptors than in the current situation where EB3C and EB4L create new roads. However, the emissions from the buses are expected to be negligible in the context of other vehicle movements in the surrounding area and have not been specifically assessed.

It is expected that there will be no detectable increase in local air quality pollutant concentrations near the busway, and that overall, the beneficial impact to air quality of reducing traffic congestion on Tī Rākau Drive will be seen throughout the alignment area.

7 Mitigation

Chapter Summary
• *The ESCP for the project, updated to include EB3C and EB4L, will set out measures to minimise, so far as reasonably practicable, impacts on air quality due to dust emissions during construction* • *Monitoring for dust outside the construction site boundaries will comprise a combination of visual observations, and stakeholder communications* • *Real-time instrumental monitoring is not recommended for EB3C and EB4L because the risk of dust nuisance has not been assessed as "high", assuming that mitigation has been implemented in accordance with the proposed ESCP* • *The Contractor(s) responsible for construction of EB3C and EB4L will adopt an adaptive management approach to dust mitigation in accordance with the ESCP. If fence line monitoring indicates the potential for occurrence of adverse effects from dust emissions, potential causes of the dust emissions will be identified and additional control measures implemented to reduce the level of dust emissions, which could include targeted instrumental monitoring if appropriate* • *The Contractor(s) will also adopt a proactive management approach comprising daily and weekly review of planned activities and forecasted environmental conditions to identify whether any particular construction activities planned need to be rescheduled or monitored more closely than usual, or whether additional mitigation controls are required to proactively address potential risks of impacts from dust* • *No mitigation measures are required for the operational phase of the Project.*

7.1 Good Practice Guidance for Construction Dust Management

7.1.1 Good Practice Guide for Assessing and Managing Dust

Section 5 of the GPG Dust outlines good practice management and control of dust emissions. The following management and control practices that are potentially relevant to the construction of this Project are recommended in the GPG Dust:

- Site planning
  - Location of dust sources within the site and their orientation in relation to prevailing winds and sensitivity of the downwind receptors
  - Presence of separation distances to the site boundary and to sensitive land uses
  - Need for screening, such as by shelter belts, earth bunds or natural topography.
- Site design
  - Raw materials
  - Flow of materials and vehicles through the site.
- Operating procedures
  - Implement a preventative maintenance programme to minimise equipment failure and unplanned downtime
  - Take dust management seriously – educate staff about the importance of regulatory compliance and good management for achieving compliance
  - Have a regime of good housekeeping
  - Conduct dusty operations during weather conditions that minimise emissions wherever possible, particularly where no other mitigation option is available (e.g., avoid windy dry weather days for ground stripping)

    - Procedures and the effects that they mitigate should be clearly described in a site/dust/construction management plan for the site; staff responsible for implementing the management plan should be clearly identified.
- Dust emissions from paved surfaces
    - Controlling the movement and handling of fine materials to prevent spillages onto paved surfaces
    - Minimising mud and dust track-out onto paved surfaces from unpaved areas by using rumble strips or wheel and vehicle wash facilities
    - Regularly cleaning paved surfaces, using a mobile vacuum sweeper or a water flushing system
    - Controls on vehicle movements
        - Speed limits
        - Limit loads to minimise spillages
        - Cover dusty loads or used enclosed bins
    - Wind reduction controls.
- Non-paved surfaces (including unsealed roads)
    - All of the measures listed above for paved surfaces
    - Wet suppression during dry windy periods, using a water cart and/or fixed sprinklers
    - Use of chemicals to enhance crusting in conjunction with wet suppression
    - Re-vegetation of exposed surfaces that are to be left undisturbed for sufficient periods of time, eg. Hydro-seeding or use of geotextiles
    - Surface improvements, such as paving or laying low-silt aggregate
    - Controls on vehicle movements as above, plus minimise travel distances onsite through site layout design.
- Stockpiles and material handling
    - Wet suppression using sprinklers
    - Grass and/or chemical suppressants for inactive stockpiles
    - Covered storage of fine material
    - Limiting the height and slope of the stockpiles to reduce wind entrainment. Take advantage of other site features (e.g., noise bunds) to enhance sheltering
    - Limiting drop heights from conveyors, loaders or other equipment transferring material to and from stockpiles.
    - Wind breaks
        - Wind speed near the pile surface is the primary factor affecting particle uptake from stockpiles

        - Windbreaks (horticultural cloth supported on poles, or planted trees) are almost as effective as a solid wall in reducing wind speeds, when constructed to the following specifications:
            - height equal or greater than the pile height
            - length equal to the pile length at the base
            - located at a distance of one pile height from the base of the pile.
    - Bunding (e.g. concrete bunding) can be very effective in controlling dust from stockpiles provided that the bunds are located facing away from the prevailing wind direction and that the bund walls are at least one third higher than the maximum height of the stockpile.

