Supporting Growth

Redhills Arterial Transport Network

Assessment of Alternatives

Volume 2 Appendix A

December 2022

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Document Status

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Acronyms

Acronym/Term	Description
AC DBC	Auckland Council Housing Infrastructure Fund Detailed Business Case
AEP	Annual Exceedance Probability
AT	Auckland Transport
AUP:OP	Auckland Unitary Plan Operative in Part 2016
FULSS	Future Urban Land Supply Strategy
GD01	GD01: Stormwater Management Devices Guide
GD04	GD04: Water Sensitive Design Guide
HIF	Housing Infrastructure Fund
MCA	Multi-Criteria Analysis
NoR	Notice of Requirement
PBC	Programme Business Case
RATN	Redhills Arterial Transport Network
RMA	Resource Management Act 1991
SG DBC	Supporting Growth Detailed Business Case
SH16	State Highway 16
SH18	State Highway 18
THAB	Residential – Terraced Housing and Apartment Zone
Waka Kotahi	Waka Kotahi NZ Transport Agency

1 Introduction

Auckland Transport (**AT**), as a requiring authority under the Resource Management Act 1991 (**RMA**), is serving Notices of Requirement (**NoR**) on Auckland Council (as the territorial authority) to designate land in the Auckland Unitary Plan: Operative in Part 2016 (**AUP:OP**) to enable the construction, operation, mitigation and maintenance of the future strategic transport network in Redhills, Auckland (the **Redhills Arterial Transport Network** or the **RATN**).

The RATN is comprised of two main arterial transport corridors; the North-South arterial corridor, and the East-West arterial corridor. The RATN has been divided into four NoRs which are described in Table 1 below.

Table 1: Overview of the Redhills Arterial Transport Network

Notice	Project	Description
NoR1	Redhills: North-South Arterial Corridor	Construction, operation and maintenance of a new arterial corridor from the centre of Redhills to the intersection of Don Buck Road and Royal Road.
NoR2a	Redhills: East-West Arterial Corridor	Construction, operation and maintenance of a new arterial corridor from Fred Taylor Drive to a new intersection with Baker Lane, generally following the alignment of Dunlop Road.
NoR2b		Construction, operation and maintenance of a new arterial corridor from Fred Taylor Drive to a new intersection with Dunlop Road, generally following the alignment of Baker Lane.
NoR2c		Construction, operation and maintenance of a new arterial corridor from a new intersection with Dunlop Road and Baker Lane to the intersection of Nixon Road, Nelson Road and Red Hills Road.

Section 171(1)(b) of the RMA requires a territorial authority, when making a recommendation on a NoR, to consider whether adequate consideration has been given to alternative sites, routes or methods of undertaking the work in situations where:

a. the requiring authority does not have an interest in the land sufficient for undertaking the work; or

b. it is likely that the work will have a significant adverse effect on the environment.

AT does not have an interest in all of the land required for the RATN and so AT is required to give adequate consideration to alternative sites, routes and methods in accordance with section 171(1)(b).

The purpose of this report is to document both the development of alternatives and the process used to assess and compare options in order to provide the information necessary to inform an assessment under section 171(1)(b) of the RMA for the RATN and to demonstrate that a thorough and robust assessment of alternatives has been undertaken.

1.1. Structure of this Report

The structure of the report is as follows:

Section	Heading	Description
1	Introduction	Purpose and structure of the report.
2	Background	Summary of the relevant project background which has directed the options development process, including a summary of the business case history for the RATN, and a discussion on the development of the investment objectives and project objectives.
3	Summary of Corridor Option Development and Assessment	Summary of the development and assessment of corridor options for the RATN as part of the Auckland Council Housing Infrastructure Fund Detailed Business Case.
4	Consideration of Alternative Routes	Overview of the development and assessment of corridor options and route options for the RATN as part of the Supporting Growth Programme Detailed Business Case, and the identification of the recommended options.
5	Stormwater Assessment	Overview of the assessment of stormwater options for the RATN.
6	Alternative Methods	Overview of the assessment of alternative methods for implementing the RATN.
7	Conclusions	Summary of conclusions.

2 Background

The delivery of bulk infrastructure is critical to enabling the urban development of greenfield land. As such, Auckland Council developed the Future Urban Land Supply Strategy (**FULSS**) to help provide clarity and certainty around when future urban land will have bulk infrastructure in place and be ready for urban development. In July 2017, the FULSS was updated in line with the AUP:OP zoning to establish an indicative approach to the staged urbanisation of rural land over the next 30 years.

In response to the FULSS, AT, Waka Kotahi NZ Transport Agency (**Waka Kotahi**), and Auckland Council identified a need to determine the most appropriate transport responses to support this envisioned urban growth.

To determine the most appropriate transport solution to respond to the scale and pace of growth in Auckland, AT and Waka Kotahi worked in partnership to develop business cases for each of Auckland's identified growth areas: Warkworth, North, North West and South.

The Supporting Growth Programme was established in 2018 which is a collaboration between AT and Waka Kotahi to undertake this work and investigate, plan and identify the preferred transport network to support Auckland's future urban growth areas over the next 30 years. AT and Waka Kotahi have partnered with Auckland Council, Manawhenua and KiwiRail Holdings Limited and are working closely with stakeholders and engaging with the community to develop the strategic transport network to support Auckland's growth areas. The RATN is located within the North West Growth area (refer to AEE for further detail).

2.1. Project Area – Overview

This report relates to the North West growth area, more particularly the area known as Redhills which is located approximately 20 km (by road) north west of the Auckland city centre. The area is comprised of 600ha of predominantly greenfield land which is bound by Fred Taylor Drive to the east, Don Buck Road to the south and Red Hills Road to the west.

Redhills was rezoned for a mix of residential and local centre land use zoning in 2016 as part of the AUP:OP process. The Redhills area was previously zoned Foothills and Countryside under the legacy Auckland Council District Plan – Waitākere Section 2003. The Redhills zoning under the AUP:OP provides for a new local centre (Business – local centre zone) in the middle of Redhills. The new local centre is surrounded by higher density residential land use zoning through the Residential – Terrace Housing and Apartment Building zone (**THAB**) and the Residential – Mixed Housing Urban zone. Further higher density residential land use is provided through THAB zoning adjacent to Fred Taylor Drive. Towards the western area of Redhills the zoning provides for lower density residential land use through the Residential – Mixed Housing Suburban zone and the Residential – Single House zone adjacent to the rural environment beyond the Rural Urban Boundary.

The Redhills zoning is complimented by the I610 Redhills Precinct, the purpose of which is to ensure a "*high quality residential development with a local centre established centrally within the precinct to provide a heart and focal point for the Redhills community*". This is implemented through the I610.10.1. Redhills Precinct: Precinct Plan 1 (Figure 2) which provides direction for the indicative transport network and opens spaces. This includes indicative alignments for the future arterial transport network within Redhills with fixed connection points into the surrounding transport network at the following existing intersections:

- Dunlop Road and Fred Taylor Drive;
- Baker Lane and Fred Taylor Drive;
- Don Buck Road and Royal Road;
- Red Hills Road, Nelson Road and Nixon Road; and
- Henwood Road (new intersection).

Figure 1 shows the land use zoning and existing precincts for Redhills under the AUP:OP, with the associated Redhills Precinct: Precinct Plan 1 shown in Figure 2.

