

Appendix B-1



A2B Long List Assessment

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A2B Long List Assessment

Technical Note

To	Auckland Transport	From	
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Subject	Airport to Botany initial options and sieving process		

This note describes the rationale applied to refine the Airport to Botany (A2B) Mass Rapid Transit (MRT) initial list of options down to a long list of options for evaluation using multi-criteria analysis. First, the methodology used to generate the initial options is outlined. Second, the scoring process used select the long list options is described. Third, the options sieved out are listed and described. Finally, the long list options are listed and described.

1. Generation of Initial Options

The option generation stage of the options assessment aims to consider a wide range of different solutions to address the problems previously established during the problem definition and Investment Logic Mapping phases of the project.

Initial options were generated by the project team by conceptualising all the possible geographical alignments between the Airport and Botany (both following existing transport infrastructure alignments and independent of it) and listing all known available technologies to deliver the benefits identified. Alignments were categorised as follows:

- Integrated off-street options connecting the Airport and Botany (code I)
- Segment A: West (Airport to Puhinui/Southern Line/Manukau)
- Segment B: Central (Puhinui through Manukau)
- Segment C: East (Manukau to Botany)
- Segment D: Beyond Botany
- Alternate Street Corridor Options not via Puhinui-Manukau (code X)

Alignments and technologies were paired according to suitability to produce a transport solution which could be integrated with existing transport networks. Any combination of options for the four segments could theoretically be selected for progression to the short list assessment.

28 initial options were generated, representing a number of different modes and alignments, as listed in Appendix 1. Due to the high number of options using bus rapid transit (BRT) and light rail transit (LRT) technologies, a preliminary assessment of street corridor mode options was also included in the option generation stage.

2. Sieving Process

Options were scored against four evaluation criteria using a seven-point scale (-3 to 3). Options that scored the highest were retained for the long list, and lower scoring options were discarded. The evaluation criteria used were:

- Potential to provide benefits established during ILM.

- Potential to provide the required capacity (i.e. not insufficient or especially superfluous capacity)
- Major environmental risks
- Cost, impacts and feasibility of delivery

Professional judgement was used to progress or discard options which presented extraordinarily strong benefits or fundamental flaws not captured adequately by the scoring. For example, the Automated Metro option (I4) was discarded despite scoring highly under three of the four criteria due to its exceedingly high cost relative to other technologies. On the other hand, a heavy rail option was retained, despite scoring negatively on three of the four criteria, so that it could be tested more comprehensively during the long list assessment stage. Additional consideration was given to the degree of variation between scored options.

Sieving of options for *Segment D: Beyond Botany* was postponed until the short list assessment.

3. Options Sieved Out

The options discarded through the sieving process are listed in Table 1 along with the rationale for the exclusion. Note that there is a more detailed discussion on the appropriateness of heavy rail options for the A2B project in the technical note *Airport to Botany Heavy Rail Option Summary (MRCagney & Aurecon, 2018)*.

Table 1: Options Sieved Out

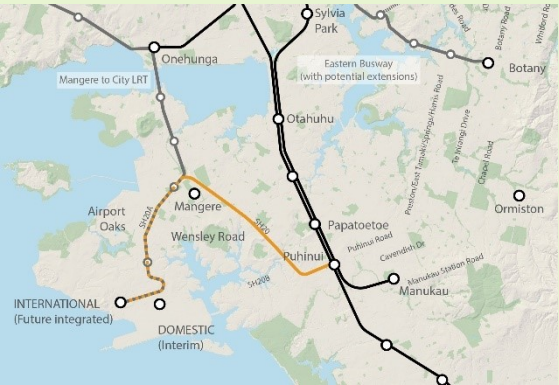
Group	Mode	Code	Name	Description	Reasons for exclusion
Integrated Off-Street Options	LRT	I1	Airport to Botany grade separated LRT	Metro-style grade separated LRT line, with grade separation of Te Irirangi Drive cross streets, and Manukau tunnel and/or elevated sections with large offline interchange stations.	High cost, particularly for extensive tunnelled sections. High streetscape, landscape and visual impacts for elevated sections. Excessive capacity (10,000+ pax/hour), compared to expected demand (1,200 pax/hour, in the peak direction).
	Busway	I2	Airport to Botany Grade Separated Busway	Northern Busway style grade separated busway, with grade separation of Te Irirangi Drive cross streets, and Manukau tunnel and/or elevated sections with large offline interchange stations.	High cost, particularly for extensive tunnelled sections. High streetscape, landscape and visual impacts for elevated sections. Excessive capacity (10,000+ pax/hour), compared to expected demand (1,200 pax/hour, in the peak direction).
	Heavy Rail	I3	Airport to Botany Heavy Rail	Heavy rail, new dedicated alignment Botany to Manukau (Te Irirangi Dr grade separation + tunnel Clover Park to Manukau Station) and Puhinui to Airport. Manukau branch becomes part of the new Airport to Botany Line, Eastern Line runs to Papakura).	High cost, particularly for grade separated sections. High environmental and social impacts of a new heavy rail line through established residential and commercial areas. Excessive capacity (10,000+ pax/hour), compared to expected demand (1,200 pax/hour, in the peak direction).
	Automated Metro	I4	Airport to Botany Metro	New fully grade separated rail line (tunnel and/or elevated) dedicated to high frequency automated metro operations.	Very high cost, new system with procurement and delivery risks. Excessive capacity (10,000+ pax/hour), compared to expected demand (1,200 pax/hour, in the peak direction).
Segment A: West (Airport to Puhinui/Southern Line/Manukau)	BRT or LRT	A3	Airport to Manukau direct via SH20 motorway corridor	Direct alongside SH20 motorway corridor from Manukau to SH20B (skips Puhinui).	Connection to Southern Line heavy rail services not provided, significantly reducing potential catchment.
	Heavy Rail	A4	Heavy Rail loop via Onehunga	Heavy Rail Onehunga Line extended Onehunga to Puhinui via Airport.	Very high cost. Duplication of transport infrastructure with heavy rail parallel to the City to Mangere LRT alignment south of Onehunga, including across the Mangere Inlet. Forced change at Puhinui. Inconsistent with planned City Rail Link network operating plan: limited capacity or impacts on other lines.

Group	Mode	Code	Name	Description	Reasons for exclusion
	Heavy Rail	A5	Heavy Rail loop via Ōtāhuhu	Heavy Rail Eastern Line extension from Ōtāhuhu to Puhinui via Airport.	Very high cost. High environmental and social impacts of a new heavy rail line along southern shore of Mangere Inlet and through established residential and commercial areas. Forced change at Puhinui. Inconsistent with planned City Rail Link network operating plan: limited capacity or impacts on other lines.
	Heavy Rail	A7	Heavy Rail Airport Shuttle Line	Heavy Rail, spur line Puhinui to Airport (via new Wiri junction) with rail shuttle service Puhinui to Airport.	Relatively high cost of operating a rail shuttle service over a short distance. Forced change at Puhinui. Excessive capacity (10,000+ pax/hour), compared to expected demand (1,200 pax/hour, in the peak direction).
	Gondola	A8	Gondola Airport-Puhinui	Elevated suspended gondola line running Airport to Puhinui direct.	Forced change at Puhinui. New system with procurement and delivery risks.
	Peplemover /cableliner	A9	Peplemover Airport-Puhinui	Elevated supported cableliner "airport peplemover" airport to Puhinui direct.	Forced change at Puhinui. New system with procurement and delivery risks.
Segment B: Central (Puhinui through Manukau)	BRT or LRT	B2	Puhinui to Clover Park via Cavendish Drive (skip Manukau Station)	Routes via Cavendish Drive giving access to north side of Manukau Metropolitan Centre but not connecting to bus and rail station. Local buses extended from Manukau Bus station to new interchange on Cavendish Drive with Airport to Botany alignment.	Lack of interchange opportunities at Manukau Station.
	BRT or LRT	B4	Puhinui to Manukau via Putney Way	Via Putney Way giving access to Manukau Metropolitan Centre, with direct access bus and rail station.	High cost and significant social and environmental impact associated with alignment through Putney Way. Benefits of alignment approximated by options B1 and B3 retained for long list assessment.
Alternate Street Corridor Options not via Puhinui-Manukau	BRT or LRT	X1	Airport to Botany via Mangere, Middlemore, Otara, Te Irirangi	Via SH20A to Mangere Town Centre, then Buckland Road-Massey Road to Middlemore, then new link to East Tamaki Road and Ormiston Road, the Harris Road, Te Irirangi Drive or Chapel Road to Botany Town Centre.	Does not serve Manukau Metropolitan Centre. High cost and environmental and social impacts of required widening of second order arterial/collector roads.

4. Long List Options

The options retained for long list assessment are listed and described in Table 2 along with rationale for inclusion.

Table 2: Long List Options

Group	Mode	Code	Name	Description	Reasons for inclusion	Map
Segment A: West (Airport to Puhinui/Southern Line/Manukau)	BRT or LRT	A1	Airport to Puhinui via Puhinui Road-SH20B	Puhinui Road from Puhinui station to airport.	Provides a direct, fast and simple connection between the Airport and Puhinui. Moderate cost option with low to moderate environmental impact. Provides sufficient capacity for expected demands.	
	BRT or LRT	A2	Airport to Puhinui via SH20A and SH20	Route to north via Mangere town centre.	Follows existing State Highway corridors, therefore has lower environmental impact on Pukaki Creek. Extends access to the A2B MRT to more people (ie those living along the SH20 and SH20A alignment). Provides sufficient capacity for expected demands, at a moderate cost.	
	Heavy Rail	A6	Heavy Rail Airport Spur Line	Heavy Rail, spur line Puhinui to Airport (via new Wiri junction) with new rail service pattern from Britomart to Airport.	Direct connection to Southern Line, so it is easy to access from the northern part of the Southern Line. Of the heavy rail options, this is the lowest cost and the most aligned with project objectives for A2B. This is the most feasibly constructible heavy rail option¹.	

¹ Note that a more detailed discussion of the heavy rail options for the A2B project is available in the technical note, *Airport to Botany Heavy Rail Option Summary (MRCagney & Aurecon, 2018)*.

Group	Mode	Code	Name	Description	Reasons for inclusion	Map
Segment B: Central (Puhinui through Manukau)	BRT or LRT	B1	Puhinui to Clover Park via Puhinui Road (skip Manukau Metropolitan Centre and Manukau Station)	Direct alignment to Puhinui skipping Manukau Metropolitan Centre. Local buses extended from Manukau Bus station to new interchange on Puhinui Road with Airport to Botany alignment.	Direct, legible alignment offering shorter travel times, particularly if paired with Springs-Harris alignment for Segment C. Use of BRT or LRT provides sufficient capacity at a moderate cost.	
	BRT or LRT	B3	Puhinui to Manukau via Ronwood Ave	Via Ronwood Ave giving access to Manukau Metropolitan Centre, with long walk to access bus and rail station.	Alignment through core of Manukau Metropolitan Centre, with indirect access to bus and rail stations for interchange (300-400m walk required). Relatively direct, so small impact on travel times through Manukau, whilst providing more direct access to Manukau than the B1 option. Use of BRT or LRT provides sufficient capacity at a moderate cost.	
	BRT or LRT	B5	Puhinui to Manukau via Manukau Station Road	Via Manukau Station Road giving access to Manukau Metropolitan Centre, with direct access bus and rail station.	Access to Manukau Metropolitan Centre, and direct access to bus and rail stations for interchange. Increased travel time through Manukau is balanced by the increased access of the A2B MRT to more of Manukau Centre. Use of BRT or LRT provides sufficient capacity at a moderate cost.	
Segment C: East (Manukau to Botany)	BRT or LRT	C1	Manukau to Botany via Chapel Road	Using modification of road corridor.	Many residential areas and some neighbourhood and town centres within catchment along Chapel Road corridor. Use of BRT or LRT provides sufficient capacity at a moderate cost.	

Group	Mode	Code	Name	Description	Reasons for inclusion	Map
	BRT or LRT	C2	Manukau to Botany via Te Irirangi Drive	Using central reservation on Te Irirangi Drive.	Te Irirangi Drive corridor with sufficient width to accommodate MRT line. Direct alignment connects many residences and several neighbourhood and town centres along Te Irirangi Drive. High potential for redevelopment along the corridor. Use of BRT or LRT provides sufficient capacity, and the pre-existing wide road corridor means this can be achieved at a relatively low cost, as no property acquisition is required.	
	BRT or LRT	C3	Manukau to Botany via Preston Road-Harris Road	Using modification of road corridor.	Connects houses from Puhinui, Manukau and Preston Road to the commercial and industrial areas on Springs Road. Could provide a very direct and fast connection from the Airport and Puhinui to Botany if paired with option B1 for segment B. Use of BRT or LRT provides sufficient capacity at a moderate cost.	
Alternate Street Corridor Options not via Puhinui-Manukau	BRT or LRT	X2	Airport to Ormiston via Mangere, Middlemore, Otara, Ormiston Road	Via SH20A to Mangere Town Centre, then Buckland Road-Massey Road to Middlemore, then new link to East Tamaki Road and Ormiston Road, continuing to terminate at Ormiston Town Centre.	Connects several neighbourhood and town centres, and other key destinations that currently have low levels of PT access (Mangere, Middlemore Hospital, Otara and Ormiston). Use of BRT or LRT provides sufficient capacity at a moderate cost.	

Appendix 1: Initial Options

Group	Mode	Code	Name	Description
Integrated Off-Street Options	LRT	I1	Airport to Botany grade separated LRT	Metro-style grade separated LRT line, with grade separation of Te Irirangi Drive cross streets, and Manukau tunnel and/or elevated sections with large offline interchange stations.
	Busway	I2	Airport to Botany Grade Separated Busway	Northern Busway style grade separated busway, with grade separation of Te Irirangi Drive cross streets, and Manukau tunnel and/or elevated sections with large offline interchange stations.
	Heavy Rail	I3	Airport to Botany Heavy Rail Crosstown	Heavy rail, new dedicated alignment Botany to Manukau (Te Irirangi Dr grade separation + tunnel Clover Park to Manukau Station) and Puhinui to Airport. Manukau branch becomes part of the new crosstown, Eastern Line runs to Papakura).
	Automated Metro	I4	Airport to Botany Metro	New fully grade separated rail line (tunnel and/or elevated) dedicated to high frequency automated metro operations.
Segment A: West (Airport to Puhinui/Southern Line/Manukau)	BRT or LRT	A1	Airport to Puhinui via Puhinui Road-SH20B	Puhinui Road from Puhinui Station to Airport.
	BRT or LRT	A2	Airport to Puhinui via SH20A and SH20	Route to north via Mangere Town Centre.
	BRT or LRT	A3	Airport to Manukau direct via SH20 motorway corridor	Direct alongside SH20 motorway corridor from Manukau to SH20B (skips Puhinui).
	Heavy Rail	A4	Heavy Rail loop via Onehunga	Heavy Rail Onehunga Line extended Onehunga to Puhinui via Airport (as per SMART full loop).
	Heavy Rail	A5	Heavy Rail loop via Ōtāhuhu	Heavy Rail Eastern Line extension from Ōtāhuhu to Puhinui via Airport (SMART full loop but from Ōtāhuhu via Māngere East).

Group	Mode	Code	Name	Description
	Heavy Rail	A6	Heavy Rail Airport Spur Line	Heavy Rail, spur line Puhinui to Airport (via new Wiri junction) with new rail service pattern from Britomart to Airport.
	Heavy Rail	A7	Heavy Rail Airport Shuttle Line	Heavy Rail, spur line Puhinui to Airport (via new Wiri junction) with rail shuttle service Puhinui to Airport.
	Gondola	A8	Gondola Airport-Puhinui	Elevated suspended gondola line running Airport to Puhinui direct.
	Peoplemover /cableliner	A9	Peoplemover Airport-Puhinui	Elevated supported cableliner "airport peoplemover" airport to Puhinui direct.
Segment B: Central (Puhinui through Manukau)	BRT or LRT	B1	Puhinui to Clover Park via Puhinui Road (skip Manukau Metropolitan Centre and Manukau Station)	Direct alignment to Puhinui skipping Manukau Metropolitan Centre. Local buses extended from Manukau Bus station to new interchange on Puhinui Road with Airport to Botany alignment.
	BRT or LRT	B2	Puhinui to Clover Park via Cavendish Drive (skip Manukau Station)	Routes via Cavendish Drive giving access to north side of Manukau Metropolitan Centre but not connecting to bus and rail station. Local buses extended from Manukau Bus station to new interchange on Cavendish Drive with Airport to Botany alignment.
	BRT or LRT	B3	Puhinui to Manukau via Ronwood Ave	Via Ronwood Ave giving access to Manukau Metropolitan Centre, with long walk to access bus and rail station.
	BRT or LRT	B4	Puhinui to Manukau via Putney Way	Via Putney Way giving access to Manukau Metropolitan Centre, with direct access bus and rail station.
	BRT or LRT	B5	Puhinui to Manukau via Manukau Station Road	Via Manukau Station Road giving access to Manukau Metropolitan Centre, with direct access bus and rail station.

Group	Mode	Code	Name	Description
Segment C: East (Manukau to Botany)	BRT or LRT	C1	Manukau to Botany via Chapel Road	Using modification of road corridor.
	BRT or LRT	C2	Manukau to Botany via Te Irirangi Drive	Using central reservation on Te Irirangi Drive.
	BRT or LRT	C3	Manukau to Botany via Preston Road-Harris Road	Using modification of road corridor.
Segment D: Beyond Botany	BRT or LRT	D1	Botany to Howick via Whitford Road	Extend along street corridors of Chapel Road to Somerville shops, then Whitford Road, Cook Street and Minerva Tce to Howick shops. Interchange with Pakuranga Road buses and local buses at Howick.
	BRT or LRT	D2	Botany to Bucklands Beach via Botany Road	Extend along street corridors of Botany Road and Ridge Road, then Bleakhouse Rd and Macleans Road to Bucklands Beach Road. Interchange with Pakuranga Road buses and local buses at Ridge Road roundabout.
	BRT or LRT	D3	Botany to Highland Park via Aviemore Drive	Extend along street corridors of Botany Road, Cascades Road and Aviemore Drive to terminate at new interchange at Highland Park shops for interchange with Pakuranga Road and local buses.
	BRT or LRT	D4	Botany to Panmure via AMETI busway	Services extend from Botany to Panmure via AMETI Eastern Busway, duplicating AMETI services to terminate at Panmure interchange.
	BRT or LRT	D5	Terminate at Botany only	Services terminate at Botany, interchange to local buses and AMETI at Botany. No connection to Pakuranga Road corridor.
Alternate Street Corridor Options	BRT or LRT	X1	Airport to Botany via Mangere, Middlemore, Otara, Te Irirangi	Via SH20A to Mangere Town Centre, then Buckland Road-Massey Road to Middlemore, then new link to East Tamaki Road and Ormiston Road, the Harris Road, Te Irirangi Drive or Chapel Road to Botany Town Centre

Group	Mode	Code	Name	Description
not via Puhinui-Manukau	BRT or LRT	X2	Airport to Ormiston via Mangere, Middlemore, Otara, Ormiston Road	Via SH20A to Mangere Town Centre, then Buckland Road-Massey Road to Middlemore, then new link to East Tamaki Road and Ormiston Road, continuing to terminate at Ormiston Town Centre.
Street Corridor Mode Options	BRT or LRT	-	Airport to Botany surface BRT or LRT: closed system	Dedicated surface BRT or LRT lanes with signal priority. Inline stops, single high frequency service pattern with dedicated articulated buses or LRT vehicles as the only thing operating on the route. Street level interchanges with connecting routes.
	BRT or LRT	-	Airport to Botany surface BRT or LRT: open system	Offline stops and turning bays allowing multiple BRT/LRT and bus service patterns, express buses to various destinations and local buses using the corridor. Mix of standard and double decker buses.

Approved by:

Title	Name	Title	Signature	Date
Author				
Reviewer				

Technical Note

To	Auckland Transport	From	[REDACTED], [REDACTED]
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Subject	Long List Assessment and Short List recommendation		

This note describes the process followed to execute the multi-criteria analysis (MCA) for the long list options for the Airport to Botany (A2B) Mass Rapid Transit. The MCA used problems, benefits and investment objectives established during the investment logic mapping (ILM) exercise carried out prior to the long list assessment. Key performance indicators (KPI) were also carried forward from the ILM, with minor refinement to fit within the limits of available data sources and analysis methods.

The assessment of the A2B long list was integrated with the parallel assessment of the 20Connect project, which proposes upgrades of State Highways 20, 20A and 20B and motorway interchanges between them. 20Connect and A2B are closely related as they both aim to provide additional transport capacity for different modes along similar corridors. It is anticipated that the demands and preferred solutions for each project will affect the other project, however, at this stage only the assessment criteria for each project has been aligned, not the options themselves. At the short list stage, the options will consist of both 20Connect and A2B components.

The long list assessment for A2B is comprised of three groups of assessment: transport planning, planning and environmental effects, and engineering feasibility.

The rest of this technical note describes the options that were assessed, what assessment was conducted, how scoring was applied, and how the long list MCA leads to a set of short list options.

1 Long list options

From the initial list of options, a sieving framework process was conducted to remove the options that would be obviously infeasible, too expensive, or have high implementation risks. The details of this sieving process are described in a separate technical note (*Airport to Botany initial options and sieving process, MRCagney – August 2018*). The main Airport to Botany (via Puhinui) corridor was divided into three segments, each with three alignment options, and an additional option was assessed that bypassed Puhinui and Manukau.

Figure 1-1 shows the ten options that were assessed. X1 is the standalone option that connects the Airport to Ormiston, bypassing Puhinui and Manukau. The main corridor (connecting the Airport, Puhinui and Botany) is shown with its three segments and their alignment options. The divisions between the segments are Puhinui Station (where all of the A segments converge), and just beyond Manukau (where all of the C segments begin).

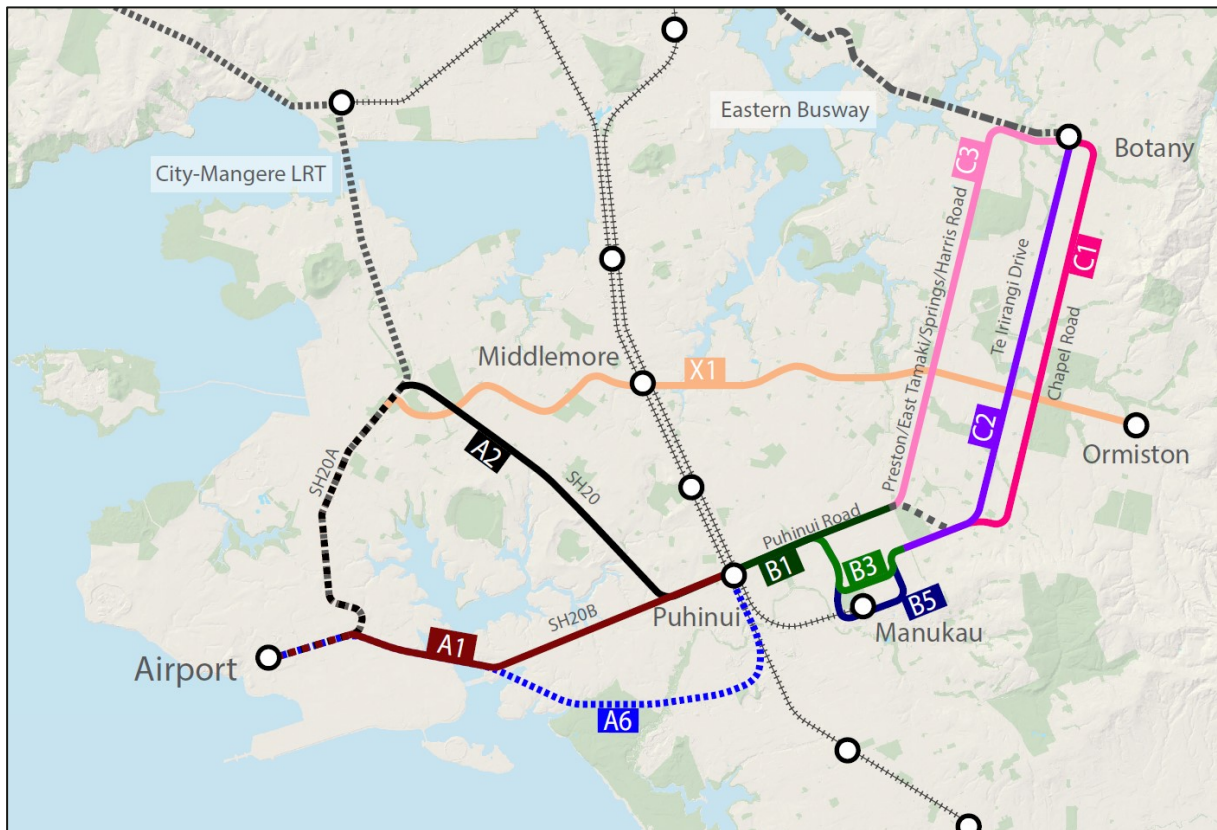


Figure 1-1: Airport to Botany long list options

2 Analysis methodology

The MCA process is a way of distinguishing how each option performs against the investment objectives of the project by assessing the options against a set of key performance indicators related to the investment objectives. Whilst some metrics can be assessed quantitatively through calculations, others must be assessed qualitatively by experts in the field. The section describes the metrics that were considered in the long list assessment for A2B.

2.1 Transport planning

The assessment of the transport planning KPIs included both the quantitative and qualitative assessment of various metrics. Descriptions of how each metric was assessed are summarised in Table 2-1.

Table 2-1: Transport planning metrics

Metric	Details
Population accessibility	Population accessible to the Airport, Manukau and Botany, using multi-modal PT and walking catchments
Jobs accessibility	Number of jobs within multi-modal PT and walking catchments from Botany, Manukau, Ormiston, Otara and Papakura

Metric	Details
Access to education and healthcare	Population within catchments from key education and hospital destinations, and maps of other key destinations with walking catchments from station locations
Peak travel time reliability	Expert assessment of reliability implications from the possible level of PT separation and intersection priority
Directness	Number of transfers required for key journeys
Travel time	Travel times based on assumptions about travel speeds
Access to 'centres'	Area of Unitary Plan Centres within walking catchment from station locations, with expert judgement on the relative importance of access to the various types of centres
Land development around stations	Extent of social housing and growth areas with access to (ie close to) the option stations
Walking access to stations	Population within walking catchment from existing and proposed rapid and frequent transit network

2.1.1 Data sources

Several sources of data were required to complete the long list assessment for the transport planning metrics. The key data inputs and their sources are detailed in Table 2-2.

Table 2-2: Data and sources

Data	Source
Public transport routes (New Network)	Auckland Transport
Walking network (streets and paths)	OpenStreetMap
Population estimates	i11 land use model
Job estimates	i11 land use model
Sites and places of value to mana whenua	Auckland Unitary Plan data
Neighbourhood, local, town, metropolitan centres	Auckland Unitary Plan data
Land development opportunities Housing New Zealand land Panuku growth centres	Housing New Zealand Panuku Development Auckland's website

2.2 Planning and environmental effects

The potential effects of each option on the environment were also assessed. Specialist assessments were undertaken in the topic areas including ecology, arboriculture, stormwater, landscape, visual and urban design, social, noise and vibration, archaeology, contaminated land and air quality¹.

¹ The long list air quality assessment was a broad qualitative assessment carried out by the planning team and did not involve an air quality specialist.

2.3 Engineering feasibility

The feasibility of implementation was assessed according to the criteria in Table 2-3.

Table 2-3: Criteria for assessing feasibility

Criterion	Description
Constructability	The level of complexity of implementing the solution, with consideration of construction methodology and staging, and constraints
Safety in design	General assessment of hazards and level of complexity in risk management during construction
Operation and maintenance	Assessment of maintenance and operational implications over the projected life
Construction disruption	Impacts of construction on people and businesses
Property	The extent of impacts on properties; primarily the necessary acquisition of properties
Construction cost and risk	Estimated construction costs, including complexity and risk in construction

3 Scoring

Each option was scored against each KPI so the long list options could easily be compared with one another.

3.1 Transport planning

A seven-point scale (-3 to 3, including 0) was used to assess the metrics for transport planning, which focuses on how the options affect transport users and the accessibility to key destinations and opportunities. Two questions were answered in determining each score:

1. Will this option improve or worsen the performance of the transport network against the KPI compared to no interventions?
 - Improved: options that improved the performance were given a positive score;
 - Worsened: those that worsened its performance received a negative score; and
 - No effect: options that had negligible effects, were scored zero.
2. How does the effect of this option compare to the effect of the other options against the same KPI?
 - Greatest positive effect: the options bringing about the greatest positive effect scored 3;
 - Modest positive effect: options with a more modest effect scored 1 or 2; and
 - Similar to another option: where effects of different options were broadly similar, they were given the same score against that KPI.

Once all options had been scored, an internal review was carried out to ensure consistency.

3.2 Planning and environmental effects

The same seven-point scale was used for the planning metrics as was used for transport planning. The approach in determining what score was appropriate differed from the transport planning assessment, due to these KPIs considering the physical implications and planning constraints of options, rather than their effects on people.

The scoring scale for planning is detailed in Table 3-1. Each of the specialists assigned each option a score ranging between -3 (unmitigable adverse effect) to 3 (significant positive benefit).

Table 3-1: Scoring scale for planning metrics

3 (Significant positive)
2 (Moderate positive)
1 (Minor positive)
0 (Neutral)
-1 (Minor/moderate adverse)
-2 (Significant adverse)
-3 (Unmitigable adverse)

3.3 Engineering feasibility

The rating scale for the feasibility of implementation of options uses a five-point scale with no negative values (1 to 5). Unlike other categories, the feasibility is not measured against a do minimum or base case approach. A descriptive rating for each criterion was specified against the five-point scale for clarity and transparency; the descriptions of the scores are included in Table 3-2.

Table 3-2: Feasibility rating scale

Rating	Implementability					
	Constructability	Safety in design	Operation and maintenance	Construction Disruption	Property ²	Construction Cost and Risk
1	Construction of this kind has not been done before or often in NZ. The work is highly specialised. There are significant and/ or multiple physical constraints.	Significant / extreme H&S design and construction risks. Significant level of risk management through safety in design. Significant hazards associated with the option which pose a significant H&S risk in design, build and final product. Safety highly difficult to be developed into the design process to control H&S and operational risks.	Significant maintenance and operation costs. Significant level of maintenance activities required and ability/ capacity to carry out maintenance activities. Significant factors that affect the ability to operate or maintain the option over its projected life with major additional costs.	Significant amounts of construction impact on people and businesses.	Impacts significant land holdings, whole or parts of communities and large, well established businesses. 100+ parcels. Extreme level of anticipated risk for property acquisition (e.g. significant risk of appeals, objections). Difficult to meet project programme timeframes. Significant constraints on property titles impacting acquisition under PWA e.g. reservation land / covenants.	Significant costs for construction of option.
2	The work has been done before in NZ but is not common. Resource to carry out the work is scarce but available. There is at least one significant constraint.	High level of H&S design and construction risks. High level of risk management through safety in design. Hazards associated with the option which pose a high H&S risk in design, build and final product. Safety is challenging to be developed into the design process to control H&S and operational risks. However, is achievable.	Moderate to high maintenance and operation costs. Moderate to high level of maintenance activities required and ability/ capacity to carry out maintenance activities. Some factors that affect the ability to operate or maintain the option over its projected life with moderate to high additional costs.	High amounts of construction impact on people and businesses.	Impacting a large number of residential and business properties. 40-100 parcels. High level of anticipated risk for property acquisition (e.g. high risk of appeals, objections). May be able to meet project programme timeframes with active management of risk. High level of constraints on property titles impacting acquisition under PWA.	High costs for construction of option.
3	Major construction works but nothing unusual. May involve some traffic and local management issues.	Moderate to high level of H&S design and construction risks but nothing unusual. High level of risk management through safety in design. Hazards associated with the option which pose a H&S risk in design, build and final product. Safety can be developed into the design process to control H&S and operational risks.	Moderate maintenance and operation costs. Moderate level of maintenance activities required and ability/ capacity to carry out maintenance activities. Some factors that affect the ability to operate or maintain the option over its projected life with moderate additional costs.	Moderate construction impact on people and businesses.	Impacting a moderate number of residential and business properties. 10-40 parcels. Moderate level of anticipated risk for property acquisition (e.g. moderate risk of appeals, objections). May be able to meet project programme timeframes with active management of risk. Moderate level of constraints on property titles impacting acquisition under PWA.	Moderate costs for construction of option.
4	Moderate works.	Low to moderate level of H&S design and construction risks but nothing unusual. Low to moderate level of risk management through safety in design. Low to moderate hazards associated with the option which pose a H&S risk in design, build and final product. Safety can be developed into the design process to control H&S and operational risks.	Minor to moderate level of maintenance and operation costs.	Minor amounts of construction impact on people and businesses.	Minimal land requirement. <10 parcels. Minor level of anticipated risk for property acquisition (e.g. minor risk of appeals, objections). Likely to meet project programme timeframes. Minor constraints on property titles impacting acquisition under PWA.	Minor costs for construction of option.
5	Straightforward and minor works.	Low level of H&S design and construction risks but nothing unusual. Low level of risk management through safety in design. Low level hazards associated with the option which pose a H&S risk in design, build and final product. Safety can be developed with ease into the design process to control H&S and operational risks.	Negligible/ minor level of maintenance and operation costs.	Negligible amounts of construction impact on people and businesses.	No land requirement. No property acquisition required. Minimal level of anticipated risk for property acquisition (e.g. minimal or no risk of appeals, objections). Likely to meet project programme timeframes. No constraints on titles.	Minimal costs for construction of option.

² Property impact has been broadly considered across the options but was not scored as part of the long list options workshop. At a high level, all options will have direct property impacts which may range between localised effects to more significant impacts.

4 MCA Results

Table 4-1 details the resulting MCA scores from the long list assessment process, as described above. The transport planning metrics for segment C are dependent on whether Manukau is bypassed in segment B (i.e. option B1), or if it is connected (i.e. B3 or B5). The main score shown assumes Manukau is connected to in segment B, whilst a secondary score is shown in brackets if this score differs by assuming Manukau is bypassed.

Table 4-1: MCA results for each of the key assessment groups

Investment objective/ criteriaKPI		Segment A – Airport to Puhinui			Segment B – Puhinui to Manukau			Segment C – Manukau to Botany ³			Alternative
		A1 – via SH20B	A2 – via SH20A, SH20	A6 – Heavy rail to Puhinui	B1 – Bypass Manukau via Puhinui Road	B3 – via Ronwood Avenue	B5 – via Manukau Station Road	C1 – via Chapel Road	C2 – via Te Irirangi Drive	C3 – via Preston Road, Harris Road	X1 – Airport to Ormiston via Māngere, Middlemore, Otara
Provide more equitable access and travel choices to jobs, learning, cultural and social activities in the south and east of Auckland	Population accessible to key employment precincts	3	1	0	2	3	3	2	3 (2)	2	-2
	Jobs accessible to key residential locations	2	2	2	2	2	2	1	2	3 (2)	0
	Access to education and healthcare	1	2	3	1	1	1	1	1	1	2
	Access to places of customary practice ⁴	0	1	0	0	0	0	0	0	0	2
Provide public transport for south and east Auckland that is easy to use, reliable, fast, resilient and affordable	Directness of key journeys	2	2	0	2	2	2	2	2	2	0
	Travel time for key journeys	3	1	2	2	3	3	3 (2)	3 (2)	3 (2)	-2
Promote urban regeneration, improved built environment, and economic opportunities	Population accessible to key employment precincts	3	1	0	2	3	3	2	3 (2)	2	-2
	Jobs accessible to key residential locations	2	2	2	2	2	2	1	2	3 (2)	0
	Improved access to ‘centres’	2	3	2	0	2	2	1 (0)	2 (0)	1 (-1)	1

³ If a second score is provided in brackets, this is the equivalent score if option B1 (bypass Manukau) is selected for segment B.

⁴ Assessed by Aurecon.

Investment objective/ criteria KPI		Segment A – Airport to Puhinui			Segment B – Puhinui to Manukau			Segment C – Manukau to Botany ³			Alternative
		A1 – via SH20B	A2 – via SH20A, SH20	A6 – Heavy rail to Puhinui	B1 – Bypass Manukau via Puhinui Road	B3 – via Ronwood Avenue	B5 – via Manukau Station Road	C1 – via Chapel Road	C2 – via Te Irirangi Drive	C3 – via Preston Road, Harris Road	X1 – Airport to Ormiston via Māngere, Middlemore, Otara
	Potential for land development	0	1	0	0	0	0	0	0	1	3
Reduces the effects of the transport system on the environment and taonga	Extent of effects on places of heritage ⁴	-2	-2	-2	-1	-1	-1	-1	-1	-1	-1
	Effect on Māori communities and wellbeing ⁴	-2	-2	-2	-1	-1	-1	-1	-1	-1	-1
	Te Taiao (air, land, water) ⁴	-1	-1	-2	-1	-1	-1	-1	-1	-1	-1
	Effects on culture and traditions ⁴	1	1	1	1	1	1	1	1	1	1
	Opportunities to recognise sites of significance ⁴	1	1	1	0	0	0	0	0	0	0
To improve health, safety, and security of people	Improved access to the RTN/FTN	1	2	1	2	1	1	2	1	3	2
Assessment of environmental effects (assessed by Aurecon and specialised sub-consultants)	Aquatic ecology	-1	-1	0	-1	0	-1	-1	-1	-1	-1
	Terrestrial ecology	-1	-1	-1	0	0	0	-1	-1	-1	-1
	Marine ecology	-1	0	-1	0	0	0	0	0	0	-1
	Arboriculture	-1	-2	-1	-2	-2	-2	-2	-2	-1	-2
	Stormwater quality	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
	Stormwater quantity	-1	-1	-1	-2	-2	-2	-1	-1	-1	-2

Investment objective/ criteria KPI		Segment A – Airport to Puhinui			Segment B – Puhinui to Manukau			Segment C – Manukau to Botany ³			Alternative
		A1 – via SH20B	A2 – via SH20A, SH20	A6 – Heavy rail to Puhinui	B1 – Bypass Manukau via Puhinui Road	B3 – via Ronwood Avenue	B5 – via Manukau Station Road	C1 – via Chapel Road	C2 – via Te Irirangi Drive	C3 – via Preston Road, Harris Road	X1 – Airport to Ormiston via Māngere, Middlemore, Otara
	Natural character and landscape	-1	-1	-1	0	0	0	0	0	0	0
	Visual	-1	-2	-1	-2	-1	-1	-2	-2	-2	-2
	Proximity to key destinations and trip generators	0	2	0	1	2	3	2	2	1	2
	Opportunities for further developments	1	2	0	0	3	3	1	1	1	2
	Ability to accommodate suitable cross-section	0	-1	0	-1	0	0	-1	0	-1	-1
	Accessibility	1	1	1	1	1	1	1	1	1	1
	Community	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
	Health and safety	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
	Operational noise and vibration	-1	-1	-2	-1	-1	-1	-1	-1	-1	-1
	Construction noise and vibration	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
	Archaeology and built heritage	-2	-2	-2	-1	-1	-1	-1	-1	-1	-1
	Contaminated land	-1	-1	-3	-1	-1	-2	-1	-1	-2	-1

Investment objective/ criteria KPI		Segment A – Airport to Puhinui			Segment B – Puhinui to Manukau			Segment C – Manukau to Botany ³			Alternative
		A1 – via SH20B	A2 – via SH20A, SH20	A6 – Heavy rail to Puhinui	B1 – Bypass Manukau via Puhinui Road	B3 – via Ronwood Avenue	B5 – via Manukau Station Road	C1 – via Chapel Road	C2 – via Te Irirangi Drive	C3 – via Preston Road, Harris Road	X1 – Airport to Ormiston via Māngere, Middlemore, Otara
	Operational air quality	0	0	0	0	0	0	0	0	-1	0
	Construction air quality	-1	-1	-2	-1	-1	-1	-1	-1	-1	-1
Engineering feasibility/ implementability (assessed by Aurecon)	Constructability	3	2	2	3	3	3	3	3	3	3
	Construction disruption	3	2	1	3	3	3	3	4	2	3
	Construction cost and risk	3	2	1	3	3	3	3	3	3	2
	Safety in design and construction	3	2	2	3	3	3	3	3	3	3
	Operation and maintenance	4	2	2	4	4	4	4	4	4	4
	Consentability	2	2	1	2	2	2	2	2	2	2

5 Selecting components for the short list

Four short list options were preliminarily chosen based on the long list assessment for review by the project team and stakeholder group. This section details how the MCA results were used to select which options should proceed to the short list assessment stage.

5.1 Alternative option (bypass Puhinui & Manukau, terminate in Ormiston instead of Botany)

Option X1 was removed as an option because it generally performed poorly in all assessment groups – this is exemplified by its very low MCA score. Nonetheless, while it did not deliver against the Airport to Botany project objectives, it was identified that this corridor does provide some benefits that other options are unable to achieve, and therefore may be worthwhile as a frequent service bus route or other transit line intended to achieve other outcomes.

5.2 Segment A – Airport to Puhinui

Options A1 and A2 were advanced to the short list assessment stage. These two options performed relatively similarly across many of the metrics. They each have some different benefits and complexities compared to each other. The fine details of these benefits and complexities will be best assessed in more detail at the short list stage.

Option A6 (heavy rail from the Airport to Puhinui) was discarded at this stage. Its overall MCA score was very low (similar to X1) compared to all other options. Whilst a heavy rail option between the Airport and Manukau performed similarly to the other options assessed, it performed poorly on engineering feasibility metrics and very negatively in most metrics considering planning and environmental effects.

5.3 Segment B – Puhinui to Manukau

Option B1 (bypassing Manukau) was eliminated following the long list assessment. Bypassing Manukau Metropolitan Centre improved travel time, but generally worsened its performance against the other key objectives for the transport planning criteria. Additionally, this option performed similarly or worse than the other segment B options against all metrics in the planning and environment and engineering feasibility assessments.

Options B3 and B5 are very similar, with the difference being the alignment of the RTN through Manukau. The choice largely surrounds whether to run the RTN on a direct alignment through Manukau's retail and employment locations, or on a slightly less direct alignment that also directly serves the existing bus and rail station. The differences between these options are at a very detailed level, which should be considered in the short list assessment.

5.4 Segment C – Manukau to Botany

The options in segment C performed relatively similarly compared to one another in most criteria. A primary differentiator in segment C is in the property assessment. Te Irirangi Drive has an existing public transport reservation in its median, resulting in this option having fewer direct property impacts compared to the other two alignments. Option C2 was, therefore, deemed the most appropriate alignment, with the other two options being discarded at this stage and not progressed to the short list.

Option C1 (via Chapel Road) and C3 (via Preston Road and Harris Road) scored lower than option C2 in the MCA, in part due to:

- Poorer access to residences and/or employment opportunities;
- Less interaction with neighbourhood and local centres; and

- Greater construction disruption to local residents and businesses.

These, along with the greater property acquisition that would be necessary for options C1 and C2, are the key reasons that option C2 (via Te Irirangi Drive) was proceeded as the most appropriate alignment for segment C.

6 Summary

This long list assessment reviewed 10 route options for the A2B Mass Rapid Transit project. The project was split into three segments for the long list assessment (Airport to Puhinui; Puhinui to Manukau; Manukau to Botany). Within each section were three alignment options. There was also one alternative option (Airport to Ormiston via Māngere, Middlemore, Otara). Each option was assessed and scored by a relevant expert in the field for each group of metrics (transport planning; planning and environmental effects; engineering feasibility). The resulting MCA scores are shared in Table 4-1 and were used to better understand the differences between the options, and highlight where the major concerns and or benefits are in each option.

The MCA scores were evaluated and, as a result, some options were discarded at this stage.

Five options were found to have favourable enough scores to be considered (as seen in Table 4-1). These five options have been combined into four different route choices, outlined below. These make up the final short list of options to undergo another, more comprehensive, stage of assessment.

The short list options are shown in Figure 6-1, and are defined by the following combinations of the long list options from each segment:

Table 6-1: Short list options from long list (segment) options

Option	Segment A: Airport to Puhinui	Segment B: Puhinui to Manukau	Segment C: Manukau to Botany
A1-B3-C2	A1 – via SH20B	B3 – via Ronwood Avenue	C2 – via Te Irirangi Drive
A2-B3-C2	A2 – via SH20A, SH20	B3 – via Ronwood Avenue	C2 – via Te Irirangi Drive
A1-B5-C2	A1 – via SH20B	B5 – via Manukau Station Road	C2 – via Te Irirangi Drive
A2-B5-C2	A2 – via SH20A, SH20	B5 – via Manukau Station Road	C2 – via Te Irirangi Drive

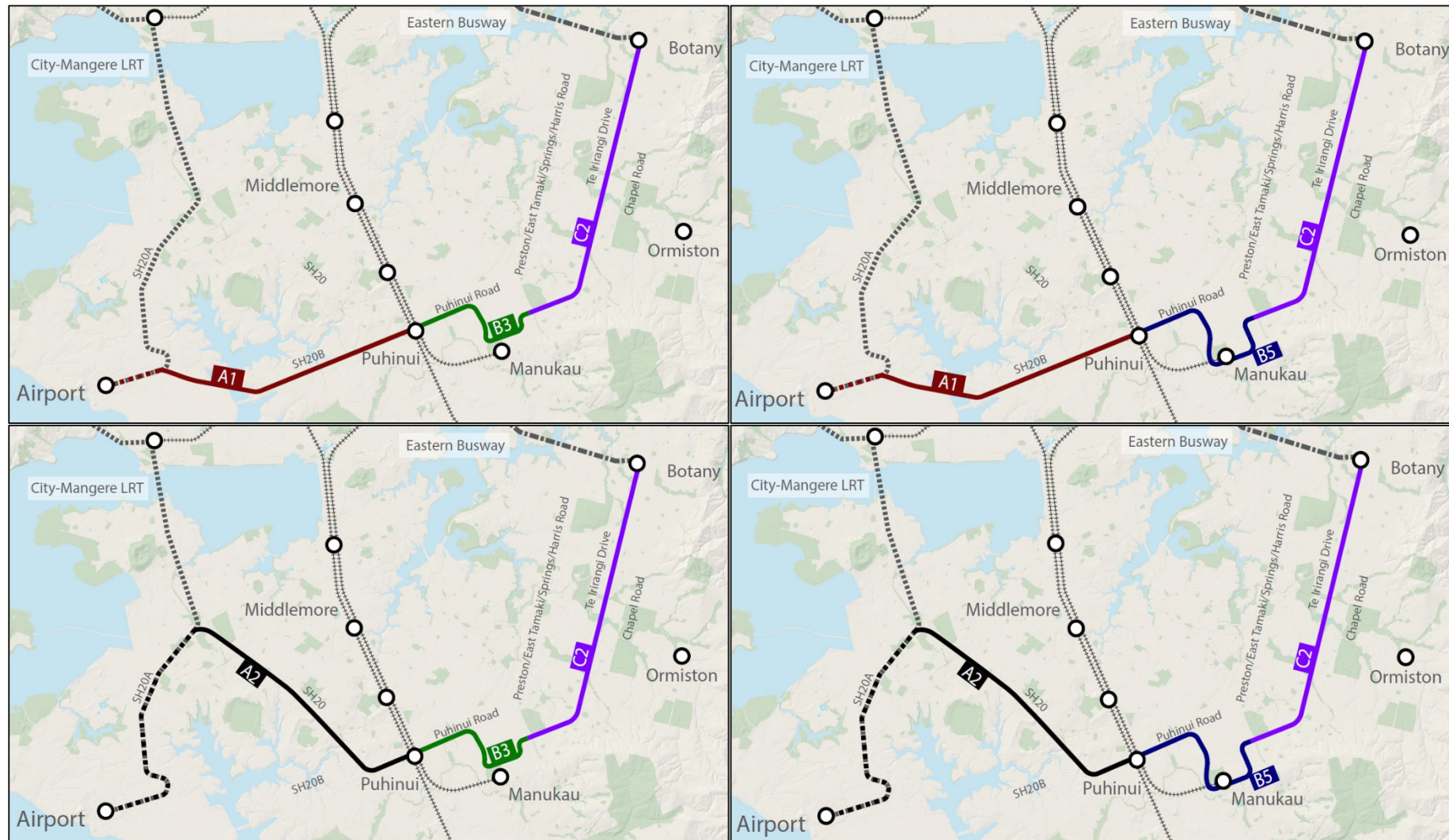


Figure 6-1: Long list to short list options

Approved by:

Title	Name	Position	Signature	Date
Author				
Reviewer				

Technical Note

To	Auckland Transport	From	
Copy		Reference No.:	502334-6000-TEC-KK-0012
Date	2019-04-09	Pages (including this page)	12
Subject	Long List Transport Planning Assessment		

1 Introduction

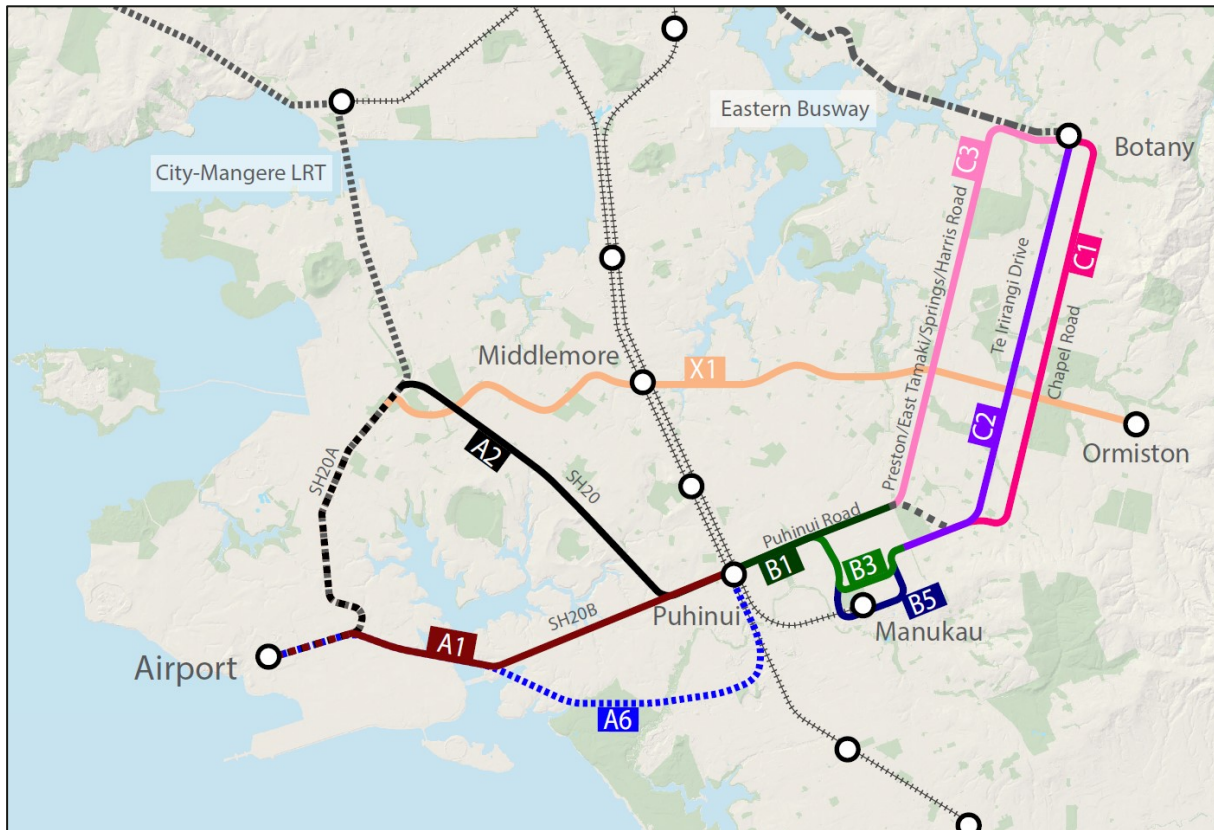
This note describes the process followed to score long list options against transport planning criteria as part of the multi-criteria analysis (MCA) for the Airport to Botany (A2B) Mass Rapid Transit project.