7.1.2 Transport Agency Guide to Assessing Air Quality Impacts from State Highway Projects

While the Project is not a state highway project, the potential for air emissions during construction is similar. Therefore, the performance criteria and assessment methods recommended in the Waka Kotahi Guide for construction dust are considered to be relevant.

The Waka Kotahi Guide states that options for managing construction effects generally involve minimising emissions from earthworks, unpaved surfaces, paved surfaces, vehicles travelling in, to and from the construction area, and material stockpiles. Options suggested are similar to those listed above from the GPG Dust, and include:

- Wet suppression of unpaved areas using water carts or sprinklers
- Limiting vehicle speeds using unpaved surfaces, e.g. to 15 km/h
- Controlling the use of local roads by construction vehicles
- Covering loads and storage areas with tarpaulins or enclosures
- Locating storage areas away from sensitive areas or using water sprays to control dust
- Minimising travel distances
- Using wheel and truck wash facilities at site exits
- Installing wind break fencing at appropriate locations.

7.2 Construction

7.2.1 Dust Management

The ESCP for EB3C and EB4L will set out measures to minimise, so far as reasonably practicable, impacts on air quality due to dust emissions during construction. In addition to the management measures, the ESCP will detail stakeholder communication requirements, monitoring methods and actions that arise from the results of analysing that information.

The GPG Dust includes advice for information to be included when addressing dust management during construction. Items recommended to be included in the ESCP are:

- Key personnel and contact addresses/numbers
- Complaints contact persons and response protocols
- Process description and method of operation
- Methods of mitigation and operating procedures, including maintenance and contingency
- Monitoring, including methods and record keeping
- Staff training
- System review and reporting procedures.

The ESCP would be dynamic in nature and the methods detailed in the plan would be an ongoing management tool. The ESCP would be subject to regular revision and update as required in response to audits, technology improvements, incidents, changes in legal requirements and new data or information obtained through monitoring activities to ensure that all reasonably practicable construction air quality monitoring and management measures are being implemented throughout the works.

The ESCP will:

- Identify the main sources of dust, and the location of sensitive receptors
- Set out how the project would control the emission of dust into the atmosphere during construction utilising the good practice measures outlined in the GPG Dust, the Waka Kotahi Guide, and any other relevant guidance
- Include a monitoring plan that outlines:
  - Monitoring methods and actions that arise from the results of analysing that information (as per Sections 7.2.2 and 7.2.3)
  - Environmental performance indicators for each type of monitoring and the triggers that enable responsive and timely intervention and modification of site activities in response to elevated air quality measurements, or adverse meteorological and environmental conditions when required
  - Procedures to be followed after trigger alerts are activated, to enable responsive and timely intervention and mitigation
- Describe processes for identifying opportunities for continual improvement in management of air quality impacts from construction
- Describe a process for daily and weekly check-list style review of planned activities and forecasted environmental conditions at the start of each day and week, to identify whether any particular planned construction activities need to be rescheduled or whether additional mitigation controls are required (such as additional watering of dry surfaces).

7.2.2 Monitoring

Off-site monitoring for dust outside the construction site boundaries will comprise a combination of visual observations and stakeholder communications and these measures will be included in the ESCP. No off-site instrumental monitoring for ambient air quality concentrations of PM_{10} is recommended for the EB3C and EB4L sections of the project 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, 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.

The recommended monitoring methods include:

- Targeted community monitoring, such as regular visits with nearby sensitive receptors and company hot lines for community members to report dust impacts which would trigger investigations and timely corrective actions onsite
- Visual monitoring, such as (but not limited to):
  - Checking internal and external access road surfaces for tracked dust that requires cleaning
  - Checking effectiveness and maintenance of truck rumble grids and wheel wash
  - Checking integrity of shelter fences
  - Inspecting surfaces outside the site boundary near sensitive receptors for signs of dust deposition
  - Observations of visible dust suspended in air carrying beyond site boundary
  - Closed-circuit television (CCTV) monitoring (or similar, potentially connected to the boundary instrumental monitoring to start video recording when alert thresholds are exceeded) of boundaries and/or dust sources.
- Fenceline instrumental monitoring at the northeast boundary of the main construction zones, such as with Dustrak or SiteHive.
  - Any monitoring equipment should be located downwind of the construction areas under the prevailing wind direction, to the northeast of any construction compounds or construction activities involving earthworks or fill activities with heightened risk of dust emissions
  - The locations of the monitoring equipment could be moved as the construction programme progresses and the locations of dust-generating activities changes
  - Monitoring data should be reviewed regularly by site managers to assess the effectiveness of dust controls and identify any activities requiring additional mitigation
  - The monitors should also have the capability to send alarms to site managers if dust concentration thresholds are exceeded. These thresholds would be adjusted and determined on a site-specific basis depending on the sensitivity of the immediate receiving environment.