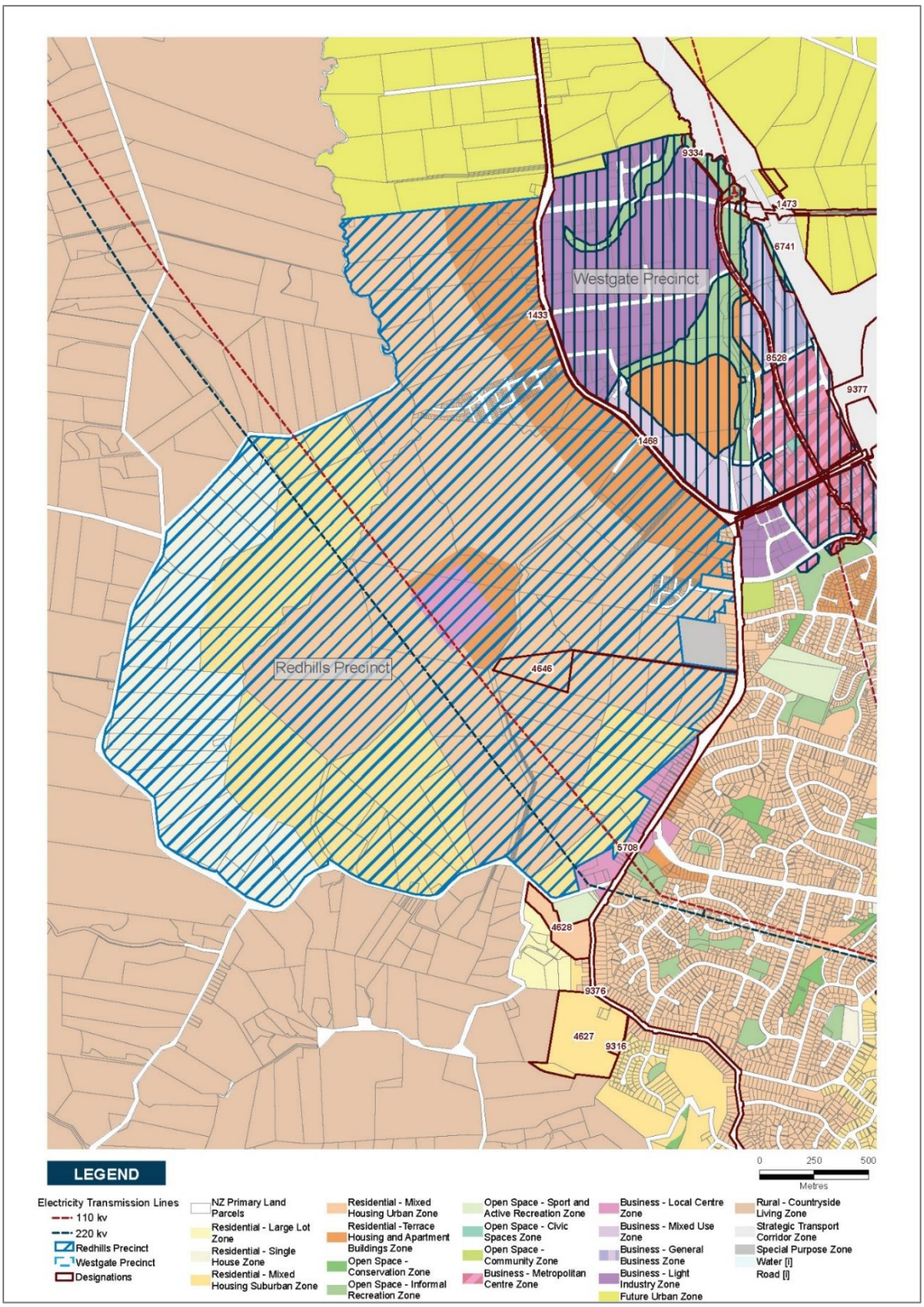

Figure 1: Redhills AUP:OP Land Use Zoning and Precincts

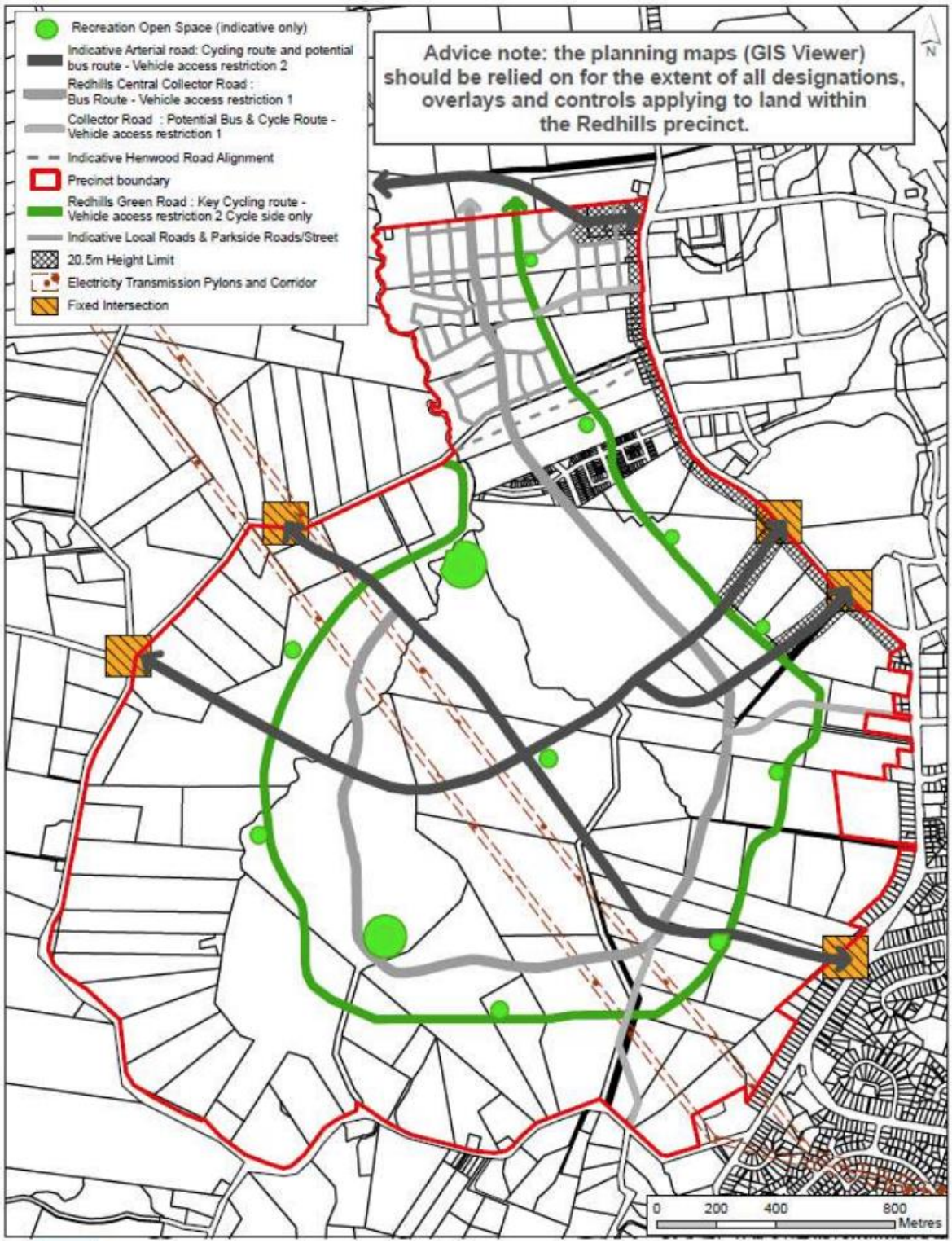

Figure 2: Redhills Precinct - Precinct Plan 1

2.2. Overview of the Option Development and Evaluation Process

In 2016, the Programme Business Case (**PBC**) was completed which identified a high-level draft preferred strategic transport network to support all of the growth areas in Auckland. This initial option development process involved workshops and collaborative consultation with multiple stakeholders to formulate potential options and interventions.

For the North West growth area, the PBC considered 80 long list options and 39 short list options, ultimately recommending 13 transport network components, including new and improved north-south and east-west connections in Redhills.

Following the completion of the PBC, the Crown announced its recommendation (in principle) to provide a loan to Auckland Council to fund $300 million of bulk infrastructure in North West Auckland through the Housing Infrastructure Fund (**HIF**).[1] This funding of bulk infrastructure was estimated at the time to support the early construction of at least 10,500 new homes in North West Auckland.

In order to consider the extent to which the HIF could be used to fund the investment of all infrastructure required to support accelerated development in Whenuapai and Redhills, Auckland Council prepared the Housing Infrastructure Fund Detailed Business Case (**AC DBC**). The AC DBC was supported by the Transport Network Option Evaluation Report that assessed options for Redhills.

The AC DBC concluded that a portion of the funding available from the HIF should be used to support the development of parts of the RATN. It is expected that this funding will be used where it can be integrated with early housing developments – likely to be those areas adjacent to Fred Taylor Drive where developers have progressed design and consenting. As such, there is a short term need to secure the land necessary to undertake the works as well as a longer term need to provide flexibility of staging and implementation within the wider RATN.

Following the AC DBC, the Supporting Growth Programme prepared the Supporting Growth Programme Detailed Business Case (**SG DBC**) in 2019 which specifically developed and evaluated options for the RATN. The SG DBC included further corridor refinement, multi-criteria analysis (**MCA**) and input from stakeholder/community engagement to assess options for the RATN.