Assessments of each option against planning and environmental effects and engineering feasibility were also carried out but are not covered by this technical note.

The long list options were divided into three segments (A, B and C), with each option assessing one alignment for a particular segment. A standalone option (X1) was also considered, which bypasses the key points between the main segments being assessed. In total, ten long list options were assessed, and are shown in Figure 1 and listed here:

- Segment A: Airport to Puhinui:
 - A1 - via SH20B and Puhinui Road
 - A2 - via SH20A, SH20 and Puhinui Road
 - A6 - Heavy rail spur line from Wiri junction
- Segment B: Puhinui to Manukau:
 - B1 - to Clover Park via Puhinui Rd
 - B3 - to Manukau via Ronwood Ave
 - B5 - to Manukau via Manukau Station Rd
- Segment C: Manukau to Botany:
 - C1 - via Chapel Rd
 - C2 - via Te Irirangi Dr
 - C3 - via Preston Road-Harris Road
- Option X1 - Airport, Māngere, Middlemore, Ōtara, Ormiston

Figure 1: Airport to Botany long list options



The metrics, or key performance indicators (KPIs), against which the options were assessed were organised under four A2B benefits. Several KPIs were assessed for each benefit.

- Benefit 1: More equitable access to jobs, learning and social activities
- Benefit 2: Provide public transport for south and east Auckland that is easy to use, reliable, fast, resilient and affordable
- Benefit 3: Promote urban regeneration improved built environment and economic opportunities
- Benefit 5: Healthier and safer people

It should be noted that Benefit 4, *Local taonga enhanced*, was assessed against environmental criteria rather than transport planning criteria, so is not discussed in this technical note.

The rest of this technical note provides detail on the scoring methodology applied to complete the long list assessment. A summary of MCA scores for transport planning KPIs is included in Appendix A of this document.

2 Scoring

A seven-point scale (-3 to 3) was used to assess the metrics for transport planning, which focuses on how the options affect public transport users and the accessibility to key destinations and opportunities using public transport. Two questions were answered in determining each score:

1. Will this option improve or worsen the performance of the transport network against the KPI compared to no interventions?
 - Improved: options that improved the performance were given a positive score;
 - Worsened: those that worsened its performance received a negative score; and

- No effect: options that had negligible effects, were scored zero.
2. How does the effect of this option compare to the effect of the other options against the same KPI?
- Greatest positive effect: the options bringing about the greatest positive effect scored 3;
 - Modest positive effect: options with a more modest effect scored 1 or 2; and
 - Similar to another option: where effects of different options were broadly similar, they were given the same score against that KPI.

Once all options had been scored, an internal review was carried out to ensure consistency.

3 Assessment against A2B benefits

Note that where job and population estimates are made, they refer to the 2046, i11 land use forecasts.

3.1 Benefit 1: More equitable access to jobs, learning and social activities

3.1.1 Population accessibility

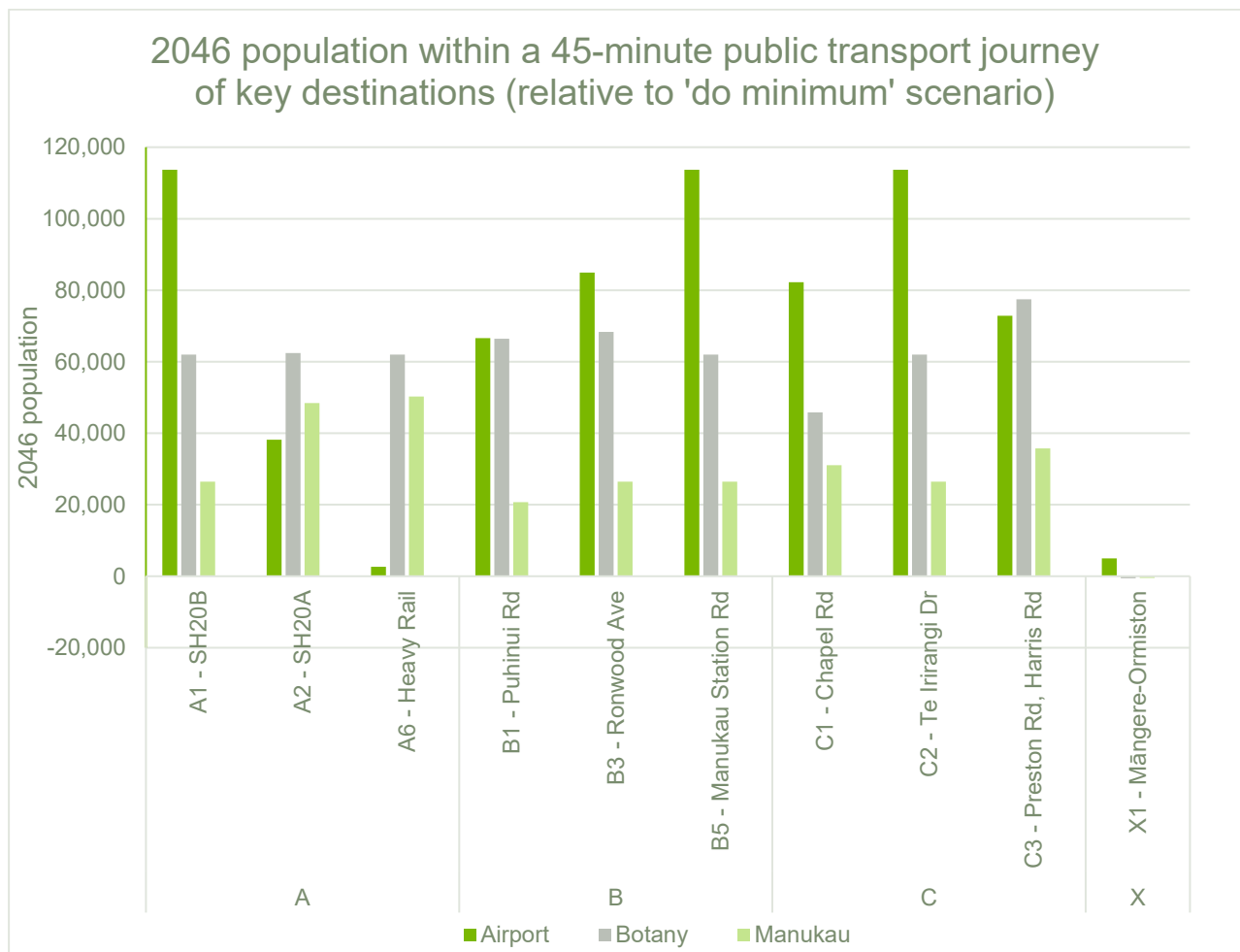
The first measure assesses the number of people forecast to be resident in 2046 within a 45-minute public transport (PT) journey of the airport, Manukau and Botany during the morning peak. The destinations were selected because they are the key employment centres in the study area, so this measure assesses the population with access to these centres. For all but one option, the interventions increased the population with access to all three destinations compared with no interventions.

For segment A, the options differed most regarding population with access to the airport and to a lesser degree those with access to Manukau. The options were ranked, and A1 (SH20B) scored 3, A2 (SH20A) 1 and A6 (heavy rail) 0 due to the magnitude of the access increases brought about by the respective interventions.

For segment B, all three options scored highly. Options B3 and B5 scored 3, whilst B1 (Puhinui Road) scored 2, due to lower population accessible to the airport and Manukau.

For segment C, all three options scored highly. Option C2 (Te Irirangi Drive) scored 3 primarily due to its markedly higher population value for access to the airport. C1 and C3 scored 2.

Option X1 (Māngere, Middlemore, Ōtara, Ormiston) had negative or low positive values for additional population accessible, meaning it decreased or only marginally increased access to the destinations relative to do-minimum, and hence scored -2.



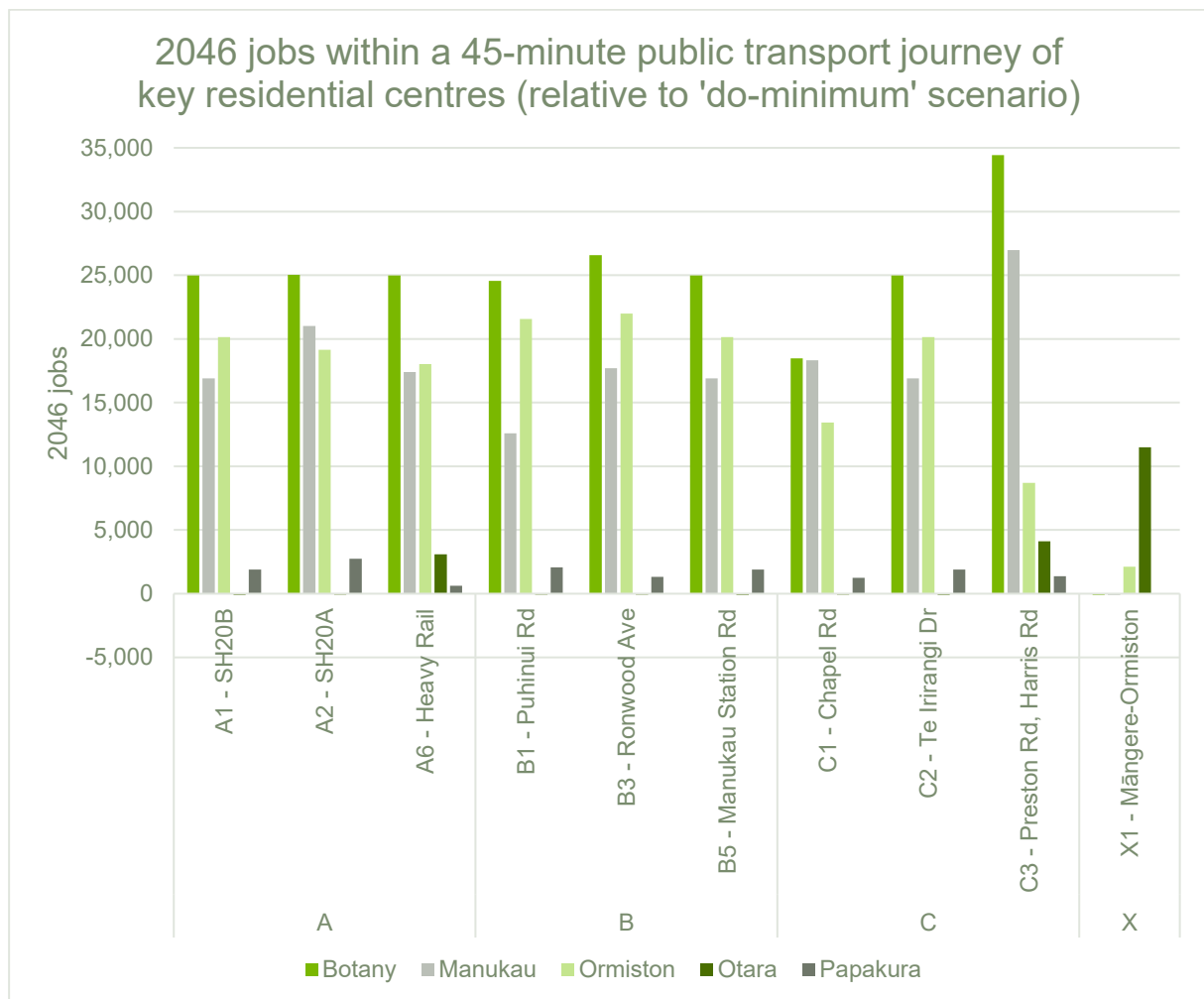
3.1.2 Job accessibility

This measure assesses the change in the number of jobs accessible within a 45-minute PT journey during the morning peak in 2046 from catchments of five residential centres - Botany, Manukau, Ormiston, Ōtara and Papakura.

For segments A and B, all three options scored 2 as they increased the number of jobs accessible significantly and did not differ greatly.

Significant differences in job accessibility were measured for segment C, resulting in a cascade of scores. Option C3 (Preston Road, Harris Road) scored 3 as it was forecast to generate the most significant increases in job accessibility from Botany and Manukau, as well as generating larger increases in job accessibility from Ōtara than the other segment C options. Option C2 (Te Irirangi Drive), scored 2 as it had similar job accessibility as the segment A and B options, which all scored 2. C1 scored 1 because C2 and C3 generated more job accessibility uplift from most centres.

Option X1 was forecast to result in some improvements and some worsened job accessibility to each of the centres that were assessed. The net effect of this was to score it a 0.



3.1.3 Access to education and healthcare

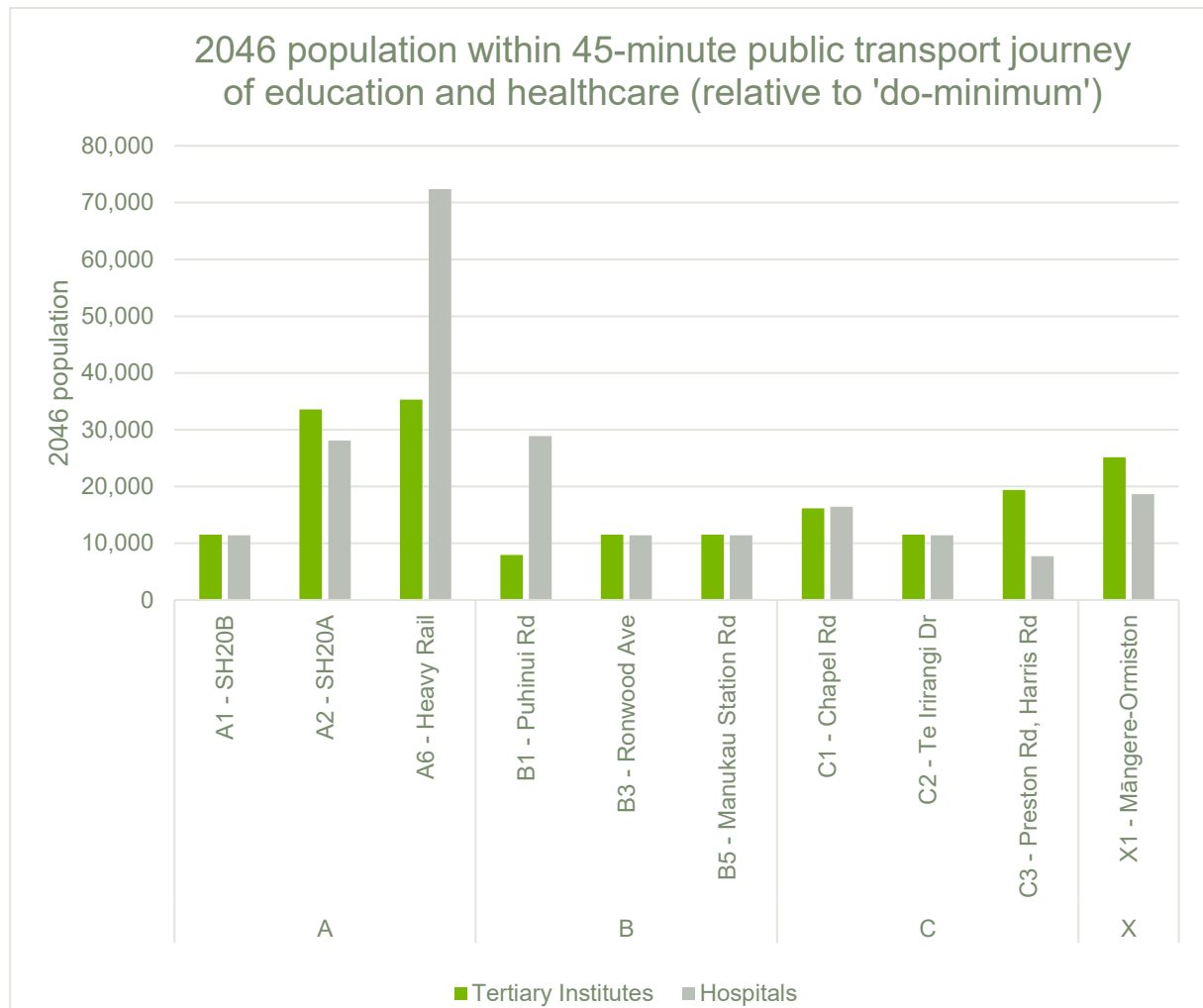
This measure assesses the change in population within 45-minute PT catchments from key education and hospital destinations (MIT Manukau, MIT Ōtara, AUT South Campus, Middlemore Hospital and the Manukau Superclinic) during the morning peak in 2046. All options generated an increase in the population catchments of both tertiary institutes and hospitals.

For segment A, a range of scores was given due to clear differences in population catchments. Option A6 (Heavy Rail) scored 3 due to the high uplift in population catchments, particularly regarding access to hospitals. This is because option A6 assumes the heavy rail spur would involve direct services from the airport to Puhinui, and then along the southern line to Britomart; therefore a 45-minute catchment from Middlemore would extend to the airport precinct and future urban growth areas, as well as have higher frequencies into the city, with shorter wait times and therefore an increased catchment. A2 scored second best at 2 due to the added frequent services from Manukau (with 2 large tertiary institutes) to Māngere, which currently has very low access to those tertiary institutes. A1 scored lowest with 1 as the forecast catchment for both tertiary institutes and hospitals is much lower with this option – this is because A1 is very direct between the airport and just east of Manukau, therefore it doesn't directly connect with many of the origins being assessed.

As results for the segment B options differed only slightly, scores of 1 were given for all three options. B1 would generate a bigger increase in population catchment for hospitals but a lower catchment for tertiary institutes. Options B3 and B5 would bring about modest and similar increases for both tertiary institutes and hospitals.

Similarly, options C1, C2 and C3 all scored 1 as they would result in similar catchments for tertiary institutes and hospitals.

Option X1 (Māngere, Middlemore, Ōtara, Ormiston) scored 2 because of the significant population catchment increases it would bring about for tertiary institutes (particularly MIT Ōtara) and hospitals (particularly Middlemore Hospital).



3.2 Benefit 2: Provide public transport for south and east Auckland that is easy to use, reliable, fast, resilient and affordable

3.2.1 Peak travel time reliability

The reliability of PT journeys along the option alignments was assessed by transport planners to compare the expected reliability of the options based on the level of PT separation from general traffic, and intersection priority. The assessments were made relative to a do minimum scenario, which assumes little-to-no bus priority.

For segment A, both of the LRT/BRT options (A1 and A2) scored 2 due to having a high degree of separation from general traffic, and the heavy rail option (A6) scored 3 due to being fully separated.

On segment B, the options routed via Manukau (B3 and B5) both scored 2 due to the assumed alignment of the LRT/BRT lines down the median or along one side of arterial roads. Option B1 bypasses Manukau via Puhinui Road and scored 0 because the alignment to the east of Lambie Drive, particularly when it turns into Reagan Road and Boundary Road, gets much narrower, so there is likely to be less space available to construct a fully separated running way for PT services as is expected for B3 and B5. The treatment for option B1 is more likely to be bus lanes alongside vehicular traffic.

For segment C, option C2 would have a high level of separation running down the median of Te Irirangi Drive. No firm assumption was made on the level of separation and priority possible for the other options, C1 via Chapel Road and C3 via Preston Road and Harris Road. It is likely that bus lanes would be the highest level of separation able to be achieved on either corridor, so both options were scored 0.

Option X1 (Māngere, Middlemore, Ōtara, Ormiston) scored lowest of all at -1, as it is unlikely to have significant priority along the majority of its alignment.

3.2.2 Directness

This metric assesses the directness of PT trips by comparing the number of transfers required for several key journeys in the study area: city centre to the airport, Botany to the airport, Papakura to the airport and Botany to Manukau. No transfers are required under the 2046 do minimum scenario for the city centre to airport, and Botany to Manukau journeys, and only one transfer is required for the Papakura to airport journey, and this is also the case for all A2B alignment options. Therefore, scoring was based only on changes to the number of transfers required for the Botany to airport journey.

For segment A, options A1 and A2 scored 2 as they would remove the need to transfer on the trip from Botany to the airport. Option A6 scored 0 as a transfer would be required at Puhinui Station from the heavy rail service to the bus service.

All segment B and C options can be paired with any of the segment A options, therefore they all have the potential to remove the need to transfer for the Botany to airport journey, and they all scored 2.

Option X1 would offer a 'single-seat' journey (i.e. no transfers) from the airport via Māngere, Middlemore, Ōtara, Ormiston. However, it does not provide the final connection to Botany, that was assessed for this metric. Therefore, it scored 0.

3.2.3 Travel time

This KPI assessed options based on travel times compared to the do minimum scenario for key journeys (the same key journeys as described in 3.2.2) by PT in 2046. None of the options changed the journey time for the city centre to airport journey, so only the other three key journeys are assessed for this metric.

For this assessment it was assumed that:

- BRT/LRT speeds on dedicated space on state highways travel at an average speed of 45 km/h;
- BRT/LRT speeds on fully separated corridors travel at an average of 35 km/h;
- BRT/LRT speeds on 'bus lanes' with some vehicle interaction travel at an average of 20 km/h; and
- Heavy rail on a spur line between the airport and Puhinui travels at 40 km/h (for comparison, note that trains between Manukau and Puhinui travel at about 35 km/h).

For segment A, there is no differentiation in travel times for the Botany to Manukau journey. Option A1 scored 3 as it is estimated to deliver the biggest reductions in travel times between Botany and the airport, and Papakura and the airport. Option A2 is estimated to save somewhat more time on those

key journeys than A6 due to the lower frequencies and therefore longer wait times for the heavy rail option (A6). However, the perception of PT passengers is such that the difference in journey times between these options is small enough that the perception of journey times on the heavy rail option (A6) is less than A2, therefore it scored a 2, whilst option A2 scored a 1.

Significant reductions in PT travel times would be achieved by all three segment B options, particularly for the Botany to airport journey. Options B3 and B5 were scored 3 and B1 scored 2. Option B1 (bypassing Manukau) achieves a faster journey from Botany to the airport, however the journey from Botany to Manukau is slower for this option than the options via Manukau.

All segment C options scored 3 as they were modelled to deliver similar, large reductions in PT travel times for all key journeys.

Option X1 (Māngere, Middlemore, Ōtara, Ormiston) scored -2 as it was modelled to deliver the lowest reductions in journey times of all the options for all three key journeys, including no reductions achieved for the Botany to Manukau journey.



3.3 Benefit 3: Promote urban regeneration improved built environment and economic opportunities

3.3.1 Access to Auckland Unitary Plan Centres

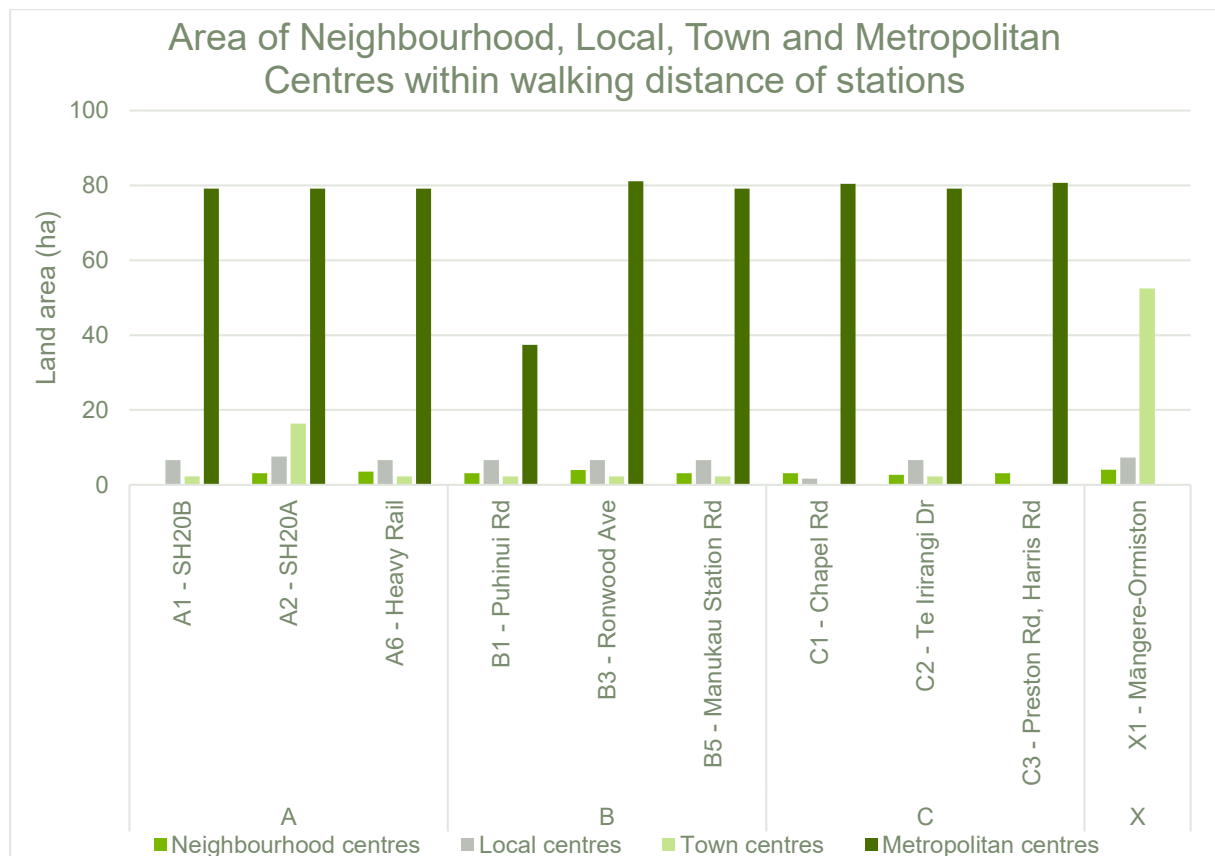
This measure assessed the alignment options based on the land area of the Auckland Unitary Plan Neighbourhood, Local, Town and Metropolitan Centres within walking catchment from station locations. The relative importance of access to the various types of centres was factored into the expert transport planning judgement based on their position in the Unitary Plan hierarchy of centres.

For segment A, the three options generated similar results for Neighbourhood, Local and Metropolitan Centres; Town Centres differentiated the options. Option A2 via SH20A provided better access to Māngere Town Centre, so it scored 3 while options A1 and A6 scored 2, as they still improve access to centres.

Options B3 and B5 showed very similar results, with a large extent of all centre types within walking catchment of the routes, so they both scored 2. Option B1 via Puhinui Road scored 0 because by bypassing Manukau it misses out on over 40 ha of the Manukau Metropolitan Centre within the walking catchment of its stations.

For segment C, option C2 via Te Irirangi Drive scored best with 2 as a large extent of all Centre types would be within walking catchment of its stations. Options C1 and C3 scored 1 due to smaller extents of Neighbourhood, Local and Town Centres accessible by walking.

Option X1 via Māngere, Middlemore, Ōtara and Ormiston scored 1 as it provided walking access to a large extent of all Centre types apart from Metropolitan Centres.



3.3.2 Land development around stations

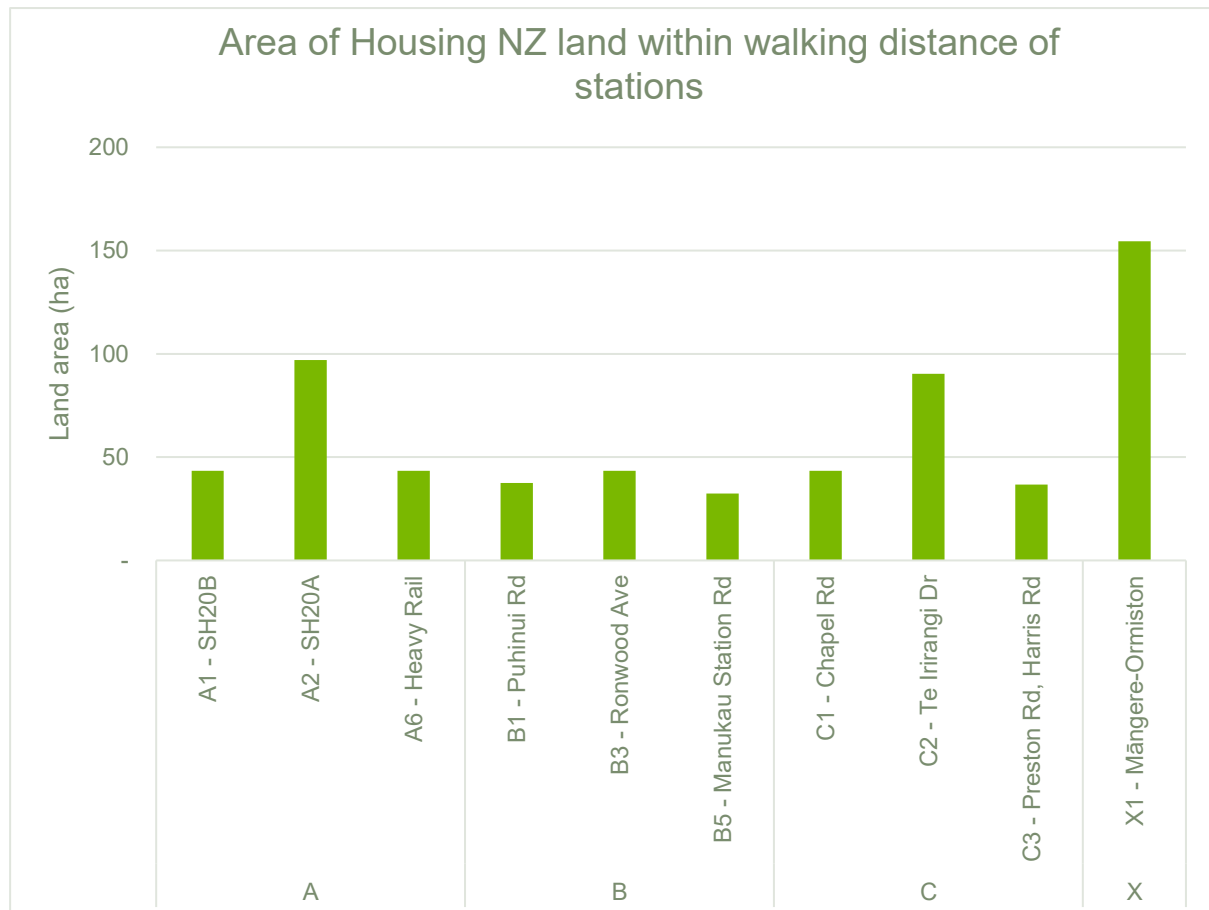
For this metric, the area of Housing New Zealand (HNZ) land within the walking catchment of stations along each alignment option was used to assess the improvement delivered to access from social housing and growth areas to the rapid transit network.

The segment A results showed moderate amounts of HNZ land within the walking catchment of stations for options A1 (SH20B) and A6 (Heavy Rail). These options scored 0. Option A2 (SH20A) scored 1 due to the large amount of HNZ land accessible from the option's stations.

Moderate amounts of HNZ land would be accessible from all segment B options, so B1, B3 and B5 all scored 0.

For segment C, moderate amounts of land would be within walking distance of stations for options C1 and C2, so they scored 0. By contrast, option C3 via Preston and Harris Roads would provide walking access to large amounts of HNZ land, so it scored 1.

Option X1 would provide walking access to a very large amount of HNZ land, particularly in Māngere and Ōtara, so it scored 3.



3.4 Benefit 4: Healthier and safer people

3.4.1 Walking access to stations

This metric forecasts the 2046 population within walking distance from existing and proposed rapid and frequent transit network. It primarily assesses the increased catchment of the full rapid and frequent transit network, so options that service an area that is currently outside of the extent of the rapid and frequent transit network will score highly. As such, the population catchments were assessed in terms of their addition to the populations under the do minimum scenario.

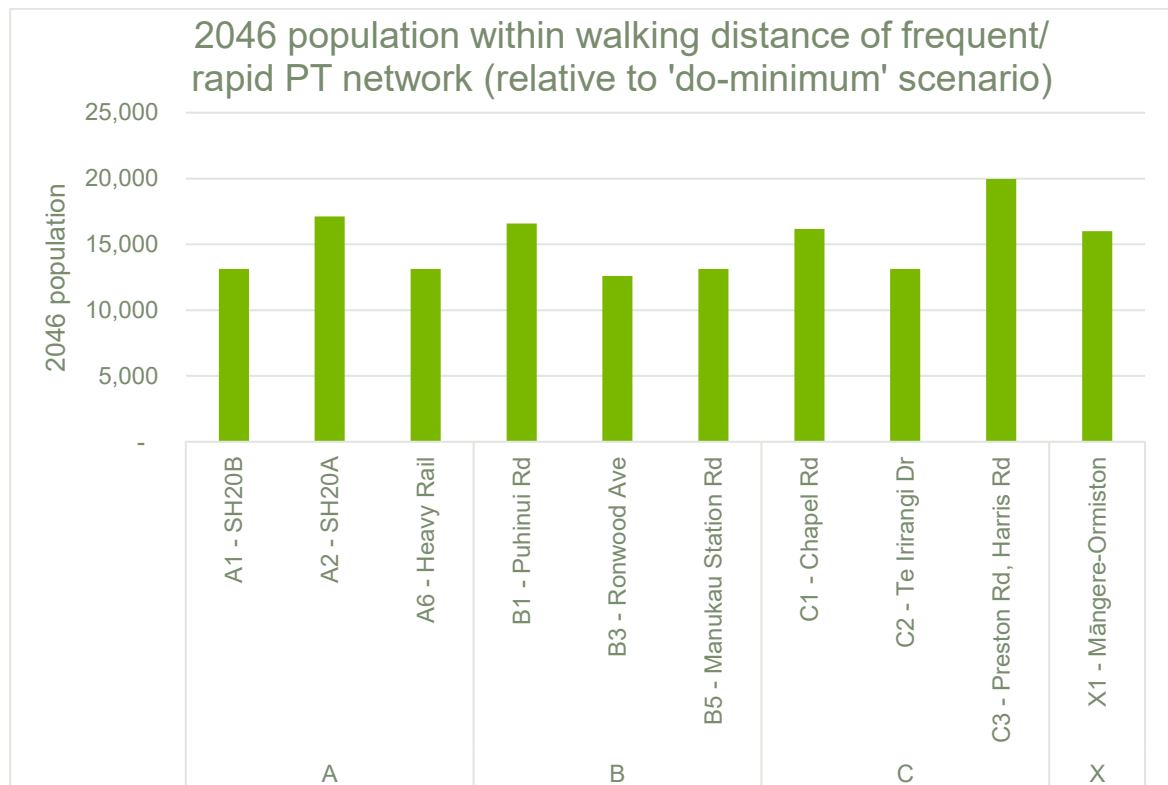
For segment A, options A1 (SH20B) and A6 (Heavy Rail) would result in modest increases in the population catchment, so they both scored 1. By comparison, option A2 (SH20A) would bring about a large increase, so scored 2.

Option B1 (Puhinui Road) would result in the largest increase in population catchment for segment B, so it scored 2. Options B3 (Ronwood Ave) and B5 (Manukau Station Road) brought about relatively modest increases, so they both scored 1.

For segment C, a cascade of scores reflects the differing levels of additional population catchments. Option C3 (Preston Road, Harris Road) would generate the largest increase, so it scored 3. C1 via

Chapel Road would bring about a moderate increase, so it scored 2, and C2 via Te Irirangi Drive scored 1 due to the relatively low increase it would create.

Option X1 via Māngere, Middlemore, Ōtara and Ormiston scored 2 due to the moderate increase in population catchment it was forecast to deliver.



4 Summary

This note describes the process followed to score long list alignment options against transport planning criteria as part of the MCA for the A2B Mass Rapid Transit project. Scoring decisions were made based on a combination of transport and spatial modelling and professional transport planning judgement. The scores formed the core of the transport planning assessment for A2B alignment options. The entire long list assessment process is summarised in a separate technical note titled *Long List Assessment and Short List recommendation* (reference 502334-6000-TEC-JJ-0002), issued on 6 November 2018.

Title	Name	Position	Signature	Date
Author				
Reviewer				

Appendix A: MCA Results

Table 1: MCA results for transport planning KPIs

KPI	Segment A – Airport to Puhinui			Segment B – Puhinui to Manukau			Segment C – Manukau to Botany ¹			Alternative
	A1 – via SH20B	A2 – via SH20A, SH20	A6 – Heavy rail to Puhinui	B1 – Bypass Manukau via Puhinui Road	B3 – via Ronwood Avenue	B5 – via Manukau Station Road	C1 – via Chapel Road	C2 – via Te Irirangi Drive	C3 – via Preston Road, Harris Road	X1 – Airport to Ormiston via Māngere, Middlemore, Ōtara
Population accessible to key employment precincts	3	1	0	2	3	3	2	3 (2)	2	-2
Jobs accessible to key residential locations	2	2	2	2	2	2	1	2	3 (2)	0
Access to education and healthcare	1	2	3	1	1	1	1	1	1	2
Peak travel time reliability	2	2	3	0	2	2	0	2	0	-1
Directness of key journeys	2	2	0	2	2	2	2	2	2	0
Travel time for key journeys	3	1	2	2	3	3	3 (2)	3 (2)	3 (2)	-2
Improved access to Auckland Unitary Plan Centres	2	3	2	0	2	2	1 (0)	2 (0)	1 (-1)	1
Potential for land development	0	1	0	0	0	0	0	0	1	3
Improved walking access to the RTN/FTN	1	2	1	2	1	1	2	1	3	2

¹ If a second score is provided in brackets, this is the equivalent score if option B1 (bypass Manukau) is selected for segment B.

Technical Note

To	Auckland Transport	From	[REDACTED]; [REDACTED]
Copy		Reference	502334-6000-TEC-NN-0013
Date	2019-04-10	Pages (including this page)	9
Subject	Long List Planning and Environment Assessment		

A preliminary assessment of the potential effects on the environment was carried out for the Airport to Botany (A2B) Multi Criteria Analysis (MCA) of the long list options, the purpose of which is to inform the Single Stage Business Case (SSBC) for A2B to enable the selection of a short list for further consideration and assessment.

This cover note provides a summary of the method and assumptions used, a summary of scores, and a summary of the main points raised by the environmental specialists.

Attachments to this cover note include:

- Attachment A: Environmental Context Maps
- Attachment B: Technical notes issued by environmental specialists
- Attachment C: Long list options

1 Methodology and assumptions

Specialist assessments were undertaken in the topic areas including ecology, arboriculture, stormwater, landscape, visual and urban design, social, noise and vibration, archaeology, contaminated land and air quality¹. The assessments are based on the descriptions and schematics of the long list options provided. Overall, ten options were assessed.

Each of the specialists assigned each option a score ranging between -3 (unmitigatable adverse effect) to 3 (significant positive benefit) (**Table 1**). The focus was on the assessment of the option, as opposed to a focus on the score itself. Environmental specialists advised suggested changes on the specific assessment criteria deemed important to consider as part of the assessment. Weighting has not been applied to the scores.

Table 1 Scoring scale

Scoring scale
3 (Significant positive)
2 (Moderate positive)
1 (Minor positive)
0 (Neutral)
-1 (Minor/moderate adverse)
-2 (Significant adverse)
-3 (Unmitigatable adverse)

¹ The long list air quality assessment was a broad qualitative assessment carried out by the planning team and did not involve an air quality specialist.

2 Description of the long list options

There are ten long list options for A2B. **Table 2** summaries each of the options.

Following provision of the long list options to specialists and prior to the completion of assessment and scoring, the following changes were made:

- Option I5 was renumbered Option A6
- Option B2 was renumbered Option B3
- Option B3 was renumbered Option B5

The long list options in MCA scoring table, and this cover note reflect the long list naming conventions. However, some of the technical notes in Appendix B and the option information at Appendix C reflect the earlier option naming conventions.

Table 2 Description of long list options

Option		Description
Corridor A	Option A1: SH20B to Puhinui	■ The LRT/BRT corridor will run between SH20B and the offline four lane motorway (worse case scenario 20Connect² Option C2B). The LRT/BRT corridor will run down the central median along the remainder of Puhinui Road towards Puhinui Train station. ■ The LRT/BRT corridor along SH20B will connect to the median LRT/BRT corridor on Puhinui Road via the intersection of Puhinui Road and the SH20northbound on and off ramps. ■ A SUP will run along the north side of the LRT/BRT corridor along SH20B. Segregated walking and cycling facilities will run along the remainder of Puhinui Road towards Puhinui Train Station.
	Option A2: SH20A to Puhinui	■ The LRT/BRT will run down the central median of SH20A and Puhinui Road, and the eastern side of SH20. ■ A SUP will run along the eastern side of SH20 and SH20A. Segregated walking and cycling facilities will run along the remainder of Puhinui Road towards Puhinui Train Station. ■ A new interchange ramp will be constructed to connect the LRT/BRT corridor from SH20A over SH20. ■ The LRT/BRT corridor along SH20 will connect to the median LRT/BRT corridor on Puhinui Rd via the intersection of Puhinui Rd and the SH20 southbound on and off ramps.
	Option A6 (formerly Option I5): Heavy rail to Puhinui	■ The rail corridor runs on the south side of SH20B until it diverts to connect to the existing line to the south of Puhinui Station. ■ The rail corridor will transition into an underground tunnel at Pukaki Creek towards the Airport. ■ There will be an offline four lane carriageway along the south side of SH20B (worst case scenario as per 20Connect Option C2B).
Corridor B	Option B1: Puhinui Road bypassing Manukau	■ The LRT/BRT corridor will run down the central median throughout the entirety of the route. ■ Segregated walking and cycling facilities will run on both sides of the route.

² 20Connect is the SSBC by the NZ Transport Agency looking at improving access and travel choices to and from the Airport area.

Option		Description
	Option B3 (formerly Option B2): Ronwood Avenue through Manukau	- The LRT/BRT corridor will run down the central median throughout the entirety of the route. - Segregated walking and cycling facilities will run on both sides of the route.
	Option B5 (formerly Option B3): Manukau Station Road through Manukau	- The LRT/BRT corridor will run down the central median throughout the entirety of the route. - Segregated walking and cycling facilities will run on both sides of the route.
Corridor C	Option C1: Via Manukau, Chapel Road	- The LRT/BRT corridor will run down the central median throughout the entirety of the route. - Segregated walking and cycling facilities will run on both sides of the route.
	Option C2: Via Manukau, Te Irirangi Drive	- The LRT/BRT corridor will run down the central median throughout the entirety of the route. - Segregated walking and cycling facilities will run on both sides of the route.
	Option C3: Via Manukau, Preston Road, Harris Road	- The LRT/BRT corridor will run down the central median throughout the entirety of the route. - Segregated walking and cycling facilities will run on both sides of the route.
Corridor X	Option X2: Crosstown via Mangere, Middlemore, Otara, Ormiston	- The LRT/BRT corridor will run down the central median of SH20A. SH20A will have additional lanes in each direction (worst case as per 20Connect Option C1). - The LRT/BRT corridor will run down the central median from Mangere to Ormiston. - Walking and cycling facilities will run on both sides of the route from Mangere to Ormiston. - The LRT/BRT corridor will cross the rail lines at Middlemore Hospital. - The LRT/BRT corridor will go off-road between Massey Road and Gray Ave, across the Grange Golf Club and between East Tamaki Road and Ormiston Road. - Off-road sections will only consist the LRT/BRT corridor.

3 Summary of MCA scores for the environmental workstream

The long list scores ranged between -3 (unmitigatable adverse) and 3 (significant positive) (**Table 3**). A large number of potential adverse effects associated with the options can be managed through design iterations and the construction methodology, with outstanding effects appearing to be in relation to the alignment of Option A6 traversing significant areas of soil and groundwater contamination at the McLaughlins Road Landfill.