This monitoring (community, visual and instrumental) would collectively serve several purposes including:

- Provide early notice of potential issues (early in the construction phase before earthworks reach full scale) so they could be investigated and mitigated before they become actual impacts
- Inform the contractor of ongoing issues that initiate investigation and implementation of any additional mitigation measures.

7.2.3 Adaptive Management and Proactive Management

7.2.3.1 Adaptive Management

The Contractor(s) responsible for construction of EB3C and EB4L will adopt an adaptive management approach to dust mitigation. This approach will be reflected in the ESCP. If the monitoring described in Section 7.2.2 indicates a potential for issues from dust impacts beyond the works perimeters, potential causes of the dust emissions will be identified, and additional control measures implemented to reduce the level of dust emissions. Examples of specific control measures that could be undertaken for activities that are identified as the source of a trigger include the following:

- Increased use of water to dampen surfaces
- Improved cleaning of hardstand surface around stockpiles, and/or reduce stockpile size
- Relocate sources of dust within the construction site (such as stockpiles), if possible
- Reduce double-handling of spoil and drop-heights
- Increase extent or quality of hardstand surfacing on site, and/or seal hardstand surfaces if not already done
- Further reduce vehicle speeds in areas where wheel-driven dust is an issue – if that cannot be remedied by watering, sweeping, sealing or hardstand surfacing
- Construct additional windbreaks, or make existing windbreaks taller and/or more solid
- Provision to reduce work intensity (or temporarily stop work)
- Modify the type of earthmoving or excavation equipment used
- Introduction of additional targeted instrumental monitoring to more closely monitor and identify potential dust sources.

7.2.3.2 Proactive Management

The ESCP will document a process for daily and weekly review of planned activities and forecasted environmental conditions to identify whether any particular construction activities planned need to be rescheduled or monitored more closely than usual, or whether additional mitigation controls are required to proactively address potential risks of impacts from dust. Factors that may be considered during this process include:

- Forecasted wind speeds and directions
- Recent and forecasted rain
- Specific upcoming construction activities.

7.3 Operation

The assessment of potential air quality impacts during Project operation indicates that operation of the EB3C and EB4L sections of the Project will have a beneficial impact on air quality because both traffic volumes and congestion are expected to reduce slightly in the EB3C and EB4L sections due to the implementation of the Project. Therefore, no mitigation measures are required within the Project design.

8 Recommendations and Conclusions

8.1 Construction Impacts

The main air quality impact risk associated with construction of EB3C and EB4L is the discharge of dust with associated potential amenity effects. As discussed in Section 4.2.1.4, the GPG Dust states that management and control of larger dust size fractions with the potential to cause nuisance impacts (deposited dust and TSP) will, at the same time, manage and control smaller size fractions with the potential to cause health impacts (PM_{10} and $PM_{2.5}$).

The operation of trucks and heavy machinery during construction activities, and the use of mobile generators for power supply where needed, will discharge products of diesel or fuel oil combustion into the air. However, these emissions are very small in a regional context compared to regular emissions from Auckland's vehicle fleet using roads around the Project, and there are no confined spaces where this machinery will operate meaning that any emissions will disperse rapidly once discharged into the air. Therefore, no further assessment of potential impacts from emissions of combustion-derived pollutants is necessary.

Therefore, the focus of the assessment for air quality construction impacts is on avoiding or mitigating potential nuisance and amenity impacts from dust emissions. Without controls, the temporary and localised dust emissions associated with construction of EB3C and EB4L have the potential to impact on local amenity in some locations. The ESCP for the project will set out measures to minimise, so far as reasonably practicable, impacts on air quality due to dust emissions during construction. The ESCP will include requirements for:

- Dust control measures to maximise the mitigation of dust emissions
- Monitoring, including relevant triggers
- Adaptive management and proactive management to modify activities and mitigation measures based on forecasted wind conditions and in response to feedback from monitoring.

With these control measures in place, the risk of offensive or objectionable effects arising as a result of dust emissions from the construction of both EB3C and EB4L is considered to be low.

8.2 Operation Impacts

The operation of the EB3C and EB4L sections of the Project will have a beneficial impact on air quality. No mitigation measures are required for the operational phase of the Project.

9 References

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