The options from the AC DBC and SG DBC were then subject to further review, taking into account the additional protection afforded to natural wetlands under the National Policy Statement for Freshwater Management 2020.The development and assessment of alternatives for the RATN has therefore been completed through sequential options development processes in the PBC, AC DBC and SG DBC. This process forms the basis for this report, and

[1] The HIF was established by the Crown in 2016 to provide 10-year interest-free loans to high-growth councils. The funds were provided to help address funding constraints of high growth councils, with the purpose of funding core infrastructure to support housing development and increase housing supply. With approval of the HIF in 2017 for bulk infrastructure in the North West, Auckland Council is expected to repay this loan by 2027.

a summary of this process is outlined in

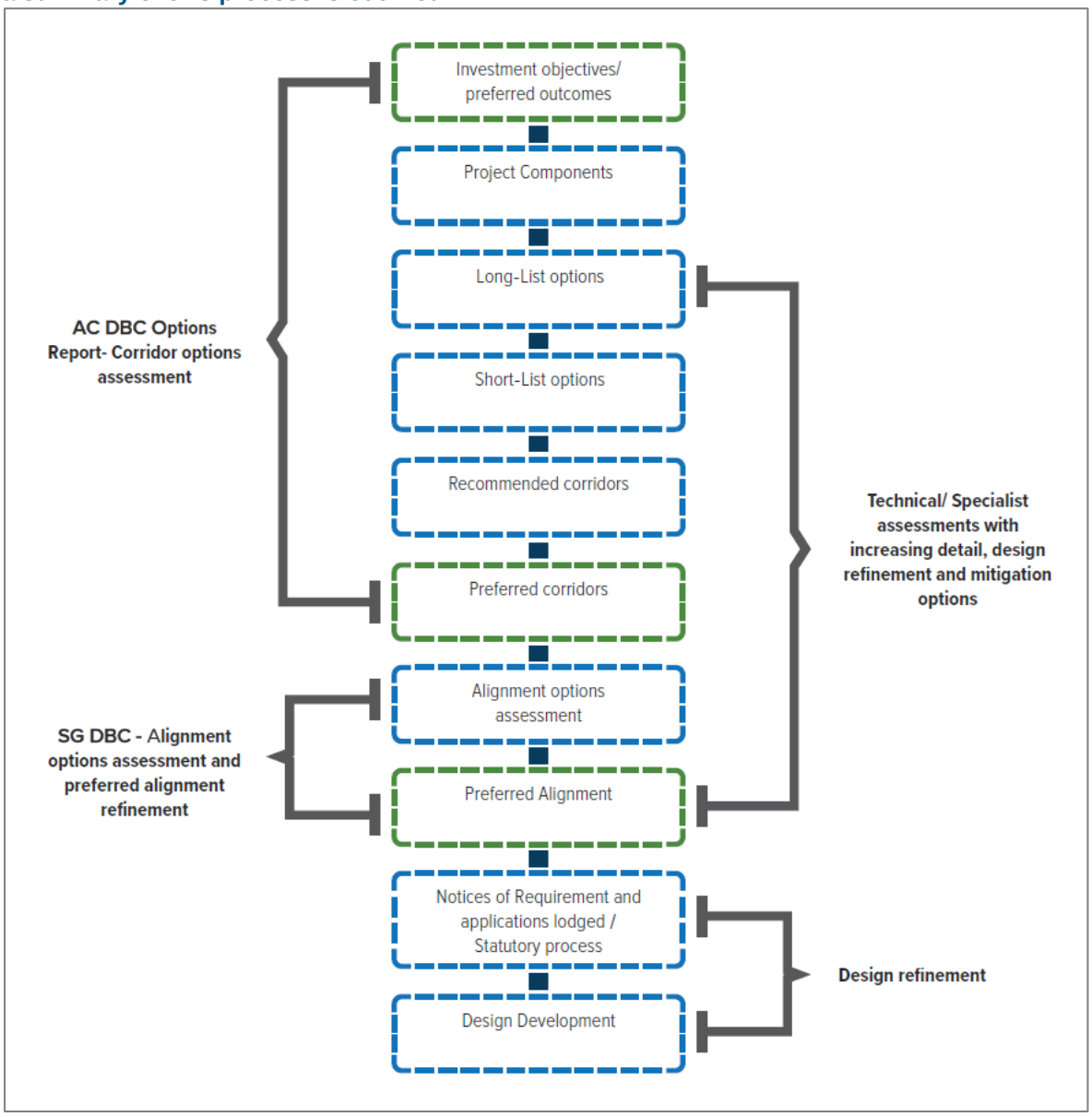

Figure 3 below.

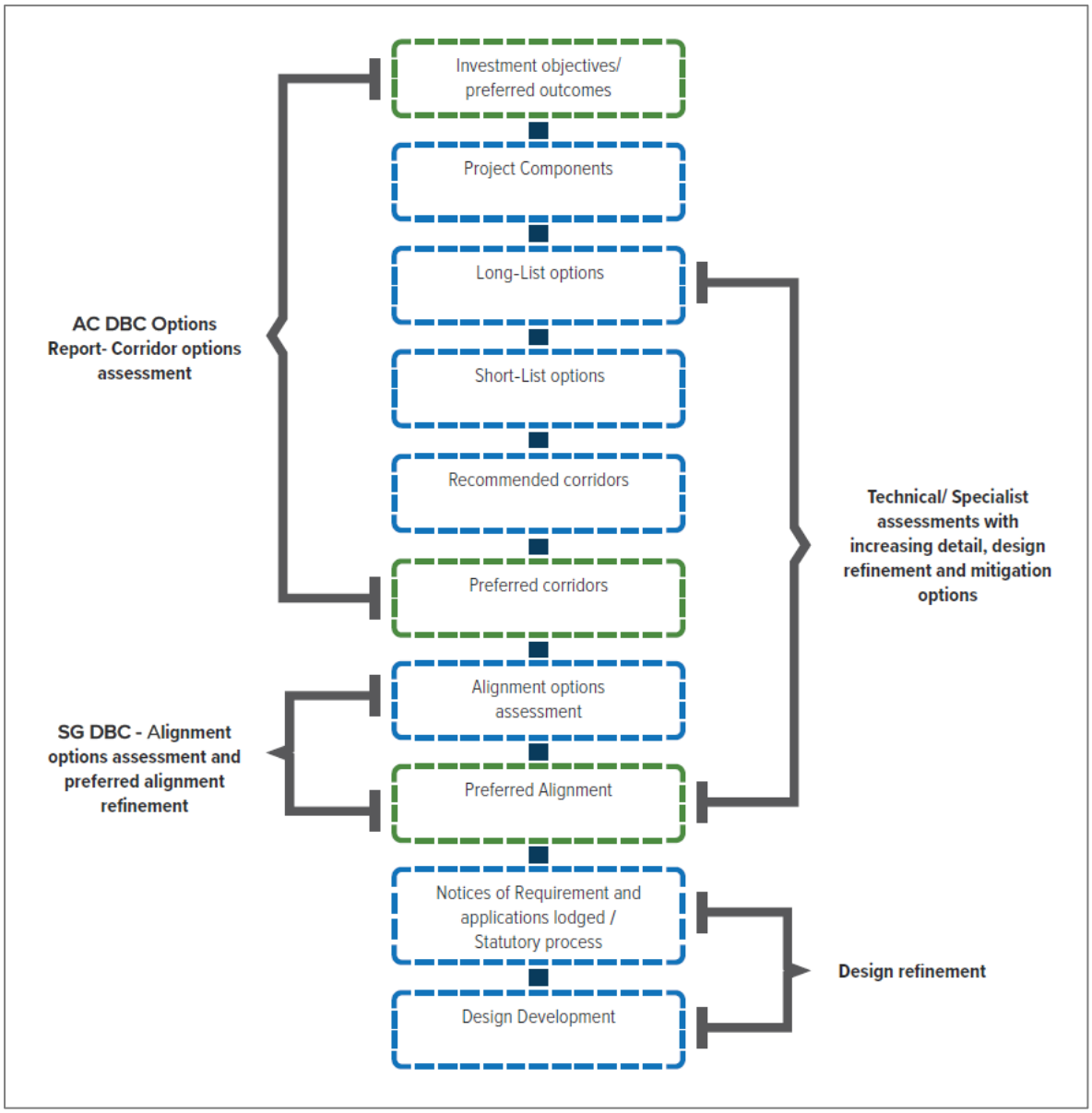

Figure 3: Options Development Process

2.3. Redhills Arterial Transport Network Investment Objectives and Project Objectives

Investment objectives were developed through the AC DBC process to assist with option assessment and investment decisions. These were developed at an area wide level for Whenuapai and Redhills and therefore did not contain project specific detail.

The investment objectives were then refined through the SG DBC process to confirm whether they remained relevant when focusing on the transport network option evaluation for the North West HIF area. As discussed at section 4.1 of this report, options have been assessed against the investment objectives in each of the MCA processes to assist in identifying the preferred options for the RATN.

The investment objectives have then been used to develop the RMA project objectives that are specific to the RATN. This process is shown in Figure 4 below.