Table 3 MCA scoring for environmental criteria

Topic	Criteria	Corridor A			Corridor B			Corridor C			Corridor X
		Option A1	Option A2	Option A6	Option B1	Option B3	Option B5	Option C1	Option C2	Option C3	Option X2
Aquatic ecology	Extent, nature and degree of effects on freshwater aquatic ecology, in particular on significant habitats of indigenous fauna and vegetation, and opportunities for ecological restoration and enhancement.	-1	-1	0	-1	0	-1	-1	-1	-1	-1
Terrestrial ecology	Extent, nature and degree of effects on terrestrial ecology, in particular on significant habitats of indigenous fauna and vegetation, and opportunities for ecological restoration and enhancement.	-1	-1	-1	0	0	0	-1	-1	-1	-1
Marine ecology	Extent, nature and degree of effects on marine ecology, in particular on significant habitats of indigenous fauna and vegetation, and opportunities for ecological restoration and enhancement.	-1	0	-1	0	0	0	0	0	0	-1
Arboriculture	Extent and effects of tree removal or alteration on arboricultural values.	-1	-2	-1	-2	-2	-2	-2	-2	-1	-2
Stormwater quality	Impact of operational stormwater discharges on flooding within the catchment, including vulnerability to impacts of climate change such as increased storm events, and opportunities to increase resilience.	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
Stormwater quantity	Impact of operational stormwater discharges on flooding within the catchment, including vulnerability to impacts of climate change such as increased storm events, and opportunities to increase resilience.	-1	-1	-1	-2	-2	-2	-1	-1	-1	-2
Natural character and landscape	Extent, nature and degree of effects on natural character, features, and landscape.	-1	-1	-1	0	0	0	0	0	0	0
Visual	Extent, nature and degree of effects on visual amenity.	-1	-2	-1	-2	-1	-1	-2	-2	-2	-2
Urban design	Proximity to key destination and trip generators; and general patronage through higher numbers of residents and employment opportunities within a 10 minute (800m) walk of the corridor.	0	2	0	1	2	3	2	2	1	2
	Opportunities for further intensive development (either through operative Auckland Unitary Plan zoning or through up-zoning).	1	2	0	0	3	3	1	1	1	2
	Ability of road reserve to accommodate suitable cross -section (and avoid poor urban design outcomes such as inadequate footpaths etc).	0	-1	0	-1	0	0	0	-1	-1	-1
Accessibility	Extent and degree of effects on the community concerning accessibility to/from facilities, services, properties and businesses.	1	1	1	1	1	1	1	1	1	1
Community	Extent and degree of change to groups and activities, including sense of community and to known aspirations and plans.	-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
Health and safety	Extent and degree of effects on human health and safety.	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1

Topic	Criteria	Corridor A			Corridor B			Corridor C			Corridor X
		Option A1	Option A2	Option A6	Option B1	Option B3	Option B5	Option C1	Option C2	Option C3	Option X2
Operational noise and vibration	Impact of operational noise and vibration on sensitive receivers. Ability to mitigate adverse impact.	-1	-1	-2	-1	-1	-1	-1	-1	-1	-1
Construction noise and vibration	Impact of operational noise and vibration on sensitive receivers. Ability to mitigate adverse impact.	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
Archaeology and built heritage	Extent of effects on sites and places of archaeological value and on heritage buildings and places.	-2	-2	-2	-1	-1	-1	-1	-1	-1	-1
Contaminated land	Potential to encounter and ability to manage the effects of contaminated soils and/or groundwater on human health and the environment.	-1	-1	-3	-1	-1	-2	-1	-1	-2	-1
Operational air quality	Extent and degree of effects on human health arising from operational air pollution.	0	0	0	0	0	0	0	0	-1	0
Construction air quality	Extent and degree of effects on human health arising from discharges to air from construction activities.	-1	-1	-2	-1	-1	-1	-1	-1	-1	-1

4 Summary of the main points raised by each environmental specialist

4.1 Ecology

Freshwater: All options with the exception of Option B3 are likely to require a number of stream crossings or extensions of culverts, including works in the freshwater/coastal marine area (CMA) interface for Options A1 and A6.

Terrestrial: There are no extensive areas of established vegetation within Corridor B that are likely to be impacted. Corridors A and C have both a number of areas which contain established vegetation that could support herpetofauna that could be adversely impacted by vegetation removal. There is a Significant Ecological Area (SEA) along parts of Puhinui Creek which could be impacted by Option A6. Option X2 may also impact an area of SEA near Middlemore Station.

Marine: The proposed designs for Options A1, A6 and X2 have potential to require works in or very close to the CMA. The CMA at Pukaki and Waokauri Creeks is identified as a SEA – Marine (and the CMA has been surveyed as extending further south of the Waokauri Creek Bridge than the boundaries indicated in the Coastal Plan provisions). Works could result in adverse impacts to the CMA and the SEA as a result of vegetation removal and crossings including an extension to the Waokauri Bridge.

4.2 Arboriculture

The key areas of arboricultural value include the substantial number of Pohutakawa trees lining Puhinui Road, mature trees within the central medians of Lambie Drive and Ronwood Avenue, Norfolk Pine trees on Manukau Station Road, Washington Palms along the length of Ti Irirangi Drive, and concentrated areas of street trees throughout Mangere.

The LRT/BRT alignment is likely to require the removal of these trees. To mitigate the impacts of this removal, berms and open space would need to be extended either side of the road corridor to allow for adequate replacement planting.

4.3 Stormwater

All options are likely to have a minor adverse effect for stormwater quality as no treatment has been considered as part of the long list options assessment. Parts of SH20, SH20A and SH20B as well as segments of the local road network do not receive stormwater treatment currently.

There is likely to be existing treatment of stormwater elsewhere within the Puhinui catchment which could be used to treat the additional volume of stormwater that would be generated by the Project. Further assessment would be required to confirm this.

All options would require additional areas of impervious surfaces and therefore, would increase in the quantity of stormwater runoff. Options B1, B3 and B5 would intercept floodplains, with little space available within the road corridor to provide detention during large flood events. Option X2 may require major stream diversion works.

4.4 Landscape, visual and urban design

4.4.1 Landscape

Options A1, A2 and A6 have the potential to cause adverse effects on natural character due to the proximity of several identified landscapes and features, including Puhinui Creek, Kapua Kohu Ora/ Crater Hill, and the CMA. The remaining options are not identified as having any natural character values or landscape features along or near the alignment that could be impacted.

4.4.2 Visual

Bordering private properties along Options A2, B1, C1, C2 and C3 may experience significant adverse visual effects and loss of amenity as a result of the likely loss of landscaping along the central median and roadside berms. There would also be a likely loss of front and side yards for some residential properties, as well as minor impacts on a number of formal and informal open spaces along those alignments.

4.4.3 Urban Design

The majority of the options would be able to accommodate LTR/BRT, without resulting in poor urban design outcomes. In some instances, however, additional land would be required to accommodate suitable cross sections. It should be noted that as an aim of the Project is to change travel behaviour, a cross section with less priority for private vehicles would be appropriate (especially in metropolitan centres).

Options A2, B3, B5, C1, C2 and X2 provide more substantial potential to deliver urban design outcomes due to their proximity to key destinations / centres and trip generators. Specifically, B3 and B5 would pass through Manukau City Centre, a key metropolitan centre which provides significant development potential, employment opportunities and access to key destinations throughout Auckland via the Manukau Train Station.

Option A2 also provides a significant opportunity for growth and intensification within Mangere Town Centre, as large areas of land with significant development potential are assumed available for redevelopment.

Options C1 and C2 would provide connections to and between suburban housing within Clover Park and Chapel Downs and key employment areas such as East Tamaki Industrial Area and Ormiston Town Centre.

4.5 Social (Accessibility and Community)

All options will provide positive social effects due to an increase in mode choices between Botany and Auckland Airport, which allows for improved accessibility and greater social wellbeing.

Additional traffic lanes required to accommodate BRT/LRT in the central median may directly impact sensitive receivers and private property along the corridor which could have significant adverse effects on the community and therefore, all options have scored -2.

During construction, sensitive receivers and businesses along the proposed routes may also experience adverse social impacts associated with restricted access, noise and vibration during construction.

4.6 Noise and Vibration

All options, with the exception of Option A6, scored -1 for operational noise and vibration as they would likely have a minor adverse effect caused by increases in noise from BRT/LRT or by traffic lanes being sited closer to properties, particularly residential and community / educational facilities. It is noted that traffic noise and vibration caused from road traffic is already dominant along the proposed routes and many receivers are likely to be desensitised to any increase in operational noise and vibration (such as commercial and industrial zones). Option A6 has scored -2 as the introduction and operation of heavy rail would likely significantly increase the levels noise and vibration currently experienced by sensitive receivers and at greenfield sites (including areas of significance to mana whenua).

During construction, adverse noise and vibration effects would likely be experienced by sensitive receptors along all option corridors. Management of noise and vibration during construction would

need to be addressed through the preparation and implementation of a Construction Noise and Vibration Management Plan.

4.7 Archaeology

There are numerous registered archaeological sites associated with Papahinau in the area. Options A1, A2 and A6 have the potential to cause significant adverse impact on this archaeological landscape and consequently, they have scored -2. Furthermore, Option A2 would pass near Kapua Kohu Ora / Crater Hill, a heritage landscape of outstanding archaeological and heritage value as well as having significance at a local, regional and national level.

Construction and earthworks associated with the remaining options all have the potential to uncover previously unrecorded sites which is considered to be a minor adverse impact (-1).

4.8 Contaminated Land

It is expected that significant contamination would be encountered along the route of Option A6 with the alignment traversing the McLaughlins Road Landfill which contains industrial waste products. There is also the potential to encounter contaminated soils due to industrial land uses adjacent to, or within the proposed alignment (especially near the Wiri Industrial area which is likely to contain high levels of contamination). The impacts of directly disturbing these areas of contamination are considered to be unmitigatable (-3) with significant concentrations of soil and groundwater concentrations expected to be encountered.

Options B5 and C3 have the potential to encounter or pass near sites that have a history of significant contamination (Wiri industrial area and Greenmount Closed Landfill) and have, therefore, scored -2. All other options have scored -1 as some contamination would potentially be encountered across the alignments.

4.9 Air Quality

The long-list air quality assessment was a broad qualitative assessment carried out by the planning team and did not involve an air quality specialist. The assessments considered proximity to and scale of likely construction works and proximity to and scale of operational alignments in relation to sensitive receivers (particularly residential, community, educational land uses).

It is not expected that the operation the LRT/BRT would result in any significant adverse air quality effects. There is the potential to reduce the number of private vehicles travelling along the routes as a result of additional modal choices. Therefore, all options, with the exception of Option C3, have scored a neutral rating. Option C3 has scored -1 as this option may experience reverse sensitivity effects relating to odour during the operation of the walking and cycling facilities near the Greenmount Closed Landfill.

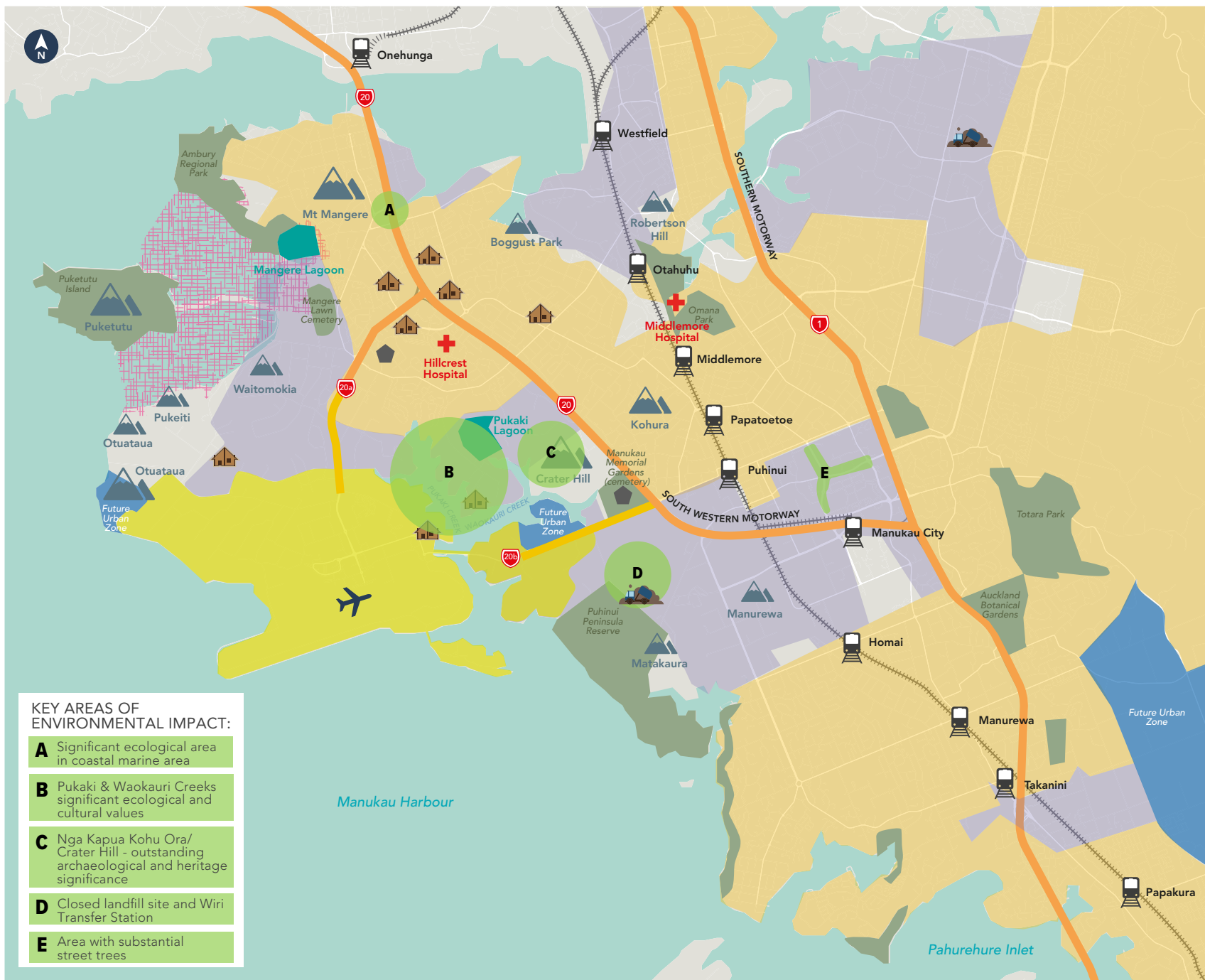
Adverse effects resulting from discharges to air from construction activities (e.g. dust) are likely to occur for all options. It is considered that these can be managed through appropriate construction management measures. Option A6 scores -2 as construction activities within the McLaughlins Road Landfill may result in the release of landfill gases which would need to be managed during construction.

Approved by:

Title	Name	Position	Signature	Date
Author				
Reviewer				

Attachments:

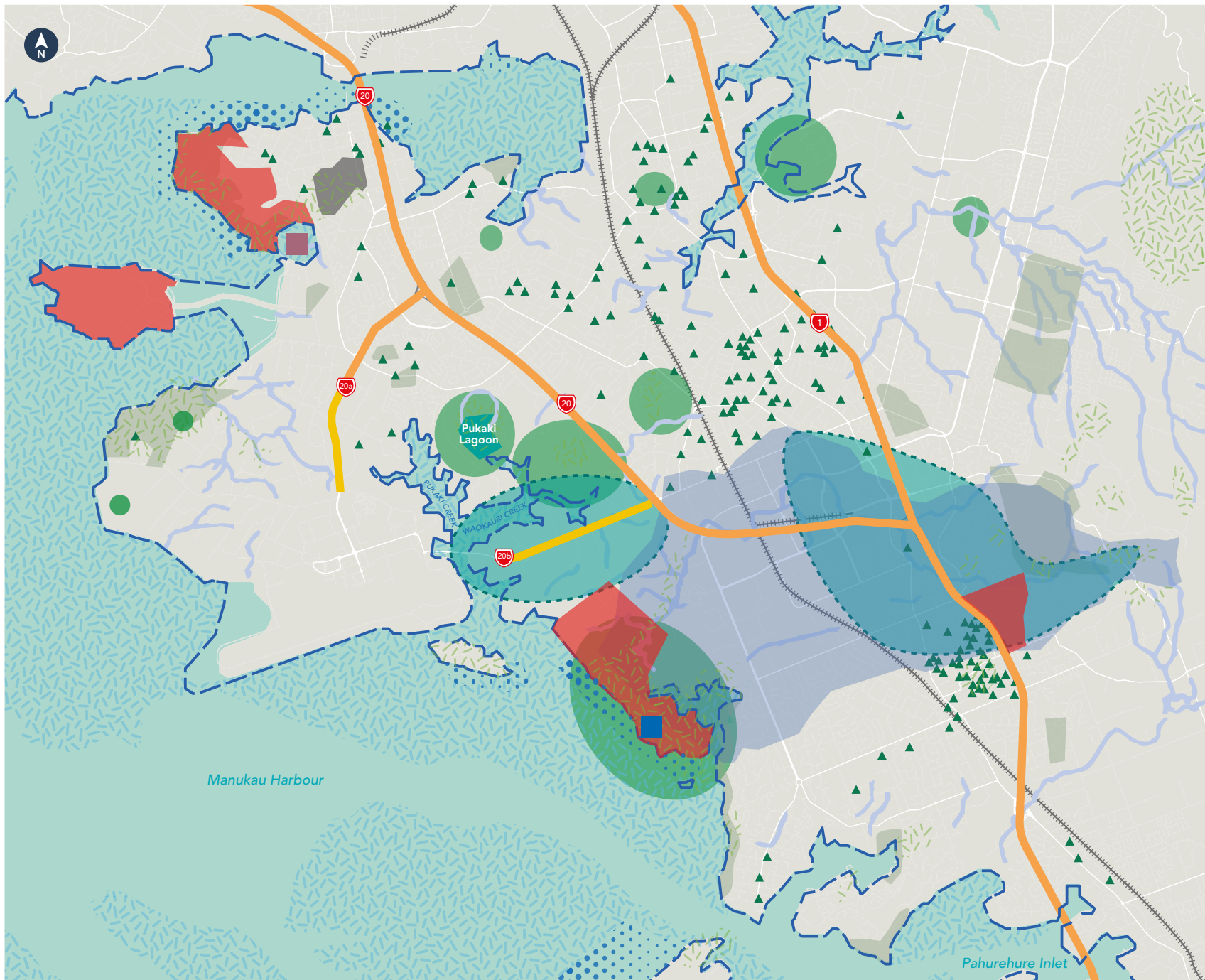
- Attachment A: Environmental Context Maps
- Attachment B: Technical notes issued by environmental specialists
- Attachment C: Long list options



ENVIRONMENTAL FEATURES OVERVIEW

LEGEND

- Auckland Airport
- Auckland Airport area
- Motorway
- Major road
- Railway
- Train station
- Future Urban Zone
- Auckland Airport area
- Commercial
- Residential
- Regional & major parks
- Marae
- Volcanic cones
- Watercare area
- Lagoons
- Hospital
- Key environmental areas of interest
- Closed landfill
- Trees

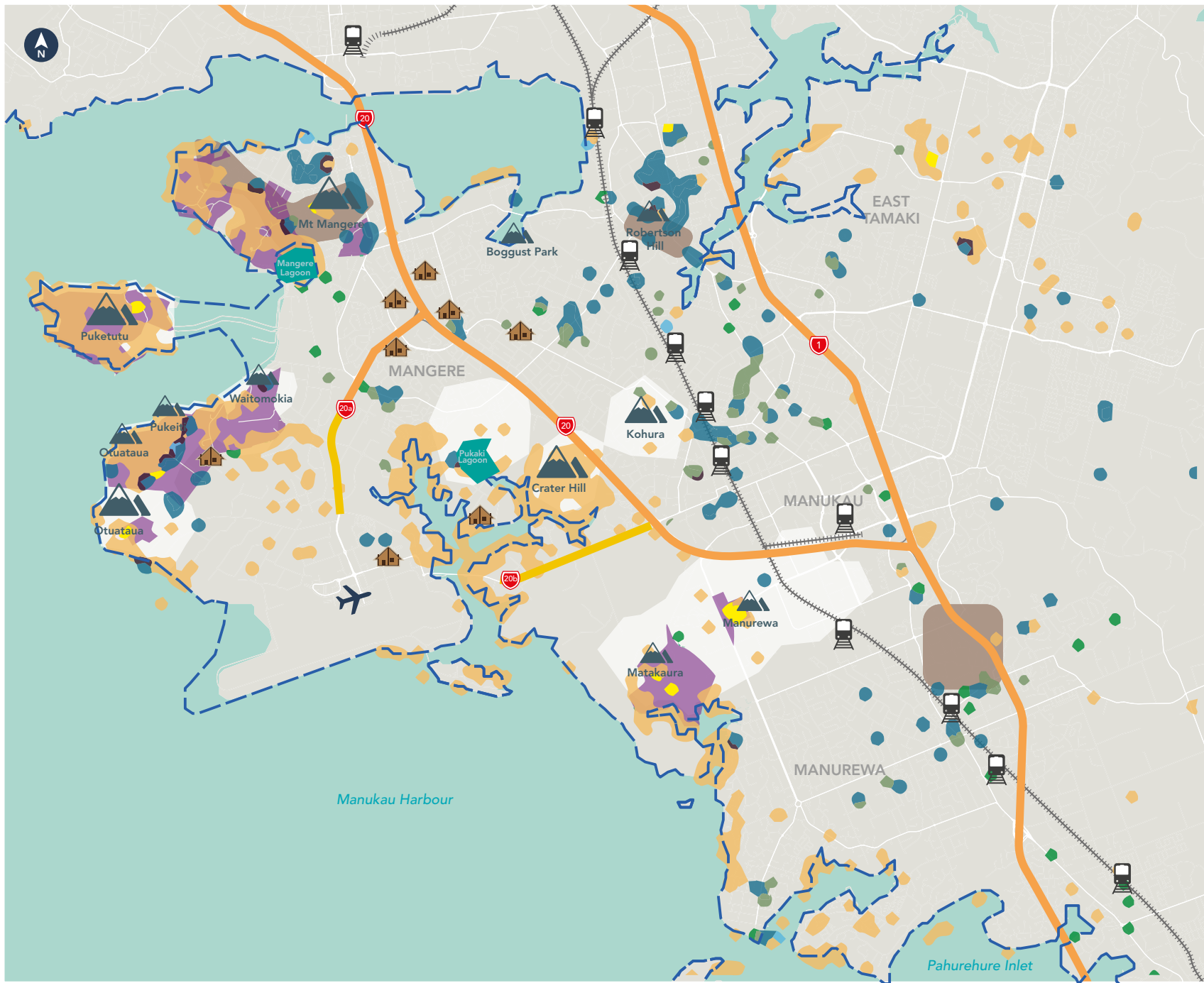


ENVIRONMENTAL CONTEXT MAP

NATURAL FEATURES

LEGEND

- Motorway
- Major road
- + + + + Railway
- - - - Stormwater management areas (Flow 1 & 2)
- Regional parks
- Parks
- Indicative coastline
- Mangere Mountain
- Waterways
- High-use stream management areas
- Outstanding natural features
- ▲ Notable trees
- Wetland management areas
- Mangere lagoon
- Significant Ecological Areas:**
- Terrestrial
- Marine 1
- Marine 2

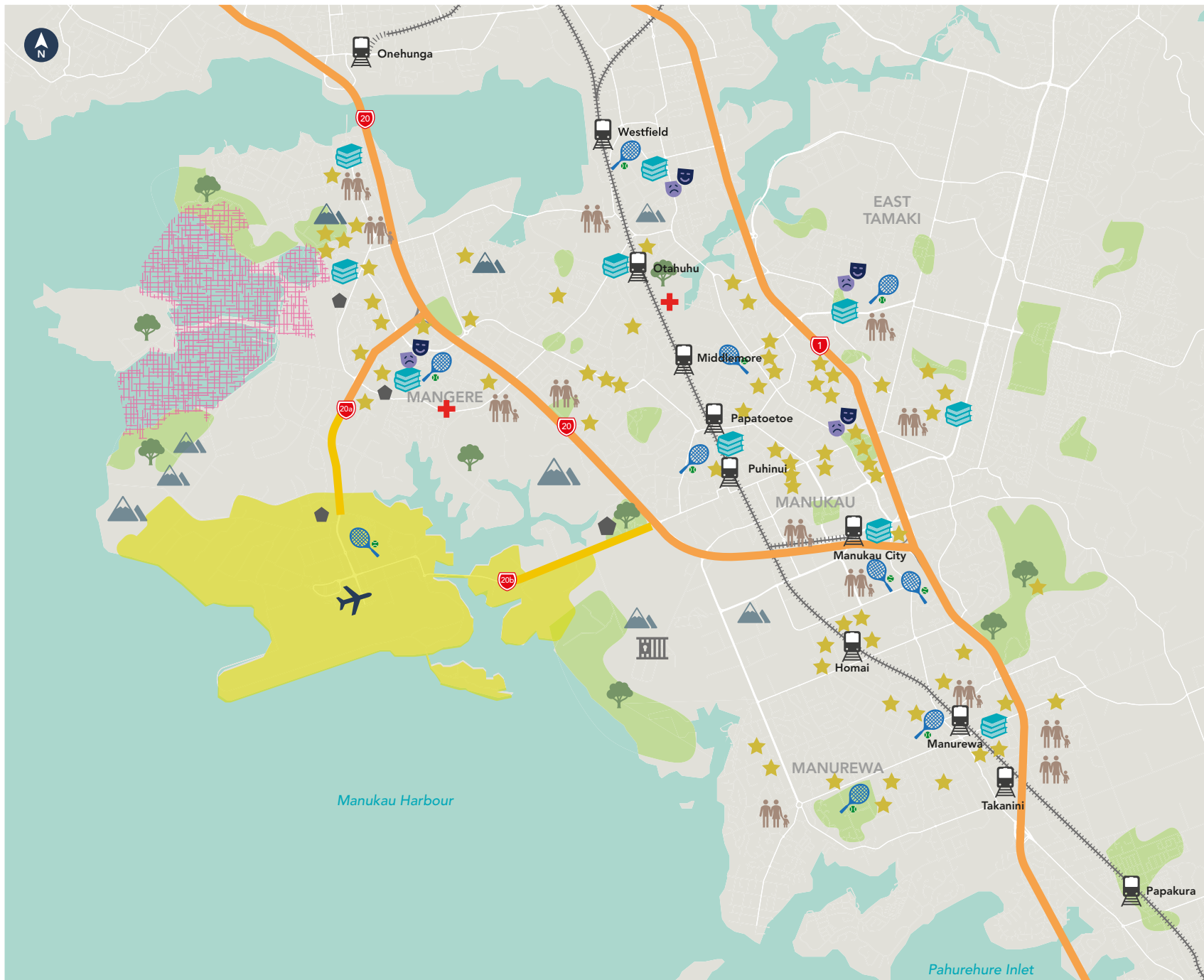


ENVIRONMENTAL CONTEXT MAP

HERITAGE & CULTURE & GEOLOGICAL FEATURES

LEGEND

- Marae
 - Motorway
 - Major Road
 - Indicative Coastline
 - Railway
 - Train Stations
 - Built Heritage & Character
 - Sites and Places of Significance to Mana Whenua (Auckland Unitary Plan)
 - Volcanic cones
 - Lagoons
 - Auckland Airport
 - Volcanic geological features (includes stone and lava fields)
- Cultural Heritage Inventory (Public):**
- Archaeological Site
 - Historical Botanical Site
 - Historic Structure
 - Maori Heritage Area
 - Maritime Site
 - Reported Historic Site



ENVIRONMENTAL CONTEXT MAP

SOCIAL FEATURES & INFRASTRUCTURE

LEGEND

- Auckland Airport
- Auckland Airport area
- Motorway
- Major road
- Railway
- Train station
- Regional/Major park
- Community centre
- Library
- School
- Hospital
- Rainbows End
- Cemetery
- South Auckland Corrections Centret
- Arts centre
- Recreational centre
- Watercare area
- Volcanic cones

Attachment B: Technical notes issued by environmental specialists

Technical Note

To		From	
Copy		Reference	502334
Date	2018-09-04	Pages (including this page)	11
Subject	Airport to Botany Long-List Options: Multi-Criteria Analysis Scoring Sheet: Freshwater Ecology		

The following provides an assessment of the long-list options for the Airport to Botany Single Stage Business Case (A2B SSBC). The assessment details the considerations which have been used to inform the assessment. This assessment is designed to contribute to the Multi-Criteria Analysis (MCA) assessment which is being undertaken for the long-list options (August 2018).

The source information assessed was based on desktop analysis only. The freshwater ecological assessments were based on:

- The A2B long-list schematics (un-dated, but attached to the A2B long-list documentation dated 17 August 2018 and the long-list options descriptions and assumptions (dated 17 August 2018).
- Auckland Council GeoMaps, with Natural Resources and Catchment and Hydrology overlays; Google Maps; Google Earth; Auckland Unitary Plan E3, Lakes, rivers, streams and wetlands.

The options are outlined in the following table. The scores and assessments are outlined in the below tables.

Group	Option	High-level description
Integrated off-street options	Option I5	Heavy rail Airport spur line and Botany BRT
Corridor A: Airport to Puhinui	Option A1	BRT/LRT via Puhinui Road-SH20B.
	Option A2	BRT/LRT via SH20A and SH20
Corridor B: Puhinui through Manukau	Option B1	BRT/LRT from Puhinui to Clover Park via Puhinui Road
	Option B2	BRT/LRT Puhinui to Manukau via Ronwood Avenue
	Option B3	BRT/LRT from Puhinui to Manukau via Manukau Station Road
Corridor C: Manukau to Botany	Option C1	BRT/LRT from Manukau to Botany via Chapel Road
	Option C2	BRT/LRT from Manukau to Botany via Te Irirangi Drive
	Option C3	BRT/LRT Manukau to Botany via Preston Road – Harris Road
Corridor X: Alternate corridors not via Puhinui-Manukau	Option X2	BRT/LRT from Airport to Ormiston via Mangere, Middlemore, Otara and Ormiston Road.

Table 1 Multi Criteria Analysis Scoring Sheet

Option I5: Heavy rail Airport spur line and Botany BRT		
Name of assessor (incl. qualifications and organisation)	[Redacted]	
Area of assessment	Freshwater Ecology	
Score: -3 Significant Adverse/Un-mitigatable -2 Significant Adverse [Redacted] 0 Neutral 1 Minor Positive 2 Moderate Positive 3 Significant Positive		
[Redacted]	Criteria	Criteria
[Redacted]	Score	Score
Notes: <u>Reasons / Comments</u> ■ <i>Three crossings of the upper Puhinui Creek:</i> – Within the CMA and SEA Marine 2 – With the CMA and SEA Marine 2 immediately downstream of works area, freshwater-marine interface and freshwater habitats on the southern side – New crossing north of Stonehills development ■ <i>Culvert extensions and potential stream works</i> – Potentially triggering discretionary or non-complying activity <u>Assumptions</u> ■ Under the AUP stream works are usually non-complying or discretionary at the minimum. ■ Assumptions listed in 2.0 of the Memorandum for environmental specialists apply, specifically that the design footprint is from Auckland International Airport to Botany Town Centre. <u>Other Information relied upon</u> ■ Auckland Unitary Plan E3, Lakes, Rivers, Streams and Wetlands		

Table 2 Multi Criteria Analysis Scoring Sheet

Option A1: BRT/LRT via Puhinui Road-SH20B		
Name of assessor (incl. qualifications and organisation)		
Area of assessment	Freshwater Ecology	
Score: -3 Significant Adverse/Un-mitigatable -2 Significant Adverse  0 Neutral 1 Minor Positive 2 Moderate Positive 3 Significant Positive		
	Criteria	Criteria
	Score	Score
Notes: <u>Reasons / Comments</u> - Three crossings of the upper Puhinui Creek: - Within the CMA and SEA Marine 2 - With the CMA and SEA Marine 2 immediately downstream of the works area, freshwater-marine interface and freshwater habitats on southern side - Culvert extensions and potential stream works: - Potentially triggering discretionary or non-complying activity <u>Assumptions</u> - Under the AUP stream works are usually non-complying or discretionary at the minimum. - Assumptions listed in 2.0 of the Memorandum for environmental specialists apply, specifically that the design footprint is from Auckland International Airport to Botany Town Centre. <u>Other Information relied upon</u> - Auckland Unitary Plan E3 Lakes, Rivers, Streams and Wetlands		

Table 3 Multi Criteria Analysis Scoring Sheet

Option A2: BRT/LRT via SH20A and SH20		
Name of assessor (incl. qualifications and organisation)	[Redacted]	
Area of assessment	Freshwater Ecology	
Score: -3 Significant Adverse/Un-mitigatable -2 Significant Adverse [Redacted] 0 Neutral 1 Minor Positive 2 Moderate Positive 3 Significant Positive		
[Redacted]	Criteria	Criteria
[Redacted]	Score	Score
Notes: <u>Reasons / Comments</u> - Numerous culvert extensions and potential stream works: - Potentially triggering discretionary or non-complying activity <u>Assumptions</u> - Under the AUP stream works are usually non-complying or discretionary at the minimum. - Assumptions listed in 2.0 of the Memorandum for environmental specialists apply, specifically that the design footprint is from Auckland International Airport to Botany Town Centre. <u>Other Information relied upon</u> - Auckland Unitary Plan E3 Lakes, Rivers, Streams and Wetlands		

Table 4 Multi Criteria Analysis Scoring Sheet

Option B1: BRT/LRT from Puhinui to Clover Park via Puhinui Road		
Name of assessor (incl. qualifications and organisation)		
Area of assessment	Freshwater Ecology	
Score: -3 Significant Adverse/Un-mitigatable -2 Significant Adverse  0 Neutral 1 Minor Positive 2 Moderate Positive 3 Significant Positive		
	Criteria	Criteria
	Score	Score
Notes: <u>Reasons / Comments</u> - Potential stream works: - One potential culvert extension on Boundary Road, near Israel Ave <u>Assumptions</u> - Under the AUP stream works are usually non-complying or discretionary at the minimum. - Assumptions listed in 2.0 of the Memorandum for environmental specialists apply, specifically that the design footprint is from Auckland International Airport to Botany Town Centre. <u>Other Information relied upon</u> - Auckland Unitary Plan E3 Lakes, Rivers, Streams and Wetlands		

Table 5 Multi Criteria Analysis Scoring Sheet

Option B2: BRT/LRT from Puhinui to Manukau via Ronwood Ave		
Name of assessor (incl. qualifications and organisation)	[Redacted]	
Area of assessment	Freshwater Ecology	
Score: -3 Significant Adverse/Un-mitigatable -2 Significant Adverse -1 Minor/Moderate Adverse [Redacted] 1 Minor Positive 2 Moderate Positive 3 Significant Positive		
[Redacted]	Criteria	Criteria
[Redacted]	Score	Score
Notes: <u>Reasons / Comments</u> - Entire stream network appears to be piped. <u>Assumptions</u> - Under the AUP stream works are usually non-complying or discretionary at the minimum. - Assumptions listed in 2.0 of the Memorandum for environmental specialists apply, specifically that the design footprint is from Auckland International Airport to Botany Town Centre. <u>Other Information relied upon</u> - Auckland Unitary Plan E3 Lakes, Rivers, Streams and Wetlands		

Table 6 Multi Criteria Analysis Scoring Sheet

Option B3: BRT/LRT from Puhinui to Manukau via Manukau Station Road		
Name of assessor (incl. qualifications and organisation)	[Redacted]	
Area of assessment	Freshwater Ecology	
Score: -3 Significant Adverse/Un-mitigatable -2 Significant Adverse [Redacted] 0 Neutral 1 Minor Positive 2 Moderate Positive 3 Significant Positive		
[Redacted]	Criteria	Criteria
[Redacted]	Score	Score
Notes: <u>Reasons / Comments</u> - Potential stream works: - One potential culvert extension on Lambie Drive <u>Assumptions</u> - Under the AUP stream works are usually non-complying or discretionary at the minimum. - Assumptions listed in 2.0 of the Memorandum for environmental specialists apply, specifically that the design footprint is from Auckland International Airport to Botany Town Centre. <u>Other Information relied upon</u> - Auckland Unitary Plan E3 Lakes, Rivers, Streams and Wetlands		

Table 7 Multi Criteria Analysis Scoring Sheet

Option C1: BRT/LRT from Manukau to Botany via Chapel Road		
Name of assessor (incl. qualifications and organisation)		
Area of assessment		Freshwater Ecology
Score: -3 Significant Adverse/Un-mitigatable -2 Significant Adverse  0 Neutral 1 Minor Positive 2 Moderate Positive 3 Significant Positive		
	Criteria	Criteria
	Score	Score
Notes: <u>Reasons / Comments</u> ■ <i>Potential stream works:</i> – Bridge crossing on Chapel Road near Ormiston Road – Culvert south of Carrick Glen Ave, low potential for stream works – Culvert/bridge near Whetstone Road on Te Iriangi Drive (unclear of route between Chapel Road and Te Iriangi Drive) <u>Assumptions</u> ■ Under the AUP stream works are usually non-complying or discretionary at the minimum. ■ Assumptions listed in 2.0 of the Memorandum for environmental specialists apply, specifically that the design footprint is from Auckland International Airport to Botany Town Centre. <u>Other Information relied upon</u> ■ Auckland Unitary Plan E3 Lake, River, Streams and Wetlands		

Table 8 Multi Criteria Analysis Scoring Sheet

Option C2: BRT/LRT from Manukau to Botany via Te Irirangi Drive		
Name of assessor (incl. qualifications and organisation)		
Area of assessment		Freshwater Ecology
Score: -3 Significant Adverse/Un-mitigatable -2 Significant Adverse  0 Neutral 1 Minor Positive 2 Moderate Positive 3 Significant Positive		
	Criteria	Criteria
	Score	Score
Notes: <u>Reasons / Comments</u> ■ <i>Potential stream works:</i> – Bridge/culvert crossing on Te Irirangi Drive near Treneary Lane – Bridge crossing of Otara Creek – Stream crossing near Whetstone Road <u>Assumptions</u> ■ Under the AUP stream works are usually non-complying or discretionary at the minimum. ■ Assumptions listed in 2.0 of the Memorandum for environmental specialists apply, specifically that the design footprint is from Auckland International Airport to Botany Town Centre. <u>Other Information relied upon</u> ■ Auckland Unitary Plan E3 Lakes, Rivers, Streams and Wetlands		

Table 9 Multi Criteria Analysis Scoring Sheet

Option C3: BRT/LRT from Manukau to Botany via Preston Road – Harris Road		
Name of assessor (incl. qualifications and organisation)	[Redacted]	
Area of assessment	Freshwater Ecology	
Score: -3 Significant Adverse/Un-mitigatable -2 Significant Adverse [Redacted] 0 Neutral 1 Minor Positive 2 Moderate Positive 3 Significant Positive		
[Redacted]	Criteria	Criteria
[Redacted]	Score	Score
Notes: <u>Reasons / Comments</u> - Potential stream works: - Bridge/culvert crossing on Ti Rakau Drive - Otara Creek crossing on East Tamaki Road <u>Assumptions</u> - Under the AUP stream works are usually non-complying or discretionary at the minimum. - Assumptions listed in 2.0 of the Memorandum for environmental specialists apply, specifically that the design footprint is from Auckland International Airport to Botany Town Centre. <u>Other Information relied upon</u> - Auckland Unitary Plan E3 Lakes, Rivers, Streams and Wetlands		

Table 10 Multi Criteria Analysis Scoring Sheet

Option X2: BRT/LRT from Airport to Ormiston via Mangere, Middlemore, Otara and Ormiston Road		
Name of assessor (incl. qualifications and organisation)		
Area of assessment		
Freshwater Ecology		
Score: -3 Significant Adverse/Un-mitigatable -2 Significant Adverse 0 Neutral 1 Minor Positive 2 Moderate Positive 3 Significant Positive		
	Criteria	Criteria
	Score	Score
Notes:		
Reasons / Comments - Potential stream works: - Stream network near Middlemore Station and Hospital - Stream crossing on East Tamaki Road - Crossing of Otara Creek on Ormiston Road		
Assumptions - Under the AUP stream works are usually non-complying or discretionary at the minimum. - Assumptions listed in 2.0 of the Memorandum for environmental specialists apply, specifically that the design footprint is from Auckland International Airport to Botany Town Centre.		
Other Information relied upon Auckland Unitary Plan E3 Lakes, Rivers, Streams and Wetlands		

Approved by:

Title	Name	Qualification	Signature	Date
Author				
Reviewer				1

Technical Note

To		From	
Copy		Reference	502334
Date	2018-09-04	Pages (including this page)	11
Subject	Airport to Botany Long-List Options: Multi-Criteria Analysis Scoring Sheet: Terrestrial Ecology		

The following provides an assessment of the long-list options for the Airport to Botany Single Stage Business Case (A2B SSBC). The assessment details the considerations which have been used to inform the assessment. This assessment is designed to contribute to the Multi-Criteria Analysis (MCA) assessment which is being undertaken for the long-list options (August 2018).

The source information assessed was based on desktop analysis only. The terrestrial ecological assessments were based on:

- The A2B long-list schematics (un-dated, but attached to the A2B long-list documentation dated 17 August 2018 and the long-list options descriptions and assumptions (dated 17 August 2018).
- Auckland Council GeoMaps, with Natural Resources and Natural Heritage overlays; Google Maps; Google Earth.

The options are outlined in the following table. The scores and assessments are outlined in the below tables.

Group	Option	High-level description
Integrated off-street options	Option I5	Heavy rail Airport spur line and Botany BRT
Corridor A: Airport to Puhinui	Option A1	BRT/LRT via Puhinui Road-SH20B.
	Option A2	BRT/LRT via SH20A and SH20
Corridor B: Puhinui through Manukau	Option B1	BRT/LRT from Puhinui to Clover Park via Puhinui Road
	Option B2	BRT/LRT Puhinui to Manukau via Ronwood Avenue
	Option B3	BRT/LRT from Puhinui to Manukau via Manukau Station Road
Corridor C: Manukau to Botany	Option C1	BRT/LRT from Manukau to Botany via Chapel Road
	Option C2	BRT/LRT from Manukau to Botany via Te Irirangi Drive
	Option C3	BRT/LRT Manukau to Botany via Preston Road – Harris Road
Corridor X: Alternate corridors not via Puhinui-Manukau	Option X2	BRT/LRT from Airport to Ormiston via Mangere, Middlemore, Otara and Ormiston Road.

Table 1 Multi Criteria Analysis Scoring Sheet

Option I5: Heavy rail Airport spur line and Botany BRT		
Name of assessor (incl. qualifications and organisation)		
Area of assessment		Terrestrial Ecology
Score: -3 Significant Adverse/Un-mitigatable -2 Significant Adverse  0 Neutral 1 Minor Positive 2 Moderate Positive 3 Significant Positive		
	Criteria	Criteria
	Score	Score
		
Notes: <u>Reasons / Comments</u> - Potential effect on SEA - SEA Terrestrial crossing of Puhinui Creek - Areas of established vegetation and/or weedy scrub and/or debris that may support herpetofauna will need to be assessed at detailed design. <u>Assumptions</u> - Assumptions listed in 2.0 of the Memorandum for environmental specialists apply, specifically that the design footprint is from Auckland International Airport to Botany Town Centre. <u>Other Information relied upon</u>		

Table 2 Multi Criteria Analysis Scoring Sheet

Option A1: BRT/LRT via Puhinui Road-SH20B		
Name of assessor (incl. qualifications and organisation)		
Area of assessment		Terrestrial Ecology
Score: -3 Significant Adverse/Un-mitigatable -2 Significant Adverse 0 Neutral 1 Minor Positive 2 Moderate Positive 3 Significant Positive		
	Criteria	Criteria
	Score	Score
Notes: <u>Reasons / Comments</u> - Areas of established vegetation and/or weedy scrub and/or debris that may support herpetofauna will need to be assessed at detailed design. <u>Assumptions</u> - Assumptions listed in 2.0 of the Memorandum for environmental specialists apply, specifically that the deign footprint is from Auckland International Airport to Botany Town Centre. <u>Other Information relied upon</u>		

Table 3 Multi Criteria Analysis Scoring Sheet

Option A2: BRT/LRT via SH20A and SH20		
Name of assessor (incl. qualifications and organisation)		
Area of assessment		Terrestrial Ecology
Score: -3 Significant Adverse/Un-mitigatable -2 Significant Adverse  0 Neutral 1 Minor Positive 2 Moderate Positive 3 Significant Positive		
	Criteria	Criteria
	Score	Score
Notes: <u>Reasons / Comments</u> ■ Areas of established vegetation and/or weedy scrub and/or debris that may support herpetofauna will need to be assessed at detailed design. ■ Potentially a notable tree near Vision Place/Puhinui Road – Position unclear on GeoMaps (Auckland Council GIS viewer) <u>Assumptions</u> ■ Assumptions listed in 2.0 of the Memorandum for environmental specialists apply, specifically that the design footprint is from Auckland International Airport to Botany Town Centre. <u>Other Information relied upon</u> ■		

Table 4 Multi Criteria Analysis Scoring Sheet

Option B1: BRT/LRT from Puhinui to Clover Park via Puhinui Road		
Name of assessor (incl. qualifications and organisation)	[Redacted]	
Area of assessment	Terrestrial Ecology	
Score: -3 Significant Adverse/Un-mitigatable -2 Significant Adverse -1 Minor/Moderate Adverse [Redacted] 1 Minor Positive 2 Moderate Positive 3 Significant Positive		
[Redacted]	Criteria	Criteria
[Redacted]	Score	Score
Notes: <u>Reasons / Comments</u> - No extensive areas of established vegetation and/or weedy scrub and/or debris that are likely to support herpetofauna. - Potentially a notable tree near Vision Place/Puhinui Road - Position unclear on GeoMaps (Auckland Council GIS viewer) <u>Assumptions</u> - Assumptions listed in 2.0 of the Memorandum for environmental specialists apply, specifically that the design footprint is from Auckland International Airport to Botany Town Centre. <u>Other Information relied upon</u>		

Table 5 Multi Criteria Analysis Scoring Sheet

Option B2: BRT/LRT from Puhinui to Manukau via Ronwood Ave		
Name of assessor (incl. qualifications and organisation)		
Area of assessment		Terrestrial Ecology
Score: -3 Significant Adverse/Un-mitigatable -2 Significant Adverse -1 Minor/Moderate Adverse 1 Minor Positive 2 Moderate Positive 3 Significant Positive		
	Criteria	Criteria
	Score	Score
Notes: <u>Reasons / Comments</u> - No extensive areas of established vegetation and/or weedy scrub and/or debris that are likely to support herpetofauna. <u>Assumptions</u> - Assumptions listed in 2.0 of the Memorandum for environmental specialists apply, specifically that the design footprint is from Auckland International Airport to Botany Town Centre. <u>Other Information relied upon</u>		

Table 6 Multi Criteria Analysis Scoring Sheet

Option B3: BRT/LRT from Puhinui to Manukau via Manukau Station Road		
Name of assessor (incl. qualifications and organisation)		
Area of assessment		Terrestrial Ecology
Score: -3 Significant Adverse/Un-mitigatable -2 Significant Adverse -1 Minor/Moderate Adverse 1 Minor Positive 2 Moderate Positive 3 Significant Positive		
	Criteria	Criteria
	Score	Score
Notes: <u>Reasons / Comments</u> - No extensive areas of established vegetation and/or weedy scrub and/or debris that are likely to support herpetofauna. <u>Assumptions</u> - Assumptions listed in 2.0 of the Memorandum for environmental specialists apply, specifically that the design footprint is from Auckland International Airport to Botany Town Centre. <u>Other Information relied upon</u>		

Table 7 Multi Criteria Analysis Scoring Sheet

Option C1: BRT/LRT from Manukau to Botany via Chapel Road		
Name of assessor (incl. qualifications and organisation)		
Area of assessment		Terrestrial Ecology
Score: -3 Significant Adverse/Un-mitigatable -2 Significant Adverse  0 Neutral 1 Minor Positive 2 Moderate Positive 3 Significant Positive		
	Criteria	Criteria
	Score	Score
Notes: <u>Reasons / Comments</u> - Areas of established vegetation and/or weedy scrub and/or debris that may support herpetofauna will need to be assessed in detailed design near Ormiston Road. <u>Assumptions</u> - Assumptions listed in 2.0 of the Memorandum for environmental specialists apply, specifically that the design footprint is from Auckland International Airport to Botany Town Centre. <u>Other Information relied upon</u>		

Table 8 Multi Criteria Analysis Scoring Sheet

Option C2: BRT/LRT from Manukau to Botany via Te Irirangi Drive		
Name of assessor (incl. qualifications and organisation)		
Area of assessment		Terrestrial Ecology
Score: -3 Significant Adverse/Un-mitigatable -2 Significant Adverse  0 Neutral 1 Minor Positive 2 Moderate Positive 3 Significant Positive		
	Criteria	Criteria
	Score	Score
Notes: <u>Reasons / Comments</u> - Areas of established vegetation that may support herpetofauna will need to be assessed at detailed design near Treneary Lane and south of the Otara Creek crossing. <u>Assumptions</u> - Assumptions listed in 2.0 of the Memorandum for environmental specialists, specifically that the design footprint is from Auckland International Airport to Botany Town Centre. <u>Other Information relied upon</u>		

Table 9 Multi Criteria Analysis Scoring Sheet

Option C3: BRT/LRT from Manukau to Botany via Preston Road – Harris Road		
Name of assessor (incl. qualifications and organisation)		
Area of assessment		
Terrestrial Ecology		
Score: -3 Significant Adverse/Un-mitigatable -2 Significant Adverse 0 Neutral 1 Minor Positive 2 Moderate Positive 3 Significant Positive		
	Criteria	Criteria
	Score	Score
Notes:		
Reasons / Comments Areas of established vegetation that may support herpetofauna will need to be assessed at detailed design at the Otara Creek crossing.		
Assumptions Assumptions listed in 2.0 of the Memorandum for environmental specialists, specifically that the design footprint is from Auckland International Airport to Botany Town Centre.		
Other Information relied upon		

Table 10 Multi Criteria Analysis Scoring Sheet

Option X2: BRT/LRT from Airport to Ormiston via Mangere, Middlemore, Otara and Ormiston Road		
Name of assessor (incl. qualifications and organisation)		
Area of assessment		
Terrestrial Ecology		
Score: -3 Significant Adverse/Un-mitigatable -2 Significant Adverse -1 Significant Adverse 0 Neutral 1 Minor Positive 2 Moderate Positive 3 Significant Positive		
	Criteria	Criteria
	Score	Score
Notes: <u>Reasons / Comments</u> - Potential effects on SEA: - SEA Terrestrial near Middlemore Station. - Areas of established vegetation and/or weedy scrub and/or debris that may support herpetofauna will need to be assessed at detailed design. <u>Assumptions</u> - Assumptions listed in 2.0 of the Memorandum for environmental specialists apply, specifically that the design footprint is from Auckland International Airport to Botany Town Centre. <u>Other Information relied upon</u>		

Approved by:

Title	Name	Qualification	Signature	Date
Author				
Reviewer				

Technical Note

To		From	
Copy		Reference	Project number
Date	Select date	Pages (including this page)	11
Subject	Airport to Botany Long-List Options: Multi-Criteria Analysis Scoring Sheet: Marine Ecology		

The following provides an assessment of the long-list options for the Airport to Botany Single Stage Business Case (A2B SSBC). The assessment details the considerations which have been used to inform the assessment. This assessment is designed to contribute to the Multi-Criteria Analysis (MCA) assessment which is being undertaken for the long-list options (August 2018).

The source information assessed was based on desktop analysis only. The marine ecological assessments were based on:

- The A2B long-list schematics (un-dated, but attached to the A2B long-list documentation dated 17 August 2018 and the long-list options descriptions and assumptions (dated 17 August 2018).
- Auckland Council GeoMaps, with Natural Resources and Catchment and Hydrology overlays, indicative coastline overlay; Google Maps; Google Earth.

The options are outlined in the following table. The scores and assessments are outlined in the below tables.

Group	Option	High-level description
Integrated off-street options	Option I5	Heavy rail Airport spur line and Botany BRT
Corridor A: Airport to Puhinui	Option A1	BRT/LRT via Puhinui Road-SH20B.
	Option A2	BRT/LRT via SH20A and SH20
Corridor B: Puhinui through Manukau	Option B1	BRT/LRT from Puhinui to Clover Park via Puhinui Road
	Option B2	BRT/LRT Puhinui to Manukau via Ronwood Avenue
	Option B3	BRT/LRT from Puhinui to Manukau via Manukau Station Road
Corridor C: Manukau to Botany	Option C1	BRT/LRT from Manukau to Botany via Chapel Road
	Option C2	BRT/LRT from Manukau to Botany via Te Irirangi Drive
	Option C3	BRT/LRT Manukau to Botany via Preston Road – Harris Road
Corridor X: Alternate corridors not via Puhinui-Manukau	Option X2	BRT/LRT from Airport to Ormiston via Mangere, Middlemore, Otara and Ormiston Road.

Table 1 Multi Criteria Analysis Scoring Sheet

Option I5: Heavy rail Airport spur line and Botany BRT		
Name of assessor (incl. qualifications and organisation)		
Area of assessment		Marine Ecology
Score: -3 Significant Adverse/Un-mitigatable -2 Significant Adverse  0 Neutral 1 Minor Positive 2 Moderate Positive 3 Significant Positive		
	Criteria	Criteria
	Score	Score
Notes: <u>Reasons / Comments</u> ■ Crossing Puhinui Creek in the Airport Precinct ■ Three crossings of the Upper Puhinui Creek: – One within the CMA and SEA Marine 2 – Two with the CMA and SEA Marine 2 immediately downstream of works area <u>Assumptions</u> ■ Assumptions listed in 2.0 of the Memorandum for environmental specialists apply, specifically that the design footprint is from Auckland International Airport to Botany Town Centre. <u>Other Information relied upon</u> ■		

Table 2 Multi Criteria Analysis Scoring Sheet

Option A1: BRT/LRT via Puhinui Road-SH20B		
Name of assessor (incl. qualifications and organisation)		
Area of assessment	Marine Ecology	
Score: -3 Significant Adverse/Un-mitigatable -2 Significant Adverse 0 Neutral 1 Minor Positive 2 Moderate Positive 3 Significant Positive		
	Criteria	Criteria
	Score	Score
Notes: <u>Reasons / Comments</u> ■ Crossing Puhinui Creek in the Airport Precinct ■ Three crossings of the Upper Puhinui Creek: – One within the CMA and SEA Marine 2 – Two with the CMA and SEA Marine 2 immediately downstream of the works area <u>Assumptions</u> ■ Assumptions listed in 2.0 of the Memorandum for environmental specialists apply, specifically that the design footprint is from Auckland International Airport to Botany Town Centre. <u>Other Information relied upon</u> ■		

Table 3 Multi Criteria Analysis Scoring Sheet

Option A2: BRT/LRT via SH20A and SH20		
Name of assessor (incl. qualifications and organisation)		
Area of assessment		Marine Ecology
Score: -3 Significant Adverse/Un-mitigatable -2 Significant Adverse -1 Minor/Moderate Adverse 1 Minor Positive 2 Moderate Positive 3 Significant Positive		
	Criteria	Criteria
	Score	Score
Notes: <u>Reasons / Comments</u> - No potential works within or in close proximity to the CMA. <u>Assumptions</u> - Assumptions listed in 2.0 of the Memorandum for environmental specialists apply, specifically that the design footprint is from Auckland International Airport to Botany Town Centre. <u>Other Information relied upon</u>		

Table 4 Multi Criteria Analysis Scoring Sheet

Option B1: BRT/LRT from Puhinui to Clover Park via Puhinui Road		
Name of assessor (incl. qualifications and organisation)	[Redacted]	
Area of assessment	Marine Ecology	
Score: -3 Significant Adverse/Un-mitigatable -2 Significant Adverse -1 Minor/Moderate Adverse [Redacted] 1 Minor Positive 2 Moderate Positive 3 Significant Positive		
[Redacted]	Criteria	Criteria
[Redacted]	Score	Score
Notes: <u>Reasons / Comments</u> - No potential works within or in close proximity to the CMA. <u>Assumptions</u> - Assumptions listed in 2.0 of the Memorandum for environmental specialists apply, specifically that the design footprint is from Auckland International Airport to Botany Town Centre. <u>Other Information relied upon</u>		

Table 5 Multi Criteria Analysis Scoring Sheet

Option B2: BRT/LRT from Puhinui to Manukau via Ronwood Ave		
Name of assessor (incl. qualifications and organisation)	[Redacted]	
Area of assessment	Marine Ecology	
Score: -3 Significant Adverse/Un-mitigatable -2 Significant Adverse -1 Minor/Moderate Adverse [Redacted] 1 Minor Positive 2 Moderate Positive 3 Significant Positive		
[Redacted]	Criteria	Criteria
[Redacted]	Score	Score
Notes: <u>Reasons / Comments</u> - No potential works within or in close proximity to the CMA. <u>Assumptions</u> - Assumptions listed in 2.0 of the Memorandum for environmental specialists apply, specifically that the design footprint is from Auckland International Airport to Botany Town Centre. <u>Other Information relied upon</u>		

Table 6 Multi Criteria Analysis Scoring Sheet

Option B3: BRT/LRT from Puhinui to Manukau via Manukau Station Road		
Name of assessor (incl. qualifications and organisation)		
Area of assessment		Marine Ecology
Score: -3 Significant Adverse/Un-mitigatable -2 Significant Adverse -1 Minor/Moderate Adverse 1 Minor Positive 2 Moderate Positive 3 Significant Positive		
	Criteria	Criteria
	Score	Score
Notes: <u>Reasons / Comments</u> - No potential works within or in close proximity to the CMA. <u>Assumptions</u> - Assumptions listed in 2.0 of the Memorandum for environmental specialists apply, specifically that the design footprint is from Auckland International Airport to Botany Town Centre. <u>Other Information relied upon</u>		

Table 7 Multi Criteria Analysis Scoring Sheet

Option C1: BRT/LRT from Manukau to Botany via Chapel Road		
Name of assessor (incl. qualifications and organisation)		
Area of assessment		Marine Ecology
Score: -3 Significant Adverse/Un-mitigatable -2 Significant Adverse -1 Minor/Moderate Adverse 1 Minor Positive 2 Moderate Positive 3 Significant Positive		
	Criteria	Criteria
	Score	Score
Notes: <u>Reasons / Comments</u> - No potential works within or in close proximity to the CMA. <u>Assumptions</u> - Assumptions listed in 2.0 of the Memorandum for environmental specialists apply, specifically that the design footprint is from Auckland International Airport to Botany Town Centre. <u>Other Information relied upon</u>		

Table 8 Multi Criteria Analysis Scoring Sheet

Option C2: BRT/LRT from Manukau to Botany via Te Irirangi Drive		
Name of assessor (incl. qualifications and organisation)		
Area of assessment		Marine Ecology
Score: -3 Significant Adverse/Un-mitigatable -2 Significant Adverse -1 Minor/Moderate Adverse 1 Minor Positive 2 Moderate Positive 3 Significant Positive		
	Criteria	Criteria
	Score	Score
Notes: <u>Reasons / Comments</u> - No potential works within or in close proximity to the CMA. <u>Assumptions</u> - Assumptions listed in 2.0 of the Memorandum for environmental specialists apply, specifically that the design footprint is from Auckland International Airport to Botany Town Centre. <u>Other Information relied upon</u>		

Table 9 Multi Criteria Analysis Scoring Sheet

Option C3: BRT/LRT from Manukau to Botany via Preston Road – Harris Road		
Name of assessor (incl. qualifications and organisation)		
Area of assessment		Marine Ecology
Score: -3 Significant Adverse/Un-mitigatable -2 Significant Adverse -1 Minor/Moderate Adverse 1 Minor Positive 2 Moderate Positive 3 Significant Positive		
	Criteria	Criteria
	Score	Score
Notes: <u>Reasons / Comments</u> ■ No potential works within or in close proximity to the CMA. <u>Assumptions</u> ■ Assumptions listed in 2.0 of the Memorandum for environmental specialists apply, specifically that the design footprint is from Auckland International Airport to Botany Town Centre. <u>Other Information relied upon</u> ■		

Table 10 Multi Criteria Analysis Scoring Sheet

Option X2: BRT/LRT from Airport to Ormiston via Mangere, Middlemore, Otara and Ormiston Road		
Name of assessor (incl. qualifications and organisation)		
Area of assessment		
Marine Ecology		
Score: -3 Significant Adverse/Un-mitigatable -2 Significant Adverse 0 Neutral 1 Minor Positive 2 Moderate Positive 3 Significant Positive		
	Criteria	Criteria
	Score	Score
Notes: Reasons / Comments - Works within SEA Marine 2 near Middlemore Station. Assumptions - Assumptions listed in 2.0 of the Memorandum for environmental specialists apply, specifically that the design footprint is from Auckland International Airport to Botany Town Centre. Other Information relied upon		

Approved by:

Title	Name	Qualification	Signature	Date
Author				
Reviewer				

Technical Note

To		From	
Copy		Reference	502334
Date	2018-08-24	Pages (including this page)	11
Subject	Airport to Botany Long-List Options: Multi-Criteria Analysis Scoring Sheet: Arboriculture		

The following provides an assessment of the long-list options for the Airport to Botany Single Stage Business Case (A2B SSBC). The assessment details the considerations which have been used to inform the assessment. This assessment is designed to contribute to the Multi-Criteria Analysis (MCA) assessment which is being undertaken for the long-list options (dated 17 August 2018).

The source information assessed was based on desktop analysis only. The 10 assessments were based on:

- The A2B long-list schematics (dated 17 August 2018) and the long-list options descriptions and assumptions (dated 17 August 2018).
- Google Maps and the Auckland Unitary Plan Viewer (accessed August 2018)

The options are outlined in the following table. The scores and assessments are outlined in the below tables.

Group	Option	High-level description
Integrated off-street options	Option I5	Heavy rail Airport spur line and Botany BRT
Corridor A: Airport to Puhinui	Option A1	BRT/LRT via Puhinui Road-SH20B.
	Option A2	BRT/LRT via SH20A and SH20
Corridor B: Puhinui through Manukau	Option B1	BRT/LRT from Puhinui to Clover Park via Puhinui Road
	Option B2	BRT/LRT Puhinui to Manukau via Ronwood Avenue
	Option B3	BRT/LRT from Puhinui to Manukau via Manukau Station Road
Corridor C: Manukau to Botany	Option C1	BRT/LRT from Manukau to Botany via Chapel Road
	Option C2	BRT/LRT from Manukau to Botany via Te Irirangi Drive
	Option C3	BRT/LRT Manukau to Botany via Preston Road – Harris Road
Corridor X: Alternate corridors not via Puhinui-Manukau	Option X2	BRT/LRT from Airport to Ormiston via Mangere, Middlemore, Otara and Ormiston Road.

Table 1 Multi Criteria Analysis Scoring Sheet

Option I5: Heavy rail Airport spur line and Botany BRT			
Name of assessor (incl. qualifications and organisation)	[Redacted]		
Area of assessment	Option I5 Mapped area as provided		
Score: <table border="1"> <tr> <td>Extent and effects of tree removal on arboricultural values</td> </tr> <tr> <td>-1 (Minor/moderate adverse)</td> </tr> </table>		Extent and effects of tree removal on arboricultural values	-1 (Minor/moderate adverse)
Extent and effects of tree removal on arboricultural values			
-1 (Minor/moderate adverse)			
Notes: <u>Reasons / Comments</u> ■ <i>Tree removal:</i> – Critical area where trees are affected is along the main airport road (Tom Pearson Dr). Critical elements will be the requirement for a shared corridor if LRT is also required in this area. Rows of mature Pohutukawa growing within the northern section of Road Reserve. The remaining sections of the route are largely either farmland or industrial areas with some street trees. One stream/watercourse to be crossed with likely vegetation removal. However, appears to be large mangroves and weed species. ■ <i>Corridor available for replanting:</i> – Options for planting extensive through farmland. Constraints around planting in the industrial estates within the Manukau industrial precinct. <u>Assumptions</u> ■ All survey was done from Aerial photographs, Google street view and the AUP viewer. ■ The reference to 'protected trees' are those in open space zones or are on Auckland Transport land (resource consent required for alteration or removal if over 4m in height or 400mm in girth as per the Auckland Unitary Plan). <u>Other Information relied upon</u> ■ Nil			

Table 2 Multi Criteria Analysis Scoring Sheet

Option A1: BRT/LRT via Puhinui Road-SH20B			
Name of assessor (incl. qualifications and organisation)			
Area of assessment	A1 Mapped area as provided		
Score: <table border="1"> <tr> <td>Extent and effects of tree removal on arboricultural values</td> </tr> <tr> <td>-1 (Minor/moderate adverse)</td> </tr> </table>		Extent and effects of tree removal on arboricultural values	-1 (Minor/moderate adverse)
Extent and effects of tree removal on arboricultural values			
-1 (Minor/moderate adverse)			
Notes: <u>Reasons / Comments</u> ■ <i>Tree Removal:</i> ■ The main trees affected would be those growing on Puhinui Road. The use of the central median will mean a potential widening of the roadway to incorporate the new SUP and would require the removal of street trees. There is also the potential for overall road widening in parts which will further impact those protected street trees growing on the southern side of Puhinui Road. ■ <i>Corridor Available for Replanting:</i> ■ Replacement tree planting is dependent on the ability to regain/maintain an open berm width conducive to street tree planting. <u>Assumptions</u> ■ All survey was done from Aerial photographs, Google street view and the AUP viewer. ■ The reference to 'protected trees' are those in open space zones or are on Auckland Transport land (resource consent required for alteration or removal if over 4m in height or 400mm in girth as per the Auckland Unitary Plan). <u>Other Information relied upon</u> ■ Nil			

Table 3 Multi Criteria Analysis Scoring Sheet

Option A2: BRT/LRT via SH20A and SH20			
Name of assessor (incl. qualifications and organisation)			
Area of assessment	A2 Mapped area as provided		
Score: <table border="1"> <tr> <td>Extent and effects of tree removal on arboricultural values</td> </tr> <tr> <td>-2 (Significant Adverse)</td> </tr> </table>		Extent and effects of tree removal on arboricultural values	-2 (Significant Adverse)
Extent and effects of tree removal on arboricultural values			
-2 (Significant Adverse)			
Notes: <u>Reasons / Comments</u> ■ <i>Tree Removal:</i> – The main areas of concern for this route are: – Removal of trees/potential impacts on large trees located within and adjacent to the historic house located at 5 Nixon Road. The site is partially covered by a historic heritage overlay with a significant grouping of large trees on the site. If practical, this alignment should be orientated in such a way so as to avoid this site. – Impacts on those protected street trees growing on Puhinui Road in order to create new walking and cycling facilities and the SUP. ■ <i>Corridor Available for Replanting:</i> – Options for planting throughout the Nixon Road, open farmland area to enhance route. Limited opportunities along Puhinui Road for new street tree plantings. <u>Assumptions</u> ■ All survey was done from Aerial photographs, Google street view and the AUP viewer. ■ The reference to 'protected trees' are those in open space zones or are on Auckland Transport land (resource consent required for alteration or removal if over 4m in height or 400mm in girth as per the Auckland Unitary Plan). <u>Other Information relied upon</u> ■ Nil			

Table 4 Multi Criteria Analysis Scoring Sheet

Option B1: BRT/LRT from Puhinui to Clover Park via Puhinui Road			
Name of assessor (incl. qualifications and organisation)			
Area of assessment	B1 Mapped area as provided		
Score: <table border="1"> <tr> <td>Extent and effects of tree removal on arboricultural values</td> </tr> <tr> <td>-2 (Significant Adverse)</td> </tr> </table>		Extent and effects of tree removal on arboricultural values	-2 (Significant Adverse)
Extent and effects of tree removal on arboricultural values			
-2 (Significant Adverse)			
Notes: <u>Reasons / Comments</u> ■ <i>Tree Removal:</i> - Impacts on those protected street trees growing on Puhinui Road in order to create new walking and cycling facilities and the SUP. A number of large Pohutukawa trees growing along Puhinui Road. Limited space available for open space creation due to width anticipated for the shared path and LRT. Could be reduced to -1 if adequate mitigation locations are available. ■ <i>Corridor Available for Replanting:</i> - Limited opportunities along Puhinui Road for new street tree plantings. <u>Assumptions</u> ■ All survey was done from Aerial photographs, Google street view and the AUP viewer. ■ The reference to 'protected trees' are those in open space zones or are on Auckland Transport land (resource consent required for alteration or removal if over 4m in height or 400mm in girth as per the Auckland Unitary Plan). <u>Other Information relied upon</u> Nil			

Table 5 Multi Criteria Analysis Scoring Sheet

Option B2: BRT/LRT from Puhinui to Manukau via Ronwood Ave					
Name of assessor (incl. qualifications and organisation)	[Redacted]				
Area of assessment	B2 Mapped area as provided				
Score: <table border="1"> <tr> <td>Extent and effects of tree removal on arboricultural values</td> <td></td> </tr> <tr> <td>-2 (Significant Adverse)</td> <td></td> </tr> </table>		Extent and effects of tree removal on arboricultural values		-2 (Significant Adverse)	
Extent and effects of tree removal on arboricultural values					
-2 (Significant Adverse)					
Notes: <u>Reasons / Comments</u> ■ <i>Tree Removal:</i> – Significant impacts on the entire Lambie Drive and Ronwood Ave streetscape. Approximately 81 protected trees growing within road reserve on Lambie Drive and Ronwood Ave, within the central median. [Redacted] ■ <i>Corridor available for replanting:</i> – [Redacted] <u>Assumptions</u> ■ All survey was done from Aerial photographs, Google street view and the AUP viewer. (Historically, site visits have also been undertaken within these areas for other projects). ■ The reference to 'protected trees' are those in open space zones or are on Auckland Transport land (resource consent required for alteration or removal if over 4m in height or 400mm in girth as per the Auckland Unitary Plan). <u>Other Information relied upon</u> ■ Nil					

Table 6 Multi Criteria Analysis Scoring Sheet

Option B3: BRT/LRT from Puhinui to Manukau via Manukau Station Road			
Name of assessor (incl. qualifications and organisation)	[REDACTED]		
Area of assessment	B3 Mapped area as provided		
Score: <table border="1"> <tr> <td>Extent and effects of tree removal on arboricultural values</td> </tr> <tr> <td>-2 (Significant Adverse)</td> </tr> </table>		Extent and effects of tree removal on arboricultural values	-2 (Significant Adverse)
Extent and effects of tree removal on arboricultural values			
-2 (Significant Adverse)			
Notes: <u>Reasons / Comments</u> ■ <i>Tree Removal:</i> – Significant impacts on the entire Lambie Drive streetscape. Approximately 60 protected trees growing road reserve, on Lambie Drive, within the central median. [REDACTED] ■ <i>Corridor available for replanting:</i> – Not considered there would be adequate space for significant replanting unless berms and open space was extended either side of the new roading layout. <u>Assumptions</u> ■ All survey was done from Aerial photographs, Google street view and the AUP viewer. (Historically, site visits have also been undertaken within these areas for other projects). ■ The reference to 'protected trees' are those in open space zones or are on Auckland Transport land (resource consent required for alteration or removal if over 4m in height or 400mm in girth as per the Auckland Unitary Plan). <u>Other Information relied upon</u> ■ Nil			

Table 7 Multi Criteria Analysis Scoring Sheet

Option C1: BRT/LRT from Manukau to Botany via Chapel Road			
Name of assessor (incl. qualifications and organisation)	[Redacted]		
Area of assessment	C1 Mapped area as provided		
Score: <table border="1"> <tr> <td>Extent and effects of tree removal on arboricultural values</td> </tr> <tr> <td>-2 (Significant Adverse)</td> </tr> </table>		Extent and effects of tree removal on arboricultural values	-2 (Significant Adverse)
Extent and effects of tree removal on arboricultural values			
-2 (Significant Adverse)			
Notes: <u>Reasons / Comments</u> ■ <i>Tree Removal:</i> – Significant impacts on the iconic Norfolk Pine trees on Manukau Station Road. Approximately 21 protected trees growing on Manukau Station Road, within the central median. [Redacted] ■ <i>Corridor available for replanting:</i> – [Redacted] <u>Assumptions</u> ■ All survey was done from Aerial photographs, Google street view and the AUP viewer. (Historically site visits have also been undertaken within these areas for other projects). ■ The reference to 'protected trees' are those in open space zones or are on Auckland Transport land (resource consent required for alteration or removal if over 4m in height or 400mm in girth as per the Auckland Unitary Plan). <u>Other Information relied upon</u> ■ Nil			

Table 8 Multi Criteria Analysis Scoring Sheet

Option C2: BRT/LRT from Manukau to Botany via Te Irirangi Drive			
Name of assessor (incl. qualifications and organisation)	[Redacted]		
Area of assessment	C2 Mapped area as provided		
Score: <table border="1"> <tr> <td>Extent and effects of tree removal on arboricultural values</td> </tr> <tr> <td>-2 (Significant Adverse)</td> </tr> </table>		Extent and effects of tree removal on arboricultural values	-2 (Significant Adverse)
Extent and effects of tree removal on arboricultural values			
-2 (Significant Adverse)			
Notes: <u>Reasons / Comments</u> ■ <i>Tree Removal:</i> ■ Te Irirangi Drive is lined with Washingtonian Palm trees for the entire length from Manukau to Botany. To some these are seen as an asset, others an unwanted exotic. [Redacted] ■ <i>Corridor available for replanting:</i> – [Redacted] <u>Assumptions</u> ■ All survey was done from Aerial photographs, Google street view and the AUP viewer. (Historically, site visits have also been undertaken within these areas for other projects). ■ The reference to 'protected trees' are those in open space zones or are on Auckland Transport land (resource consent required for alteration or removal if over 4m in height or 400mm in girth as per the Auckland Unitary Plan). <u>Other Information relied upon</u> ■ Nil			

Table 9 Multi Criteria Analysis Scoring Sheet

Option C3: BRT/LRT from Manukau to Botany via Preston Road-Harris Road			
Name of assessor (incl. qualifications and organisation)	[Redacted]		
Area of assessment	C3 Mapped area as provided		
Score: <table border="1"> <tr> <td>Extent and effects of tree removal on arboricultural values</td> </tr> <tr> <td>-1 (Minor/moderate adverse)</td> </tr> </table>		Extent and effects of tree removal on arboricultural values	-1 (Minor/moderate adverse)
Extent and effects of tree removal on arboricultural values			
-1 (Minor/moderate adverse)			
Notes: <u>Reasons / Comments</u> ■ <i>Tree Removal:</i> ■ This particular route is largely heavy industrial land. There are a number of large protected berm trees in isolated areas along the route. Potential for incorporation or replacement planting in wide berm areas. ■ <i>Corridor available for replanting:</i> – [Redacted] <u>Assumptions</u> ■ All survey was done from Aerial photographs, Google street view and the AUP viewer. (Historically, site visits have also been undertaken within these areas for other projects). ■ The reference to 'protected trees' are those in open space zones or are on Auckland Transport land (resource consent required for alteration or removal if over 4m in height or 400mm in girth as per the Auckland Unitary Plan). <u>Other Information relied upon</u> ■ Nil			

Table 10 Multi Criteria Analysis Scoring Sheet

Option X2: BRT/LRT from Airport to Ormiston via Mangere, Middlemore, Otara and Ormiston Road			
Name of assessor (incl. qualifications and organisation)	[Redacted]		
Area of assessment	X2 Mapped area as provided		
Score: <table border="1"> <tr> <td>Extent and effects of tree removal on arboricultural values</td> </tr> <tr> <td>-2 (Significant Adverse)</td> </tr> </table>		Extent and effects of tree removal on arboricultural values	-2 (Significant Adverse)
Extent and effects of tree removal on arboricultural values			
-2 (Significant Adverse)			
Notes: <u>Reasons / Comments</u> ■ <i>Tree Removal:</i> ■ Widening of lanes through Mangere to Ormiston will impact a large number of street trees growing on the edge of the existing carriageways. The area most impacted will be Massey Road due to the required land take for road widening and the creation of a shared path. Also noted private property tree removal and potential impacts on the Grange Golf Course (some areas under development). There are a number of large protected berm trees in isolated areas along the route which may be impacted by road widening and associated carriageway works. ■ <i>Corridor available for replanting:</i> – [Redacted] <u>Assumptions</u> ■ All survey was done from Aerial photographs, Google street view and the AUP viewer. (Historically, site visits have also been undertaken within these areas for other projects). ■ The reference to 'protected trees' are those in open space zones or are on Auckland Transport land (resource consent required for alteration or removal if over 4m in height or 400mm in girth as per the Auckland Unitary Plan). <u>Other Information relied upon</u> ■ Nil			

Approved by:

Title	Name	Qualification	Signature	Date
Author	[Redacted]	[Redacted]	[Redacted]	[Redacted]
Reviewer	[Redacted]	[Redacted]		[Redacted]

Technical Note

To		From	
Copy		Reference	502334
Date	2018-09-17	Pages (including this page)	21
Subject	Airport to Botany Long-List Options: Multi-Criteria Analysis Scoring Sheet: Stormwater and water quality		

The following provides an assessment of the long-list options for the Airport to Botany Single Stage Business Case (A2B SSBC). The assessment details the considerations which have been used to inform the assessment. This assessment is designed to contribute to the Multi-Criteria Analysis (MCA) assessment which is being undertaken for the long-list options (dated 17 August 2018).

The source information assessed was based on desktop analysis only. The 10 assessments were based on:

- The 20 Connect long-list schematics (dated 17/08/2018) and the long-list options descriptions and assumptions (dated 17/08/2018).
- Auckland Council Geo Maps.
- Stormwater Management Devices in the Auckland Region – Guideline Document GD01.
- Airport Access – Gap Analysis Report (Stormwater Section), 501094-4401-REP-JJ-0001, by Aurecon (February 2018)
- Auckland Unitary Plan Operative in Part (AUPOIP) - 2016

The options are outlined in the following table. The scores and assessments are outlined in the below tables.

Group	Option	High-level description
Integrated off-street options	Option I5	Heavy rail Airport spur line and Botany BRT
Corridor A: Airport to Puhinui	Option A1	BRT/LRT via Puhinui Road-SH20B.
	Option A2	BRT/LRT via SH20A and SH20
Corridor B: Puhinui through Manukau	Option B1	BRT/LRT from Puhinui to Clover Park via Puhinui Road
	Option B2	BRT/LRT Puhinui to Manukau via Ronwood Avenue
	Option B3	BRT/LRT from Puhinui to Manukau via Manukau Station Road
Corridor C: Manukau to Botany	Option C1	BRT/LRT from Manukau to Botany via Chapel Road
	Option C2	BRT/LRT from Manukau to Botany via Te Irirangi Drive
	Option C3	BRT/LRT Manukau to Botany via Preston Road – Harris Road
Corridor X: Alternate corridors not via Puhinui-Manukau	Option X2	BRT/LRT from Airport to Ormiston via Mangere, Middlemore, Otara and Ormiston Road.

Table 1 Multi Criteria Analysis Scoring Sheet

Option I5: Heavy rail Airport spur line and Botany BRT	
Name of assessor (incl. qualifications and organisation)	
Area of assessment	Stormwater and treatment
Score:	
Water Quality	Water Quantity
-1 (Minor/moderate adverse)	-1 (Minor/moderate adverse)
Notes: <u>Reasons / Comments</u> ■ Stormwater treatment: - AMA noted during a meeting on 5 December 2017 with Aurecon that the following sections of state highway within the project extent do not currently receive stormwater treatment: - SH20B; - Section of SH20 between SH20A and SH20B; and - SH20 / SH20A interchange. - As the option involves upgrade to existing SH20B, there is an opportunity to improve water quality as the existing road is not treated. However, depending on the level of treatment achievable on both SH20B (TBC during later design phases), there may be minor adverse effects if all new high-use road areas cannot be treated, therefore this criterion has been scored as Minor. - It has been assumed that no treatment is required for the heavy rail proposed as part of this option. ■ SMAF: - The proposed option is to be constructed in a Stormwater Management Area Control - Flow 1. Stormwater management area control – Flow 1 are those catchments which discharge to sensitive or high value streams that have relatively low levels of existing impervious area. Depending on the level of mitigation achievable, there may be potential for minor adverse impacts to stream health. - Consider space requirements for detention swales and/or wetlands within SMAF areas during the short list design. ■ Overland Flow path: - There are locations within the project extents where the existing shoulder and/or channels adjacent to existing state highways act as overland flow paths for external Auckland Council catchments. At some of these locations, the state highway corridor is constrained and is adjacent to urban development. - Options for widening the motorway over these channels need to consider the management of existing overland flow paths to avoid / minimise impacts to other properties. Depending on the space constraints, the provision to manage existing overland flow paths may be expensive or may not be practically feasible and need to be considered during the shot-list options assessment. - As no analysis has been taken to determine the impact of the proposed option on flow paths this criterion has been scored Minor/Moderate.	

■ **Flood plain interaction / Detention for larger storm events:**

- There are numerous location where proposed option crosses flood plains. This is seen as minor as the extents of the flood plains are small and there is minimal interaction with the proposed option.
- Designing for larger storm events may be required for various reasons, including but not limited:
 - Mitigation of flood effects caused by an increase in impervious surfaces
 - Reduction of existing flooding
 - Insufficient network capacity
- As no analysis has been taken to determine the impact of the proposed option on flood plains this criterion has been scored Minor/Moderate.

■ **Highway footprint clash:**

- The proposed heavy rail route will likely require a new crossing or modification of the existing bridge crossing the Waokauri Creek and a new crossing over the Puhinui Creek. This may have an impact on the upstream catchment flood levels.
- As no analysis has been taken to determine the impact of a new bridge or bridge widening this criterion has been scored Minor/Moderate.

Assumptions

- This assessment is based on a desktop study. No surveys, investigations or detailed site visits have been undertaken as part of this assessment.
- All roads are assumed to have over >5000 vehicles per day Annual Daily Traffic volume, triggering AUP Section E9 high contaminant generating zones requirements for water quality treatment.
- No area take off has been carried out as part of the MCA.
- A number of sub-criteria has been considered under Water Quantity. The overall Water Quantity score is based on the sub-criterion with the worst score.
- Existing Culverts do not perform part of this assessment as no information is held on them within the Auckland Council Geo Maps.

Other Information relied upon

- This assessment is a desktop study has been carried out using Auckland Council Geo Maps.
- Stormwater Management Devices un the Auckland Region – Guideline Document V1.
- Airport Access – Gap Analysis Report (Stormwater Section), 501094-4401-REP-JJ-0001, by Aurecon (February 2018).
- Auckland Unitary Plan Operative in Part (AUPOIP) - 2016

Table 2 Multi Criteria Analysis Scoring Sheet

Option A1: BRT/LRT via Puhinui Road-SH20B	
Name of assessor (incl. qualifications and organisation)	
Area of assessment	Stormwater and treatment
Score:	
Water Quality	Water Quantity
-1 (Minor/moderate adverse)	-1 (Minor/moderate adverse)
Notes: <u>Reasons / Comments</u> ■ SMAF: - The proposed option is to be constructed in a Stormwater Management Area Control - Flow 1. Stormwater management area control – Flow 1 are those catchments which discharge to sensitive or high value streams that have relatively low levels of existing impervious area. - Consider space requirements for detention swales and/or wetlands within SMAF areas during the short list design. ■ Overland Flow path: - There are locations within the project extents where the existing shoulder and/or channels adjacent to existing state highways act as overland flow paths for external Auckland Council catchments. At some of these locations, the state highway corridor is constrained and is adjacent to urban development. - Options for widening the motorway over these channels need to consider the management of existing overland flow paths to avoid / minimise impacts to other properties. Depending on the space constraints, the provision to manage existing overland flow paths may be expensive or may not be practically feasible and need to be considered during the shot-list options assessment. - As no analysis has been taken to determine the impact of the proposed option on flow paths this criterion has been scored Minor/Moderate. ■ Stormwater treatment: - AMA noted during a meeting on 5 December 2017 with Aurecon that the following sections of state highway within the project extent do not currently receive stormwater treatment: ■ SH20B; ■ Section of SH20 between SH20A and SH20B; and ■ SH20 / SH20A interchange. - As the option involves upgrade to existing SH20B, there is an opportunity to improve water quality as the existing road is not treated. However, depending on the level of treatment achievable on both SH20B (TBC during later design phases), there may be minor adverse effects if all new high-use road areas cannot be treated, therefore this criterion has been scored as Minor. ■ Flood plain interaction / Detention for larger storm events: - There are numerous location where proposed option crosses flood plains. This is seen as minor as the extents of the flood plains are small and there is minimal interaction with the proposed option.	

- Designing for larger storm events may be required for various reasons, including but not limited:
 - Mitigation of flood effects caused by an increase in impervious surfaces
 - Reduction of existing flooding
 - Insufficient network capacity
- There are numerous location where the proposed option crosses flood plains. This is seen as Minor/Moderate as the extents of the flood plains are small and there is minimal interaction with the proposed. Additionally, as no analysis has been taken to determine the impact of the proposed option on flood plains this criterion has been scored Minor/Moderate.

Assumptions

- This assessment is based on a desktop study. No surveys, investigations or detailed site visits have been undertaken as part of this assessment.
- All roads are assumed to have over >5000 vehicles per day Annual Daily Traffic volume, triggering AUP Section E9 high contaminant generating zones requirements for water quality treatment.
- No area take off has been carried out as part of the MCA.
- A number of sub-criteria has been considered under Water Quantity. The overall Water Quantity score is based on the sub-criterion with the worst score.
- Existing Culverts do not perform part of this assessment as no information is held on them within the Auckland Council Geo Maps.

Other Information relied upon

- This assessment is a desktop study has been carried out using Auckland Council Geo Maps.
- Stormwater Management Devices un the Auckland Region – Guideline Document V1.
- Airport Access – Gap Analysis Report (Stormwater Section), 501094-4401-REP-JJ-0001, by Aurecon (February 2018).
- Auckland Unitary Plan Operative in Part (AUPOIP) - 2016

Table 3 Multi Criteria Analysis Scoring Sheet

Option A2: BRT/LRT via SH20A and SH20					
Name of assessor (incl. qualifications and organisation)					
Area of assessment	Stormwater and treatment				
Score: <table border="1"> <thead> <tr> <th>Water Quality</th> <th>Water Quantity</th> </tr> </thead> <tbody> <tr> <td>-1 (Minor/moderate adverse)</td> <td>-1 (Minor/moderate adverse)</td> </tr> </tbody> </table>		Water Quality	Water Quantity	-1 (Minor/moderate adverse)	-1 (Minor/moderate adverse)
Water Quality	Water Quantity				
-1 (Minor/moderate adverse)	-1 (Minor/moderate adverse)				
Notes: <u>Reasons / Comments</u> ■ SMAF – The proposed option does not interact with a SMAF zone. ■ Overland Flow path: – There are locations within the project extents where the existing shoulder and/or channels adjacent to existing state highways act as overland flow paths for external Auckland Council catchments. At some of these locations, the state highway corridor is constrained and is adjacent to urban development. – Options for widening the motorway over these channels need to consider the management of existing overland flow paths to avoid / minimise impacts to other properties. Depending on the space constraints, the provision to manage existing overland flow paths may be expensive or may not be practically feasible and need to be considered during the shot-list options assessment. – As no analysis has been taken to determine the impact of the proposed option on flow paths this criterion has been scored Minor/Moderate. ■ Stormwater treatment: – AMA noted during a meeting on 5 December 2017 with Aurecon that the following sections of state highway within the project extent do not currently receive stormwater treatment: ■ SH20B; ■ Section of SH20 between SH20A and SH20B; and ■ SH20 / SH20A interchange. – As the option involves upgrade to existing SH20 and SH20B, there is an opportunity to improve water quality as the existing road is not treated. However, depending on the level of treatment achievable on both SH20 and SH20B (TBC during later design phases), there may be minor adverse effects. if all new high-use road areas cannot be treated, therefore this criterion has been scored as Minor.. ■ Flood plain interaction / Detention for larger storm events: – There are numerous location where proposed option crosses flood plains. This is seen as minor as the extents of the flood plains are small and there is minimal interaction with the proposed option. – Designing for larger storm events may be required for various reasons, including but not limited: ■ Mitigation of flood effects caused by an increase in impervious surfaces					

- Reduction of existing flooding
- Insufficient network capacity
- There are numerous location where the proposed option crosses flood plains. This is seen as Minor/Moderate as the extents of the flood plains are small and there is minimal interaction with the proposed. Additionally, as no analysis has been taken to determine the impact of the proposed option on flood plains this criterion has been scored Minor/Moderate.

Assumptions

- This assessment is based on a desktop study. No surveys, investigations or detailed site visits have been undertaken as part of this assessment.
- All roads are assumed to have over >5000 vehicles per day Annual Daily Traffic volume, triggering AUP Section E9 high contaminant generating zones requirements for water quality treatment.
- No area take off has been carried out as part of the MCA.
- A number of sub-criteria has been considered under Water Quantity. The overall Water Quantity score is based on the sub-criterion with the worst score.
- Existing Culverts do not perform part of this assessment as no information is held on them within the Auckland Council Geo Maps.

Other Information relied upon

- This assessment is a desktop study has been carried out using Auckland Council Geo Maps.
- Stormwater Management Devices un the Auckland Region – Guideline Document V1.
- Airport Access – Gap Analysis Report (Stormwater Section), 501094-4401-REP-JJ-0001, by Aurecon (February 2018).
- Auckland Unitary Plan Operative in Part (AUPOIP)- 2016.

Table 4 Multi Criteria Analysis Scoring Sheet

Option B1: BRT/LRT from Puhinui to Clover Park via Puhinui Road					
Name of assessor (incl. qualifications and organisation)					
Area of assessment	Stormwater and treatment				
Score: <table border="1"> <thead> <tr> <th>Water Quality</th> <th>Water Quantity</th> </tr> </thead> <tbody> <tr> <td>-1 (Minor/moderate adverse)</td> <td>-2 (Significant Adverse)</td> </tr> </tbody> </table>		Water Quality	Water Quantity	-1 (Minor/moderate adverse)	-2 (Significant Adverse)
Water Quality	Water Quantity				
-1 (Minor/moderate adverse)	-2 (Significant Adverse)				
Notes: <u>Reasons / Comments</u> ■ SMAF: – The proposed Puhinui Road portion of the option is to be constructed in a Stormwater Management Area Control - Flow 2. Stormwater management area control – Flow 2 are those catchments with a moderate or high value streams, but generally with higher levels of existing impervious area within the catchment. – Consider space requirements for detention swales and/or wetlands within SMAF areas during the short list design. ■ Overland Flow path: – There are locations within the project extents where the existing shoulder and/or channels adjacent to Puhinui and Boundary Road act as overland flow paths for external Auckland Council catchments. At some of these locations, the state highway corridor is constrained and is adjacent to urban development. – Options for widening Puhinui and Boundary Road over these channels need to consider the management of existing overland flow paths to avoid / minimise impacts to other properties. Depending on the space constraints, the provision to manage existing overland flow paths may be expensive or may not be practically feasible and need to be considered during the short-list options assessment. – As no analysis has been taken to determine the impact of the proposed option on flood plains this criterion has been scored Minor/Moderate. ■ Stormwater treatment: – A review of the Auckland Council GeoMaps identified that there is potentially existing storm water treatment to Puhinui Road within the Puhinui domain. This would have to be assessed to determine if It can treat the additional flow volume from the proposed option. Boundary Road is assumed to have no existing stormwater treatment as no treatment device was identified from a review of Auckland Council GeoMaps. – As the level of treatment that will be achievable is not known at this stage, this criterion has been scored as Minor. ■ Flood plain interaction / Detention for larger storm events: – The Puhinui Road portion of the option drains to the low point on Plunket Avenue. This area has been identified as a flood plain within the Auckland Council Geo Maps. The boundary Road portion of the option has no significant flood plain interaction.					

- Alignment options should aim to avoid impacting existing flood plains and existing stormwater ponds. Proposed alignments may cross streams with the use of culverts and bridges.
- Designing for larger storm events may be required for various reasons, including but not limited:
 - Mitigation of flood effects caused by an increase in impervious surfaces
 - Reduction of existing flooding
 - Insufficient network capacity
- As the Puhinui Road portion of the proposed option interacts significantly with a flood plain and there is limited space for detention due to heavy urbanisation in the catchment this criterion has been scored as Significant/Adverse.

Assumptions

- This assessment is based on a desktop study. No surveys, investigations or detailed site visits have been undertaken as part of this assessment.
- All roads are assumed to have over >5000 vehicles per day Annual Daily Traffic volume, triggering AUP Section E9 high contaminant generating zones requirements for water quality treatment.
- No area take off has been carried out as part of the MCA.
- A number of sub-criteria has been considered under Water Quantity. The overall Water Quantity score is based on the sub-criterion with the worst score.
- Existing Culverts do not perform part of this assessment as no information is held on them within the Auckland Council Geo Maps.

Other Information relied upon

- This assessment is a desktop study has been carried out using Auckland Council Geo Maps.
- Stormwater Management Devices un the Auckland Region – Guideline Document V1.
- Airport Access – Gap Analysis Report (Stormwater Section), 501094-4401-REP-JJ-0001, by Aurecon (February 2018).
- Auckland Unitary Plan Operative in Part (AUPOIP)- 2016.

Table 5 Multi Criteria Analysis Scoring Sheet

Option B2: BRT/LRT from Puhinui to Manukau via Ronwood Ave	
Name of assessor (incl. qualifications and organisation)	
Area of assessment	Stormwater and treatment
Score:	
Water Quality	Water Quantity
-1 (Minor/moderate adverse)	-3 (Significant Adverse/Un-mitigatable) ¹
Notes: ■ SMAF: – The proposed option is to be constructed in a Stormwater Management Area Control - Flow 2. Stormwater management area control – Flow 2 are those catchments with a moderate or high value streams, but generally with higher levels of existing impervious area within the catchment. – Consider space requirements for detention swales and/or wetlands within SMAF areas during the short list design. ■ Overland Flow path: – There are locations within the project extents where the existing shoulder and/or channels adjacent to the road act as overland flow paths for external Auckland Council catchments. At some of these locations, the state highway corridor is constrained and is adjacent to urban development. – Options for widening the road over these channels need to consider the management of existing overland flow paths to avoid / minimise impacts to other properties. Depending on the space constraints, the provision to manage existing overland flow paths may be expensive or may not be practically feasible and need to be considered during the short-list options assessment. – As no analysis has been taken to determine the impact of the proposed option on flow paths this criterion has been scored Minor/Moderate. ■ Stormwater treatment: – A review of the Auckland Council GeoMaps identified that there is potentially existing storm water treatment to Puhinui Road within the Puhinui domain. This would have to be assessed to determine if it can treat the additional flow volume from the proposed option. Boundary Road is assumed to have no existing stormwater treatment as no treatment device was identified from a review of Auckland Council GeoMaps. – As the level of treatment that will be achievable is not known at this stage, this criterion has been scored as Minor. ■ Flood plain interaction / Detention for larger storm events: – The proposed option is within an area that has been identified as a flood plain within the Auckland Council Geo Maps. – Alignment options should aim to avoid impacting existing flood plains and existing stormwater ponds. Proposed alignments may cross streams with the use of culverts and bridges.	

¹ Following a review of the scoring against the other environmental criteria, the scoring for Water Quantity for this option has been reduced to a -2 (significant adverse).

- Designing for larger storm events may be required for various reasons, including but not limited:
 - Mitigation of flood effects caused by an increase in impervious surfaces
 - Reduction of existing flooding
 - Insufficient network capacity
- As the proposed option is within a flood plain and there is limited space for detention due to heavy urbanisation in the catchment this criterion has been scored as Significant Adverse/ Un-mitigatable.

Assumptions

- This assessment is based on a desktop study. No surveys, investigations or detailed site visits have been undertaken as part of this assessment.
- All roads are assumed to have over >5000 vehicles per day Annual Daily Traffic volume, triggering AUP Section E9 high contaminant generating zones requirements for water quality treatment.
- No area take off has been carried out as part of the MCA.
- A number of sub-criteria has been considered under Water Quantity. The overall Water Quantity score is based on the sub-criterion with the worst score.
- Existing Culverts do not perform part of this assessment as no information is held on them within the Auckland Council Geo Maps.