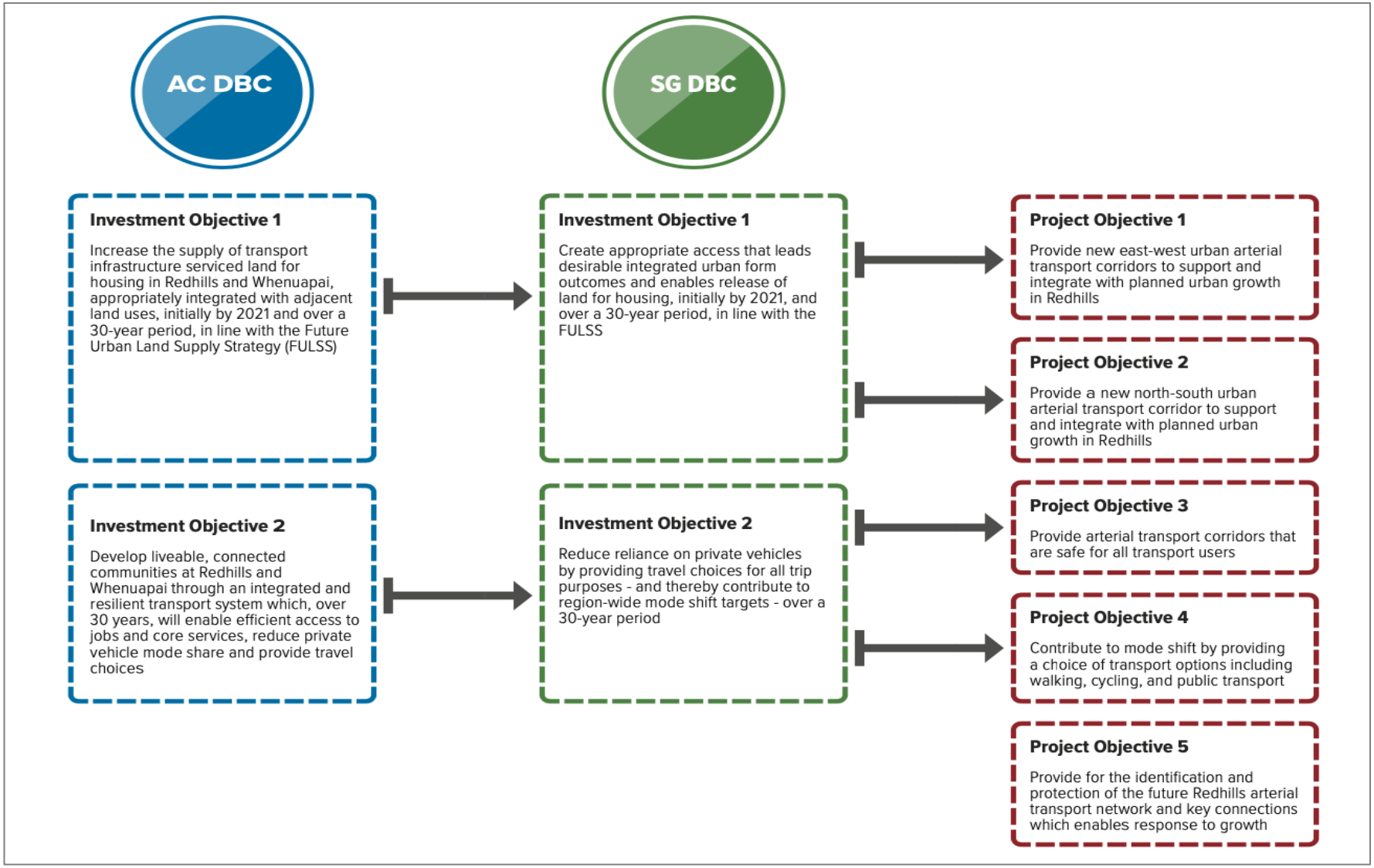

Figure 4: Development Process for Project Objectives

3 Summary of Corridor Option Development and Assessment

As noted above, following the Crown's recommendation (in principle) to provide a loan to Auckland Council to fund $300 million of bulk infrastructure in North West Auckland through the HIF, Auckland Council undertook to assess which parts of the PBC recommended network should be accelerated through the HIF funding.

This section of the report briefly describes the options assessment undertaken as part of the AC DBC which built on the conclusions of the PBC that new and improved north-south and east-west connections were required in Redhills.

For the purposes of this assessment, a 30m wide cross section was assumed for all Redhills assessments in order to accommodate the recommended typologies and key features of an urban arterial road.

3.1. Overview of Assessment Framework

To enable a structured, consistent, systematic and replicable process for assessing alternatives and options, an MCA framework was developed for the AC DBC. The MCA is a tool that is often used to assist in the decision-making process and provides an opportunity to understand how different options compare against a set of standard and grouped criteria. This interdisciplinary framework was developed collaboratively, drawing on the collective knowledge and experience of AT, Waka Kotahi, Auckland Council, Manawhenua and the Supporting Growth Programme team. This framework, with additional refinements, would later form the basis of the Supporting Growth Programme wide MCA framework (as discussed further at section 4.1), and was used during the SG DBC options assessments discussed at section 4 of this report.

The MCA framework utilised for the AC DBC adopted four broad criteria – investment objectives, implementability, assessment of environmental effects and opportunity outcomes and applied the following principles:

- The process should be transparent and ideally replicable, allowing additional options to be consistently assessed if they are developed or raised after the original options;
- The environmental effects component of the MCA framework would be finer grained and would require specialist input; and
- No in-built weighting would be applied, although sensitivity testing could be undertaken as appropriate.

The full MCA framework is set out in Appendix 1 to this report. The MCA used a graduated 11-point scoring scale, ranging from -5 for Very High Adverse Effects to +5 Very High Positive Impacts. A final overall score was based on a qualitative assessment of potential effects.

In addition to the MCA scoring, the options and their scores were discussed at a workshop with the Project stakeholders and Manawhenua. These stakeholders included members of the Supporting Growth Programme Partners (Waka Kotahi, AT) and Auckland Council. The workshops helped to test options and scoring and assist with determining which options should proceed to the next stage and be assessed further.

3.2. East-West Corridor Options Development and Assessment

3.2.1 East-West Corridor Long List

3.2.1.1 Option Development

The need for a new east-west connection in Redhills was identified in the PBC. A new east-west connection would provide access across Redhills, providing a central connection for the residents in Redhills to access the key metropolitan centre at Westgate/Massey North and both the State Highway 16 (**SH16**) and State Highway 18 (**SH18**) motorways. The connection would form an important link to the future employment node within Whenuapai, and would significantly improve connectivity between Taupaki (and beyond) to the west and destinations in the east. Transport modelling for this potential connection indicated that due to the anticipated traffic volumes this connection would provide an arterial function.

Influencing factors that would contribute to a liveable community were also considered when developing options, which included accessibility and connection to key land uses such as the future Redhills local centre, Westgate metropolitan centre, future Whenuapai industrial area, the state highway network (SH16 and SH18) and the future rapid transit network.

Overall, ten options were developed at the long list phase described and shown in Table 2 and Figure 5 below.

Table 2: East-West Corridor Long List Options

Option Name	Option Description
East-West A	East-west connection from Nelson Road to Dunlop Road, to the north of the local centre zoning.
East-West B	East-west connection from Nelson Road to Dunlop Road, through the local centre zoning.
East-West C	East-west connection from Nelson Road to Dunlop Road, to the south of the local centre zoning.
East-West D	East-west connection from Nelson Road to Fred Taylor Drive intersection, to the north of the local centre zoning.
East-West E	East-west connection from Nelson Road to Fred Taylor Drive intersection, through the local centre zoning.
East-West F	East-west connection from Nelson Road to Fred Taylor Drive intersection, to the south of the local centre zoning.
East-West G	East-west connection from Nelson Road to Westgate Drive, to the north of the local centre zoning.
East-West H	East-west connection from Nelson Road to Westgate Drive, through the local centre zoning.
East-West I	East-west connection from Nelson Road to Westgate Drive, to the south of the local centre zoning.
East-West J	East- west option that connects to the west at a mid-point south of Nelson Road and connects to the east at Fred Taylor Drive. This was used to test the assumption of the Nelson Road connection.

With the exception of East-West Option J, all other options provided the western connection point at the existing intersection of Red Hills Road, Nelson Road and Nixon Road. This location is strategic as it provides access from Redhills to the land to the north (via Nixon Road), the west (via Nelson Road) and the south (via Red Hills Road).

While the area to the west of Redhills remains rurally zoned in the AUP:OP and no substantial development is anticipated in that area over the next 30 years, this area provides a large catchment that uses Westgate (including the NorthWest Mall and Westgate shopping area), which is the closest metropolitan centre. The existing roads to the west and north of Redhills also provide alternative connections between Kumeu-Huapai and Westgate, allowing traffic to avoid the use of SH16, strengthening the need for access into the adjacent rural area.