Other Information relied upon

- This assessment is a desktop study has been carried out using Auckland Council Geo Maps.
- Stormwater Management Devices un the Auckland Region – Guideline Document V1.
- Airport Access – Gap Analysis Report (Stormwater Section), 501094-4401-REP-JJ-0001, by Aurecon (February 2018).
- Auckland Unitary Plan Operative in Part (AUPOIP) - 2016.

Table 6 Multi Criteria Analysis Scoring Sheet

Option B3: BRT/LRT from Puhinui to Manukau via Manukau Station Road	
Name of assessor (incl. qualifications and organisation)	
Area of assessment	Stormwater and treatment
Score:	
Water Quality	Water Quantity
-1 Minor/Moderate Adverse	-3 Significant Adverse/Un-mitigatable ²
Notes: <u>Reasons / Comments</u> ■ SMAF : – The proposed option is to be constructed in a Stormwater Management Area Control - Flow 2. Stormwater management area control – Flow 2 are those catchments with a moderate or high value streams, but generally with higher levels of existing impervious area within the catchment. – Consider space requirements for detention swales and/or wetlands within SMAF areas during the short list design. ■ Overland Flow path: – There are locations within the project extents where the existing shoulder and/or channels adjacent to the road act as overland flow paths for external Auckland Council catchments. At some of these locations, the state highway corridor is constrained and is adjacent to urban development. – Options for widening the road over these channels need to consider the management of existing overland flow paths to avoid / minimise impacts to other properties. Depending on the space constraints, the provision to manage existing overland flow paths may be expensive or may not be practically feasible and need to be considered during the short-list options assessment. – As no analysis has been taken to determine the impact of the proposed option on flow paths this criterion has been scored Minor/Moderate. ■ Stormwater treatment: – A review of the Auckland Council GeoMaps identified that there is potentially existing storm water treatment to Puhinui Road within the Puhinui domain. This would have to be assessed to determine if it can treat the additional flow volume from the proposed option. Boundary Road is assumed to have no existing stormwater treatment as no treatment device was identified from a review of Auckland Council GeoMaps. – As the level of treatment that will be achievable is not known at this stage, this criterion has been scored as Minor. ■ Flood plain interaction / Detention for larger storm events: – The proposed option is within an area that has been identified as a flood plain within the Auckland Council Geo Maps. – Alignment options should aim to avoid impacting existing flood plains and existing stormwater ponds. Proposed alignments may cross streams with the use of culverts and bridges.	

² Following a review of the scoring against the other environmental criteria, the scoring for Water Quantity for this option has been reduced to a -2 (significant adverse).

- Designing for larger storm events may be required for various reasons, including but not limited:
 - Mitigation of flood effects caused by an increase in impervious surfaces
 - Reduction of existing flooding
 - Insufficient network capacity
- As the proposed option is within a flood plain and there is limited space for detention due to heavy urbanisation in the catchment this criterion has been scored as Significant Adverse/ Un-mitigatable.

Assumptions

- This assessment is based on a desktop study. No surveys, investigations or detailed site visits have been undertaken as part of this assessment.
- All roads are assumed to have over >5000 vehicles per day Annual Daily Traffic volume, triggering AUP Section E9 high contaminant generating zones requirements for water quality treatment.
- No area take off has been carried out as part of the MCA.
- A number of sub-criteria has been considered under Water Quantity. The overall Water Quantity score is based on the sub-criterion with the worst score.
- Existing Culverts do not perform part of this assessment as no information is held on them within the Auckland Council Geo Maps.

Other Information relied upon

- This assessment is a desktop study has been carried out using Auckland Council Geo Maps.
- Stormwater Management Devices un the Auckland Region – Guideline Document V1.
- Airport Access – Gap Analysis Report (Stormwater Section), 501094-4401-REP-JJ-0001, by Aurecon (February 2018).
- Auckland Unitary Plan Operative in Part (AUPOIP)- 2016

Table 7 Multi Criteria Analysis Scoring Sheet

Option C1: BRT/LRT from Manukau to Botany via Chapel Road					
Name of assessor (incl. qualifications and organisation)					
Area of assessment	Stormwater and treatment				
Score: <table border="1"> <thead> <tr> <th>Water Quality</th> <th>Water Quantity</th> </tr> </thead> <tbody> <tr> <td>-1 (Minor/Moderate Adverse)</td> <td>-1 (Minor/Moderate Adverse)</td> </tr> </tbody> </table>		Water Quality	Water Quantity	-1 (Minor/Moderate Adverse)	-1 (Minor/Moderate Adverse)
Water Quality	Water Quantity				
-1 (Minor/Moderate Adverse)	-1 (Minor/Moderate Adverse)				
Notes: <u>Reasons / Comments</u> ■ SMAF: – The southern tie-in area is of the proposed option is to be constructed in a Stormwater Management Area Control - Flow 2. Stormwater management area control – Flow 2 are those catchments with a moderate or high value streams, but generally with higher levels of existing impervious area within the catchment. – Consider space requirements for detention swales and/or wetlands within SMAF areas during the short list design. ■ Overland Flow path: – There are locations within the project extents where the existing shoulder and/or channels adjacent to the road act as overland flow paths for external Auckland Council catchments. At some of these locations, the state highway corridor is constrained and is adjacent to urban development. – Options for widening the road over these channels need to consider the management of existing overland flow paths to avoid / minimise impacts to other properties. Depending on the space constraints, the provision to manage existing overland flow paths may be expensive or may not be practically feasible and need to be considered during the short-list options assessment. – As no analysis has been taken to determine the impact of the proposed option on flow paths this criterion has been scored Minor/Moderate. ■ Stormwater treatment: – The proposed option is assumed to have no existing stormwater treatment as no treatment devices were identified from a review of Auckland Council GeoMaps. – As the level of treatment that will be achievable is not known at this stage, this criterion has been scored as Minor. ■ Flood plain interaction / Detention for larger storm events: – There are numerous location where proposed option crosses flood plains. This is seen as minor as the extents of the flood plains are small and there is minimal interaction with the proposed option. – Designing for larger storm events may be required for various reasons, including but not limited: ■ Mitigation of flood effects caused by an increase in impervious surfaces ■ Reduction of existing flooding ■ Insufficient network capacity					

- There are numerous location where the proposed option crosses flood plains. This is seen as Minor/Moderate as the extents of the flood plains are small and there is minimal interaction with the proposed. Additionally, as no analysis has been taken to determine the impact of the proposed option on flood plains this criterion has been scored Minor/Moderate.

Assumptions

- This assessment is based on a desktop study. No surveys, investigations or detailed site visits have been undertaken as part of this assessment.
- All roads are assumed to have over >5000 vehicles per day Annual Daily Traffic volume, triggering AUP Section E9 high contaminant generating zones requirements for water quality treatment.
- No area take off has been carried out as part of the MCA.
- A number of sub-criteria has been considered under Water Quantity. The overall Water Quantity score is based on the sub-criterion with the worst score.
- Existing Culverts do not perform part of this assessment as no information is held on them within the Auckland Council Geo Maps.

Other Information relied upon

- This assessment is a desktop study has been carried out using Auckland Council Geo Maps.
- Stormwater Management Devices un the Auckland Region – Guideline Document V1.
- Airport Access – Gap Analysis Report (Stormwater Section), 501094-4401-REP-JJ-0001, by Aurecon (February 2018).
- Auckland Unitary Plan Operative in Part (AUPOIP)- 2016

Table 8 Multi Criteria Analysis Scoring Sheet

Option C2: BRT/LRT from Manukau to Botany via Te Irirangi Drive	
Name of assessor (incl. qualifications and organisation)	[Redacted]
Area of assessment	Stormwater and treatment
Score:	
Water Quality	Water Quantity
-1 (Minor/Moderate Adverse)	-1 (Minor/Moderate Adverse)
Notes: <u>Reasons / Comments</u> ■ SMAF: - The proposed option is to be constructed in a Stormwater Management Area Control - Flow 2. Stormwater management area control – Flow 2 are those catchments with a moderate or high value streams, but generally with higher levels of existing impervious area within the catchment. [Redacted] ■ Overland Flow path: - There are locations within the project extents where the existing shoulder and/or channels adjacent to the road act as overland flow paths for external Auckland Council catchments. At some of these locations, the state highway corridor is constrained and is adjacent to urban development. - Options for widening the road over these channels need to consider the management of existing overland flow paths to avoid / minimise impacts to other properties. [Redacted] [Redacted] - As no analysis has been taken to determine the impact of the proposed option on flow paths this criterion has been scored Minor/Moderate. ■ Stormwater treatment: - The proposed option is assumed to have no existing stormwater treatment as no treatment devices were identified from a review of Auckland Council GeoMaps. - As the level of treatment that will be achievable is not known at this stage, this criterion has been scored as Minor. ■ Flood plain interaction / Detention for larger storm events: - There are numerous location where proposed option crosses flood plains. This is seen as minor as the extents of the flood plains are small and there is minimal interaction with the proposed option. - Designing for larger storm events may be required for various reasons, including but not limited: ■ Mitigation of flood effects caused by an increase in impervious surfaces ■ Reduction of existing flooding ■ Insufficient network capacity	

- There are numerous location where the proposed option crosses flood plains. This is seen as Minor/Moderate as the extents of the flood plains are small and there is minimal interaction with the proposed. Additionally, as no analysis has been taken to determine the impact of the proposed option on flood plains this criterion has been scored Minor/Moderate.

Assumptions

- This assessment is based on a desktop study. No surveys, investigations or detailed site visits have been undertaken as part of this assessment.
- All roads are assumed to have over >5000 vehicles per day Annual Daily Traffic volume, triggering AUP Section E9 high contaminant generating zones requirements for water quality treatment.
- No area take off has been carried out as part of the MCA.
- A number of sub-criteria has been considered under Water Quantity. The overall Water Quantity score is based on the sub-criterion with the worst score.
- Existing Culverts do not perform part of this assessment as no information is held on them within the Auckland Council Geo Maps.

Other Information relied upon

- This assessment is a desktop study has been carried out using Auckland Council Geo Maps.
- Stormwater Management Devices un the Auckland Region – Guideline Document V1.
- Airport Access – Gap Analysis Report (Stormwater Section), 501094-4401-REP-JJ-0001, by Aurecon (February 2018).
- Auckland Unitary Plan Operative in Part (AUPOIP)- 2016.

Table 9 Multi Criteria Analysis Scoring Sheet

Option C3: BRT/LRT from Manukau to Botany via Preston Rd – Harris Rd					
Name of assessor (incl. qualifications and organisation)					
Area of assessment	Stormwater and treatment				
Score: <table border="1"> <thead> <tr> <th>Water Quality</th> <th>Water Quantity</th> </tr> </thead> <tbody> <tr> <td>-1 (Minor/Moderate Adverse)</td> <td>-1 (Minor/Moderate Adverse)</td> </tr> </tbody> </table>		Water Quality	Water Quantity	-1 (Minor/Moderate Adverse)	-1 (Minor/Moderate Adverse)
Water Quality	Water Quantity				
-1 (Minor/Moderate Adverse)	-1 (Minor/Moderate Adverse)				
Notes: <u>Reasons / Comments</u> ■ SMAF: - The proposed option does not interact with a SMAF zone. ■ Overland Flow path: - There are locations within the project extents where the existing shoulder and/or channels adjacent to the road act as overland flow paths for external Auckland Council catchments. At some of these locations, the state highway corridor is constrained and is adjacent to urban development. - Options for widening the road over these channels need to consider the management of existing overland flow paths to avoid / minimise impacts to other properties. - As no analysis has been taken to determine the impact of the proposed option on flow paths this criterion has been scored Minor/Moderate. ■ Stormwater treatment: - The proposed option is assumed to have no existing stormwater treatment as no treatment devices were identified from a review of Auckland Council GeoMaps. - As the level of treatment that will be achievable is not known at this stage, this criterion has been scored as Minor. ■ Flood plain interaction / Detention for larger storm events: - There are numerous location where proposed option crosses flood plains. This is seen as minor as the extents of the flood plains are small and there is minimal interaction with the proposed option. - Designing for larger storm events may be required for various reasons, including but not limited: - Mitigation of flood effects caused by an increase in impervious surfaces - Reduction of existing flooding - Insufficient network capacity - There are numerous location where the proposed option crosses flood plains. This is seen as Minor/Moderate as the extents of the flood plains are small and there is minimal interaction with the proposed. Additionally, as no analysis has been taken to determine the impact of the proposed option on flood plains this criterion has been scored Minor/Moderate. <u>Assumptions</u>					

- This assessment is based on a desktop study. No surveys, investigations or detailed site visits have been undertaken as part of this assessment.
- All roads are assumed to have over >5000 vehicles per day Annual Daily Traffic volume, triggering AUP Section E9 high contaminant generating zones requirements for water quality treatment.
- No area take off has been carried out. For proposed works in SMAF zones It has been assumed that this will be in excess of 5000m² and associated standards should be adhered to Auckland Unitary Plan E10 guidance document.
- Existing Culverts do not perform part of this assessment as no information is held on them within the Auckland Council Geo Maps.

Other Information relied upon

- This assessment is a desktop study has been carried out using Auckland Council Geo Maps.
- Stormwater Management Devices un the Auckland Region – Guideline Document V1.
- Airport Access – Gap Analysis Report (Stormwater Section), 501094-4401-REP-JJ-0001, by Aurecon (February 2018).
- Auckland Unitary Plan Operative in Part (AUPOIP)- 2016.

Table 10 Multi Criteria Analysis Scoring Sheet

Option X2: BRT/LRT from Airport to Ormiston via Mangere, Middlemore, Otara and Ormiston Road					
Name of assessor (incl. qualifications and organisation)					
Area of assessment	Stormwater and treatment				
Score: <table border="1"> <thead> <tr> <th>Water Quality</th> <th>Water Quantity</th> </tr> </thead> <tbody> <tr> <td>-1 (Minor/Moderate Adverse)</td> <td>-2 (Significant Adverse)</td> </tr> </tbody> </table>		Water Quality	Water Quantity	-1 (Minor/Moderate Adverse)	-2 (Significant Adverse)
Water Quality	Water Quantity				
-1 (Minor/Moderate Adverse)	-2 (Significant Adverse)				
Notes: <u>Reasons / Comments</u> ■ SMAF: Score 0 – The proposed option does not interact with a SMAF zone. ■ Overland Flow path: – There are locations within the project extents where the existing shoulder and/or channels adjacent to the road act as overland flow paths for external Auckland Council catchments. At some of these locations, the state highway corridor is constrained and is adjacent to urban development. – Options for widening the road over these channels need to consider the management of existing overland flow paths to avoid / minimise impacts to other properties. Depending on the space constraints, the provision to manage existing overland flow paths may be expensive or may not be practically feasible and need to be considered during the short-list options assessment. – As no analysis has been taken to determine the impact of the proposed option on flow paths this criterion has been scored Minor/Moderate. ■ Stormwater treatment: – The proposed option is assumed to have no existing stormwater treatment as no treatment devices were identified from a review of Auckland Council GeoMaps. – As the level of treatment that will be achievable is not known at this stage, this criterion has been scored as Minor. ■ Flood plain interaction / Detention for larger storm events: – There are numerous location where proposed option crosses flood plains. This is seen as minor as the extents of the flood plains are small and there is minimal interaction with the proposed option. – Designing for larger storm events may be required for various reasons, including but not limited: ■ Mitigation of flood effects caused by an increase in impervious surfaces ■ Reduction of existing flooding ■ Insufficient network capacity – There are numerous location where the proposed option crosses flood plains. This is seen as Minor/Moderate as the extents of the flood plains are small and there is minimal interaction with the proposed. Additionally, as no analysis has been taken to determine the impact of the proposed option on flood plains this criterion has been scored Minor/Moderate. ■ Highway footprint clash:					

- There is a potential requirement for major stream diversion work to watercourses to the south of Middlemore hospital. This has been scored as Significant Adverse until a refined alignment is proved so that the interaction of the option with watercourse can be fully appreciated.

Assumptions

- This assessment is based on a desktop study. No surveys, investigations or detailed site visits have been undertaken as part of this assessment.
- All roads are assumed to have over >5000 vehicles per day Annual Daily Traffic volume, triggering AUP Section E9 high contaminant generating zones requirements for water quality treatment.
- No area take off has been carried out as part of the MCA.
- A number of sub-criteria has been considered under Water Quantity. The overall Water Quantity score is based on the sub-criterion with the worst score.
- Existing Culverts do not perform part of this assessment as no information is held on them within the Auckland Council Geo Maps.

Other Information relied upon

- This assessment is a desktop study has been carried out using Auckland Council Geo Maps.
- Stormwater Management Devices un the Auckland Region – Guideline Document V1.
- Airport Access – Gap Analysis Report (Stormwater Section), 501094-4401-REP-JJ-0001, by Aurecon (February 2018).
- Auckland Unitary Plan Operative in Part (AUPOIP)- 2016.

Approved by:

Title	Name	Qualification	Signature	Date
Author				
Reviewer				

Technical Note

To		From	
Copy		Reference	Project number
Date	2018-08-28	Pages (including this page)	20
Subject	Airport to Botany Long-List Options: Multi-Criteria Analysis Scoring Sheet: Landscape, Visual and Urban Design Effects		

The following provides an assessment of the long-list options for the Airport to Botany Single Stage Business Case (A2B SSBC). The assessment details the considerations which have been used to inform the assessment. This assessment is designed to contribute to the Multi-Criteria Analysis (MCA) assessment which is being undertaken for the long-list options (dated 17th August 2018).

The source information assessed was based on desktop analysis only. The 10 assessments were based on:

- The A2B long-list schematics (dated 17th August 2018) and the long-list options descriptions and assumptions (dated 17th August 2018).
- The Urban Design and Landscape and Visual Assessments were based on a desktop analysis of each route map, aerial photographs (Google & Auckland GIS), census data and the Auckland Unitary Plan zones.

The options are outlined in the following table. The scores and assessments are outlined in the below tables.

Group	Option	High-level description
Integrated off-street options	Option I5	Heavy rail Airport spur line and Botany BRT
Corridor A: Airport to Puhinui	Option A1	BRT/LRT via Puhinui Road-SH20B.
	Option A2	BRT/LRT via SH20A and SH20
Corridor B: Puhinui through Manukau	Option B1	BRT/LRT from Puhinui to Clover Park via Puhinui Road
	Option B2	BRT/LRT Puhinui to Manukau via Ronwood Avenue
	Option B3	BRT/LRT from Puhinui to Manukau via Manukau Station Road
Corridor C: Manukau to Botany	Option C1	BRT/LRT from Manukau to Botany via Chapel Road
	Option C2	BRT/LRT from Manukau to Botany via Te Irirangi Drive
	Option C3	BRT/LRT Manukau to Botany via Preston Road – Harris Road
Corridor X: Alternate corridors not via Puhinui-Manukau	Option X2	BRT/LRT from Airport to Ormiston via Mangere, Middlemore, Otara and Ormiston Road.

Table 1 Multi Criteria Analysis Scoring Sheet

Option I5: Heavy rail Airport spur line and Botany BRT				
Name of assessor (incl. qualifications and organisation)				
Area of assessment		Landscape , visual and urban design effects		
Score:				
Natural character and landscape	Visual Amenity	Proximity to key destinations and trip generators	Opportunities for further development	Ability to accommodate suitable cross-section
-1 (Minor/moderate adverse)	-1 (Minor/moderate adverse)	0 (Neutral)	0 (Neutral)	0 (Neutral)
Notes:				
Reasons / Comments				
■ Criteria: Extent, nature and degree of effects on natural character, features, and landscape. – Assumes that indirect effects on the ONF south of the route can be mitigated in the adjoining public open space. – Minor infringements to the semi-natural creek that passes through passive recreational space and connects with the ONF. – The coastal edge / CMA has a local natural landscape value which will be affected by widening the existing inlet crossing and by additional traffic. Minor negative effect. ■ Criteria: Extent, nature and degree of effects on visual amenity. – Minor effects in relation to AUP light industrial and future urban land uses. – Negligible effects in relation to existing Heavy Industrial zone – Passes close to an area of mana whenua interest this is set within an industrial complex and therefore impacts are minor. – Severs small section of informal public open space that connects to the ONF. Moderate negative effects. – Popular Scenic (airport runway) lookouts on both sides of Puhinui Road may need to be removed unless sufficient space and safe access provided. Minor negative effect ■ Criteria: Proximity to key destinations and trip generators – Apart from a small amount of low density employment in south Wiri, this route would not serve any major destinations or trip generators or high numbers of residents. ■ Criteria: Opportunities for further intensive development (either through Operative Auckland Unitary Plan zoning, or through up-zoning) – Runs through land zoned for future industrial (light and heavy) which would offer little opportunity for intensive employment to support a new transport route. In any case, a				

heavy rail option is also unlikely to have a new stop between the airport and the existing rail line, and so a new node is unlikely.

- **Criteria: Ability of road reserve to accommodate suitable cross-section (and avoid poor urban design outcomes such as inadequate footpaths etc.)**
 - There is no existing corridor for this route, although the heavy rail option would require a narrower corridor than LRT or BRT, and so should be relatively easy to provide once a route has been identified.

Assumptions

- As per “A2B long-list PT options description and assumptions” document dated 17th August 2018.

Table 2 Multi Criteria Analysis Scoring Sheet

Option A1: BRT/LRT via Puhinui Road-SH20B				
Name of assessor (incl. qualifications and organisation)				
Area of assessment		Landscape , visual and urban design effects		
Score:				
Natural character and landscape	Visual Amenity	Proximity to key destinations and trip generators	Opportunities for further development	Ability to accommodate suitable cross-section
-1 (Minor/moderate adverse)	-1 (Minor/moderate adverse)	0 (Neutral)	1 (Minor positive)	0 (Neutral)
Notes:				
Reasons / Comments				
■ Criteria: Extent, nature and degree of effects on natural character, features, and landscape. – Nearby Crater Hill ONF located north of the Puhinui Road is not visually distinctive from the route, therefore landscape character effects unlikely. Negligible effect. – The coastal edge / CMA has a local natural landscape value which will be affected by widening the existing inlet crossing and additional traffic. Minor negative effect. Effects on the existing open fields are negligible in relation to planned light industrial / future urban development policies for this area in the current AUP. ■ Criteria: Extent, nature and degree of effects on visual amenity. – West of SH20: From 2 to 7 lanes and additional 11.4m width. Minor impact in relation to AUP land uses. East of SH20 2 additional bus /LR lanes requiring additional 9 m resulting in loss of trees in grass berms and planted boundaries and garden fences. Major impact for approx. 1/4 of the route. – Corridor width will reduce front gardens amenity to existing residential property. Major impact along 20% of the route. – Popular scenic (airport runway) lookouts on both sides of Puhinui Road may need to be removed unless sufficient space and safe access provided. Minor negative effect. – Potential loss of amenity trees along Manukau Memorial Gardens could be avoided and or mitigated to prevent new views into the Cemetery. Minor negative effect. – Minor infringements to one small reserve. ■ Criteria: Proximity to key destinations and trip generators – No significant destinations or trip generators on this portion of the route. This route does not pass through any significant residential or employment areas.				

- **Criteria: Opportunities for further intensive development (either through Operative Auckland Unitary Plan zoning, or through up-zoning)**
 - This route passes through land that has been zoned for either Future Urban or Light Industry, therefore representing an opportunity for new/future development, although residential development is likely to be limited due to the proximity of the airport flight path.
- **Criteria: Ability of road reserve to accommodate suitable cross-section (and avoid poor urban design outcomes such as inadequate footpaths etc.)**
 - Additional land likely to be required to fit cross-section, although with land either side currently in agricultural use but zoned for future development, then this is not likely to be difficult.

Assumptions

- As per "A2B long-list PT options description and assumptions" document dated 17th August 2018.

Table 3 Multi Criteria Analysis Scoring Sheet

Option A2: BRT/LRT via SH20A and SH20				
Name of assessor (incl. qualifications and organisation)				
Area of assessment		Landscape, visual and urban design effects		
Score:				
Natural character and landscape	Visual Amenity	Proximity to key destinations and trip generators	Opportunities for further development	Ability to accommodate suitable cross-section
-1 (Minor/moderate adverse)	-2 (Significant adverse)	2 (Moderate positive)	2 (Moderate positive)	-1 (Minor/moderate adverse)
Notes:				
Reasons / Comments				
■ Criteria: Extent, nature and degree of effects on natural character, features, and landscape. – Existing Crater Hill ONF borders site although loss of the narrow strip of land from widening unlikely to have a significant impact from that previously created by the existing SH20. Negligible effect. ■ Criteria: Extent, nature and degree of effects on visual amenity. – In the industrial zone; less than an additional 2m required but the existing designation is highly constrained by large format buildings. Along the SH20 residential areas either side of the existing motorway 52m corridor increase 11.4m. Approximately 1/3rd of the SH20 route is through residential areas, very close to the existing motorway. widening potentially affecting both east and west boundaries / resulting in loss of extensive boundary vegetation with little room to mitigate. Along Puhinui Road Corridor width the additional 9m will result in the loss of grass berms and frequent mature trees. Major impact along the majority of the route. – Road Corridor width will reduce front gardens amenity to existing residential property. Major impact along 50% of the route. – Widening may result in loss of existing screening vegetation along the boundary to Manukau Memorial Park and cemetery although sufficient space for visual mitigation outside the western designation boundary for mitigation planting exists. Minor negative effect. – 9 separate reserves - mainly to sports fields along the SH20A. Potential moderate effects on sports field provision / operation collectively. ■ Criteria: Proximity to key destinations and trip generators – In addition to the Ascot industrial area and Mangere town centre, this route would pass close to several hotels, Mangere college and Aorere College.				

- **Criteria: Opportunities for further intensive development (either through Operative Auckland Unitary Plan zoning, or through up-zoning)**
 - Mangere town centre represents a significant opportunity for growth and intensification with large areas of land with significant development potential.
- **Criteria: Ability of road reserve to accommodate suitable cross-section (and avoid poor urban design outcomes such as inadequate footpaths etc.)**
 - Route will predominantly be alongside existing motorway (SH20B and SH20) and is likely to impact on existing road configuration and may impact adjacent property.

Assumptions

- As per "A2B long-list PT options description and assumptions" document dated 17th August 2018.

Table 4 Multi Criteria Analysis Scoring Sheet

Option B1: BRT/LRT from Puhinui to Clover Park via Puhinui Road				
Name of assessor (incl. qualifications and organisation)				
Area of assessment		Landscape, visual and urban design effects		
Score:				
Natural character and landscape	Visual Amenity	Proximity to key destinations and trip generators	Opportunities for further development	Ability to accommodate suitable cross-section
0 (Neutral)	-2 (Significant adverse)	1 (Minor positive)	0 (Neutral)	-1 (Minor/moderate adverse)
Notes: Reasons / Comments ■ <i>Criteria: Extent, nature and degree of effects on natural character, features, and landscape.</i> – None. ■ <i>Criteria: Extent, nature and degree of effects on visual amenity.</i> – 2 additional BRT/LRT lanes requiring additional 9 m resulting in loss of trees in grass berms and planted boundaries and garden fences. Major impact for approx. most of the route. – Corridor width will reduce front gardens amenity to existing residential property. Major impact along 50% of the route. – Minor infringements to one large reserve. ■ <i>Criteria: Proximity to key destinations and trip generators</i> – No significant destinations or generators different from B2 or B3 ■ <i>Criteria: Opportunities for further intensive development (either through Operative Auckland Unitary Plan zoning, or through up-zoning)</i> – No significant opportunities for further intensive development are present as the majority of this route consists of suburban housing in multiple ownership. ■ <i>Criteria: Ability of road reserve to accommodate suitable cross-section (and avoid poor urban design outcomes such as inadequate footpaths etc.)</i> – Puhinui Road is relatively narrow and is unlikely to be able to fit the proposed LRT/BRT in an acceptable form without impact on adjacent property. Assumptions ■ As per "A2B long-list PT options description and assumptions" document dated 17th August 2018.				

Table 5 Multi Criteria Analysis Scoring Sheet

Option B2: BRT/LRT from Puhinui to Manukau via Ronwood Ave				
Name of assessor (incl. qualifications and organisation)				
Area of assessment		Landscape, visual and urban design effects		
Score:				
Natural character and landscape	Visual Amenity	Proximity to key destinations and trip generators	Opportunities for further development	Ability to accommodate suitable cross-section
0 (Neutral)	-1 (Minor/moderate negative)	2 (Moderate positive)	3 (Significant positive)	0 (Neutral)
Notes: Reasons / Comments ■ <i>Criteria: Extent, nature and degree of effects on natural character, features, and landscape.</i> – None. ■ <i>Criteria: Extent, nature and degree of effects on visual amenity.</i> – Manukau City Centre Section Additional -1m to +4m road corridor required. Puhinui Road and Ronwood Ave. section will result in the removal of distinctive central median and roadside berms resulting in the loss of occasional / infrequent mature trees although open space adjacent to the corridor can be used to mitigate this impact, therefore minor negative effects. Puhinui Road Section, 2 additional BRT/LRT lanes requiring additional 9 m resulting in loss of trees in grass berms and planted boundaries and garden fences. Major negative impact for approx. 1/2 of the route. – Corridor width will reduce front gardens amenity to existing residential property. Major negative impact along 25% of the route. – Hayman Park widening along Ronwood Ave may result in loss of mature and semi-mature parkland avenue trees although this effect is buffered by parkland trees and existing mounding and potential available space replacement planting. Moderate negative effects. ■ <i>Criteria: Proximity to key destinations and trip generators</i> – Passing through the northern part of Manukau city, one of Auckland's 10 Metropolitan centres, this route would serve a significant destination and trip generator and employment opportunities offered by the commercial business area of Manukau City. ■ <i>Criteria: Opportunities for further intensive development (either through Operative Auckland Unitary Plan zoning, or through up-zoning)</i>				

- Manukau City is zoned as a Metropolitan centre, which allows for significant development potential including buildings up to 72.5m high. Given the relative low density of the existing urban form, this represents a massive opportunity for new development.
- *Criteria: Ability of road reserve to accommodate suitable cross-section (and avoid poor urban design outcomes such as inadequate footpaths etc.)*
 - Both B1 and B2 have similar issues with existing road reserves. Puhinui Road is likely to require widening, but roads through the centre of Manukau may be able to fit the proposed cross-section without significant impact on adjacent property. In any case, given Manukau City is a Metropolitan Centre and the project is aiming to change travel behaviour, a cross section with less priority for private vehicles would be appropriate.

Assumptions

- As per “A2B long-list PT options description and assumptions” document dated 17th August 2018.

Table 6 Multi Criteria Analysis Scoring Sheet

Option B3: BRT/LRT from Puhinui to Manukau via Manukau Station Road				
Name of assessor (incl. qualifications and organisation)				
Area of assessment		Landscape, visual and urban design effects		
Score:				
Natural character and landscape	Visual Amenity	Proximity to key destinations and trip generators	Opportunities for further development	Ability to accommodate suitable cross-section
0 (Neutral)	-2 (Significant adverse)	3 (Significant positive)	3 (Significant positive)	0 (Neutral)
Notes:				
Reasons / Comments				
■ <i>Criteria: Extent, nature and degree of effects on natural character, features, and landscape.</i> – None. ■ <i>Criteria: Extent, nature and degree of effects on visual amenity.</i> – Manukau City Centre Section Additional +1m to +4m road corridor required. Puhinui Road and Manukau Station Road section will result in the removal of distinctive central median and roadside berms resulting in the loss of occasional / infrequent mature trees with limited space along Manukau Station Road beyond the designation to mitigate this impact, therefore moderate negative impact. Puhinui Road Section, 2 additional BRT/LRT lanes requiring additional 9 m resulting in loss of trees in grass berms and planted boundaries and garden fences. Major negative impact for approx. 1/2 of the route. – Corridor width will reduce front gardens amenity to existing residential property. Major impact along 25% of the route. – Hayman Park frontage along Lambie Drive. Potential minor reduction in park grass edges only. Minor negative effects. ■ <i>Criteria: Proximity to key destinations and trip generators</i> – Passing through the northern part of Manukau city, one of Auckland's 10 Metropolitan centres, this route would serve a significant destination and trip generator and employment opportunities offered by the commercial business area of Manukau City. Different to B2 this route would be even closer to the destinations / generators of central Manukau including Westfield Manukau City, Rainbow's End, Civic buildings train station and new bus interchange. ■ <i>Criteria: Opportunities for further intensive development (either through Operative Auckland Unitary Plan zoning, or through up-zoning)</i>				

- Manukau City is zoned as a Metropolitan centre, which allows for significant development potential including buildings up to 72.5m high. Given the relative low density of the existing urban form, this represents a massive opportunity for new development.
- *Criteria: Ability of road reserve to accommodate suitable cross-section (and avoid poor urban design outcomes such as inadequate footpaths etc.)*
 - Both B1 and B2 have similar issues with existing road reserves. Puhinui Road is likely to require widening, but roads through the centre of Manukau may be able to fit the proposed cross-section without significant impact on adjacent property. In any case, given Manukau City is a Metropolitan Centre and the project is aiming to change travel behaviour, a cross section with less priority for private vehicles would be appropriate.

Assumptions

- As per “A2B long-list PT options description and assumptions” document dated 17th August 2018.

Table 7 Multi Criteria Analysis Scoring Sheet

Option C1: BRT/LRT from Manukau to Botany via Chapel Road				
Name of assessor (incl. qualifications and organisation)				
Area of assessment		Landscape, visual and urban design effects		
Score:				
Natural character and landscape	Visual Amenity	Proximity to key destinations and trip generators	Opportunities for further development	Ability to accommodate suitable cross-section
0 (Neutral)	-2 (Significant adverse)	2 (Moderate positive)	1 (Minor positive)	-1 (Minor/moderate adverse)
Notes: Reasons / Comments ■ <i>Criteria: Extent, nature and degree of effects on natural character, features, and landscape.</i> – Minor infringements to the edges of semi-natural creeks. ■ <i>Criteria: Extent, nature and degree of effects on visual amenity.</i> – 2 to 4m additional width. Great South Road section with numerous large visually significant pohutukawa trees along west boundary at risk and difficult to mitigate with new planting within a reasonable time frame. Irirangi Drive and Chapel Road loss of grass central reserve (Irirangi Dr. only) and grass side berms with occasional / infrequent semi-mature trees. Major negative impact. – Chapel Drive Section. Additional land to mitigate vegetation /amenity loss would need to come from predominantly residential properties Major negative for 70% of the route. – Barry Curtis Park, has an extensive existing grass edge to highway, unlikely to result in significant tree loss or noticeable reduction in park extent. Negligible effect. – Minor infringements to several areas of typically linear informal open spaces. ■ <i>Criteria: Proximity to key destinations and trip generators</i> – Both C1 and C2 would pick up the suburban housing of Clover Park and Chapel Downs. Similar to C1, but slightly closer to Ormiston Town Centre and Barry Curtis Park which would both be within 800m of the route. Also would pass beside Botany Downs Secondary college ■ <i>Criteria: Opportunities for further intensive development (either through Operative Auckland Unitary Plan zoning, or through up-zoning)</i> – Route runs through a combination of Mixed Housing Urban and Suburban zone, which offers some intensification opportunities, but relatively small given that most of the land is already in fragmented individual residential ownership. Doesn't appear to be any major development opportunities along the route.				

- *Criteria: Ability of road reserve to accommodate suitable cross-section (and avoid poor urban design outcomes such as inadequate footpaths etc.)*
 - Additional land likely to be required along a significant length of this route to fit a suitable cross-section, which could impact on adjacent property.

Assumptions

- As per "A2B long-list PT options description and assumptions" document dated 17th August 2018.

Table 8 Multi Criteria Analysis Scoring Sheet

Option C2: BRT/LRT from Manukau to Botany via Te Irirangi Drive				
Name of assessor (incl. qualifications and organisation)				
Area of assessment		Landscape, visual and urban design effects		
Score:				
Natural character and landscape	Visual Amenity	Proximity to key destinations and trip generators	Opportunities for further development	Ability to accommodate suitable cross-section
0 (Neutral)	-1 (Minor/moderate adverse)	2 (Moderate positive)	1 (Minor positive)	0 (Neutral)
Notes: Reasons / Comments ■ <i>Criteria: Extent, nature and degree of effects on natural character, features, and landscape.</i> – Minor infringements to the edges of semi-natural creeks. ■ <i>Criteria: Extent, nature and degree of effects on visual amenity.</i> – 2 to 4m additional width. Great South Road section with numerous large visually significant pohutukawa trees along west boundary at risk and difficult to mitigate with new planting within a reasonable time frame. Irirangi Drive - loss of grass central reserve and grass side berms with frequent semi-mature trees. Assume that significant land from within the existing designation can be used to mitigate some of the visual impacts. Moderate negative impact. – Assume that significant land from within the existing designation can be used to mitigate some of the visual impacts. Moderate negative impact for 70% of the route. – Minor infringements to several areas of typically linear informal open spaces and to edge vegetation of Manukau Sports Bowl. ■ <i>Criteria: Proximity to key destinations and trip generators</i> – Both C1 and C2 would pick up the suburban housing of Clover Park and Chapel Downs. This route would pass through the retail centre of Botany Junction and alongside an area of Light Industry (Accent Drive). ■ <i>Criteria: Opportunities for further intensive development (either through Operative Auckland Unitary Plan zoning, or through up-zoning)</i> – Route runs largely through Mixed Housing Urban zone, which offers some intensification opportunities, but relatively small given that most of the land is already in fragmented individual residential ownership. There is one large vacant site along the route, although it is zoned for light industrial (and currently under development) so unlikely to represent a significant high trip generator.				

- *Criteria: Ability of road reserve to accommodate suitable cross-section (and avoid poor urban design outcomes such as inadequate footpaths etc.)*
 - Additional land likely to be required along only part of this route to create suitable cross-section, which could impact on adjacent property. Most of the length would fit the proposed cross-section comfortably.

Assumptions

- As per "A2B long-list PT options description and assumptions" document dated 17th August 2018.

Table 9 Multi Criteria Analysis Scoring Sheet

Option C3: BRT/LRT from Manukau to Botany via Preston Road – Harris Road				
Name of assessor (incl. qualifications and organisation)				
Area of assessment		Landscape, visual and urban design effects		
Score:				
Natural character and landscape	Visual Amenity	Proximity to key destinations and trip generators	Opportunities for further development	Ability to accommodate suitable cross-section
0 (Neutral)	-2 (Significant adverse)	1 (Minor positive)	1 (Minor positive)	-1 (Minor/moderate adverse)
Notes:				
Reasons / Comments				
■ <i>Criteria: Extent, nature and degree of effects on natural character, features, and landscape.</i> – Minor infringement to a single natural creek that crosses the road. ■ <i>Criteria: Extent, nature and degree of effects on visual amenity.</i> – 0.7 to 3.3m additional width along Preston road / Harris Road. Loss of existing grass berm and tree planting, the scale and frequency of which increases along the northern section of the road. Northern light industrial section with open landscape areas have the potential to be utilised in part for some mitigation planting. Major negative effect. – Corridor width will reduce front gardens amenity to existing residential property. Major impact along 60% of the route. – Minor infringements to several areas of typically linear informal open spaces and edge of Greenmount Enviro Waste Site. ■ <i>Criteria: Proximity to key destinations and trip generators</i> – Compared to C1 and C2, this option would serve less existing residential catchment. However it would pass right through the heart of the East Tamaki industrial / employment area, serving a much higher number of employment opportunities (although the nature of this business area is still relatively low density employment). ■ <i>Criteria: Opportunities for further intensive development (either through Operative Auckland Unitary Plan zoning, or through up-zoning)</i> – Runs through a mix of Mixed Housing Urban / Suburban and Light / Heavy Industrial zones, none of which offers major development opportunities, although the industrial zones could be re-zoned along the route to create more intensive opportunities ■ <i>Criteria: Ability of road reserve to accommodate suitable cross-section (and avoid poor urban design outcomes such as inadequate footpaths etc.)</i>				

- Additional land likely to be required along a significant length of this route to fit a suitable cross-section, which could impact on adjacent property.

Assumptions

- As per “A2B long-list PT options description and assumptions” document dated 17th August 2018.

Table 10 Multi Criteria Analysis Scoring Sheet

Option X2: BRT/LRT from Airport to Ormiston via Mangere, Middlemore, Otara and Ormiston Road				
Name of assessor (incl. qualifications and organisation)				
Area of assessment		Landscape, visual and urban design effects		
Score:				
Natural character and landscape	Visual Amenity	Proximity to key destinations and trip generators	Opportunities for further development	Ability to accommodate suitable cross-section
0 (Neutral)	-2 (Significant adverse)	2 (Moderate positive)	2 (Moderate positive)	-1 (Minor/moderate adverse)
Notes:				
Reasons / Comments				
■ <i>Criteria: Extent, nature and degree of effects on natural character, features, and landscape.</i> – Nearby Crater Hill ONF located north of the Puhinui Road is not visually distinctive from the route, therefore landscape character effects unlikely. Negligible effect. – The coastal edge / CMA has a local natural landscape value which will be affected by widening the existing inlet crossing and additional traffic. Minor negative effect. – Effects on the existing open fields are negligible in relation to planned light industrial / future urban development policies for this area in the current AUP. ■ <i>Criteria: Extent, nature and degree of effects on visual amenity.</i> – 1.7 to 9.8m additional width. Very variable effects. Pinch point at Massey Road and Bucklands Road. Existing roads generally with grass berms and few highway trees. Ormiston Road section has a relatively wide existing designation with a recently established landscape with greater ability to accept change Moderate negative effect. – Corridor width will reduce front gardens amenity to existing residential property. Major impact along 80% of the route. – Severs 'The Grange Golf Club' and therefore a major negative effect. However, the long term effect is minor in relation to its future use of Mixed Urban Housing for this area. – Minor infringements to several areas of typically linear informal open spaces. ■ <i>Criteria: Proximity to key destinations and trip generators</i> – This route would pass through a number of key nodes, including the new Ormiston town centre, Botany junction retail centre, Otara town centre (with Manukau Institute of Technology), Middlemore Hospital and Mangere Town Centre.				

- *Criteria: Opportunities for further intensive development (either through Operative Auckland Unitary Plan zoning, or through up-zoning)*
 - Runs through a whole mixture of planning zones, including some Terrace House and Apartment Building (THAB) zones which offers one of the better opportunities for new intensive development and through several local or town centres, which also could provide development opportunities
- *Criteria: Ability of road reserve to accommodate suitable cross-section (and avoid poor urban design outcomes such as inadequate footpaths etc.)*
 - Additional land likely to be required along a significant length of this route to fit a suitable cross-section, which could impact on adjacent property.

Assumptions

- As per "A2B long-list PT options description and assumptions" document dated 17th August 2018.

Approved by:

Title	Name	Qualification	Signature	Date
Author				
Author				
Reviewer				

Technical Note

To		From	
Copy		Reference	502334
Date	2018-08-27	Pages (including this page)	16
Subject	Airport to Botany Long-List Options: Multi-Criteria Analysis Scoring Sheet: Social		

The following provides an assessment of the long-list options for the Airport to Botany Single Stage Business Case (A2B SSBC). The assessment details the considerations which have been used to inform the assessment. This assessment is designed to contribute to the Multi-Criteria Analysis (MCA) assessment which is being undertaken for the long-list options (dated 31/08/2018).

The source information assessed was based on desktop analysis only. The review of potential social impacts is based on:

- The A2B long-list schematics (dated 17 August 2018) and the long-list options descriptions and assumptions (dated 17 August 2018).
- Auckland Council GeoMaps viewer (accessed August 2018).
- Environmental Context Maps (20Connect Single-Stage Business Case Part A: Strategic Context dated 13 August 2018).
- Auckland Plan 2050 (accessed August 2018).
- Southern Initiative (accessed August 2018).

The options are outlined in the following table. The scores and assessments are outlined in the below tables.

Group	Option	High-level description
Integrated off-street options	Option I5	Heavy rail Airport spur line and Botany BRT
Corridor A: Airport to Puhinui	Option A1	BRT/LRT via Puhinui Road-SH20B.
	Option A2	BRT/LRT via SH20A and SH20
Corridor B: Puhinui through Manukau	Option B1	BRT/LRT from Puhinui to Clover Park via Puhinui Road
	Option B2	BRT/LRT Puhinui to Manukau via Ronwood Avenue
	Option B3	BRT/LRT from Puhinui to Manukau via Manukau Station Road
Corridor C: Manukau to Botany	Option C1	BRT/LRT from Manukau to Botany via Chapel Road
	Option C2	BRT/LRT from Manukau to Botany via Te Irirangi Drive
	Option C3	BRT/LRT Manukau to Botany via Preston Road – Harris Road
Corridor X: Alternate corridors not via Puhinui-Manukau	Option X2	BRT/LRT from Airport to Ormiston via Mangere, Middlemore, Otara and Ormiston Road.

Table 1 Multi Criteria Analysis Scoring Sheet

Option I5: Heavy rail Airport spur line and Botany BRT		
Name of assessor (incl. qualifications and organisation)		
Area of assessment		
Social		
Score:		
Accessibility	Community	Health and safety
1 (Minor positive)	-1 (Minor adverse)	0 (Neutral)
Reasons / Comments ■ Accessibility: – The Auckland Plan anticipates that there will be a high number of jobs in the Auckland Airport area by 2036 yet the Mangere-Otahuhu area is identified as one of the most deprived areas in Auckland. A BRT/LRT would provide a dedicated east-west PT connection which is not currently present between AIA and Wiri Junction. Therefore, would provide additional accessibility and modal choice for residents and staff/customers of business travelling between these two locations/destinations. Further analysis of options should be undertaken of potential route stops to confirm locations that provide the most benefit to community and user groups. – As this route does not progress through a residential area, it has limited ability to support short journeys between neighbourhoods and local service. – There may be effects on access to community facilities and services, private properties and businesses during construction. These effects are likely to be temporary and could be managed through Stakeholder and Communication Plans and Construction Management Plans. ■ Community: – Avoids private residential neighbourhoods and the impact that property take could have in terms of identify and cohesion. – Traverses through Puhinui Precinct and may impact on the plans and aspirations of landowners for development and those considering locating to the area to establish businesses within the Precinct. – There would be direct property impacts to properties south of SH20B/Puhinui Road which would segregate/hinder access to several large parcels of land. This may lead to uncertainty regarding the acquisition process and/or possible loss of future tenants / developers. ■ Health and Safety: – Sensitive uses (future business / retail within Puhinui Precinct) adjacent the corridor alignment may experience adverse amenity (e.g. air quality, noise and vibration) impacts during construction which could be managed through Stakeholder and Communication Plans and Construction Management Plans. Assumptions ■ No community consultation information is available at the time of writing (which would help inform the community aspirations and plans). ■ No specific surveys of the community have been undertaken to inform this long list assessment.		

- The assumed 'study area' for social effects is the area surrounding the identified corridors, in particular
- Property effects have been assessed separately. This technical note assesses social impacts only with high-level commentary on potential economic and property impacts with relation to social effects.
- Community profiling or social baseline has not been carried out for this long list assessment.

Table 2 Multi Criteria Analysis Scoring Sheet

Option A1: BRT/LRT via Puhinui Road-SH20B		
Name of assessor (incl. qualifications and organisation)		
Area of assessment		
Social		
Score:		
Accessibility	Community	Health and safety
1 (Minor positive)	-2 (Significant adverse)	-1 (Minor adverse)
Reasons / Comments ■ Accessibility: – The Auckland Plan anticipates that there will be a high number of jobs in the Auckland Airport area by 2036 yet the Mangere-Otahuhu area is identified as one of the most deprived areas in Auckland. A BRT/LRT would provide a dedicated east-west PT connection which is not currently present between AIA and Puhinui Station. Therefore, would provide additional accessibility and modal choice for residents and staff/customers of business travelling between these two locations/destinations. Further analysis of options should be undertaken of potential route stops to confirm locations that provide the most benefit to community and user groups. – There may be effects on access to community facilities/services (e.g. Manuaku Memorial Gardens), residential properties and businesses (e.g. Perry Berrys) during construction. These effects are likely to be temporary and could be managed through Stakeholder and Communication Plans and Construction Management Plans. ■ Community: – Provision of the BRT/LRT would occur close to residential properties and may affect how individuals enjoy the amenity and use of their homes. – Provision of the BRT/LRT would require additional land and therefore has the potential to directly impact properties. The extent of potential land acquisition is unclear at this option stage. Full or partial acquisition of multiple properties may result in the loss of local identity and cohesion, or blight. ■ Health and Safety: – Sensitive receivers along SH20B and Puhinui Road (including residential properties) may experience adverse amenity (e.g. air quality, noise and vibration) impacts during construction which could be managed through Stakeholder and Communication Plans and Construction Management Plans. Assumptions ■ No community consultation information is available at the time of writing (which would help inform the community aspirations and plans). ■ No specific surveys of the community have been undertaken to inform this long list assessment. ■ The assumed 'study area' for social effects is the area surrounding the identified corridors, in particular ■ Property effects have been assessed separately. This technical note assesses social impacts only with high-level commentary on potential economic and property impacts with relation to social effects. ■ Community profiling or social baseline has not been carried out for this long list assessment.		

Table 3 Multi Criteria Analysis Scoring Sheet

Option A2: BRT/LRT via SH20A and SH20		
Name of assessor (incl. qualifications and organisation)		
Area of assessment		Social
Score:		
Accessibility	Community	Health and safety
1 (Minor positive)	-2 (Significant adverse)	-1 (Minor adverse)
Reasons / Comments ■ <i>Accessibility:</i> - The Auckland Plan anticipates that there will be a high number of jobs in the Auckland Airport area by 2036 yet the Mangere-Otahuhu area is identified as one of the most deprived areas in Auckland. A BRT/LRT would provide a dedicated east-west PT connection which is not currently present between AIA and Puhinui Station. Therefore, it would provide additional accessibility and modal choice for residents and staff/customers of business travelling between these two locations/destinations. Further analysis of options should be undertaken of potential route stops to confirm locations that provide the most benefit to community and user groups. - Dedicated walking and cycling infrastructure will provide additional accessibility and modal choice. Further analysis of options should be undertaken of the potential SUP and to confirm a location and connections to the local network that provide the most benefit to community and user groups. - There may be effects on access to community facilities/services residential properties and businesses during construction. These effects are likely to be temporary and could be managed through Stakeholder and Communication Plans and Construction Management Plans. ■ <i>Community:</i> - Provision of the BRT/LRT would occur close to residential properties and other sensitive uses (educational facilities, marae and open space areas) along Puhinui Road, SH20 and SH20B. This may affect how individuals enjoy the amenity and use of their homes and the function/operation of community facilities and services. - Provision of the BRT/LRT would require additional land along Puhinui Road and SH20B. Consequently, there is the potential to directly impact properties. The extent of potential land acquisition is unclear at this option stage. Full or partial acquisition of multiple properties may result in the loss of local identity and cohesion, blight, or the loss of community facilities/services effecting people's way of life. ■ <i>Health and Safety:</i> - Sensitive receivers along SH20B and Puhinui Road (including residential properties, educational facilities and marae) may experience adverse amenity (e.g. air quality, noise and vibration) impacts during construction which could be managed through Stakeholder and Communication Plans and Construction Management Plans. Assumptions ■ No community consultation information is available at the time of writing (which would help inform the community aspirations and plans).		

- No specific surveys of the community have been undertaken to inform this long list assessment.
- The assumed 'study area' for social effects is the area surrounding the identified corridors, in particular
- Property effects have been assessed separately. This technical note assesses social impacts only with high-level commentary on potential economic and property impacts with relation to social effects.
- Community profiling or social baseline has not been carried out for this long list assessment.

Table 4 Multi Criteria Analysis Scoring Sheet

Option B1: BRT/LRT from Puhinui to Clover Park via Puhinui Road		
Name of assessor (incl. qualifications and organisation)		
Area of assessment		Social
Score:		
Accessibility	Community	Health and safety
1 (Minor positive)	-2 (Significant adverse)	-1 (Minor adverse)
Reasons / Comments Accessibility: - The Auckland Plan anticipates that there will be a high number of jobs in the Auckland Airport area by 2036 yet the Mangere-Otahuhu area is identified as one of the most deprived areas in Auckland. A BRT/LRT would provide a dedicated east-west PT connection which is not currently present between Puhinui Station and Clover Park. Therefore, it would provide additional accessibility and modal choice for residents and staff/customers of business travelling between these two locations/destinations. Further analysis of options should be undertaken of potential route stops to confirm locations that provide the most benefit to community and user groups. - There may be effects on access to community facilities/services (e.g. educational facilities, Manukau Sports Bowl), residential properties and businesses (e.g. Puhinui Rd shops) during construction. These effects are likely to be temporary and could be managed through Stakeholder and Communication Plans and Construction Management Plans. Community: - Provision of the BRT/LRT would occur close to residential properties and other sensitive uses (e.g. educational facilities, Manukau Sports Bowl) along Puhinui and Boundary Roads. This may affect how individuals enjoy the amenity and use of their homes and the function/operation of community facilities and services. - Provision of the BRT/LRT would require additional land along Puhinui and Boundary Roads. Consequently, there is the potential to directly impact properties. The extent of potential land acquisition is unclear at this option stage. Full or partial acquisition of multiple properties may result in the loss of local identity and cohesion, blight, or the loss of community facilities/services effecting people's way of life. Health and Safety: - Sensitive receivers along SH20B and Puhinui Road may experience adverse amenity (e.g. air quality, noise and vibration) impacts during construction which could be managed through Stakeholder and Communication Plans and Construction Management Plans. - Segregated cycle facilities would have a positive safety benefit and may result in greater uptake by less confident cyclists with the potential for a healthier lifestyle. Assumptions - No community consultation information is available at the time of writing (which would help inform the community aspirations and plans). - No specific surveys of the community have been undertaken to inform this long list assessment.		

- The assumed 'study area' for social effects is the area surrounding the identified corridors, in particular
- Property effects have been assessed separately. This technical note assesses social impacts only with high-level commentary on potential economic and property impacts with relation to social effects.
- Community profiling or social baseline has not been carried out for this long list assessment.

Table 5 Multi Criteria Analysis Scoring Sheet

Option B2: BRT/LRT from Puhinui to Manukau via Ronwood Ave		
Name of assessor (incl. qualifications and organisation)		
Area of assessment		
Social		
Score:		
Accessibility	Community	Health and safety
1 (Minor positive)	-2 (Significant adverse)	-1 (Minor adverse)
Reasons / Comments Accessibility: - The Auckland Plan anticipates that there will be a high number of jobs in the Auckland Airport area by 2036 yet the Mangere-Otahuhu area is identified as one of the most deprived areas in Auckland. A BRT/LRT would provide a dedicated east-west PT connection which is not currently present between Puhinui Station and Manukau. Therefore, it would provide additional accessibility and modal choice for residents and staff/customers of business travelling between these two locations/destinations. Further analysis of options should be undertaken of potential route stops to confirm locations that provide the most benefit to community and user groups. - There may be effects on access to community facilities/services (e.g. Hayman Park, day to day services), and businesses during construction. These effects are likely to be temporary and could be managed through Stakeholder and Communication Plans and Construction Management Plans. Community: - Provision of the BRT/LRT would occur close to residential properties and other potential sensitive uses along Puhinui Road, Lambie Drive and Ronwood Ave. This may affect how individuals enjoy the amenity and use of their homes and the function/operation of community facilities and services. - Provision of the BRT/LRT would require additional land along Puhinui Road and Lambie Drive. Consequently, there is the potential to directly impact properties. The extent of potential land acquisition is unclear at this option stage. Full or partial acquisition of multiple properties may result in the loss of local identity and cohesion, blight, or the loss of community facilities/services effecting people's way of life. Health and Safety: - Sensitive receivers along Puhinui Road, Lambie Drive and Ronwood Ave may experience adverse amenity (e.g. air quality, noise and vibration) impacts during construction which could be managed through Stakeholder and Communication Plans and Construction Management Plans. - Segregated cycle facilities would have a positive safety benefit and may result in greater uptake by less confident cyclists with the potential for a healthier lifestyle. Assumptions - No community consultation information is available at the time of writing (which would help inform the community aspirations and plans). - No specific surveys of the community have been undertaken to inform this long list assessment.		

- The assumed 'study area' for social effects is the area surrounding the identified corridors, in particular
- Property effects have been assessed separately. This technical note assesses social impacts only with high-level commentary on potential economic and property impacts with relation to social effects.
- Community profiling or social baseline has not been carried out for this long list assessment.

Table 6 Multi Criteria Analysis Scoring Sheet

Option B3: BRT/LRT from Puhinui to Manukau via Manukau Station Road		
Name of assessor (incl. qualifications and organisation)		
Area of assessment		
Social		
Score:		
Accessibility	Community	Health and safety
1 (Minor positive)	-2 (Significant adverse)	-1 (Minor adverse)
Reasons / Comments Accessibility: - The Auckland Plan anticipates that there will be a high number of jobs in the Auckland Airport area by 2036 yet the Mangere-Otahuhu area is identified as one of the most deprived areas in Auckland. A BRT/LRT would provide a dedicated east-west PT connection which is not currently present between Puhinui Station and Manukau. Therefore, it would provide additional accessibility and modal choice for residents and staff/customers of business travelling between these two locations/destinations. Further analysis of options should be undertaken of potential route stops to confirm locations that provide the most benefit to community and user groups. - There may be effects on access to community facilities/services (e.g. Hayman Park, day to day services), and businesses during construction. These effects are likely to be temporary and could be managed through Stakeholder and Communication Plans and Construction Management Plans. Community: - Provision of the BRT/LRT would occur close to residential properties and other potential sensitive uses along Puhinui Road and Lambie Drive. This may affect how individuals enjoy the amenity and use of their homes and the function/operation of community facilities and services. - Provision of the BRT/LRT would require additional land along Puhinui Road and Lambie Drive. Consequently, there is the potential to directly impact properties. The extent of potential land acquisition is unclear at this option stage. Full or partial acquisition of multiple properties may result in the loss of local identity and cohesion, blight, or the loss of community facilities/services effecting people's way of life. Health and Safety: - Sensitive receivers along Puhinui Road and Lambie Drive may experience adverse amenity (e.g. air quality, noise and vibration) impacts during construction which could be managed through Stakeholder and Communication Plans and Construction Management Plans. - Segregated cycle facilities would have a positive safety benefit and may result in greater uptake by less confident cyclists with the potential for a healthier lifestyle. Assumptions - No community consultation information is available at the time of writing (which would help inform the community aspirations and plans). - No specific surveys of the community have been undertaken to inform this long list assessment. - The assumed 'study area' for social effects is the area surrounding the identified corridors, in particular		

- Property effects have been assessed separately. This technical note assesses social impacts only with high-level commentary on potential economic and property impacts with relation to social effects.
- Community profiling or social baseline has not been carried out for this long list assessment.

Table 7 Multi Criteria Analysis Scoring Sheet

Option C1: BRT/LRT from Manukau to Botany via Chapel Road		
Name of assessor (incl. qualifications and organisation)		
Area of assessment		Social
Score:		
Accessibility	Community	Health and safety
1 (Minor positive)	-2 (Significant adverse)	-1 (Minor adverse)
Reasons / Comments ■ Accessibility: – The Auckland Plan anticipates that there will be a high number of jobs in the Auckland Airport area by 2036 yet the Mangere-Otahuhu area is identified as one of the most deprived areas in Auckland. A BRT/LRT would provide a dedicated north-south PT connection which is not currently present between Botany and Manukau, although it is noted that a number of bus services route on Chapel Road. Therefore, it would provide additional accessibility and modal choice for residents and staff/customers of business travelling between these two locations/destinations. Further analysis of options should be undertaken of potential route stops to confirm locations that provide the most benefit to community and user groups. – There may be effects on access to a large number of community facilities/services (e.g. educational facilities, local shops and open space areas), and businesses during construction. These effects are likely to be temporary and could be managed through Stakeholder and Communication Plans and Construction Management Plans. ■ Community: – Provision of the BRT/LRT would occur close to residential properties and other potential sensitive uses (eg. Fo Guan Shan Buddhist Temple complex, Chapel Downs Primary School). This may affect how individuals enjoy the amenity and use of their homes and the function/operation of community facilities and services. – Provision of the BRT/LRT would require additional land along sections of Chapel Road and Te Irirangi Drive. Consequently, there is the potential to directly impact properties. The extent of potential land acquisition is unclear at this option stage. Full or partial acquisition of multiple properties may result in the loss of local identity and cohesion, blight, or the loss of community facilities/services effecting people's way of life. ■ Health and Safety: – Sensitive receivers along Chapel Road (including residential properties, educational facilities) may experience adverse amenity (e.g. air quality, noise and vibration) impacts during construction which could be managed through Stakeholder and Communication Plans and Construction Management Plans. – Segregated cycle facilities would have a positive safety benefit and may result in greater uptake by less confident cyclists with the potential for a healthier lifestyle. Assumptions ■ No community consultation information is available at the time of writing (which would help inform the community aspirations and plans). ■ No specific surveys of the community have been undertaken to inform this long list assessment.		

- The assumed 'study area' for social effects is the area surrounding the identified corridors, in particular
- Property effects have been assessed separately. This technical note assesses social impacts only with high-level commentary on potential economic and property impacts with relation to social effects.
- Community profiling or social baseline has not been carried out for this long list assessment.

Table 8 Multi Criteria Analysis Scoring Sheet

Option C2: BRT/LRT from Manukau to Botany via Te Irirangi Drive		
Name of assessor (incl. qualifications and organisation)		
Area of assessment		
Social		
Score:		
Accessibility	Community	Health and safety
1 (Minor positive)	-2 (Significant adverse)	-1 (Minor adverse)
Reasons / Comments Accessibility: - The Auckland Plan anticipates that there will be a high number of jobs in the Auckland Airport area by 2036 yet the Mangere-Otahuhu area is identified as one of the most deprived areas in Auckland. A BRT/LRT would provide a dedicated north-south PT connection which is not currently present between Botany and Manukau. Therefore, it would provide additional accessibility and modal choice for residents and staff/customers of business travelling between these two locations/destinations. Further analysis of options should be undertaken of potential route stops to confirm locations that provide the most benefit to community and user groups. - There may be effects on access to a large number of community facilities/services (e.g. educational facilities, local shops and open space areas), and businesses during construction. These effects are likely to be temporary and could be managed through Stakeholder and Communication Plans and Construction Management Plans. Community: - Provision of the BRT/LRT would occur close to residential properties and other potential sensitive uses (e.g. Sancta Maria College). This may affect how individuals enjoy the amenity and use of their homes and the function/operation of community facilities and services. - Provision of the BRT/LRT would require additional land along Te Irirangi Drive. Consequently, there is the potential to directly impact properties. The extent of potential land acquisition is unclear at this option stage. Full or partial acquisition of multiple properties may result in the loss of local identity and cohesion, blight, or the loss of community facilities/services effecting people's way of life. Health and Safety: - Sensitive receivers along the route (including residential properties, educational facilities) may experience adverse amenity (e.g. air quality, noise and vibration) impacts during construction which could be managed through Stakeholder and Communication Plans and Construction Management Plans. - Segregated cycle facilities would have a positive safety benefit and may result in greater uptake by less confident cyclists with the potential for a healthier lifestyle. Assumptions - No community consultation information is available at the time of writing (which would help inform the community aspirations and plans). - No specific surveys of the community have been undertaken to inform this long list assessment.		

- The assumed 'study area' for social effects is the area surrounding the identified corridors, in particular
- Property effects have been assessed separately. This technical note assesses social impacts only with high-level commentary on potential economic and property impacts with relation to social effects.
- Community profiling or social baseline has not been carried out for this long list assessment.

Table 9 Multi Criteria Analysis Scoring Sheet

Option C3: BRT/LRT from Manukau to Botany via Preston Road / Harris Road		
Name of assessor (incl. qualifications and organisation)		
Area of assessment		
Social		
Score:		
Accessibility	Community	Health and safety
1 (Minor positive)	-1 (Moderate adverse)	-1 (Minor adverse)
Reasons / Comments ■ Accessibility: – The Auckland Plan anticipates that there will be a high number of jobs in the Auckland Airport area by 2036 yet the Mangere-Otahuhu area is identified as one of the most deprived areas in Auckland. A BRT/LRT would provide a dedicated north-south PT connection which is not currently present between Botany and Manukau. Therefore, it would provide additional accessibility and modal choice for residents and staff/customers of business travelling between these two locations/destinations. Further analysis of options should be undertaken of potential route stops to confirm locations that provide the most benefit to community and user groups. – There may be effects on access to a large number of community facilities/services (e.g. local shops and open space areas), and businesses during construction. These effects are likely to be temporary and could be managed through Stakeholder and Communication Plans and Construction Management Plans. ■ Community: – Provision of the BRT/LRT would occur close to residential properties and other potential sensitive uses (e.g. child care facilities). This may affect how individuals enjoy the amenity and use of their homes and the function/operation of community facilities and services. ■ Health and Safety: – Sensitive receivers along the route may experience adverse amenity (e.g. air quality, noise and vibration) impacts during construction which could be managed through Stakeholder and Communication Plans and Construction Management Plans. – Segregated cycle facilities would have a positive safety benefit and may result in greater uptake by less confident cyclists with the potential for a healthier lifestyle. Assumptions ■ No community consultation information is available at the time of writing (which would help inform the community aspirations and plans). ■ No specific surveys of the community have been undertaken to inform this long list assessment. ■ The assumed 'study area' for social effects is the area surrounding the identified corridors, in particular ■ Property effects have been assessed separately. This technical note assesses social impacts only with high-level commentary on potential economic and property impacts with relation to social effects. ■ Community profiling or social baseline has not been carried out for this long list assessment.		

Table 10 Multi Criteria Analysis Scoring Sheet

Option X2: BRT/LRT from Airport to Ormiston via Mangere, Middlemore, Otara and Ormiston Road		
Name of assessor (incl. qualifications and organisation)		
Area of assessment		Social
Score:		
Accessibility	Community	Health and safety
1 (Moderate positive)	-1 (Moderate adverse)	-1 (Minor adverse)
Reasons / Comments ■ Accessibility: – The Auckland Plan anticipates that there will be a high number of jobs in the Auckland Airport area by 2036 yet the Mangere-Otahuhu area is identified as one of the most deprived areas in Auckland. A BRT/LRT would provide a dedicated east - west PT connection which is not currently present between Ormiston and Mangere. Therefore, it would provide additional accessibility and modal choice for residents and staff/customers of business travelling between these two locations/destinations. Further analysis of options should be undertaken of potential route stops to confirm locations that provide the most benefit to community and user groups (such as Middlemore Hospital). – There may be effects on access to a large number of community facilities/services (e.g. educational facilities, Middlemore Hospital, local shops and open space areas), and businesses during construction. These effects are likely to be temporary and could be managed through Stakeholder and Communication Plans and Construction Management Plans. ■ Community: – Provision of the BRT/LRT would occur close to residential properties and other potential sensitive uses (e.g. educational facilities, child care facilities, areas of open space/ sporting facilities). This may affect how individuals enjoy the amenity and use of their homes and the function/operation of community facilities and services. ■ Health and Safety: – Sensitive receivers along the route may experience adverse amenity (e.g. air quality, noise and vibration) impacts during construction which could be managed through Stakeholder and Communication Plans and Construction Management Plans. – Segregated cycle facilities would have a positive safety benefit and may result in greater uptake by less confident cyclists with the potential for a healthier lifestyle. Assumptions ■ No community consultation information is available at the time of writing (which would help inform the community aspirations and plans). ■ No specific surveys of the community have been undertaken to inform this long list assessment. ■ The assumed 'study area' for social effects is the area surrounding the identified corridors, in particular ■ Property effects have been assessed separately. This technical note assesses social impacts only with high-level commentary on potential economic and property impacts with relation to social effects.		

- Community profiling or social baseline has not been carried out for this long list assessment.

Approved by:

Title	Name	Qualification	Signature	Date
Author				
Reviewer				

Technical Note

To		From	
Copy		Reference	502334
Date	2018-08-27	Pages (including this page)	16
Subject	Airport to Botany Long-List Options: Multi-Criteria Analysis Scoring Sheet: Acoustics		

The following provides an assessment of the long-list options for the Airport to Botany Single Stage Business Case (A2B SSBC). The assessment details the acoustic considerations which have been used to inform the assessment. This assessment is designed to contribute to the Multi-Criteria Analysis (MCA) assessment which is being undertaken for the long-list options.

Operational Noise and Vibration

The source information assessed was based on desktop analysis only. The assessments were based on the following information:

- The A2B long-list schematics and long-list options descriptions and assumptions described in the Memo from Helen Hamilton dated 17 August 2018, and updated schematics received by email.
- New Zealand Standard NZS 6806:2010 Acoustics- Road-traffic noise – New and altered roads
- NZTA 'Guide to assessing road traffic noise using NZS 6806.
- Auckland Unitary Plan, Operative in Part (AUP) dated 13 July 2018

Sensitive Receivers

The location of noise and vibration sensitive receivers have been reviewed based on a desktop study of aerial photography and the AUP planning maps. NZS 6806 describes noise sensitive activities as Protected Premises and Facilities (PPF's), which include:

- Residential activities;
- Marae;
- Overnight medical care;
- Teaching (and sleeping) areas in educational facilities;
- Playgrounds that are part of education facilities that are within 20m of buildings used for teaching purposes.

For the purposes of this review, we have considered effects on PPF's and also on commercial /other premises where appropriate.

Construction Noise and Vibration

Noise and vibration emissions during construction of the project should be assessed in accordance with *NZS 6803:1999 Acoustics – Construction Noise* and the relevant limits in the AUP. A comprehensive assessment and preparation of a Construction Noise and Vibration Management Plan (CNVMP) would be required for all schemes.

Future Land Uses

The proposed options pass through a range of land use types as specified in the AUP. In the area surrounding SH20B Puhinui Road, the future land use is 'Business-Light Industrial' (i.e. commercial in nature) and 'Future Urban Zone'. Whilst there are currently residential premises in the vicinity, the long-term the intention is for this land to become industrial/commercial. This MCA assumes the AUP future land uses as the basis of the assessment.

Options reviewed

The options which we have reviewed are listed in the following Table A. The acoustic scores and assessments are outlined in the subsequent tables.

Table A Airport to Botany Long-List Options

Group	Option	High-level description
Integrated off-street options	Option I5	Heavy rail Airport spur line and Botany BRT
Corridor A: Airport to Puhinui	Option A1	BRT/LRT via Puhinui Road-SH20B.
	Option A2	BRT/LRT via SH20A and SH20
Corridor B: Puhinui through Manukau	Option B1	BRT/LRT from Puhinui to Clover Park via Puhinui Road
	Option B2	BRT/LRT Puhinui to Manukau via Ronwood Avenue
	Option B3	BRT/LRT from Puhinui to Manukau via Manukau Station Road
Corridor C: Manukau to Botany	Option C1	BRT/LRT from Manukau to Botany via Chapel Road
	Option C2	BRT/LRT from Manukau to Botany via Te Irirangi Drive
	Option C3	BRT/LRT Manukau to Botany via Preston Road – Harris Road
Corridor X: Alternate corridors not via Puhinui-Manukau	Option X2	BRT/LRT from Airport to Ormiston via Mangere, Middlemore, Otara and Ormiston Road.

Table 1 Multi Criteria Analysis Scoring Sheet

Option I5: Heavy rail Airport spur line and Botany BRT	
Name of assessor (incl. qualifications and organisation)	██████████ ██████████ ██████████
Area of assessment	Acoustics
Score:	-2 Significant Adverse
Notes: <u>Reasons / Comments</u> - Existing commercial and industrial premises along the heavy rail line route are unlikely to have been constructed to withstand rail noise. Rail noise and vibration levels could be disruptive to some business activities and would require consideration. Vibration sensitive receivers (sensitive machinery / equipment etc) would need to be identified along the route. - The heavy rail spur line is expected to moderately change the noise environment at the Recreation Zones located to the south and west of the route. No schools have been identified with 200 metres of the route. - Our assessment is based on the heavy rail spur route passing through Light Industrial, Future Urban, Sport and Active Recreation and Informal Recreation zones (as per the AUP). Any dwellings that remain in these zones would experience a significant change in the noise environment. Given that these dwellings may not remain, the potential effects on these dwellings has not been considered in the rating. - Given the potential impacts of noise and vibration described above, a -2 rating is given. - A detailed acoustic assessment would be required to identify sensitive receivers and assess noise and vibration levels. - Construction noise and vibration, including construction of the tunnelling underneath sensitive receivers, would need to be assessed in accordance with NZS 6803 and other relevant standards and guidelines. <u>Assumptions</u> - Heavy rail spur line from Wiri junction; - Rail would be generally passenger trains and not intended for freight trains - Rail corridor runs on the south side of SH20B until it diverts to connect to the existing line to the south of Puhinui station; - Rail corridor will transition into an underground tunnel at Pukaki Creek towards the airport; - There will be an offline four lane carriageway along the southside of SH20B (as per 20Connect Option C2b). - It is assumed for the LRT option; traffic lanes will be pushed out further towards the outer edges of the road reserve (and in some cases possibly outside of the road reserve) to allow for the LRT/BRT to be located in the central median. - It is expected that the Mangere to CBD LRT route would require the widening of roads along the route to accommodate the new infrastructure. As a result of traffic lanes moving to closer to dwellings / buildings, there is expected to be an increase in noise levels at PPF's. Provided the widening occurs	

within the existing road corridor, this is considered to be a minor impact due to existing road traffic noise levels along the route.

- This assessment is based on a desktop assessment. No surveys, investigations or detailed site visits have been undertaken as part of this assessment.

Other Information relied upon

- Auckland Unitary Plan zones, accessed at <https://geomapspublic.aucklandcouncil.govt.nz/viewer/index.html>;

Table 2 Multi Criteria Analysis Scoring Sheet

Option A1: BRT/LRT via Puhinui Road-SH20B		
Name of assessor (incl. qualifications and organisation)		
Area of assessment	Acoustics	
Score:		
-1 Minor/Moderate Adverse		
Notes:		
<u>Reasons / Comments</u>		
- Option schematic shows new LRT/BRT along existing SH20B route, between SH20 and the airport. It is expected that this route would require the widening of roads to accommodate the new infrastructure. This would increase noise levels at some PPF's as a result of traffic lanes moving to closer to PPF's and the LRT. Overall, this is considered to be a minor (-1) impact due to existing road traffic noise levels along the route. - An increase in vibration levels from operation of the LRT and/or road traffic at PPF's is unlikely but would require consideration. - For the new offline 4 lane motorway alongside the SH20B corridor, our assessment is based on future Urban and Light industrial land use corridor between SH20 and the airport. Any dwellings that remain in these zones would experience a significant change in the noise environment. Given that these dwellings may not remain, the potential effects on these dwellings has not been considered in the rating. - A detailed noise assessment would be required to assess noise mitigation requirements in accordance with NZS 6806. - Any potential increase in vibration levels from road traffic on the motorway as a result of widening SH20/SH20A is likely to be negligible. - Construction noise and vibration would need to be assessed in accordance with NZS 6803 and other relevant standards and guidelines.		
<u>Assumptions</u>		
- Airport to Puhinui via SH20B and Puhinui Road; - Off-line 4-lane motorway along the southside of SH20B, with LRT/BRT corridor between SH20B and the off-line 4-lane motorway; - The LRT/BRT corridor will run down central median of Puhinui Road towards Puhinui train station; - LRT/BRT corridor along SH20B will connect to the median LRT/BRT corridor on Puhinui Road via the intersection of Puhinui Road and SH20 northbound ramps; - An SUP will run along the north side of the LRT/BRT corridor along SH20B; - Segregated walking and cycling facilities; - It is assumed traffic lanes will be pushed further towards the outer edges of the road reserve (and in some cases possibly outside of the road reserve) to allow for the LRT/BRT to be located in the central median.		

- The LRT/BRT stops are unknown and so it is unclear as to whether there will be any sensitive receptors/PPFs near these locations that may experience adverse effects as a result of braking or warning bells on the LRT. The impact of this has not been assessed as part of this MCA.
- This assessment is based on a desktop assessment. No surveys, investigations or detailed site visits have been undertaken as part of this assessment.

Other Information relied upon

- Auckland Unitary Plan zones, accessed at <https://geomapspublic.aucklandcouncil.govt.nz/viewer/index.html>

Table 3 Multi Criteria Analysis Scoring Sheet

Option A2: BRT/LRT via SH20A and SH20		
Name of assessor (incl. qualifications and organisation)		
Area of assessment	Acoustics	
Score:		
-1 Minor/Moderate Adverse		
Notes:		
<u>Reasons / Comments</u>		
■ The LRT/BRT corridor passes through existing residential and industrial zones and has a significant number of PPF's within 100m of the route, primarily between Puhinui and Mangere. ■ The LRT/BRT is proposed along Puhinui Road, SH20 and SH20A. It is expected that this would require the widening of roads to accommodate the new infrastructure. This would increase noise levels at some PPF's as a result of traffic lanes moving to closer to PPF's. Overall, this is considered to be a minor (-1) impact due to existing road traffic noise levels along the route. ■ An increase in vibration levels from operation of the LRT and/or road traffic at PPF's is unlikely but would require consideration. ■ At this stage, the impact of interchange ramps has not been assessed and would be considered in more detail at subsequent stages. ■ Any potential increase in vibration levels from road traffic on the motorway as a result of widening SH20/SH20A is likely to be negligible. ■ The impact at specific properties would vary. A detailed assessment would be required to assess potential noise and vibration effects. Noise mitigation such as barriers or upgrades to houses may be required in some cases. ■ Construction noise and vibration would need to be assessed in accordance with NZS 6803 and other relevant standards and guidelines.		
<u>Assumptions</u>		
■ Airport to Puhinui via SH20A, SH20 and Puhinui Road; ■ LRT/BRT corridor will run down central median of SH20A and Puhinui Road; ■ LRT/BRT corridor will run down east side of SH20; ■ A SUP will run along the eastern side of SH20A and SH20; ■ Segregated walking and cycling facilities will run on both sides of Puhinui Road; ■ SH20 and SH20A will have additional lanes in each direction (worst case as per 20Conenct option C1); ■ A new interchange ramp will be constructed to connect the LRT/BRT corridor from SH20A over SH20; ■ The LRT/BRT corridor along SH20 will connect to the median LRT/BRT corridor on Puhinui Road via the intersection of Puhinui Road and SH20 southbound ramps. ■ It is assumed traffic lanes will be pushed further towards the outer edges of the road reserve (and in some cases possibly outside of the road reserve) to allow for the LRT/BRT to be located in the central median.		

- The LRT/BRT stops are unknown and so it is unclear as to whether there will be any sensitive receptors/PPFs near these locations that may experience adverse effects as a result of braking or warning bells on the LRT. The impact of this has not been assessed as part of this MCA.
- It is expected that the Mangere to CBD LRT route would require the widening of roads along the route to accommodate the new infrastructure. This would increase noise levels at some PPF's as a result of traffic lanes moving to closer to PPF's. An increase in vibration levels from operation of the LRT and/or road traffic at PPF's is unlikely but would require consideration.
- This assessment is based on a desktop assessment. No surveys, investigations or detailed site visits have been undertaken as part of this assessment.

Other Information relied upon

- Auckland Unitary Plan zones, accessed at <https://geomapspublic.aucklandcouncil.govt.nz/viewer/index.html>;

Table 4 Multi Criteria Analysis Scoring Sheet

Option B1: BRT/LRT from Puhinui to Clover Park via Puhinui Road		
Name of assessor (incl. qualifications and organisation)		
Area of assessment	Acoustics	
Score:		
-1 Minor/Moderate Adverse		
Notes:		
<u>Reasons / Comments</u>		
■ The LRT/BRT corridor between Puhinui and Boundary Road passes through existing residential and industrial zones and has a significant number of PPF's within 100m of the route. It is expected that the option would require widening of roads to accommodate the new infrastructure. This would increase noise levels at some PPF's as a result of traffic lanes moving to closer to PPF's. Overall, this is considered to be a minor (-1) impact due to existing road traffic noise levels along the route. ■ An increase in vibration levels from operation of the LRT and/or road traffic at PPF's is unlikely but would require consideration. ■ The impact at specific properties would vary. A detailed assessment would be required to assess potential noise and vibration effects. Noise mitigation such as barriers or upgrades to houses may be required in some cases. ■ Construction noise and vibration would need to be assessed in accordance with NZS 6803 and other relevant standards and guidelines.		
<u>Assumptions</u>		
■ Puhinui to Clover Park via Puhinui Road as shown on Option B1 schematic. ■ LRT/BRT corridor will run down the central median throughout the entirety of the route. ■ Segregated walking and cycling facilities will run on both sides of the route. ■ It is assumed traffic lanes will be pushed further towards the outer edges of the road reserve (and in some cases possibly outside of the road reserve) to allow for the LRT/BRT to be located in the central median. ■ The LRT/BRT stops are unknown and so it is unclear as to whether there will be any sensitive receptors/PPFs near these locations that may experience adverse effects as a result of braking or warning bells on the LRT. The impact of this has not been assessed as part of this MCA. ■ This assessment is based on a desktop assessment. No surveys, investigations or detailed site visits have been undertaken as part of this assessment.		
<u>Other Information relied upon</u>		
■ Auckland Unitary Plan zones, accessed at https://geomapspublic.aucklandcouncil.govt.nz/viewer/index.html;		

Table 5 Multi Criteria Analysis Scoring Sheet

Option B2: BRT/LRT from Puhinui to Manukau via Ronwood Ave		
Name of assessor (incl. qualifications and organisation)		
Area of assessment	Acoustics	
Score:		
-1 Minor/Moderate Adverse		
Notes:		
<u>Reasons / Comments</u>		
■ The LRT/BRT corridor passes through existing residential, industrial and metropolitan centre zones along Puhinui Road, Lambie Drive or Ronwood Avenue and has a number of PPF's within 100m of the route, primarily on Puhinui Road. It is expected that this route would require the widening of roads to accommodate the new infrastructure which would increase noise levels at some PPF's as a result of traffic lanes moving to closer to PPF's. Overall, this is considered to be a minor (-1) impact due to existing road traffic noise levels along the route. ■ An increase in vibration levels from operation of the LRT and/or road traffic at PPF's is unlikely but would require consideration. ■ The impact at specific properties would vary. A detailed assessment would be required to assess potential noise and vibration effects. Noise mitigation such as barriers or upgrades to houses may be required in some cases. ■ Construction noise and vibration would need to be assessed in accordance with NZS 6803 and other relevant standards and guidelines.		
<u>Assumptions</u>		
■ Puhinui to Manukau via Ronwood Avenue as shown on Option B2 schematic; ■ LRT/BRT corridor will run down the central median throughout the entirety of the route; ■ Segregated walking and cycling facilities will run on both sides of the entire route. ■ It is assumed traffic lanes will be pushed further towards the outer edges of the road reserve (and in some cases possibly outside of the road reserve) to allow for the LRT/BRT to be located in the central median. ■ The LRT/BRT stops are unknown and so it is unclear as to whether there will be any sensitive receptors/PPFs near these locations that may experience adverse effects as a result of braking or warning bells on the LRT. The impact of this has not been assessed as part of this MCA. ■ This assessment is based on a desktop assessment. No surveys, investigations or detailed site visits have been undertaken as part of this assessment.		
<u>Other Information relied upon</u>		
■ Auckland Unitary Plan zones, accessed at https://geomapspublic.aucklandcouncil.govt.nz/viewer/index.html;		

Table 6 Multi Criteria Analysis Scoring Sheet

Option B3: BRT/LRT from Puhinui to Manukau via Manukau Station Road		
Name of assessor (incl. qualifications and organisation)		
Area of assessment	Acoustics	
Score:		
-1 Minor/Moderate Adverse		
Notes:		
<u>Reasons / Comments</u>		
■ The LRT/BRT corridor passes through existing residential and industrial zones and has a number of PPF's within 100m of the route, primarily on Puhinui Road. There is expected to be a slight increase in noise at PPF's as a result of traffic lanes moving further outwards to accommodate the LRT/BRT along Puhinui Road and Lambie Drive. Overall, this is considered to be a minor (-1) impact due to existing road traffic noise levels along the route. ■ An increase in vibration levels from operation of the LRT and/or road traffic at PPF's is unlikely but would require consideration. ■ Any potential increase in vibration levels from road traffic as a result of widening Puhinui Road or Lambie Drive is likely to be negligible. ■ The impact at specific properties would vary. A detailed assessment would be required to assess potential noise and vibration effects. Noise mitigation such as barriers or upgrades to houses may be required in some cases. ■ Construction noise and vibration would need to be assessed in accordance with NZS 6803 and other relevant standards and guidelines.		
<u>Assumptions</u>		
■ Puhinui to Manukau via Manukau Station Road as shown on Option B3 schematic; ■ LRT/BRT corridor will run down the central median throughout the entirety of the route; ■ Segregated walking and cycling facilities will run on both sides of the entire route. ■ It is assumed traffic lanes will be pushed further towards the outer edges of the road reserve (and in some cases possibly outside of the road reserve) to allow for the LRT/BRT to be located in the central median. ■ The LRT/BRT stops are unknown and so it is unclear as to whether there will be any sensitive receptors/PPFs near these locations that may experience adverse effects as a result of braking or warning bells on the LRT. The impact of this has not been assessed as part of this MCA. ■ This assessment is based on a desktop assessment. No surveys, investigations or detailed site visits have been undertaken as part of this assessment.		
<u>Other Information relied upon</u>		
■ Auckland Unitary Plan zones, accessed at https://geomapspublic.aucklandcouncil.govt.nz/viewer/index.html;		

Table 7 Multi Criteria Analysis Scoring Sheet

Option C1: BRT/LRT from Manukau to Botany via Chapel Road	
Name of assessor (incl. qualifications and organisation)	██████████ ██████████ ██████████
Area of assessment	Acoustics
Score:	
-1 Minor/Moderate Adverse	
Notes: <u>Reasons / Comments</u> ■ The LRT/BRT corridor for the option passes through existing residential and industrial zones and has a number of PPF's within 100m of the route, primarily on Chapel Road and Te Irirangi Drive. This would increase noise levels at some PPF's as a result of traffic lanes moving to closer to PPF's. Overall, this is considered to be a minor (-1) impact due to existing road traffic noise levels along the route. ■ An increase in vibration levels from operation of the LRT and/or road traffic at PPF's is unlikely but would require consideration. ■ The impact at specific properties would vary. A detailed assessment would be required to assess potential noise and vibration effects. Noise mitigation such as barriers or upgrades to houses may be required in some cases. ■ Construction noise and vibration would need to be assessed in accordance with NZS 6803 and other relevant standards and guidelines. <u>Assumptions</u> ■ Manukau to Botany via Chapel Road route as shown in Option C1 schematic; ■ LRT/BRT corridor will run down the central median throughout the entirety of the route; ■ Segregated walking and cycling facilities will run on both sides of the entire route; ■ It is assumed traffic lanes will be pushed further towards the outer edges of the road reserve (and in some cases possibly outside of the road reserve) to allow for the LRT/BRT to be located in the central median. ■ The LRT/BRT stops are unknown and so it is unclear as to whether there will be any sensitive receptors/PPFs near these locations that may experience adverse effects as a result of braking or warning bells on the LRT. The impact of this has not been assessed as part of this MCA. ■ This assessment is based on a desktop assessment. No surveys, investigations or detailed site visits have been undertaken as part of this assessment. ■ The Eastern busway route is highlighted on the schematic but is excluded from assessment of this option. <u>Other Information relied upon</u> ■ Auckland Unitary Plan zones, accessed at https://geomapspublic.aucklandcouncil.govt.nz/viewer/index.html;	

Table 8 Multi Criteria Analysis Scoring Sheet

Option C2: BRT/LRT from Manukau to Botany via Te Irirangi Drive		
Name of assessor (incl. qualifications and organisation)		
Area of assessment	Acoustics	
Score:		
-1 Minor/Moderate Adverse		
Notes:		
<u>Reasons / Comments</u>		
■ The LRT/BRT corridor for Option C2 passes through existing residential and industrial zones and has a significant number of PPF's within 100m of the route, primarily on Te Irirangi Drive. This would increase noise levels at some PPF's as a result of traffic lanes moving to closer to PPF's. Overall, this is considered to be a minor (-1) impact due to existing road traffic noise levels along the route. ■ An increase in vibration levels from operation of the LRT and/or road traffic at PPF's is unlikely but would require consideration. ■ The impact at specific properties would vary. A detailed assessment would be required to assess potential noise and vibration effects. Noise mitigation such as barriers or upgrades to houses may be required in some cases. ■ Construction noise and vibration would need to be assessed in accordance with NZS 6803 and other relevant standards and guidelines.		
<u>Assumptions</u>		
■ Manukau to Botany route via Te Irirangi Drive as shown on Option C2 schematic; ■ LRT/BRT corridor will run down the central median throughout the entirety of the route; ■ Segregated walking and cycling facilities will run on both sides of the entire route. ■ It is assumed traffic lanes will be pushed further towards the outer edges of the road reserve (and in some cases possibly outside of the road reserve) to allow for the LRT/BRT to be located in the central median. ■ The LRT/BRT stops are unknown and so it is unclear as to whether there will be any sensitive receptors/PPFs near these locations that may experience adverse effects as a result of braking or warning bells on the LRT. The impact of this has not been assessed as part of this MCA. ■ This assessment is based on a desktop assessment. No surveys, investigations or detailed site visits have been undertaken as part of this assessment. ■ The Eastern busway route is highlighted on the schematic but is excluded from assessment of this option.		
<u>Other Information relied upon</u>		
■ Auckland Unitary Plan zones, accessed at https://geomapspublic.aucklandcouncil.govt.nz/viewer/index.html;		

Table 9 Multi Criteria Analysis Scoring Sheet

Option C3: BRT/LRT from Manukau to Botany via Preston Road, Harris Road		
Name of assessor (incl. qualifications and organisation)		
Area of assessment	Acoustics	
Score:		
-1 Minor/Moderate Adverse		
Notes:		
<u>Reasons / Comments</u>		
■ The LRT/BRT corridor for Option C3 passes through existing residential and industrial zones and has a significant number of PPF's within 100m of the route, primarily on Preston Road. This would increase noise levels at some PPF's as a result of traffic lanes moving to closer to PPF's. Overall, this is considered to be a minor (-1) impact due to existing road traffic noise levels along the route. ■ An increase in vibration levels from operation of the LRT and/or road traffic at PPF's is unlikely but would require consideration. ■ The impact at specific properties would vary. A detailed assessment would be required to assess potential noise and vibration effects. Noise mitigation such as barriers or upgrades to houses may be required in some cases. ■ Construction noise and vibration would need to be assessed in accordance with NZS 6803 and other relevant standards and guidelines.		
<u>Assumptions</u>		
■ Manukau to Botany via Preston Road and Harris Road as shown on Option C3 schematic; ■ LRT/BRT corridor will run down the central median throughout the entirety of the route; ■ Segregated walking and cycling facilities will run on both sides of the entire route. ■ It is assumed traffic lanes will be pushed further towards the outer edges of the road reserve (and in some cases possibly outside of the road reserve) to allow for the LRT/BRT to be located in the central median. ■ The LRT/BRT stops are unknown and so it is unclear as to whether there will be any sensitive receptors/PPFs near these locations that may experience adverse effects as a result of braking or warning bells on the LRT. The impact of this has not been assessed as part of this MCA. ■ This assessment is based on a desktop assessment. No surveys, investigations or detailed site visits have been undertaken as part of this assessment. ■ The Eastern busway route is highlighted on the schematic but is excluded from assessment of this option.		
<u>Other Information relied upon</u>		
■ Auckland Unitary Plan zones, accessed at https://geomapspublic.aucklandcouncil.govt.nz/viewer/index.html		

Table 10 Multi Criteria Analysis Scoring Sheet

Option X2: BRT/LRT from Airport to Ormiston via Mangere, Middlemore, Otara and Ormiston Road	
Name of assessor (incl. qualifications and organisation)	██████████ ██████████ ██████████
Area of assessment	Acoustics
Score:	
-1 Minor/Moderate Adverse	
Notes: <u>Reasons / Comments</u> ■ The LRT/BRT corridor for Option X2 passes through existing residential and industrial zones and has a number of PPF's within 100m of the route, primarily on Ormiston Road, East Tamaki Drive and Massey Road. The majority of the route length is through residential zones between Ormiston and Mangere. This would increase noise levels at some PPF's as a result of traffic lanes moving to closer to PPF's. Furthermore, widening of SH20A may increase noise levels at some PPF's as a result of decreased distance between PPF's and traffic lanes. Overall, this is considered to be a minor (-1) impact due to existing road traffic noise levels along the route. ■ An increase in vibration levels from operation of the LRT and/or road traffic at PPF's is unlikely but would require consideration. ■ The impact at specific properties would vary. A detailed assessment would be required to assess potential noise and vibration effects. Noise mitigation such as barriers or upgrades to houses may be required in some cases. ■ Construction noise and vibration would need to be assessed in accordance with NZS 6803 and other relevant standards and guidelines. <u>Assumptions</u> ■ SH20A, Mangere, Middlemore, Otara, Ormiston; ■ SH20A will have lanes in each direction (worst-case as per 20 Connect Option C1); ■ LRT/BRT corridor will run down the central median of SH20A; ■ LRT/BRT corridor will run down the central median from Mangere to Ormiston; ■ Walking and cycling facilities will run on both sides of the route from Mangere to Ormiston; ■ LRT/BRT will cross the rail lines at Middlemore Hospital; ■ LRT/BRT corridor will go off-road between Massey Road and Gray Avenue, across Grange Golf Clun and between East Tamaki Road and Ormiston Road; ■ Off-road sections will only consist the LRT/BRT corridor. ■ It is assumed traffic lanes will be pushed further towards the outer edges of the road reserve (and in some cases possibly outside of the road reserve) to allow for the LRT/BRT to be located in the central median. ■ The LRT/BRT stops are unknown and so it is unclear as to whether there will be any sensitive receptors/PPFs near these locations that may experience adverse effects as a result of braking or warning bells on the LRT. The impact of this has not been assessed as part of this MCA.	

- This assessment is based on a desktop assessment. No surveys, investigations or detailed site visits have been undertaken as part of this assessment.

Other Information relied upon

- Auckland Unitary Plan zones, accessed at <https://geomapspublic.aucklandcouncil.govt.nz/viewer/index.html>;

Approved by:

Title	Name	Qualification	Signature	Date
Author				
Reviewer				

Technical Note

To		From	
Copy		Reference	255727
Date	2018-08-28	Pages (including this page)	13
Subject	Airport to Botany Long-List Options: Multi-Criteria Analysis Scoring Sheet: Archaeology and Built Heritage		

The following provides an assessment of the long-list options for the Airport to Botany Single Stage Business Case (A2B SSBC). The assessment details the considerations which have been used to inform the assessment. This assessment is designed to contribute to the Multi-Criteria Analysis (MCA) assessment which is being undertaken for the long-list options (dated 17 August 2018).

The source information assessed was based on desktop analysis only. The Archaeology and Built Heritage assessments were based on:

- The A2B long-list schematics (dated 17 August 2018) and the long-list options descriptions and assumptions (dated 17 August 2018).
- New Zealand Archaeological Association (NZAA) site records (accessed 23 August 2018) for sites within 200m of proposed options (200m allows for potential site inaccuracy and site extents which may extend into road reserve).
- The Heritage New Zealand Pouhere Taonga List (HNZPT List) (accessed 23 August 2018)
- Auckland Council Cultural Heritage Inventory (CHI) (accessed 23 August 2018)
- Auckland Council Unitary Plan - Operative in Part (AUP) (accessed 23 August 2018)
- Google Earth Pro (accessed 23 August 2018)

The options are outlined in the following table. The scores and assessments are outlined in the below tables.