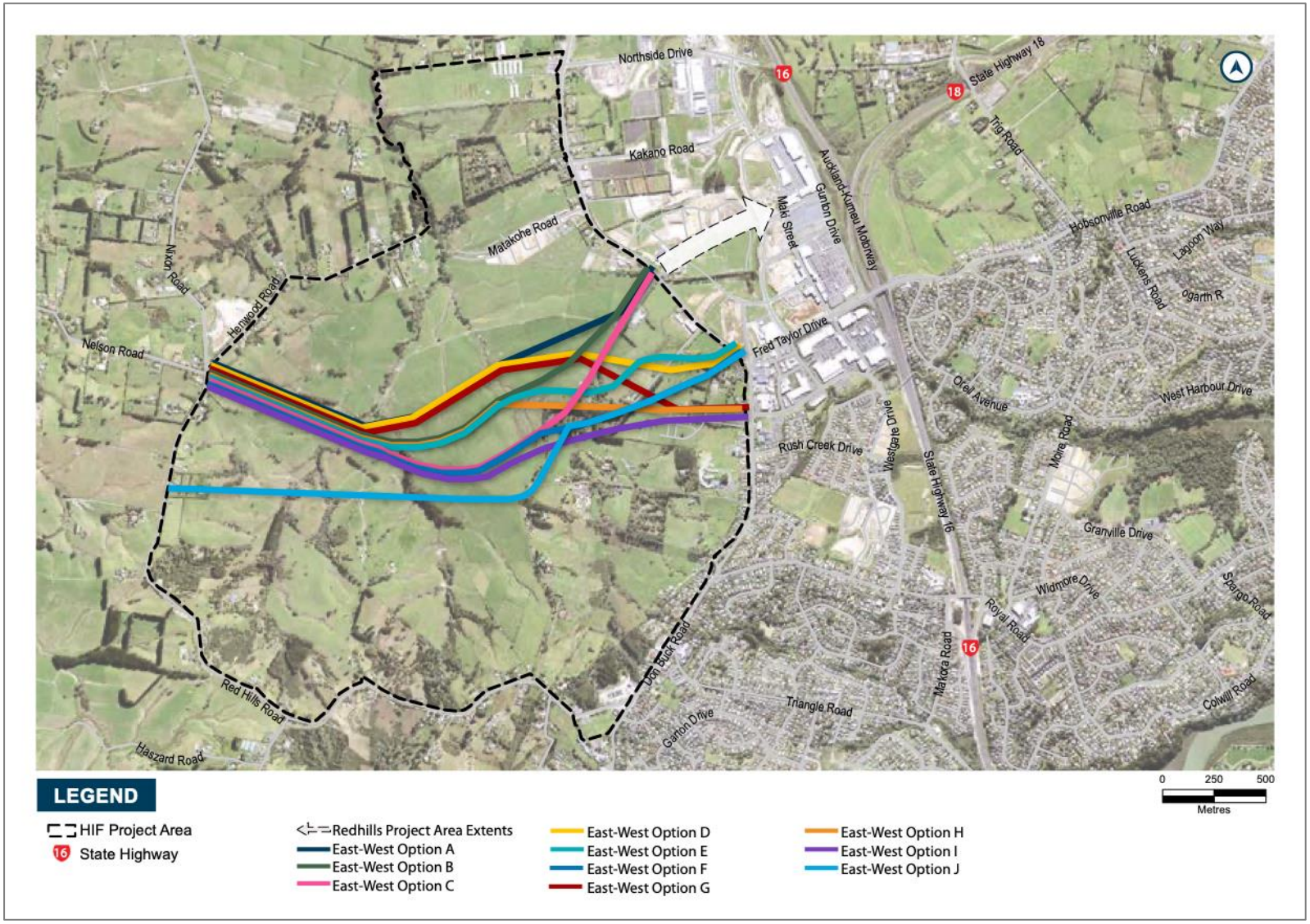

Figure 5: East-West Corridor Long List Options

3.2.1.2 Option Assessment

These long list options were then evaluated using the MCA assessment framework set out above at section 3.1, with input from specialists. Options were also discussed at a workshop with stakeholders and Manawhenua.

Key outcomes of the East-West long list MCA scoring were:

- While all options scored positively against Investment Objectives 1 and 2, East-West Option D and East-West Option F scored particularly well due to providing direct connection to Westgate without bisecting the future Redhills local centre. Options which did not provide direct connections to Westgate generally scored less favourably as they did not provide as strong strategic connections. Likewise, those options which bisected the local centre were considered less desirable as this would result in poorer land use integration outcomes.
- East-West Option F scored more favourably than all other options for the transport system integration criteria due to being the most direct strategic connection.
- East-West Option B, East-West Option E and East-West Option H, all scored less favourably against the urban design land use futures criteria compared with all other options as these options bisected the future local centre resulting in a poor urban design outcome.
- While most of the options scored similarly for the environmental criteria, East-West Option H scored less favourably for the landscape/visual, water quality, and ecology criteria due to the greater number of stream crossings required for this option.
- Scores for all other criteria were equal and therefore did not provide any differentiating factors.

Manawhenua advised during the workshop that their preference is to avoid options that adversely impact the wetlands to the east of the local centre zone and highlighted the cultural significance of these wetlands. It was noted that options which bisected this area would limit the potential to restore this wetland area. Options East-West B, East-West C, East-West E, East-West F, East-West H, and East-West I all bisected the wetland area and were therefore considered less favourable.

Stakeholders and specialists generally agreed that the options which were aligned to the north of the local centre zone, adjacent to the THAB zone (Options East-West A, East-West D and East-West G) achieved better integration for land use and transport. The scale of an arterial corridor bisecting the local centre zone would result in poor urban design outcomes, leading to severance of the local centre. This would adversely impact the desired purpose for this centre “to provide a heart and focal point for the Redhills community” (I610. Redhills Precinct).

Options which provided a connection to the Westgate Metropolitan Centre via Dunlop Road (Options East-West A, East-West B and East-West C) were considered the best options to support the wider public transport network as they provided a more direct connection to the future Westgate Transport Hub. However, the options which provided a direct connection into the current Fred Taylor Drive/Don Buck Road/Te Oranui Way intersection (Options East-West D, East-West E, East-West F and East-West J) were considered optimal for vehicular traffic travelling through and from Redhills despite concerns with increasing the traffic volume and intersection size. It was also noted that these options were less attractive for walking and cycling due to heavy vehicle traffic volumes and the lack of walking and cycling protection.

As a result of the above issues, the option of splitting the East-West arterial function emerged at the workshop, leading to a new dual arterial option. This resulted in the provision of an arterial corridor for vehicle traffic on Fred Taylor Drive, and an arterial corridor prioritising active modes and public transport modes on Dunlop Road. This option is discussed further at section 3.2.3 of this report.

3.2.1.3 Recommended Options to proceed to Short List

Based on the MCA and workshop discussions, East-West Option A and East-West Option D were selected to progress to the short list phase with the following attributes:

- A western connection at the intersection of Red Hills Road/Nixon Road/Nelson Road;
- An alignment to the north of the proposed local centre;
- An eastern connection to be tested at Dunlop Road and Fred Taylor Drive;
- Consideration of dual arterial transport corridors, with an arterial corridor to Fred Taylor Drive (along Dunlop Road) prioritising public transport and an additional arterial corridor for vehicular traffic to Fred Taylor Drive;
- Both roundabout and an optimised intersection layout to be tested at Fred Taylor Drive.

3.2.2 East-West Corridor Short List

3.2.2.1 Option Development

The options had been developed at the long list phase based on packaging together individual components along the route such as network connection points, or a route around the local centre. Through the assessment process it became clear that some of these components still had individual merit which may have been overshadowed by being partnered with lower performing components and therefore could not be justified to be discarded at the long list stage. These components were highlighted throughout the long list process and were recommended to be included as variants within the short list stage. This approach is standard practice to ensure the optimal route is identified.

Table 3 lists the five options which were developed from the long list East-West Option A and East West Option D for the short list stage.

Table 3: East-West Corridor Short List Options

Option Name	Option Description
East-West 1	This option originates from East-West Option A and provides a connection from the Red Hills Road/Nixon Road/Nelson Road intersection to Dunlop Road. Alignment passes to the north of the local centre and the adjacent THAB zoning. Full arterial corridor along alignment (including public transport and pedestrian/cycle).
East-West 2a – roundabout	This option is a variant of East-West Option D providing a connection from the Red Hills Road/Nixon Road/Nelson Road intersection connecting to the Fred Taylor Drive roundabout. Alignment passes to the north of the local centre and the adjacent THAB zoning. This option assumes a collector connection via Dunlop Road could be established with less strategic priority (although not directly provided by this option). This option assumed a connection into a five-way round-about at Fred Taylor Drive.

East-West 2b – optimised intersection	As per East-West 2a, however with a signalised intersection at the existing Fred Taylor Drive roundabout.
East-West 3a – roundabout	This option was derived from East-West Option A and East-West Option D providing a connection from the Red Hills Road/Nixon Road/Nelson Road intersection with two connections into Fred Taylor Drive east of the local centre: • an arterial connection via Dunlop Road; and • an arterial connection into Fred Taylor Drive Roundabout. This option assumes a connection into a five-way round-about at Fred Taylor Drive. The alignment passed to the north of the local centre and central THAB zoning.
East-West 3b – optimised intersection	As per East-West 3a, however with a signalised intersection at Fred Taylor Drive.

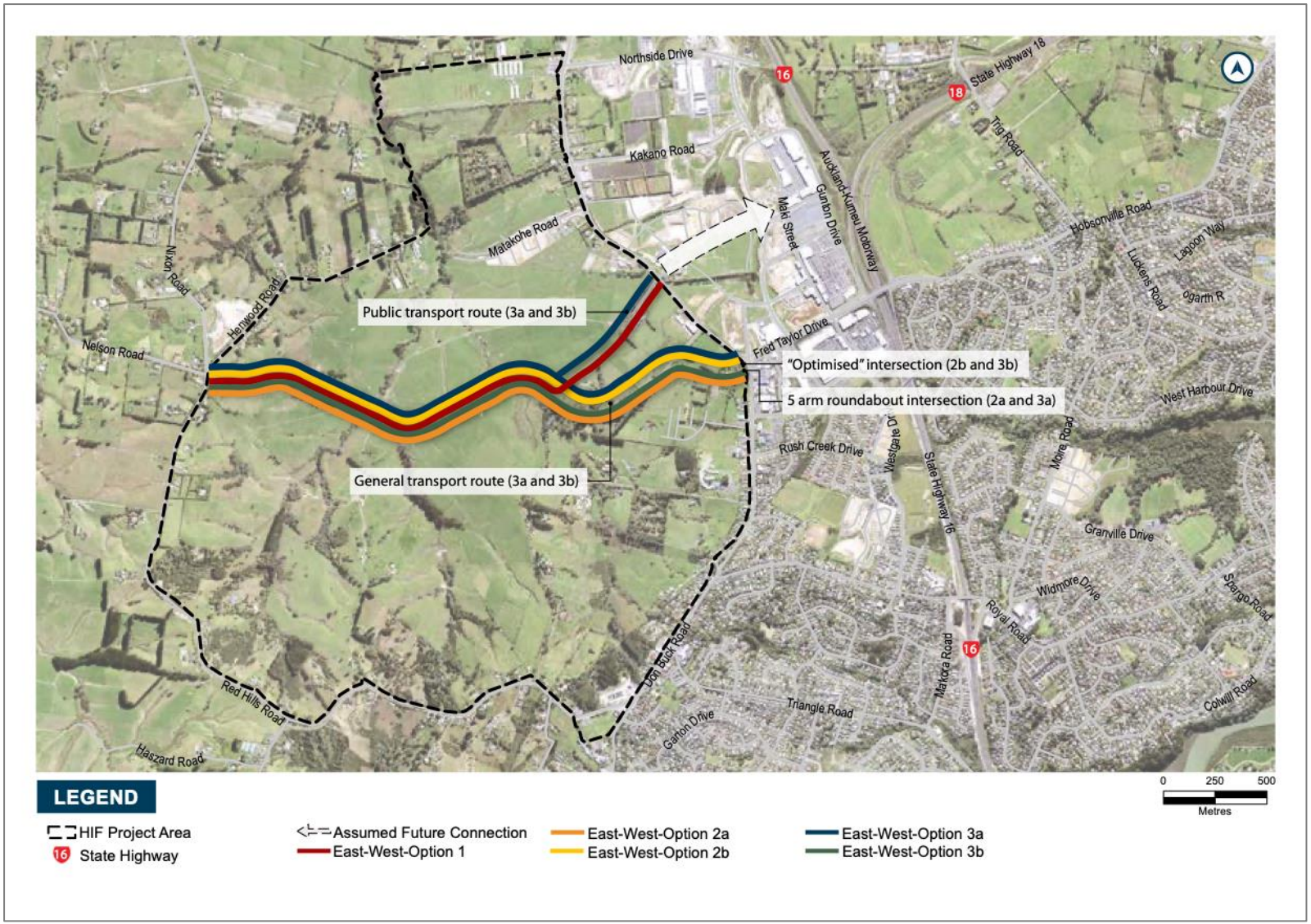

Figure 6: East-West Corridor Short List Options

3.2.2.2 Option Assessment

The short list options were then evaluated using MCA and discussions with stakeholders. Technical investigations were also undertaken to understand the feasibility of the options and if there were any road design, construction or integration issues with the surrounding network.

Key outcomes of the East-West short list MCA scoring were:

- While all options scored positively against the investment objectives, East-West Option 2B and East West Option 3B with signalised intersections scored more favourably compared to the other options which utilised a roundabout intersection, as a five way roundabout was considered a less favourable transport outcome with lesser benefits for all users. This scoring was also reflected in the transport system integration criterion, where East-West Option 2B and East-West Option 3B scored significantly better. East-West Option 3B scored highest as Dunlop Road was identified as the best route for public transport and cycling, while the additional arterial corridor provides a more strategic and direct connection to Fred Taylor Drive.
- The urban design criteria were the other key differentiators, with East-West Option 3B scoring the best due to providing increased connectivity to the proposed local centre and with the Dunlop Road intersection being smaller and easier to navigate for active mode users.
- Scores for construction impacts, human health, economic, water quality, ecology, heritage, climate change, social equitability, and greenhouse gas emissions were equal and did not provide any differentiation between the options.

Stakeholders at the workshop agreed that both Dunlop Road (with its public transport and active modes prioritisation) and the arterial connection to the existing Fred Taylor Drive intersection (providing a strategic connection) provided benefits to the network. During the Redhills Precinct Environment Court process significant concerns were being raised by businesses accessing to and from Te Oranui Way – the function of which would be curtailed by a five-leg intersection. To address the concerns with the requirement for a five-leg intersection, it was suggested that another connection option could be tested for the East West arterial to Fred Taylor Drive via what is known as Baker Lane (an undeveloped paper road) (East-West Option 3C).

3.2.2.3 Further Corridor Refinement – Assessment of East-West Option 3C

East-West Option 3C was tested as an alternative connection to Fred Taylor Drive (Figure 7). This option used the preferred Fred Taylor Drive option (East-West Option 3B) as a base and replaced the East-West arterial leg from the Fred Taylor Drive/Don Buck Road/Te Oranui Way intersection with a new signalised intersection at a Fred Taylor Drive/Baker Lane (roughly 250m north), which is also identified in the AUP:OP as a future strategic connection into the Westgate Precinct.