Group	Option	High-level description
Integrated off-street options	Option I5	Heavy rail Airport spur line and Botany BRT
Corridor A: Airport to Puhinui	Option A1	BRT/LRT via Puhinui Road-SH20B.
	Option A2	BRT/LRT via SH20A and SH20
Corridor B: Puhinui through Manukau	Option B1	BRT/LRT from Puhinui to Clover Park via Puhinui Road
	Option B2	BRT/LRT Puhinui to Manukau via Ronwood Avenue
	Option B3	BRT/LRT from Puhinui to Manukau via Manukau Station Road
Corridor C: Manukau to Botany	Option C1	BRT/LRT from Manukau to Botany via Chapel Road
	Option C2	BRT/LRT from Manukau to Botany via Te Irirangi Drive
	Option C3	BRT/LRT Manukau to Botany via Preston Road – Harris Road
Corridor X: Alternate corridors not via Puhinui-Manukau	Option X2	BRT/LRT from Airport to Ormiston via Mangere, Middlemore, Otara and Ormiston Road.

Table 1 Multi Criteria Analysis Scoring Sheet

Option I5: Heavy rail Airport spur line and Botany BRT			
Name of assessor (incl. qualifications and organisation)			
Area of assessment	Archaeology and Built Heritage		
Score:			
<table border="1"> <tr> <td>Extent of effects on sites and places of archaeological value and on heritage buildings and places.</td> </tr> <tr> <td>-2 (Significant adverse)</td> </tr> </table>		Extent of effects on sites and places of archaeological value and on heritage buildings and places.	-2 (Significant adverse)
Extent of effects on sites and places of archaeological value and on heritage buildings and places.			
-2 (Significant adverse)			
Notes: <u>Reasons / Comments</u> ■ <i>SH20B 'Offline Motorway to Airport'</i> – There are 18 recorded archaeological sites in the vicinity of this option, mainly to the west of the proposed Offline Motorway. This area is part of a larger settlement complex (papakainga) known as Papahinau, centred on the eastern bank of the Pukaki Creek. It is likely that archaeological material will be encountered during works through this section of the option. Papahinau can be considered to have significant heritage values. – An underground tunnel has been proposed for this option, and this could lessen the score depending on where the tunnel starts. ■ <i>SH20B Offline Motorway</i> – There are five recorded archaeological sites recorded within 200m of the current road reserve. Although all these sites are located on the northern side of Puhinui road, it is indicative of the density of archaeological sites in the area. Recent archaeological survey including test pitting by Clough and Associates (Baquie et al 2018) on the southern side of Puhinui road did not reveal any archaeological features. there is a low, yet possible chance of encountering archaeological material along the proposed offline motorway route. ■ <i>Puhinui Road to Wiri</i> – There are a number of archaeological sites in the vicinity of this route, including Mutukutureia / McLaughlins Mountain. Although the maunga itself is to the south of the proposed route, it is an area where stonewalled gardening has been observed, and there is reasonable cause to suspect archaeological material may be encountered during works through this area. <u>Assumptions</u> ■ Works will be undertaken within existing road reserves. ■ The tunnel/railway will impact the Papahinau complex <u>Other Information relied upon</u> ■ [Insert]			

Table 2 Multi Criteria Analysis Scoring Sheet

Option A1: BRT/LRT via Puhinui Road-SH20B			
Name of assessor (incl. qualifications and organisation)	[Redacted]		
Area of assessment	Archaeology and Built Heritage		
Score: <table border="1"> <tr> <td>Extent of effects on sites and places of archaeological value and on heritage buildings and places.</td> </tr> <tr> <td>-2 (Significant adverse)</td> </tr> </table>		Extent of effects on sites and places of archaeological value and on heritage buildings and places.	-2 (Significant adverse)
Extent of effects on sites and places of archaeological value and on heritage buildings and places.			
-2 (Significant adverse)			
Notes: Reasons / Comments ■ <i>SH20B Offline Motorway to Airport</i> – There are 18 recorded archaeological sites in the vicinity of this option, mainly to the west of the proposed Offline Motorway. This area is part of a larger settlement complex (papakainga) known as Papahinai, centred on the eastern bank of the Pukaki Creek. It is likely that archaeological material will be encountered during works through this section of the option. Papahinai can be considered to have significant heritage values. ■ <i>SH20B Offline Motorway</i> – There are five recorded archaeological sites recorded within 200m of the current road reserve. Although all of these sites are located on the northern side of Puhinui road, it is indicative of the density of archaeological sites in the area. Recent archaeological survey including test pitting by Clough and Associates (Baquie et al 2018) on the southern side of Puhinui road did not reveal any archaeological features. there is a low, yet possible chance of encountering archaeological material along the proposed offline motorway route. ■ <i>SH20B/SH20 interchange to Puhinui station</i> There are four items listed in the CHI along the Puhinui road section. These include two historic homes, a stone cairn and the Puhinui Station footbridge. The historic houses should be avoidable as works will be undertaken within road reserves, but the stone cairn (CHI item 15944) and the Footbridge (CHI item 19381) will need to be taken into account when planning access into the rail corridor. Assumptions ■ All NZAA site records are up to date. ■ Works will be undertaken within existing road reserves. Other Information relied upon ■ Cruickshank, A. 2018. South East Auckland Airport Access: archaeological assessment. Unpublished CFG Heritage Ltd report to Auckland International Airport Limited. ■ Baquie, B., Z. Burnett, S. Macready and R. Clough. 2018. Park and Ride South, 454 Puhinui Road, Wiri, Auckland: Archaeological Assessment. Unpublished Clough and Associates Ltd report to Auckland International Airport Ltd.			

Table 3 Multi Criteria Analysis Scoring Sheet

Option A2: BRT/LRT via SH20A and SH20			
Name of assessor (incl. qualifications and organisation)			
Area of assessment	Archaeology and Built Heritage		
Score: <table border="1"> <tr> <td>Extent of effects on sites and places of archaeological value and on heritage buildings and places.</td> </tr> <tr> <td>-2 (Significant adverse)</td> </tr> </table>		Extent of effects on sites and places of archaeological value and on heritage buildings and places.	-2 (Significant adverse)
Extent of effects on sites and places of archaeological value and on heritage buildings and places.			
-2 (Significant adverse)			
Notes: Reasons / Comments ■ <i>Realignment and use of SH20a</i> – There have been both pre-European and historic sites identified near to SH20a, and it cannot be completely ruled out that unrecorded archaeological material will be uncovered within the road reserves. – The HNZPT List has item 2654 'Abbeyville' within the proposed route. This appears to be an erroneous grid reference, as the homestead is located to the east of the proposed alignment. ■ <i>SH20a/SH20 interchange</i> – There have been archaeological sites identified near to SH20 and SH20a, and it cannot be completely ruled out that unrecorded archaeological material will be uncovered within the vicinity of the proposed interchange. ■ <i>Widening of SH20 south of SH20A (Southbound)</i> – Item 2625 in the Unitary Plan (Operative in Part) 'Homestead at Mangere Centre Park' has an extent of place which could be impacted if widening of the designation is required to fit extra lanes. – The portion of SH20 between Puhinui Road and Massey Road runs through the extent of Nga Kapua Kohu Ora / Crater Hill. Nga Kapua Kohu Ora / Crater Hill is a heritage landscape of outstanding archaeological and heritage value and significance at a local, regional and national level and is part of the volcanic cones (tupuna maunga) landscape which is of international significance. Although a majority of the recorded sites are on the western side of the motorway, it is likely that these sites extend onto the eastern side of the motorway and that archaeological material associated with this would be uncovered. Works to the east of the motorway are considered mitigatable. ■ <i>SH20B/SH20 interchange to Puhinui station</i> – There are four items listed in the CHI along the Puhinui road section. These include two historic homes, a stone cairn and the Puhinui Station footbridge. The historic houses should be avoidable as works will be undertaken within road reserves, but the stone cairn (CHI item 15944) and the Footbridge (CHI item 19381) will need to be taken into account when planning access into the rail corridor. Assumptions			

- All NZAA site records are up to date.
- The CHI is up to date.
- All works and associated land use will be undertaken on the eastern side of SH20.
- All other works will be undertaken within road reserves

Other Information relied upon

- Self Family Trust v Auckland Council [2018] NZEnvC 49

Table 4 Multi Criteria Analysis Scoring Sheet

Option B1: BRT/LRT from Puhinui to Clover Park via Puhinui Road			
Name of assessor (incl. qualifications and organisation)			
Area of assessment	Archaeology and Built Heritage		
Score: <table border="1"> <tr> <td>Extent of effects on sites and places of archaeological value and on heritage buildings and places.</td> </tr> <tr> <td>-1 (Minor/moderate adverse)</td> </tr> </table>		Extent of effects on sites and places of archaeological value and on heritage buildings and places.	-1 (Minor/moderate adverse)
Extent of effects on sites and places of archaeological value and on heritage buildings and places.			
-1 (Minor/moderate adverse)			
Notes: Reasons / Comments ■ <i>Puhinui Station Footbridge</i> – The footbridge (CHI item 19387) is located at the beginning of this option. The condition of this footbridge is unknown, but further research would be required when planning access through the rail corridor. ■ <i>Possible subsurface archaeological material</i> – Although no pre-1900 archaeological sites are identified along this route, it cannot be completely ruled out that unrecorded archaeological material will not be uncovered within the road reserves. Assumptions ■ All NZAA site records are up to date. ■ The CHI is up to date. ■ All works will be undertaken within road reserves Other Information relied upon			

Table 5 Multi Criteria Analysis Scoring Sheet

Option B2: BRT/LRT from Puhinui to Manukau via Ronwood Ave			
Name of assessor (incl. qualifications and organisation)			
Area of assessment	Archaeology and Built Heritage		
Score: <table border="1"> <tr> <td>Extent of effects on sites and places of archaeological value and on heritage buildings and places.</td> </tr> <tr> <td>-1 (Minor/moderate adverse)</td> </tr> </table>		Extent of effects on sites and places of archaeological value and on heritage buildings and places.	-1 (Minor/moderate adverse)
Extent of effects on sites and places of archaeological value and on heritage buildings and places.			
-1 (Minor/moderate adverse)			
Notes: Reasons / Comments ■ <i>Puhinui Station Footbridge</i> – The footbridge (CHI item 19387) is located at the beginning of this option. The condition of this footbridge is unknown, but further research would be required when planning access through the rail corridor. ■ <i>Possible subsurface archaeological material</i> – Although no pre-1900 archaeological sites are identified along this route, it cannot be completely ruled out that unrecorded archaeological material will not be uncovered within the road reserves. Assumptions ■ All NZAA site records are up to date. ■ The CHI is up to date. ■ All works will be undertaken within road reserves Other Information relied upon ■			

Table 6 Multi Criteria Analysis Scoring Sheet

Option B3: BRT/LRT from Puhinui to Manukau via Manukau Station Road			
Name of assessor (incl. qualifications and organisation)			
Area of assessment	Archaeology and Built Heritage		
Score: <table border="1"> <tr> <td>Extent of effects on sites and places of archaeological value and on heritage buildings and places.</td> </tr> <tr> <td>-1 (Minor/moderate adverse)</td> </tr> </table>		Extent of effects on sites and places of archaeological value and on heritage buildings and places.	-1 (Minor/moderate adverse)
Extent of effects on sites and places of archaeological value and on heritage buildings and places.			
-1 (Minor/moderate adverse)			
Notes: Reasons / Comments ■ <i>Puhinui Station Footbridge</i> – The footbridge (CHI item 19387) is located at the beginning of this option. The condition of this footbridge is unknown, but further research would be required when planning access through the rail corridor. ■ <i>Possible subsurface archaeological material</i> – Although no pre-1900 archaeological sites are identified along this route, it cannot be completely ruled out that unrecorded archaeological material will not be uncovered within the road reserves. Assumptions ■ All NZAA site records are up to date. ■ The CHI is up to date. ■ All works will be undertaken within road reserves Other Information relied upon ■			

Table 7 Multi Criteria Analysis Scoring Sheet

Option C1: BRT/LRT from Manukau to Botany via Chapel Road			
Name of assessor (incl. qualifications and organisation)			
Area of assessment	Archaeology and Built Heritage		
Score: <table border="1"> <tr> <td>Extent of effects on sites and places of archaeological value and on heritage buildings and places.</td> </tr> <tr> <td>-1 (Minor/moderate adverse)</td> </tr> </table>		Extent of effects on sites and places of archaeological value and on heritage buildings and places.	-1 (Minor/moderate adverse)
Extent of effects on sites and places of archaeological value and on heritage buildings and places.			
-1 (Minor/moderate adverse)			
Notes: <u>Reasons / Comments</u> ■ <i>Manukau side of SH1</i> – Milepost marker (CHI 20284) purported location is on Great South Road between Ronwood Avenue and Cavendish Drive. Presumed destroyed. Although this was likely within the road reserve, it is not likely to have any archaeological footprint remaining. ■ <i>Chapel Road</i> – There are a number of archaeological and built heritage sites recorded along Chapel Road. The built heritage is unlikely to have any associated elements outside of their respective property boundaries. The pre-European sites obviously pre-date the road reserve, so it cannot be ruled out that archaeological material would be encountered within the road reserve. ■ <i>Criteria:</i> – Reasons/comments <u>Assumptions</u> ■ All NZAA site records are up to date. ■ The CHI is up to date. ■ All works will be undertaken within road reserves <u>Other Information relied upon</u> ■			

Table 8 Multi Criteria Analysis Scoring Sheet

Option C2: BRT/LRT from Manukau to Botany via Te Irirangi Drive			
Name of assessor (incl. qualifications and organisation)			
Area of assessment	Archaeology and Built Heritage		
Score: <table border="1"> <tr> <td>Extent of effects on sites and places of archaeological value and on heritage buildings and places.</td> </tr> <tr> <td>-1 (Minor/moderate adverse)</td> </tr> </table>		Extent of effects on sites and places of archaeological value and on heritage buildings and places.	-1 (Minor/moderate adverse)
Extent of effects on sites and places of archaeological value and on heritage buildings and places.			
-1 (Minor/moderate adverse)			
Notes: Reasons / Comments ■ <i>Manukau side of SH1</i> – Milepost marker (CHI 20284) purported location is on Great South Road between Ronwood Avenue and Cavendish Drive. Presumed destroyed. Although this was likely within the road reserve, it is not likely to have any archaeological footprint remaining. ■ <i>Te Irirangi Drive</i> – There are a number of archaeological and built heritage sites recorded along Te Irirangi Drive. The built heritage is unlikely to have any associated elements outside of their respective property boundaries. The pre-European sites obviously pre-date the road reserve, so it cannot be ruled out that archaeological material would be encountered within the road reserve. Assumptions ■ All NZAA site records are up to date. ■ The CHI is up to date. ■ All works will be undertaken within road reserves Other Information relied upon ■			

Table 9 Multi Criteria Analysis Scoring Sheet

Option C3: BRT/LRT from Manukau to Botany via Preston Road-Harris Road			
Name of assessor (incl. qualifications and organisation)			
Area of assessment	Archaeology and Built Heritage		
Score: <table border="1"> <tr> <td>Extent of effects on sites and places of archaeological value and on heritage buildings and places.</td> </tr> <tr> <td>-1 (Minor/moderate adverse)</td> </tr> </table>		Extent of effects on sites and places of archaeological value and on heritage buildings and places.	-1 (Minor/moderate adverse)
Extent of effects on sites and places of archaeological value and on heritage buildings and places.			
-1 (Minor/moderate adverse)			
Notes: Reasons / Comments ■ <i>Manukau side of SH1</i> – Milepost marker (CHI 20284) purported location is on Great South Road between Ronwood Avenue and Cavendish Drive. Presumed destroyed. Although this was likely within the road reserve, it is not likely to have any archaeological footprint remaining. ■ <i>Preston/Harris Road to Botany</i> – There are a number of archaeological and built heritage sites recorded along this stretch of road to Botany. The built heritage is unlikely to have any associated elements outside of their respective property boundaries. There is gardening associated with Matanginui Pa (R11/24) which could still be present within the road reserves. It cannot be ruled out that archaeological material would be encountered within the road reserve. Assumptions ■ All NZAA site records are up to date. ■ The CHI is up to date. ■ All works will be undertaken within road reserves Other Information relied upon ■ [Insert]			

Table 10 Multi Criteria Analysis Scoring Sheet

Option X2: BRT/LRT from Airport to Ormiston via Mangere, Middlemore, Otara and Ormiston Road			
Name of assessor (incl. qualifications and organisation)			
Area of assessment	Archaeology and Built Heritage		
Score: <table border="1"> <tr> <td>Extent of effects on sites and places of archaeological value and on heritage buildings and places.</td> </tr> <tr> <td>-1 (Minor/moderate adverse)</td> </tr> </table>		Extent of effects on sites and places of archaeological value and on heritage buildings and places.	-1 (Minor/moderate adverse)
Extent of effects on sites and places of archaeological value and on heritage buildings and places.			
-1 (Minor/moderate adverse)			
Notes: <u>Reasons / Comments</u> ■ Realignment and widening of SH20a – There have been both pre-European and historic sites identified near to SH20a, and it cannot be completely ruled out that unrecorded archaeological material will be uncovered within the road reserves. – The HNZPT List has item 2654 'Abbeville' within the proposed route. This appears to be an erroneous grid reference, as the homestead is located to the east of the proposed designation. ■ SH20a/SH20 interchange – There have been archaeological sites identified near to SH20 and SH20a, and it cannot be completely ruled out that unrecorded archaeological material will be uncovered within the vicinity of the proposed interchange. – Item 2625 in the Unitary Plan (Operative in Part) 'Homestead at Mangere Centre Park' has an extent of place which is within the proposed 50m designation outside the current road reserves. Although the building itself is outside of the proposed 50m designation, this would affect the associated gardens. ■ Historic buildings – There are a number of historic structures along the project route, most notably on Massey and Great South Roads. It is unlikely there will be any associated features within the road reserves. ■ Archaeological sites – There are five recorded archaeological sites within the route, related to both pre-European Maori and historic occupation. It cannot be completely ruled out that unrecorded archaeological material will be uncovered within the road reserves. <u>Assumptions</u> ■ All NZAA site records are up to date. ■ The CHI is up to date. ■ All works will be undertaken within road reserves			

Other Information relied upon

■

Approved by:

Title	Name	Qualification	Signature	Date
Author				
Reviewer				

Technical Note

To		From	
Copy		Reference	Project number
Date	2018-08-30	Pages (including this page)	12
Subject	Airport to Botany Long-List Options: Multi-Criteria Analysis Scoring Sheet: Contaminated Land		

The following provides an assessment of the long-list options for the Airport to Botany Single Stage Business Case (A2B SSBC). The assessment details the considerations which have been used to inform the assessment. This assessment is designed to contribute to the Multi-Criteria Analysis (MCA) assessment which is being undertaken for the long-list options (received 17 August 2018).

The source information assessed was based on desktop analysis only. The X assessments were based on:

- The A2B long-list schematics (received 17 August 2018) and the long-list options descriptions and assumptions (dated 17 August 2018).
- A review of historical and current aerial photography available on Auckland Council Geomaps
- Our previous project experience in this area
- Our assumption that excavation may extend in some location to 1.5m below ground surface and that groundwater may be present in some location at 1m below ground surface.

The options are outlined in the following table. The scores and assessments are outlined in the below tables.

Group	Option	High-level description
Integrated off-street options	Option I5	Heavy rail Airport spur line and Botany BRT
Corridor A: Airport to Puhinui	Option A1	BRT/LRT via Puhinui Road-SH20B.
	Option A2	BRT/LRT via SH20A and SH20
Corridor B: Puhinui through Manukau	Option B1	BRT/LRT from Puhinui to Clover Park via Puhinui Road
	Option B2	BRT/LRT Puhinui to Manukau via Ronwood Avenue
	Option B3	BRT/LRT from Puhinui to Manukau via Manukau Station Road
Corridor C: Manukau to Botany	Option C1	BRT/LRT from Manukau to Botany via Chapel Road
	Option C2	BRT/LRT from Manukau to Botany via Te Irirangi Drive
	Option C3	BRT/LRT Manukau to Botany via Preston Road – Harris Road
Corridor X: Alternate corridors not via Puhinui-Manukau	Option X2	BRT/LRT from Airport to Ormiston via Mangere, Middlemore, Otara and Ormiston Road.

Table 1 Multi Criteria Analysis Scoring Sheet

Option I5: Heavy rail Airport spur line and Botany BRT			
Name of assessor (incl. qualifications and organisation)			
Area of assessment	Contaminated land		
Score: -3 Significant Adverse/Un-mitigatable -2 Significant Adverse -1 Minor/Moderate Adverse 0 Neutral 1 Minor Positive 2 Moderate Positive 3 Significant Positive			
<table border="1"> <tr> <td>Potential to encounter and ability to manage the effects of contaminated soils and/or groundwater on human health and the environment.</td> </tr> <tr> <td>-3</td> </tr> </table>		Potential to encounter and ability to manage the effects of contaminated soils and/or groundwater on human health and the environment.	-3
Potential to encounter and ability to manage the effects of contaminated soils and/or groundwater on human health and the environment.			
-3			
Notes: <u>Reasons / Comments</u> ■ Criteria: Potential to encounter and ability to manage the effects of contaminated soils and/or groundwater on human health and the environment. – Shallow disturbance of soil bound contamination likely across whole route. Traverses McLaughlins Road Landfill which does some industrial waste, based on previous personal experience. Transverse the Wiri industrial estate which includes the Wiri Oil terminal and numerous other significant HAIL sites. Significant potential for contamination of soil and groundwater to affect this project route. <u>Assumptions</u> ■ excavation may extend in some location to 1.5m below ground surface and that groundwater may be present in some location at 1m below ground surface. <u>Other Information relied upon</u> ■ A review of historical and current aerial photography available on Auckland Council Geomaps ■ Our previous project experience in this area			

Table 2 Multi Criteria Analysis Scoring Sheet

Option A1: BRT/LRT via Puhinui Road-SH20B	
Name of assessor (incl. qualifications and organisation)	
Area of assessment	Contaminated land
Score: -3 Significant Adverse/Un-mitigatable -2 Significant Adverse -1 Minor/Moderate Adverse 0 Neutral 1 Minor Positive 2 Moderate Positive 3 Significant Positive	
Potential to encounter and ability to manage the effects of contaminated soils and/or groundwater on human health and the environment. -1	
Notes: <u>Reasons / Comments</u> ■ Criteria: Potential to encounter and ability to manage the effects of contaminated soils and/or groundwater on human health and the environment. – Shallow disturbance of soil bound contamination likely across whole route <u>Assumptions</u> ■ excavation may extend in some location to 1.5m below ground surface and that groundwater may be present in some location at 1m below ground surface. <u>Other Information relied upon</u> ■ A review of historical and current aerial photography available on Auckland Council Geomaps ■ Our previous project experience in this area	

Table 3 Multi Criteria Analysis Scoring Sheet

Option A2: BRT/LRT via SH20A and SH20	
Name of assessor (incl. qualifications and organisation)	
Area of assessment	Contaminated land
Score: -3 Significant Adverse/Un-mitigatable -2 Significant Adverse -1 Minor/Moderate Adverse 0 Neutral 1 Minor Positive 2 Moderate Positive 3 Significant Positive	
Potential to encounter and ability to manage the effects of contaminated soils and/or groundwater on human health and the environment. -1	
Notes: <u>Reasons / Comments</u> ■ Criteria: Potential to encounter and ability to manage the effects of contaminated soils and/or groundwater on human health and the environment. – Shallow disturbance of soil bound contamination likely across whole route <u>Assumptions</u> ■ excavation may extend in some location to 1.5m below ground surface and that groundwater may be present in some location at 1m below ground surface. <u>Other Information relied upon</u> ■ A review of historical and current aerial photography available on Auckland Council Geomaps ■ Our previous project experience in this area	

Table 4 Multi Criteria Analysis Scoring Sheet

Option B1: BRT/LRT from Puhinui to Clover Park via Puhinui Road	
Name of assessor (incl. qualifications and organisation)	
Area of assessment	Contaminated land
Score: -3 Significant Adverse/Un-mitigatable -2 Significant Adverse -1 Minor/Moderate Adverse 0 Neutral 1 Minor Positive 2 Moderate Positive 3 Significant Positive	
Potential to encounter and ability to manage the effects of contaminated soils and/or groundwater on human health and the environment. -1	
Notes: <u>Reasons / Comments</u> ■ Criteria: Potential to encounter and ability to manage the effects of contaminated soils and/or groundwater on human health and the environment. – Shallow disturbance of soil bound contamination likely across whole route. <u>Assumptions</u> ■ excavation may extend in some location to 1.5m below ground surface and that groundwater may be present in some location at 1m below ground surface. <u>Other Information relied upon</u> ■ A review of historical and current aerial photography available on Auckland Council Geomaps ■ Our previous project experience in this area	

Table 5 Multi Criteria Analysis Scoring Sheet

Option B2: BRT/LRT from Puhinui to Manukau via Ronwood Ave			
Name of assessor (incl. qualifications and organisation)			
Area of assessment	Contaminated land		
Score: -3 Significant Adverse/Un-mitigatable -2 Significant Adverse -1 Minor/Moderate Adverse 0 Neutral 1 Minor Positive 2 Moderate Positive 3 Significant Positive			
<table border="1"> <tr> <td>Potential to encounter and ability to manage the effects of contaminated soils and/or groundwater on human health and the environment.</td> </tr> <tr> <td>-2</td> </tr> </table>		Potential to encounter and ability to manage the effects of contaminated soils and/or groundwater on human health and the environment.	-2
Potential to encounter and ability to manage the effects of contaminated soils and/or groundwater on human health and the environment.			
-2			
Notes: <u>Reasons / Comments</u> ■ Criteria: Potential to encounter and ability to manage the effects of contaminated soils and/or groundwater on human health and the environment. – Shallow disturbance of soil bound contamination likely across whole route. Wiri industrial estate has significant contaminating history potentially contaminated groundwater may be disturbed. New services may mobilise existing contamination <u>Assumptions</u> ■ excavation may extend in some location to 1.5m below ground surface and that groundwater may be present in some location at 1m below ground surface. <u>Other Information relied upon</u> ■ A review of historical and current aerial photography available on Auckland Council Geomaps ■ Our previous project experience in this area			

Table 6 Multi Criteria Analysis Scoring Sheet

Option B3: BRT/LRT from Puhinui to Manukau via Manukau Station Rd			
Name of assessor (incl. qualifications and organisation)			
Area of assessment	Contaminated land		
Score: -3 Significant Adverse/Un-mitigatable -2 Significant Adverse -1 Minor/Moderate Adverse 0 Neutral 1 Minor Positive 2 Moderate Positive 3 Significant Positive			
<table border="1"> <tr> <td>Potential to encounter and ability to manage the effects of contaminated soils and/or groundwater on human health and the environment.</td> </tr> <tr> <td>-2</td> </tr> </table>		Potential to encounter and ability to manage the effects of contaminated soils and/or groundwater on human health and the environment.	-2
Potential to encounter and ability to manage the effects of contaminated soils and/or groundwater on human health and the environment.			
-2			
Notes: <u>Reasons / Comments</u> ■ Criteria: Potential to encounter and ability to manage the effects of contaminated soils and/or groundwater on human health and the environment. – Shallow disturbance of soil bound contamination likely across whole route. Wiri industrial estate has significant contaminating history potentially contaminated groundwater may be disturbed. New services may mobilise existing contamination <u>Assumptions</u> ■ excavation may extend in some location to 1.5m below ground surface and that groundwater may be present in some location at 1m below ground surface. <u>Other Information relied upon</u> ■ A review of historical and current aerial photography available on Auckland Council Geomaps ■ Our previous project experience in this area			

Table 7 Multi Criteria Analysis Scoring Sheet

Option C1: BRT/LRT from Manukau to Botany via Chapel Road	
Name of assessor (incl. qualifications and organisation)	
Area of assessment	Contaminated land
Score: -3 Significant Adverse/Un-mitigatable -2 Significant Adverse -1 Minor/Moderate Adverse 0 Neutral 1 Minor Positive 2 Moderate Positive 3 Significant Positive	
Potential to encounter and ability to manage the effects of contaminated soils and/or groundwater on human health and the environment. -1	
Notes: <u>Reasons / Comments</u> ■ Criteria: Potential to encounter and ability to manage the effects of contaminated soils and/or groundwater on human health and the environment. – Shallow disturbance of soil bound contamination likely across whole route <u>Assumptions</u> ■ excavation may extend in some location to 1.5m below ground surface and that groundwater may be present in some location at 1m below ground surface. <u>Other Information relied upon</u> ■ A review of historical and current aerial photography available on Auckland Council Geomaps ■ Our previous project experience in this area	

Table 8 Multi Criteria Analysis Scoring Sheet

Option C2: BRT/LRT from Manukau to Botany via Te Irirangi Drive			
Name of assessor (incl. qualifications and organisation)			
Area of assessment	Contaminated land		
Score: -3 Significant Adverse/Un-mitigatable -2 Significant Adverse -1 Minor/Moderate Adverse 0 Neutral 1 Minor Positive 2 Moderate Positive 3 Significant Positive			
<table border="1"> <tr> <td>Potential to encounter and ability to manage the effects of contaminated soils and/or groundwater on human health and the environment.</td> </tr> <tr> <td>-1</td> </tr> </table>		Potential to encounter and ability to manage the effects of contaminated soils and/or groundwater on human health and the environment.	-1
Potential to encounter and ability to manage the effects of contaminated soils and/or groundwater on human health and the environment.			
-1			
Notes: <u>Reasons / Comments</u> ■ Criteria: Potential to encounter and ability to manage the effects of contaminated soils and/or groundwater on human health and the environment. – Shallow disturbance of soil bound contamination likely across whole route <u>Assumptions</u> ■ excavation may extend in some location to 1.5m below ground surface and that groundwater may be present in some location at 1m below ground surface. <u>Other Information relied upon</u> ■ A review of historical and current aerial photography available on Auckland Council Geomaps ■ Our previous project experience in this area			

Table 9 Multi Criteria Analysis Scoring Sheet

Option C3 BRT/LRT Manukau to Botany via Preston Road – Harris Road			
Name of assessor (incl. qualifications and organisation)			
Area of assessment	Contaminated land		
Score: -3 Significant Adverse/Un-mitigatable -2 Significant Adverse -1 Minor/Moderate Adverse 0 Neutral 1 Minor Positive 2 Moderate Positive 3 Significant Positive			
<table border="1"> <tr> <td>Potential to encounter and ability to manage the effects of contaminated soils and/or groundwater on human health and the environment.</td> </tr> <tr> <td>-2</td> </tr> </table>		Potential to encounter and ability to manage the effects of contaminated soils and/or groundwater on human health and the environment.	-2
Potential to encounter and ability to manage the effects of contaminated soils and/or groundwater on human health and the environment.			
-2			
Notes: <u>Reasons / Comments</u> ■ Criteria: Potential to encounter and ability to manage the effects of contaminated soils and/or groundwater on human health and the environment. – Shallow disturbance of soil bound contamination likely across whole route. Proximity to Greenmount fill may result in disturbing large volume of contamination in that section. The relatively new industrial area around Harris Road may contain poorly understood contaminated site which service may affect or which may have groundwater plumes that could be mobilised during construction <u>Assumptions</u> ■ excavation may extend in some location to 1.5m below ground surface and that groundwater may be present in some location at 1m below ground surface. <u>Other Information relied upon</u> ■ A review of historical and current aerial photography available on Auckland Council Geomaps ■ Our previous project experience in this area			

Table 10 Multi Criteria Analysis Scoring Sheet

Option X2: BRT/LRT from Airport to Ormiston via Mangere, Middlemore, Otara and Ormiston Road			
Name of assessor (incl. qualifications and organisation)	[Redacted]		
Area of assessment	Contaminated land		
Score: -3 Significant Adverse/Un-mitigatable -2 Significant Adverse -1 Minor/Moderate Adverse 0 Neutral 1 Minor Positive 2 Moderate Positive 3 Significant Positive			
<table border="1"> <tr> <td>Potential to encounter and ability to manage the effects of contaminated soils and/or groundwater on human health and the environment.</td> </tr> <tr> <td>-1</td> </tr> </table>		Potential to encounter and ability to manage the effects of contaminated soils and/or groundwater on human health and the environment.	-1
Potential to encounter and ability to manage the effects of contaminated soils and/or groundwater on human health and the environment.			
-1			
Notes: <u>Reasons / Comments</u> ■ Criteria: Potential to encounter and ability to manage the effects of contaminated soils and/or groundwater on human health and the environment. – Shallow disturbance of soil bound contamination likely across whole route <u>Assumptions</u> ■ excavation may extend in some location to 1.5m below ground surface and that groundwater may be present in some location at 1m below ground surface. <u>Other Information relied upon</u> ■ A review of historical and current aerial photography available on Auckland Council Geomaps ■ Our previous project experience in this area			

Approved by:

Title	Name	Qualification	Signature	Date
Author				
Reviewer				

Attachment C: Long list options

Memorandum

To	Environmental specialists - Airport to Botany SSBC	From	
Copy		Reference	Project number
Date	17 August 2018	Pages (including this page)	19
Subject	A2B long-list PT options description and assumptions		

1 Introduction

This memorandum provides descriptions and assumptions for the Airport to Botany (A2B) long-list Public Transport (PT) options to inform a Multi Criteria Analysis (MCA).

The A2B Long List PT Options Schematics are provided at Appendix A. The A2B long-list PT options are current at 30 July 2018.

2 Assumptions

The following outlines the assumptions for the A2B long-list PT options:

- The approximate design footprint of the A2B long-list PT options is from Auckland International Airport to Botany Town Centre.
- The proposed 20Connect Single Stage Business Case (SSBC) Project may be referred to but should not be assessed as part of the scope of the A2B long-list PT options.
- The 20Connect long-list options referenced in this memo are not to be taken as fixed options and are subject to change. The 20Connect long-list options are based on the outcome of the 20Connect SSBC Project.
- Auckland International Airport Limited (AIAL) will develop their own network response within the Airport precinct. As such, cross-sections cannot be provided at the time of writing. The schematics in Appendix A provide an indication of the extent of the Airport precinct.
- A walking and cycling component has been included within the long-list options as per the descriptions contained in this memo. A separate scope will be investigating the surrounding walking and cycling network. As such, facilities associated with each A2B option are subject to change.

3 Descriptions

3.1 General descriptions

This section outlines general descriptions that apply to all A2B long-list PT options.

- Wherever a Bus Rapid Transit/Light Rail Transit (BRT/LRT) corridor is assumed in the median of an existing corridor, it will require a cross section of 10m as per Figure 1
- Wherever a BRT/LRT corridor is assumed adjacent to a motorway, it will require a cross section of 11.4m as per Figure 2 (i.e. 2 x 0.6m wide concrete barriers, 2 x 1.6m wide channel / sway provision and 2 x 3.5m lanes)

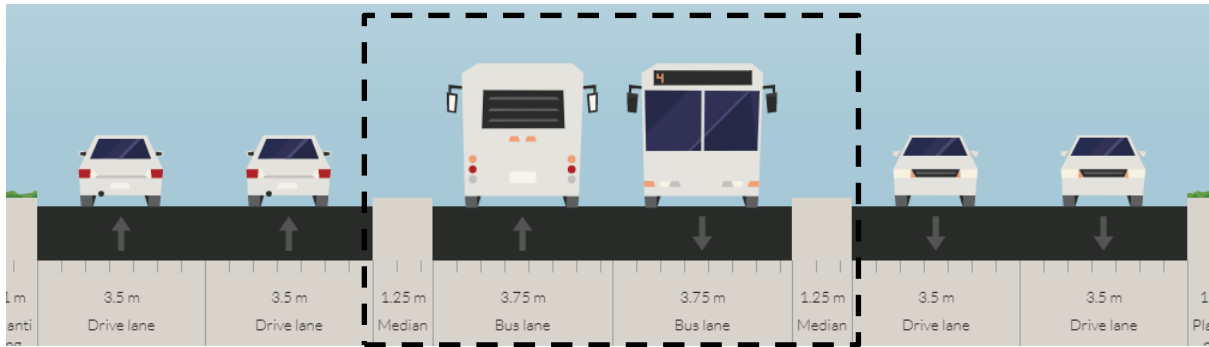


Figure 1: General cross-section when the LRT/BRT corridor is in the median of a carriageway

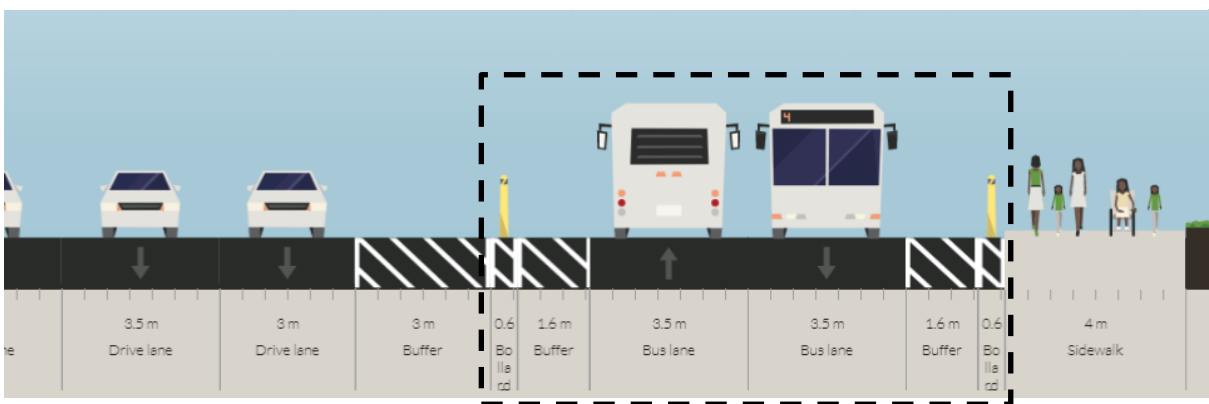


Figure 2: General cross-section when the LRT/BRT corridor is beside a carriageway

- Median BRT/LRT corridor stops will be provided at intersections which will require additional width.
- Existing road facilities will be retained or re-provided with the addition of the PT facility (i.e. number of lanes / widths, roadside parking etc. are to remain the same).
- Segregated walking and cycling facilities will comprise of 2m wide cycle paths and 2m wide footpaths. Where a Shared Use Path (SUP) is proposed this will comprise of a 4m wide facility.

3.2 Option specific descriptions

A description of each A2B long-list PT option is provided in Table 1 and shown in the schematics in Appendix A.

Table 1: Descriptions for each long-list PT option

Group	Mode	Option	Name	Description
Street corridor alignment options: A. Airport to Puhinui	BRT or LRT	A1	Airport to Puhinui via SH20B and Puhinui Road	■ There will be an offline four lane motorway along the south side of SH20a (worst case scenario as per 20Connect option C2b – SH20b High Investment with North Facing Ramps - see Appendix B for diagram) - The LRT/BRT corridor will run between SH20b and the offline 4-lane motorway ■ The LRT/BRT corridor will run down the central median along the remainder of Puhinui Road towards Puhinui Train station ■ The LRT/BRT corridor along SH20b will connect to the median LRT/BRT corridor on Puhinui Rd via the

Group	Mode	Option	Name	Description
				intersection of Puhinui Rd and SH20's northbound on and off ramps - A SUP will run along the north side of the LRT/BRT corridor along SH20b - Segregated walking and cycling facilities will run along the remainder of Puhinui Road towards Puhinui Train Station
	BRT or LRT	A2	Airport to Puhinui via SH20a, SH20 and Puhinui Road	- The LRT/BRT corridor will run down the central median of SH20a (TBC by MRC), and Puhinui Road - The LRT/BRT corridor will run down the eastern side of SH20 - A SUP will run along the eastern side of SH20a and SH20 - Segregated walking and cycling facilities will run on both sides of Puhinui Road - SH20 and SH20a will have additional lanes in each direction (worst case as per 20Connect Option C1 – SH20A High Investment - see Appendix B for diagram) - A new interchange ramp will be constructed to connect the LRT/BRT corridor from SH20a over SH20 - The LRT/BRT corridor along SH20 will connect to the median LRT/BRT corridor on Puhinui Rd via the intersection of Puhinui Rd and SH20's southbound on and off ramps
Street corridor alignment options: B. Puhinui through Manukau	BRT or LRT	B1	Puhinui to Clover Park via Puhinui Rd	- The LRT/BRT corridor will run down the central median throughout the entirety of the route - Segregated walking and cycling facilities will run on both sides of the route
	BRT or LRT	B2	Puhinui to Manukau via Ronwood Ave	- The LRT/BRT corridor will run down the central median throughout the entirety of the route - Segregated walking and cycling facilities will run on both sides of the route
	BRT or LRT	B3	Puhinui to Manukau via Manukau Station Rd	- The LRT/BRT corridor will run down the central median throughout the entirety of the route - Segregated walking and cycling facilities will run on both sides of the entire route
Street corridor	BRT or LRT	C1	Manukau to Botany	The LRT/BRT corridor will run down the central median throughout the entirety of the route

Group	Mode	Option	Name	Description
alignment options: C. Manukau to Botany			via Chapel Rd	Segregated walking and cycling facilities will run on both sides of the entire route
	BRT or LRT	C2	Manukau to Botany via Te Irirangi Dr	- The LRT/BRT corridor will run down the central median throughout the entirety of the route - Segregated walking and cycling facilities will run on both sides of the entire route
	BRT or LRT	C3	Manukau to Botany via Preston Road-Harris Road	- The LRT/BRT corridor will run down the central median throughout the entirety of the route - Segregated walking and cycling facilities will run on both sides of the entire route
Street corridor alignment options: X. Alternate Corridors not via Puhinui-Manukau	BRT or LRT	X2	SH20a, Mangere, Middlemore, Otara, Ormiston	- SH20a will have additional lanes in each direction (worst case as per 20Connect Option C1 – SH20A High Investment - see Appendix B for diagram) - The LRT/BRT corridor will run down the central median of SH20a - The LRT/BRT corridor will run down the central median from Mangere to Ormiston - Walking and cycling facilities will run on both sides of the route from Mangere to Ormiston. - The LRT/BRT corridor will cross the rail lines at Middlemore Hospital - The LRT/BRT corridor will go off-road between Massey Road and Gray Ave, across the Grange Golf Club and between East Tamaki Road and Ormiston Road - Off-road sections will only consist the LRT/BRT corridor
Integrated off-street option	Heavy Rail	I5	Heavy rail spur line from Wiri junction + Botany BRT	- The rail corridor runs on the south side of SH20b until it diverts to connect to the existing line to the south of Puhinui Station - The rail corridor will transition into an underground tunnel at Pukaki Creek towards the Airport - There will be an offline four lane carriageway along the south side of SH20b (worst case scenario as per 20Connect Option C2b – SH20b High Investment with North Facing Ramps - see Appendix B for diagram)

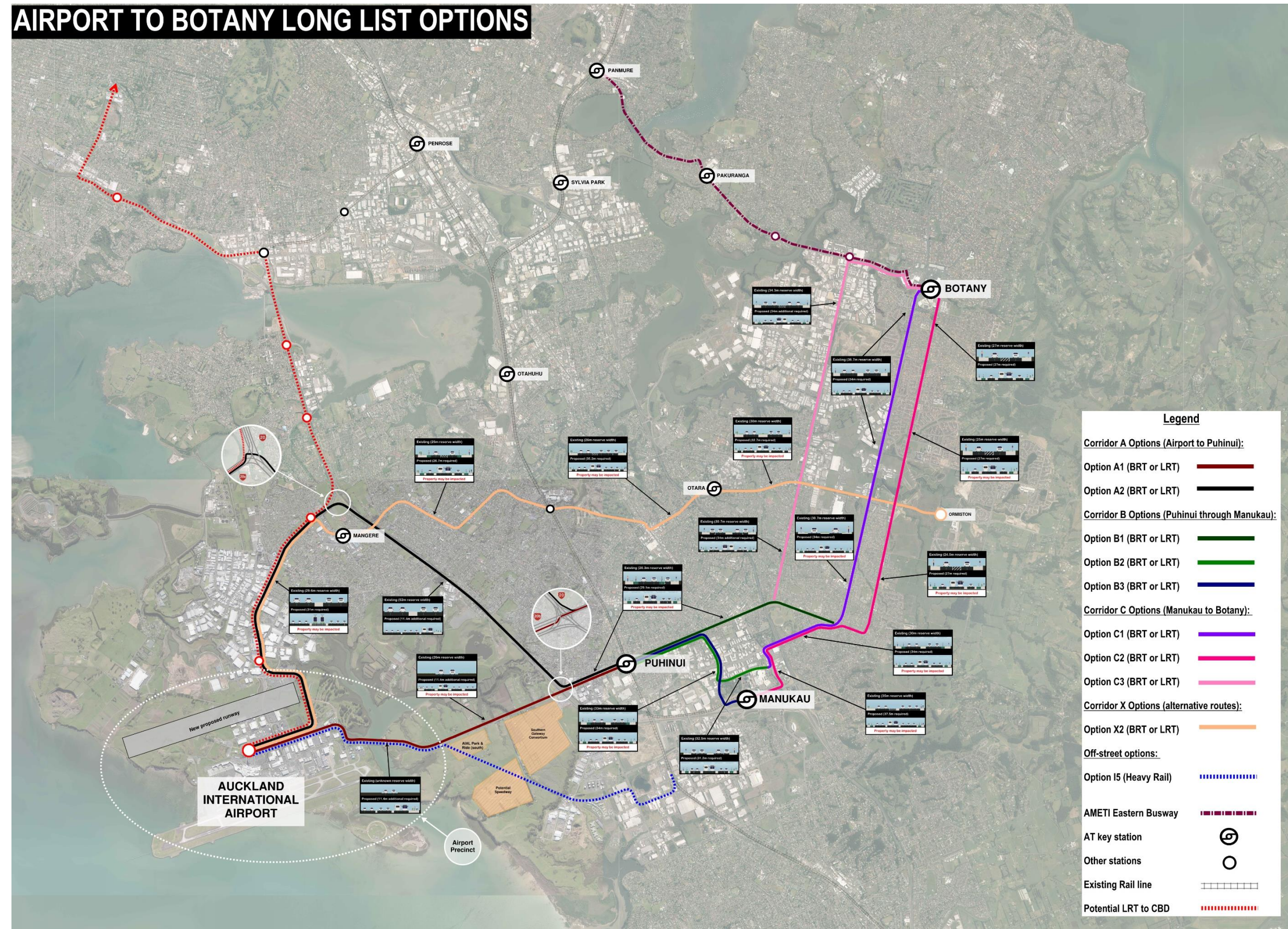
APPENDIX A

A2B Long-List PT Option Schematics

- Summary of all Options including Reserve / Proposed Widths
- Option A1 - Airport to Puhinui via SH20B and Puhinui Road
- Option A2 - Airport to Puhinui via SH20a, SH20 and Puhinui Road
- Option B1 - Puhinui to Clover Park via Puhinui Rd
- Option B2 - Puhinui to Manukau via Ronwood Ave
- Option B3 - Puhinui to Manukau via Manukau Station Rd
- Option C1 - Manukau to Botany via Chapel Rd
- Option C2 - Manukau to Botany via Te Irirangi Dr
- Option C3 – Manukau to Botany via Preston Rd – Harris Rd
- Option X2 - SH20a, Mangere, Middlemore, Otara, Ormiston
- Option I5 - Heavy Rail Spur Line from Wiri junction + Botany BRT