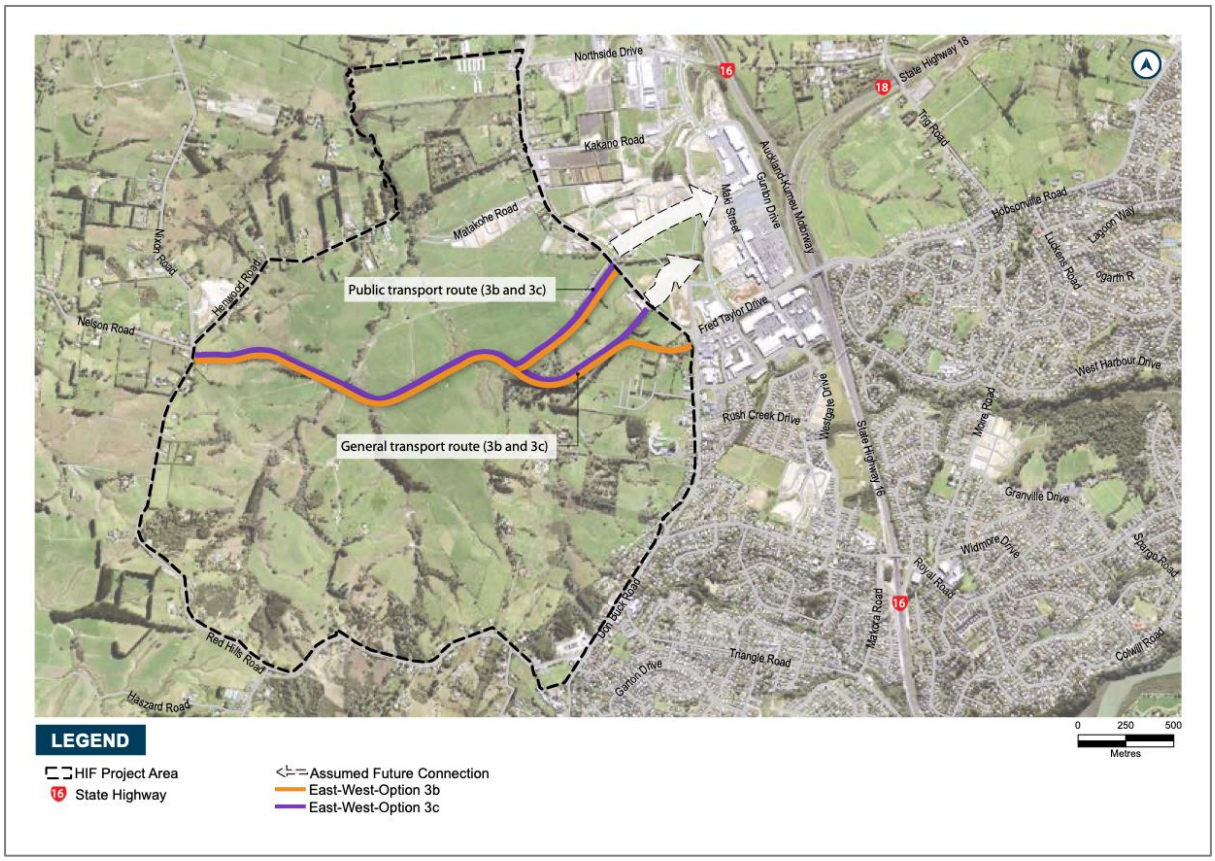

Figure 7: East-West Corridor Short List Options Refinement

The specialists assessed this East-West Option 3C against the previous East-West Option 3B using the same MCA framework. The key differentiators were as follows:

- East-West Option 3C was slightly less convenient and legible for general traffic but provided improved access for pedestrians and cycling (and thus liveability) as no five-leg intersection was required.
- Whilst the five-leg intersection associated with East-West Option 3B operated satisfactorily from a traffic perspective and provided a more direct, legible access to the strategic transport network (including SH16 and the proposed rapid transit network), the intersection layout resulted in reduced access to existing land use and reduced pedestrian amenity due to no pedestrian crossing on the eastern leg of the Fred Taylor Drive/Don Buck Road/Te Oranui Way intersection. The two intersections at Fred Taylor/Baker Lane and Fred Taylor Drive/Dunlop Road operated more efficiently than East-West Option 3B due to the four-leg intersection. This was considered to provide better pedestrian and cycling facilities, however the staggered intersections provided slightly less legibility for vehicles accessing the strategic transport network. On balance, the efficient intersections and walking and cycling benefits associated with East-West Option 3C were preferred.
- East-West Option 3C resulted in better land efficiency with a larger amount of land available for THAB zoning.
- East-West Option 3C was considered a more legible and safe walking and cycling environment, with stronger links to the Westgate Metropolitan Centre.

It should be noted that during this design process, the provisions relating to the Redhills Precinct in the AUP:OP were being resolved through an appeal process in the Environment Court. The alternatives assessments throughout the options assessment process, while considering the AUP:OP provisions as context, were based on design principles and specialist assessment. The limited scope of the appeals process meant that some outcomes agreed between the relevant parties could not be included in the AUP:OP provisions.

3.2.2.4 Recommended East-West Option

Overall, the recommended East-West route was confirmed as East-West Option 3C (Figure 8) which includes:

- A western connection at Nelson Road;
- A route to the north of the local centre where it is anticipated that the collector/local road network will continue public transport access from the arterial into the local centre zone; and
- A dual arterial connection to the east comprising:
    - A public transport priority arterial connecting at the Fred Taylor Drive/Dunlop Road intersection; and
    - An arterial connection at the Fred Taylor Drive/Baker Lane intersection.

This option was recommended because it provided:

- The most legible and direct east west connectivity for Redhills and the wider strategic network;
- The best increase of land supply with the most efficient use of THAB zoned land;
- A resilient network with clear priority for buses accessing Westgate Station;
- Exclusive pedestrian and cyclist facilities along the whole route;
- Access to the local centre without causing a severance effect; and
- A four-leg intersection at the congested existing intersection of Fred Taylor Drive/Don Buck/ Te Oranui Way.

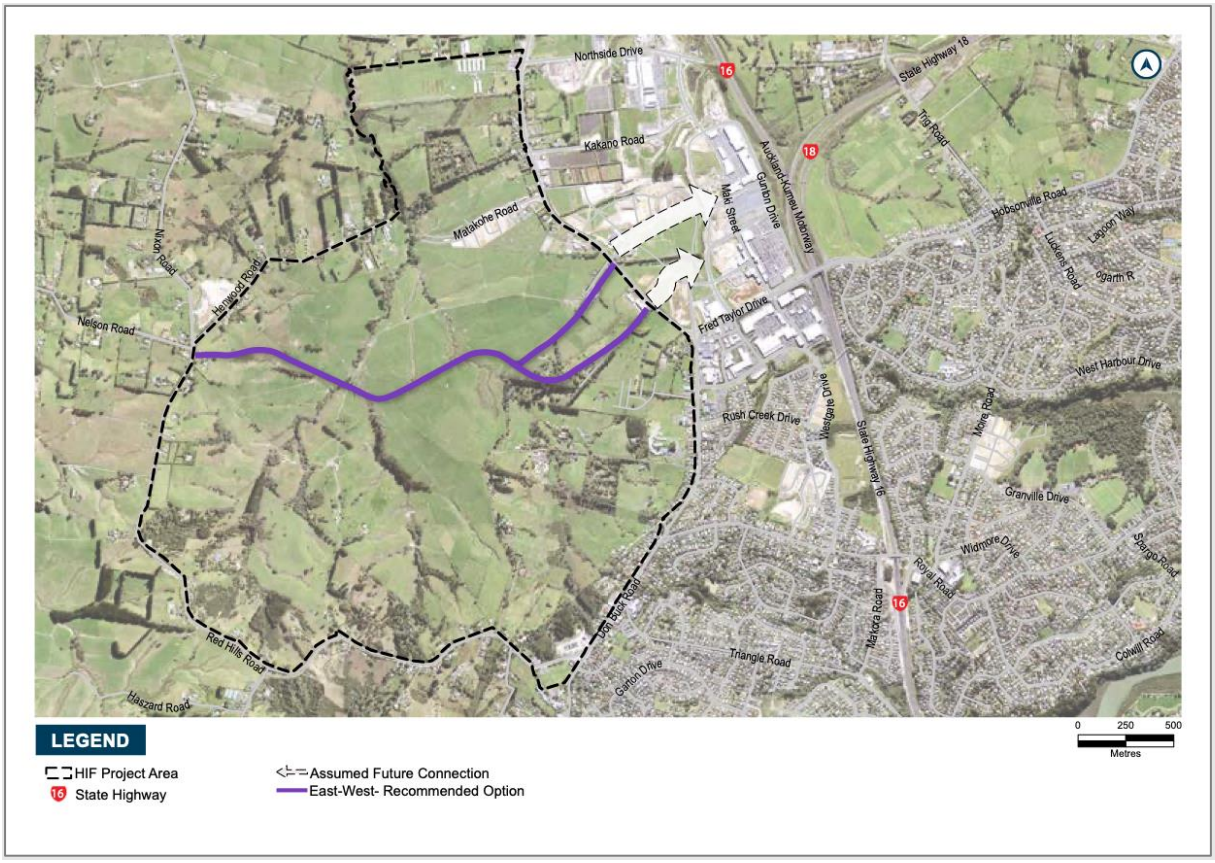

Figure 8: East-West Corridor Recommended Option

3.3. North-South Corridor Options Development and Assessment

3.3.1 North-South Corridor Long List

3.3.1.1 Option Development

The need for a new north-south connection in Redhills to connect to Don Buck Road and to provide a direct link to SH16 was also identified in the PBC. Like the east west connection, the access to the Redhills local centre zone was a key consideration for the option development. In addition, the corridor was required to provide a strategic connection to Kumeu/Riverhead and Coatesville to the north and SH16 to the south to ensure communities could efficiently access employment opportunities.

Eight options were initially developed for the North-South long list. North-South Option H was initially the only option located to the east of the Ngongetepara Stream (as shown in Figure 5 below), however North-South Option I was developed as an additional eastern option through the workshop process to test a more eastern option from Royal Road. The nine options considered at the long list stage are described in Table 4 and shown in Figure 9.