Summary of all Options including Reserve / Proposed Widths

AIRPORT TO BOTANY LONG LIST OPTIONS



Option A1 - Airport to Puhinui via SH20B and Puhinui Road



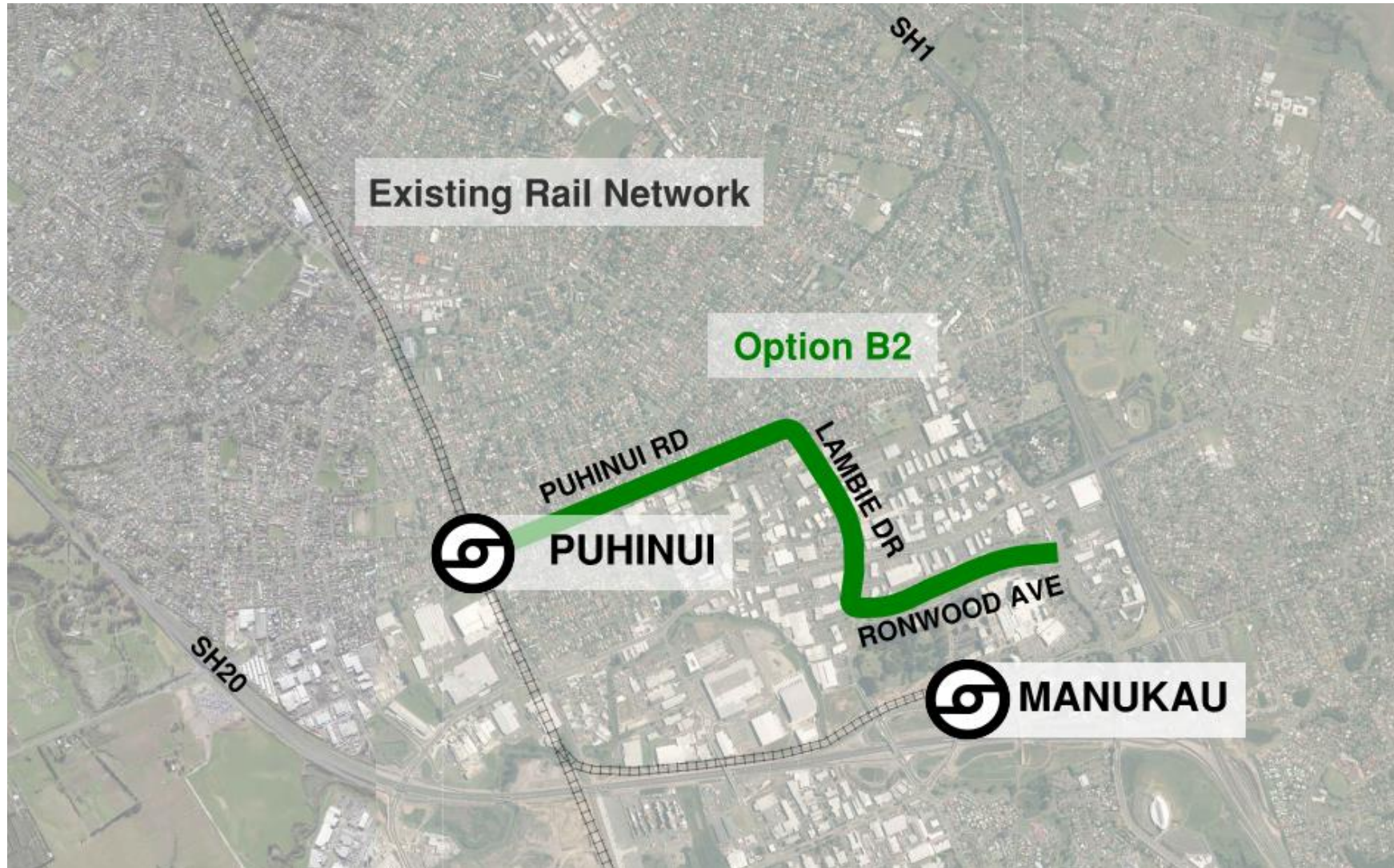
Option A2 - Airport to Puhinui via SH20a, SH20 and Puhinui Road



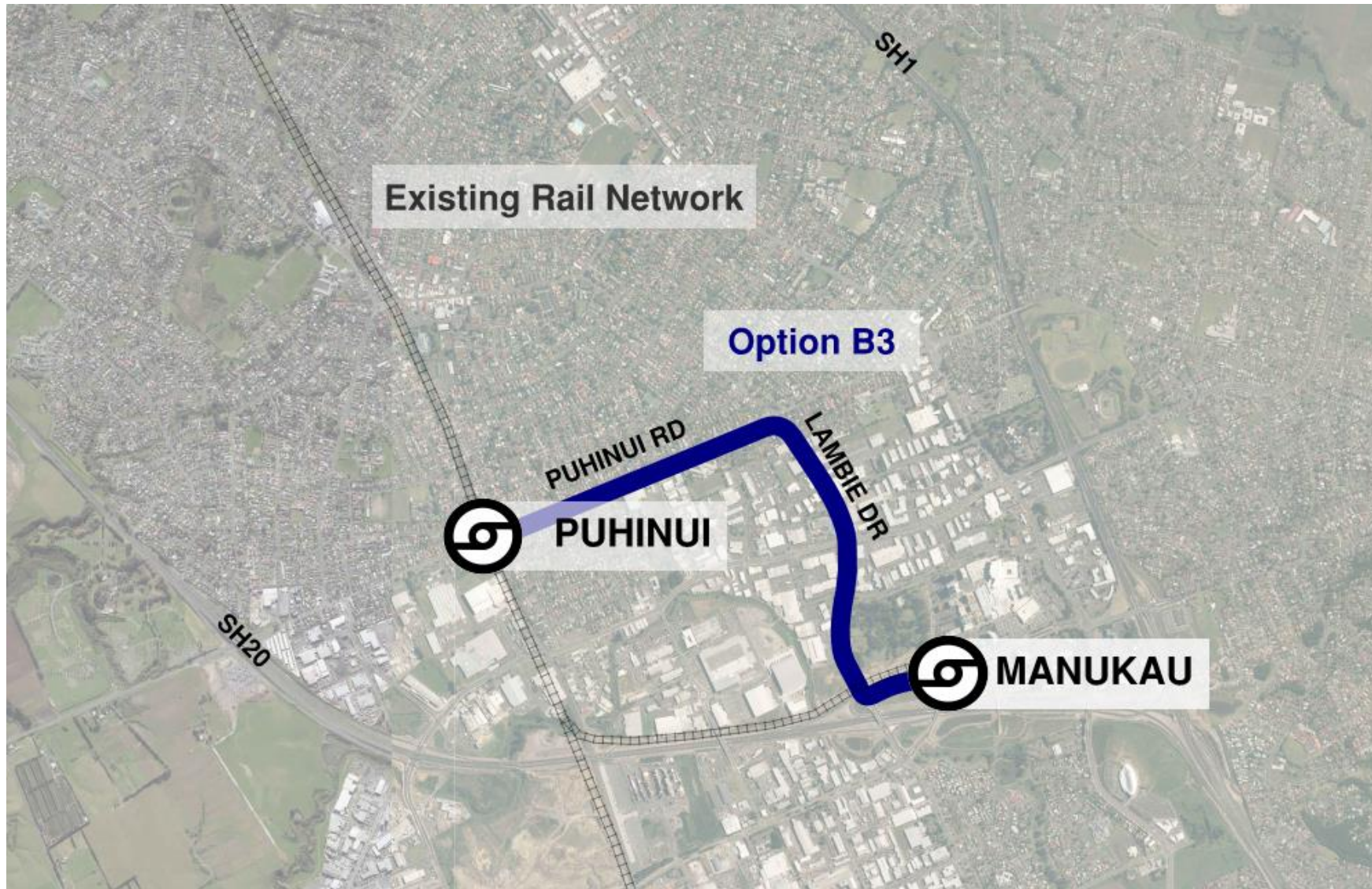
Option B1 - Puhinui to Clover Park via Puhinui Rd



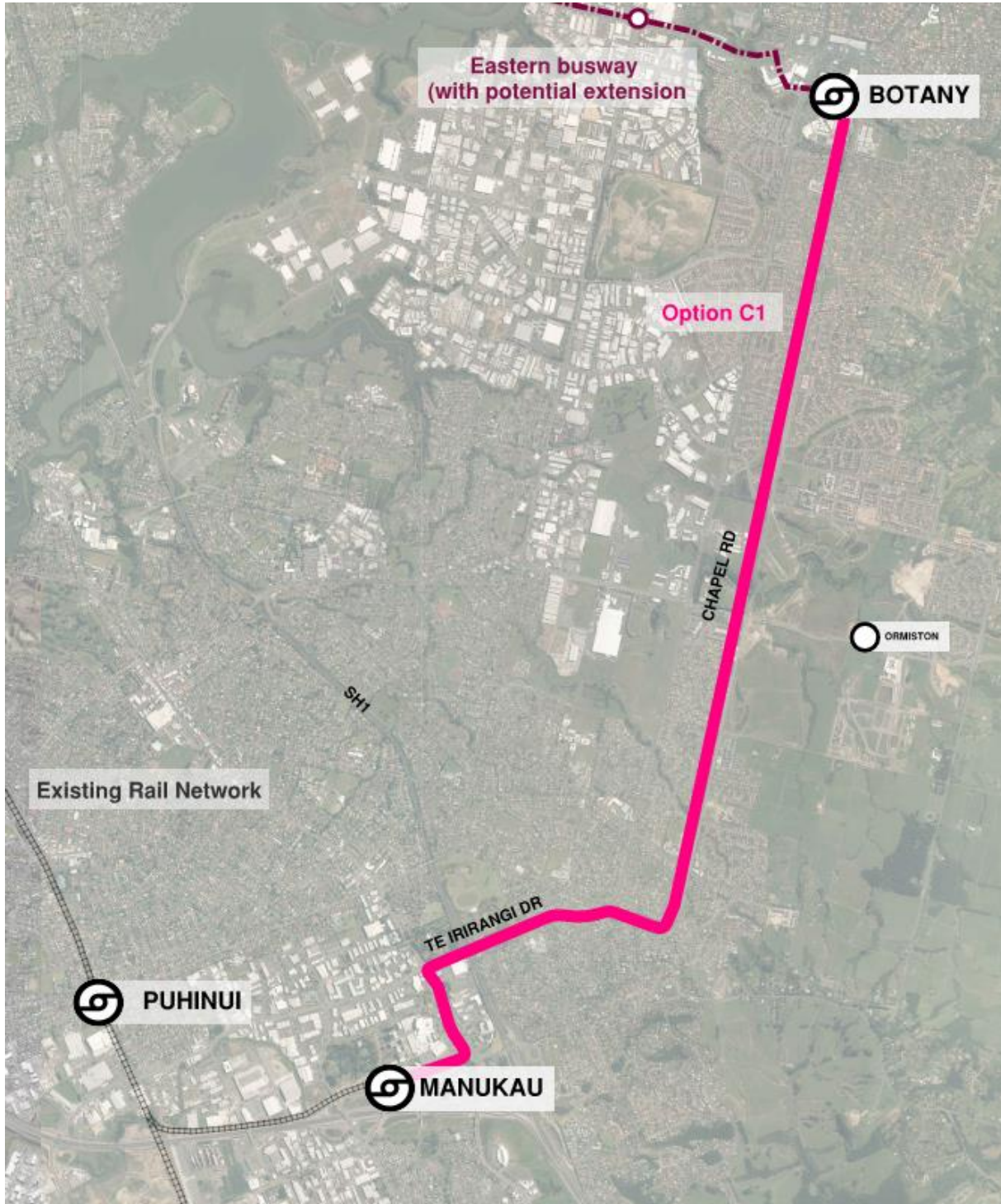
Option B2 - Puhinui to Manukau via Ronwood Ave



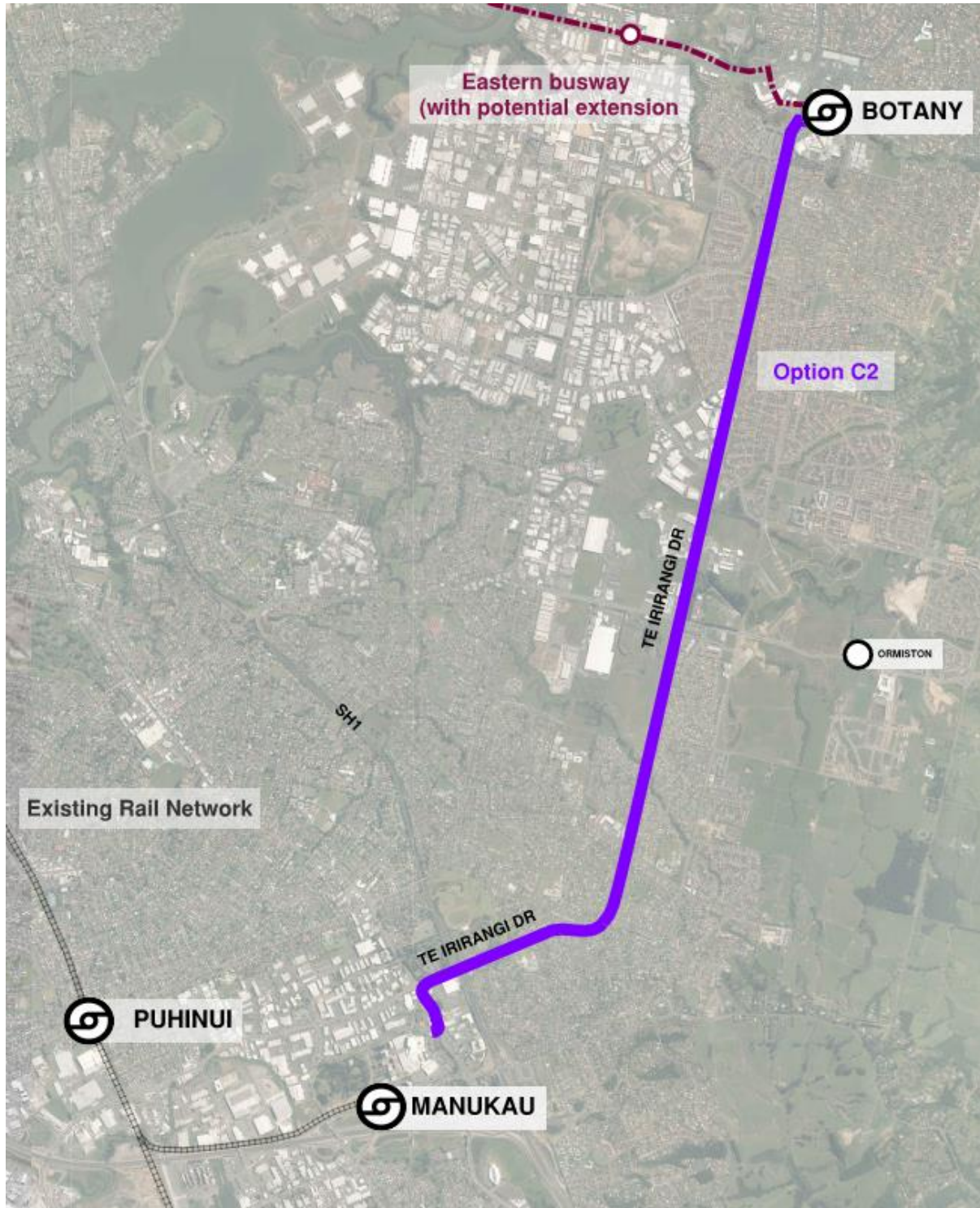
Option B3 - Puhinui to Manukau via Manukau Station Rd



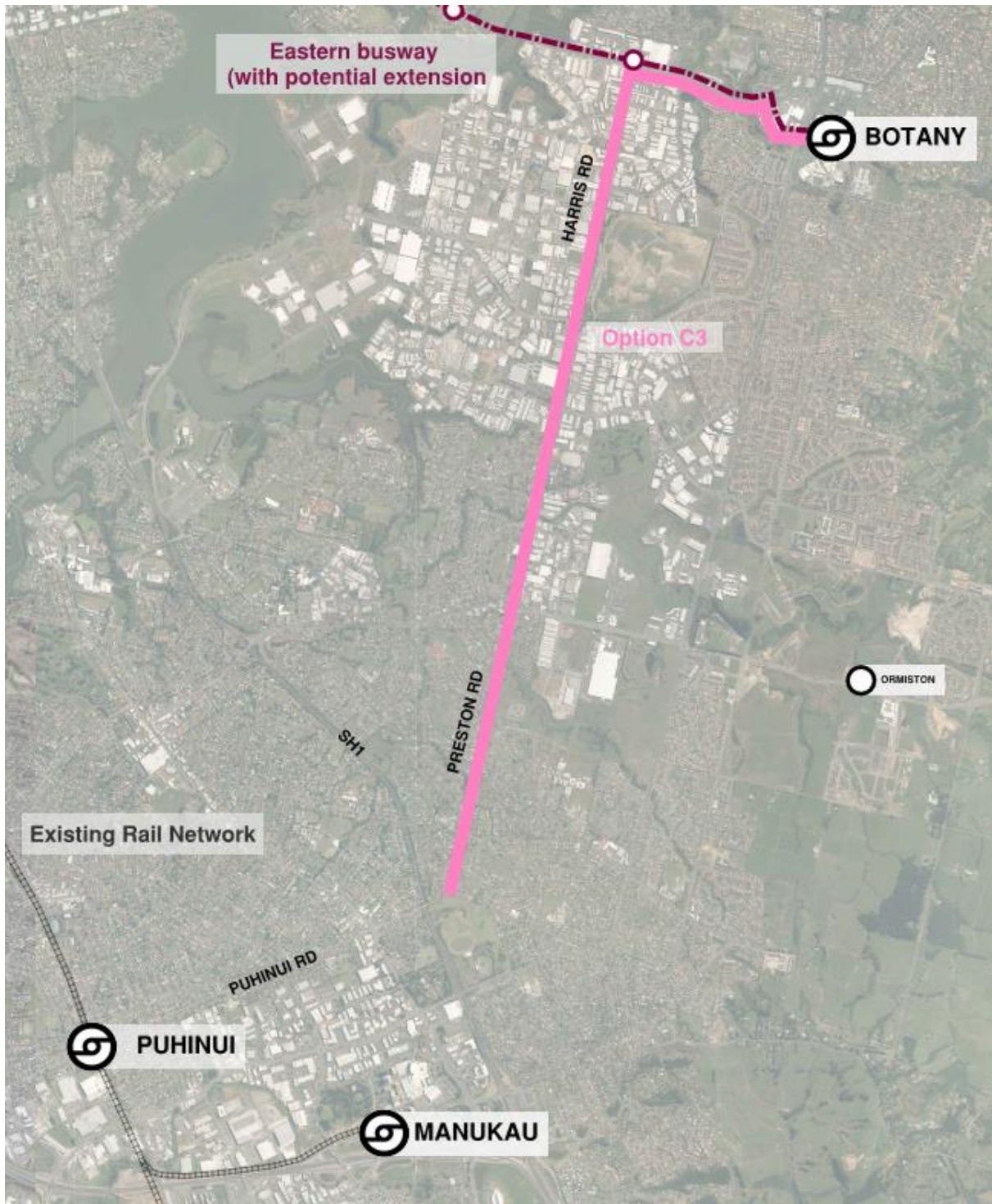
Option C1 - Manukau to Botany via Chapel Rd



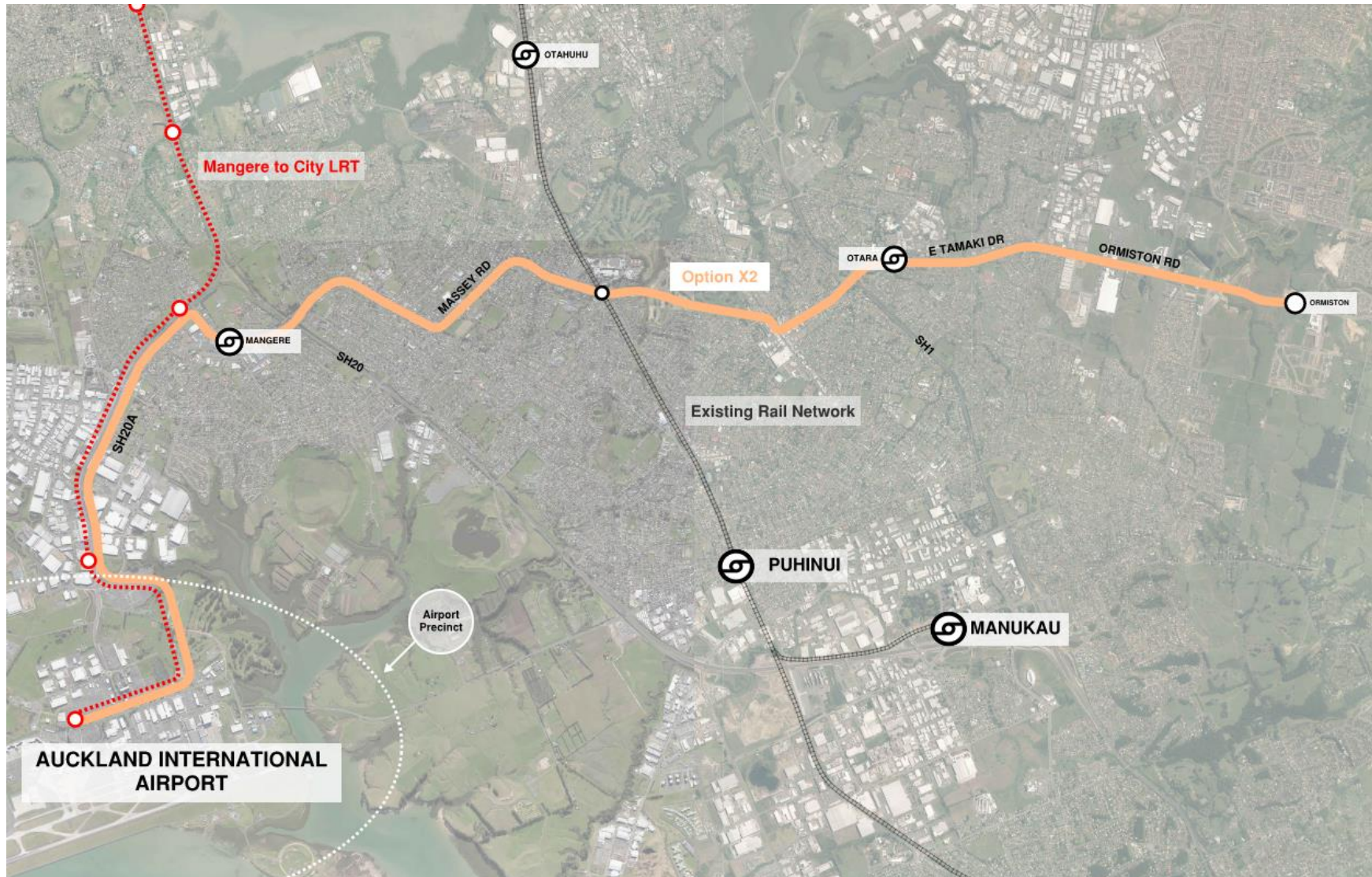
Option C2 - Manukau to Botany via Te Irirangi Dr



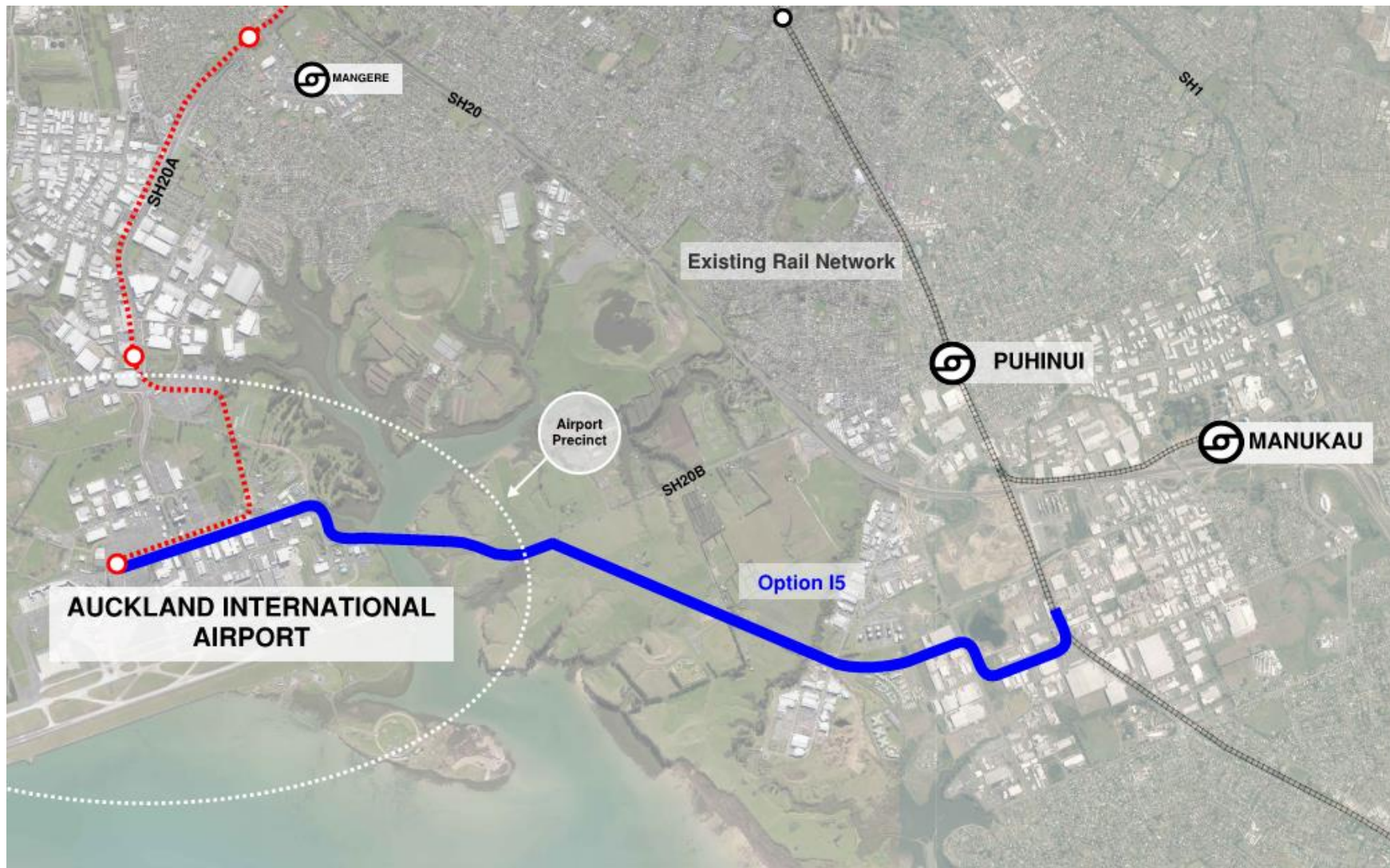
Option C3 - Manukau to Botany via Preston Rd – Harris Rd



Option X2 - SH20a, Mangere, Middlemore, Otara, Ormiston



Option I5 - Heavy rail spur line from Wiri junction + Botany BRT

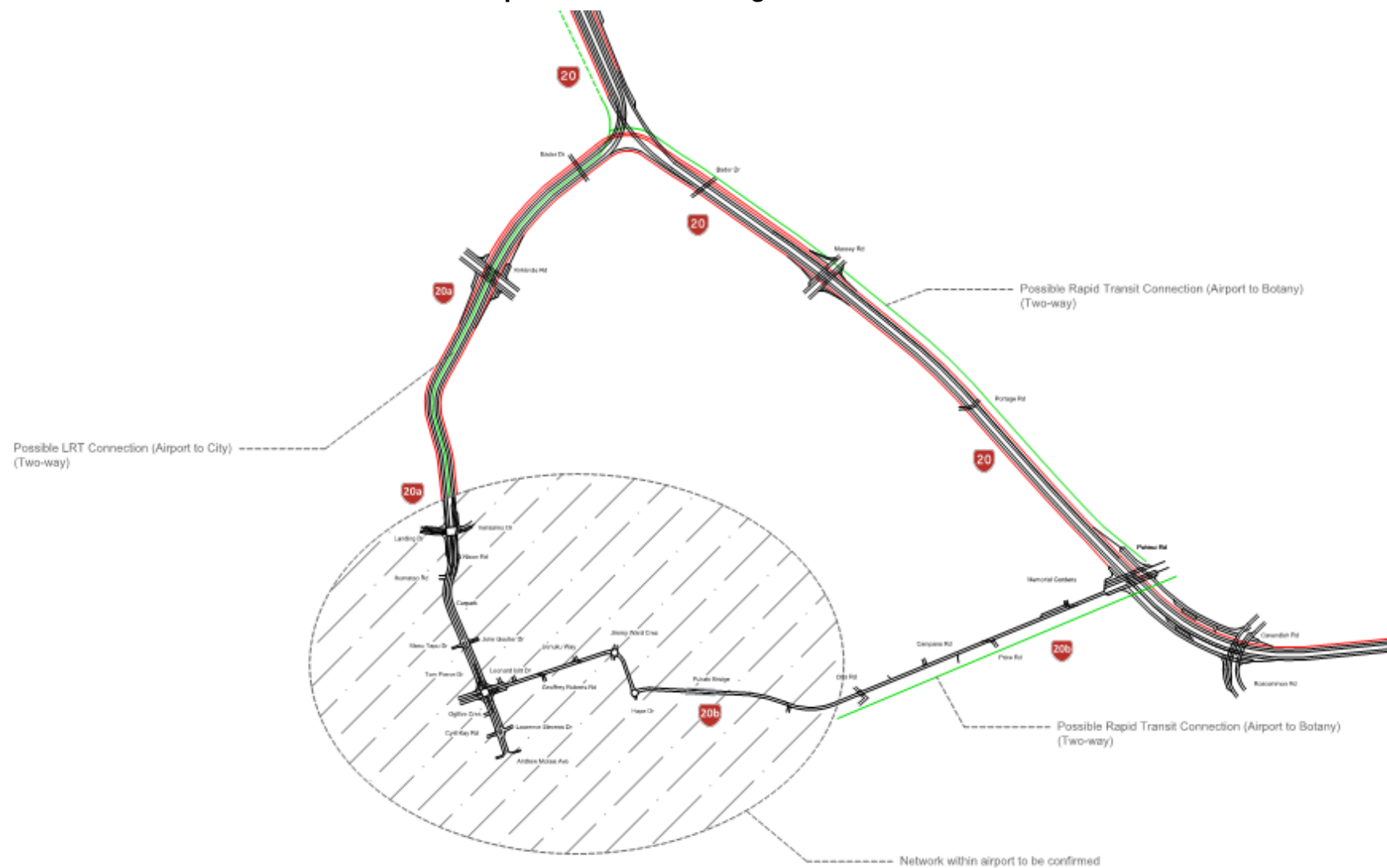


APPENDIX B

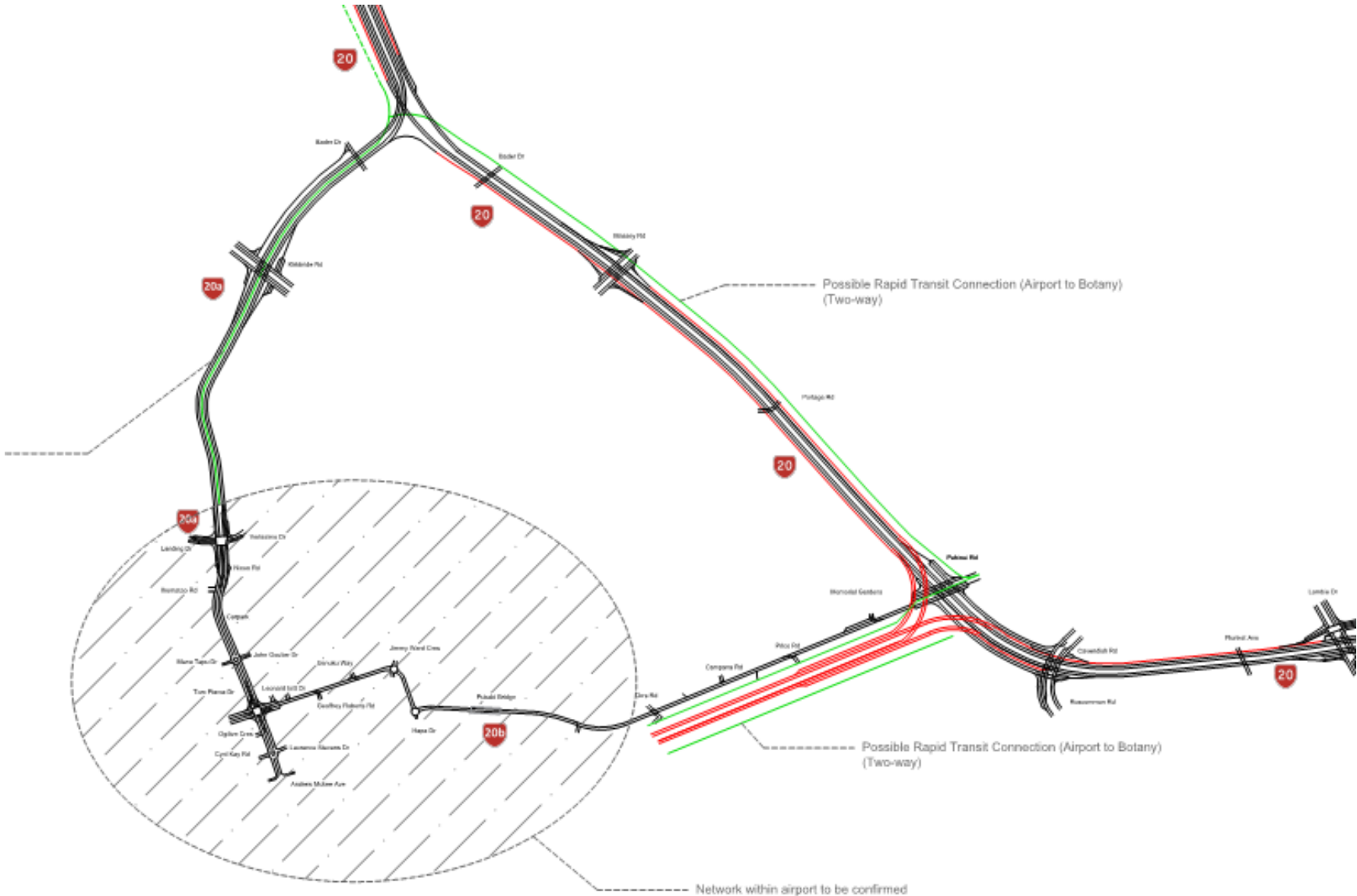
20Connect Long-List Option Schematics

- Option C1 – SH20A High Investment
- Option C2b – SH20B High Investment Only – Motorway Puhinui All Ramps

Option C1 – SH20A High Investment



Option C2b – SH20B High Investment Only – Motorway Puhinui All Ramps



Technical Note

To	Auckland Transport	From	
Copy		Reference	502334-6000-TEC-RR-0001
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Subject	Long List Engineering Assessment		

**Name of assessor
(incl. qualifications and organisation):**

1 Introduction

This document provides an assessment of the long-list options for the Airport to Botany (A2B) Single Stage Business Case (SSBC). It details the considerations which have been used to inform the assessment and is designed to contribute to the Multi-Criteria Analysis (MCA) which is being undertaken for the long-list options.

2 Methodology

This assessment has taken into consideration the implementability in relation to the proposed options. No surveys, investigations or detailed site visits have been undertaken as part of this assessment.

A high-level desktop assessment of the following criteria for the proposed long list options has been undertaken (Table 1).

Table 1: Feasibility criteria

Constructability	Level of complexity: - How straightforward is it to implement this option? - Are there any challenges with construction methodology and staging or constraints? - Consider topography, gradients, utilities, ground conditions, contaminated land, tie-ins to existing infrastructure etc.
Construction disruption	Construction impacts on people and businesses regarding: - Traffic - Existing access levels - Duration - Impacts on businesses / communities / town centres
Construction cost and risk	Assessed cost for construction of options including: - Complexity and risk in construction (including consideration of constructability) - Complexity in the programme - Construction cost

Safety in design and construction	Level of design and construction  - Are there significant hazards associated with the option which pose a health and safety risk in design, build and final product? - Can safety be developed into the design process to control it? - Level of complexity in risk management through safety in design.
Operation and maintenance	Any factors that may affect the ability to operate or maintain the option over its projected life: - Any major ongoing or additional costs and/or whole of life costs? - Level of maintenance activities required - Capability to carry out maintenance activities.

Table 2 details how the engineering and design feasibility criteria has been scored for each option.

Table 2: Scoring of feasibility criteria

Rating	Description
5	Straight forward and minor works. Low level of health and safety in design. Negligible/minor construction impacts, construction costs and maintenance and operation costs
4	Moderate works. Low to moderate level of health and safety in design. Minor to Moderate maintenance and operation costs. Minor amount of construction impacts and construction costs.
3	Major construction works. Moderate to high level of health and safety in design. Moderate maintenance and operation costs. Moderate amount of construction impacts and construction costs.
2	Uncommon construction works. High level of health and safety in design. Moderate to high maintenance and operation costs. high amount of construction impacts and construction costs.
1	Construction that has never been done in NZ. Significant/extreme level of health and safety in design. Significant maintenance and operation costs. Significant amount of construction impacts and construction costs.

3 Option Assessment

Table 3: Base case assessment

Base Case Existing Environment (Do minimum)	Score
n/a	n/a
Summary The Base Case assumes no change to the existing road network with no new construction impacts, except on-going maintenance and operations. For this reason, we have not assessed the implementation feasibility of the Base Case.	

Table 4: Option A1 assessment

Option A1 Airport to Puhinui via SH20B and Puhinui Road	Score
Constructability Major construction works but nothing unusual. May involve some traffic and local management issues. Straightforward to implement, non-challenging construction method and staging. The option passes through one motorway interchange (SH20 / SH20b), but at this stage construction is deemed to be business as usual. There are some major utilities along the option route such as a jet fuel line, wastewater and IP20 pipes. The route passes through a flight exclusion zone. An additional structure will need to be constructed adjacent to Pukaki bridge.	3
Construction disruption Moderate construction impacts on people and businesses. The area that the route passes through is rural and a major airport access route and there will be a need for an additional bridge structure, however as the majority of works will be undertaken off-line it is deemed to only have a moderate impact.	3
Construction cost and risk A construction cost estimate has not been undertaken. In comparison to Option A2 it is expected that the construction cost will be less.	3
Safety in design and construction Moderate to high level of health and safety design and construction risks but nothing unusual, with a higher level of safety in design required for the SH20 / SH20b interchange.	3
Operation and maintenance Minor to moderate level of maintenance and operation costs as the long-term maintenance is within capability, it can be carried out in isolation within the Rapid Transit Corridor (RTC), and no major ongoing costs are expected.	4
Summary Standard construction process that is straightforward to implement, with moderate construction disruption and costs. There is a moderate to high level of safety in design and construction due to the SH20/SH20b interchange, and operation and maintenance is minor to moderate as works can be carried out within the RTC.	

Table 5: Option A2 assessment

Option A2 Airport to Puhinui via SH20a, SH20 and Puhinui Road	Score
Constructability The work has been done before in NZ but is not common. The option route passes through a jet fuel line, and traverses two major interchanges, of which one is deemed to be difficult to construct due to its proximity to existing and proposed (SH20 / SH20a interchange & 20Connect) infrastructure. To cater for the proposed works, five existing local road bridges will need to be widened.	2
Construction disruption High amounts of construction impact on people and businesses. The area that the route passes through is mainly residential. The route is longer compared to Option A1. The need for widening of five local bridges is disruptive and will have a high impact on people and businesses.	2

Option A2 Airport to Puhinui via SH20a, SH20 and Puhinui Road	Score
Construction cost and risk A construction cost estimate has not been undertaken. However, due to a longer route compared to Option A, and with multiple bridge works construction costs are expected to be higher.	2
Safety in design and construction Moderate to high level of health and safety design and construction risks but nothing unusual, with a higher level of safety in design required for the works at major motorway interchanges.	3
Operation and maintenance Moderate to high level of maintenance and operation costs, as the long-term maintenance is within capability, it can be carried out in isolation within the RTC, and no major ongoing costs are expected. The option is a longer route, meaning more maintenance is required when compared to other options.	2
Summary An uncommon construction process, with moderate to high construction disruption and costs due to the longer nature of this option compared to others. A high level of safety in design and construction due to the motorway interchanges that the option passes through, and operation and maintenance is moderate to high due to the length of the option, although maintenance can be carried out in the RTC.	

Table 6: Option A6 assessment

Option A6 Airport to Puhinui via SH20B and Puhinui Road (Heavy Rail)	Score
Constructability The work has been done before in NZ but is not common. Most of the alignment is expected to be able to be built offline with minimal modification of existing rail lines. Being located on the south side of SH20B provides a connection to the Airport precinct that avoids expensive and high-impact crossings of SH20. AIAL have expressed clearly their desire for the Airport station to be located underground. This would reduce impacts on connectivity, improve the quality of place and reduce the amount of developable land lost to transit purposes. Doing so will impact major utilities within the Airport and lead to the assumption that tunnelling is required under Pukaki Creek in order to tie-in to the Airport station.	2
Construction disruption Significant amounts of construction impact on people and businesses. The area that the route passes through is commercial and industrial. The works will have a significant impact on these businesses.	1
Construction cost and risk A construction cost estimate has not been undertaken. Expected higher costs for construction than Options A1 and A2 due to rail infrastructure and tunnelling.	1
Safety in design and construction High level of health and safety design and construction risks associated with tunnelling.	2
Operation and maintenance Moderate maintenance and operation costs. Maintenance of tunnel required.	2
Summary	

An uncommon construction process, with high construction disruption and costs due to tunnelling. A high level of safety in design and construction, and operation and maintenance due to the requirements of the tunnel(s).

Table 7: Option B1 assessment

Option B1 Puhinui to Clover Park via Puhinui Road	Score
Constructability Major construction works but nothing unusual. Option will be straightforward to implement, with non-challenging construction methods and staging. Major utilities present but are unlikely to be heavily impacted; IP20, Hunua 4 pipes and fibre optic cables.	3
Construction disruption The area that the route passes through is mainly residential and contains narrow sections of existing carriageway. Therefore, acquisition of adjacent land will be required which will provide working space. The option will cause disruptions to Puhinui station. Overall, the construction impacts on people and businesses will be moderate.	3
Construction cost and risk A construction cost estimate has not been undertaken. Assumed moderate costs for construction of option with no differentiation between other corridor B options.	3
Safety in design and construction Moderate to high level of health and safety design but nothing unusual, with no significant risks associated with the option.	3
Operation and maintenance Minor to moderate level of maintenance and operation costs as the long-term maintenance is within capability, it can be carried out in isolation within the RTC, and no major ongoing costs are expected.	4
Summary Standard construction process that is straightforward to implement, with moderate construction disruption and costs. Moderate to high safety in design and construction, and minor to moderate operation and maintenance as works can be carried out within the RTC.	

Table 8: Option B3 assessment

Option B3 Puhinui to Manukau via Ronwood Ave	Score
Constructability Major construction works but nothing unusual. Option will be straightforward to implement, with non-challenging construction methods and staging. Major utilities present but are unlikely to be heavily impacted; IP20 and fibre optic cables.	3
Construction disruption The area that the route passes through is mainly residential and commercial and contains narrow sections of existing carriageway. Therefore, acquisition of adjacent land will be required which will provide working space. The option will cause disruptions to Puhinui station. Overall, the construction impacts on people and businesses will be moderate.	3
Construction cost and risk Same as Option B1	3
Safety in design and construction Same as Option B1	3
Operation and maintenance Same as Option B1	4
Summary Standard construction process that is straightforward to implement, with moderate construction disruption and costs. Moderate to high level of safety in design and construction, and minor to moderate operation and maintenance as works can be carried out within the RTC.	

Table 9: Option B5 assessment

Option B5 Puhinui to Manukau via Manukau Station Road	Score
Constructability Same as Option B3 but with additional works over the rail trench at Lambie Drive.	3
Construction disruption Same as Option B3 but includes potential disruption to Manukau Rail and Bus Stations.	3
Construction cost and risk Same as Option B1	3
Safety in design and construction Same as Option B1	3
Operation and maintenance Same as Option A1	4
Summary Standard construction process that is straightforward to implement, with moderate construction disruption and costs. Moderate to high level of safety in design and construction, and minor to moderate operation and maintenance as works can be carried out within the RTC.	

Table 10: Option C1 assessment

Option C1 Manukau to Botany via Chapel Road	Score
Constructability Major construction works but nothing unusual, including the widening of existing infrastructure over SH1. Straightforward to implement, non-challenging construction method and staging. Major utilities present but are unlikely to be heavily impacted; overhead Transpower lines at two locations (total of four lines), the Hunua 4 pipe and fibre optic cabling.	3
Construction disruption The area that the route passes through is mainly residential, with a section of commercial, recreational (Barry Curtis Park) and contains narrow sections of existing carriageway. Acquisition of adjacent land will be required for the majority of the route, which will provide working space. Alternative access connections available via Te Irirangi Drive during construction. TTM required on SH1 bridge crossing (Te Irirangi Drive), potentially displacing road users to use alternative routes to the busy connection at Redoubt Road and the lower volume Reagan Road.	3
Construction cost and risk A construction cost estimate has not been undertaken. Assumed moderate costs for construction of option with no differentiation between other corridor C options.	3
Safety in design and construction Same as Option B1	3
Operation and maintenance Same as Option B1	4
Summary Standard construction process that is straightforward to implement, with moderate construction disruption and costs. Moderate to high safety in design and construction, and minor to moderate operation and maintenance as works can be carried out within the RTC.	

Table 11: Option C2 assessment

Option C2 Manukau to Botany via Te Irirangi Drive	Score
Constructability Major construction works but nothing unusual, including the widening of existing infrastructure over SH1. Straightforward to implement, non-challenging construction method and staging. Major utilities present but are unlikely to be heavily impacted; overhead Transpower lines at two locations (total of four lines), the Hunua 4 pipe, 110kV underground cable and fibre optic cabling.	3
Construction disruption The area that the route passes through is mainly residential, with a section of commercial. The northern section of the route was previously future proofed for an RTC, providing construction space. The southern section requires land take, which will provide working space. Good alternative access connections exist via Chapel Road and Harris Road during construction. TTM required on SH1 bridge crossing (Te Irirangi Drive), potentially displacing road users to use alternative routes to the busy connection at Redoubt Road and the lower volume Reagan Road.	4
Construction cost and risk Same as Option C1	3
Safety in design and construction Same as Option B1	3
Operation and maintenance Same as Option B1	4
Summary Standard construction process that is straightforward to implement, with minor construction disruption and moderate costs due to the large existing median throughout the length of the road. Moderate to high safety in design and construction, and minor to moderate operation and maintenance as works can be carried out within the RTC.	

Table 12: Option C3 assessment

Option C3 Manukau to Botany via Preston Road and Harris Road	Score
Constructability Major construction works but nothing unusual, including the widening of existing infrastructure over SH1. Straightforward to implement, non-challenging construction method and staging. Major utilities present but are unlikely to be heavily impacted; overhead Transpower lines at two locations (total of four lines).	3
Construction disruption The area that the route passes through is industrial and residential. A section to the north of the route is wide enough to incorporate an RTC. The southern section requires land take, which will provide working space. To the north the industrial area is accessed via Harris Road, Ti Rakau and Highbrook Drive. Works along Harris Road will disrupt access to the adjacent large industrial area resulting in disruption and potentially long diversions. TTM required on SH1 bridge crossing (Reagan Road), potentially displacing road users to use alternative routes to the busy connection at Redoubt Road and Te Irirangi Drive.	2
Construction cost and risk Same as Option C1	3
Safety in design and construction	3

Same as Option B1	
Operation and maintenance	
Same as Option A1	4
Summary Standard construction process that is straightforward to implement, with high construction disruption and moderate costs. Moderate to high safety in design and construction, and minor to moderate operation and maintenance as works can be carried out within the RTC.	

Table 13: Option X2 assessment

Option X2 Airport to Ormiston via SH20a, Mangere, Middlemore, Otara, Ormiston	Score
Constructability Major construction works but nothing unusual. Motorway (SH1 & SH20) and rail crossings required. Straightforward to implement, non-challenging construction method and staging.	3
Construction disruption The area that the route passes through is mainly residential and contains narrow sections of existing carriageway. The whole route requires land take, which will provide working space. Large number of local roads affected leading to discrete disruption for many residents and local businesses.	3
Construction cost and risk A construction cost estimate has not been undertaken. Difficult to compare to other options due to different objectives.	3
Safety in design and construction Same as Option B1	3
Operation and maintenance Same as Option A1	4
Summary Standard construction process that is straightforward to implement, with moderate construction disruption. Moderate to high safety in design and construction, and minor to moderate operation and maintenance as works can be carried out within the RTN corridor.	

Approvals:

	Name	Title	Signature	Date
Authorised by:				
Reviewed by:				