The options provided a range of different approaches to:

- Connect Redhills to the existing transport network to the south, with different options connecting at Royal Road, Triangle Road and Red Hills Road;
- Interact with the proposed Redhills local centre, with different options bisecting or wrapping around either the east or west;
- Connect Redhills to a potential new transport corridor to the north of Redhills (which would involve the North-South corridor being extended beyond Redhills as part of a later Supporting Growth Programme project); and
- Deviating to the east and west of the existing Transpower transmission lines which bisect Redhills.

Table 4: North-South Corridor Long List Options

Option Name	Option Description
North-South A	This option links to Nixon Road to the north and Red Hills Road to the south. This option goes to the west of the local centre zoning.
North-South B	This option links to Nixon Road to the north and the Don Buck Road/Triangle Road intersection to the south. This option goes through the local centre zoning.
North-South C	This option links to Nixon Road to the north and the Don Buck Road/Royal Road intersection to the south. This option goes to the north of the local centre zoning.
North-South D	This option links to the Nixon Road/Taupaki Road intersection to the north and Red Hills Road to the south. This option goes to the west of the local centre zoning.
North-South E	This option links to Nixon Road/Taupaki Road intersection to the north and Triangle Road to the south. This option goes through the local centre zoning.
North-South F	This option links to Nixon Road/Taupaki Road intersection to the north and the Don Buck Road/Royal Road intersection to the south. This option goes to the north of the local centre zoning.
North-South G	This option links to Coatesville-Riverhead Highway/SH16 intersection to the north and the Don Buck Road/Royal Road intersection to the south. This option goes to the west of the local centre zoning. This option was included in the earlier PBC stage.
North-South H	North-south connection. This option links to Coatesville-Riverhead Highway/SH16 intersection to the north and Red Hills Road to the south. This option goes through the local centre zoning.
North-South I	This option links to Coatesville-Riverhead Highway/SH16 intersection to the north. This option is located to the east of the Ngongetepara stream and goes around the local centre to the west before connecting at Triangle Road.

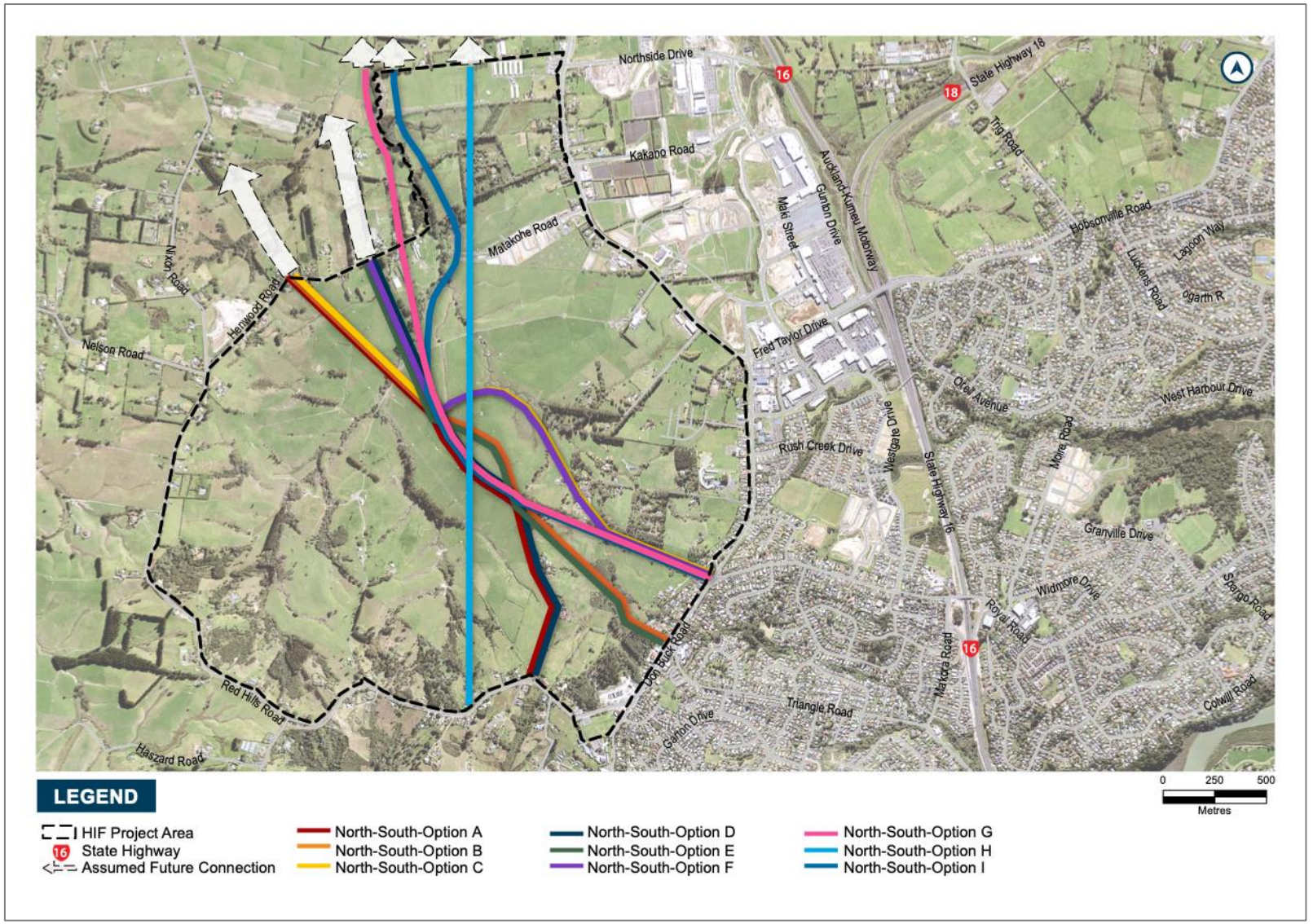

Figure 9: North-South Corridor Long List Options

3.3.1.2 Option Assessment

These long list options were then evaluated using the MCA assessment framework set out above at section 3.1, with input from specialists. Options were also discussed at a workshop with stakeholders and Manawhenua.

While all options scored positively for Investment Objectives 1 and 2, North-South Option F, North-South Option G and North-South Option I scored particularly well due to the more strategic connection provided by the Royal Road connection. Royal Road was considered the most strategic southern connection point due to the direct access to SH16, the North-Western Cycleway and the future Rapid Transit Station which is earmarked for Royal Road.

North-South Option C and North-South Option E scored less favourably compared with all other options for the property and community impacts, as the connection to Triangle Road provided by these options would likely result in significant impacts to the existing local centre which is established along Don Buck Road at this location.

North-South Option H scored poorly against the urban design and landscape/visual criteria due to direct impacts on the Ridgeline Protection Overlay (Natural Heritage) and the Significant Ecological Areas Overlay in the AUP:OP. In addition, the southern connection would not provide direct walking and cycling connectivity to the surrounding strategic network. North-South Option A and North-South Option D also scored less favourably against the urban design criteria, as these options would not provide direct walking and cycling connectivity to the surrounding strategic network. North-South Option B and North-South Option E scored poorly for the urban design: quality of the urban environment criteria as these options bisected the proposed Redhills local centre.

The workshop confirmed Royal Road was the best performing southern connection because it was the most direct route to the strategic transport network, and did not affect the existing local centre at Triangle Road. However, while the options with connections to Triangle Road generally did not score as well as the options with connections to Royal Road, these options still scored well against the investment objectives. It was therefore agreed that these connection options should be included as a variant in the short list.

Manawhenua identified that opportunities to integrate with the natural environment, particularly the Ngongetepara Stream, required further consideration. Therefore as discussed above, an additional option, North-South Option I, was developed following the workshop to test a connection from Royal Road in the south and following the eastern bank of the Ngongetepara Stream in the north. This option scored relatively well against most of the MCA criteria.

Manawhenua outlined that any alignments should avoid the existing wetland area directly east of the proposed Redhills local centre, which was supported further by the ecology technical specialists. North-South Option C and North-South Option F both impact the wetlands.

As the Coatesville/Riverhead area is also a planned growth area under the FULSS 2017, support was expressed for connecting the North-South route to the Coatesville-Riverhead Highway as part of the wider strategic network. This would improve access to transport serviced land and adjacent sub-regions therefore North-South Option H was supported.

3.3.1.3 Recommended Options to proceed to Short List

Based on the MCA and workshop discussions, North-South Option G and North-South Option I were recommended to proceed to the short list stage due to having stronger socio-economic benefits in addition to better urban design outcomes and less adverse environmental effects. Key considerations which were to be further investigated at the short list stage included:

- Alignment to the west (North-South Option G) and east (North-South Option I) of the Ngongetepara Stream;
- Connection with Coatesville-Riverhead Highway to the north;
- Alignment to pass around the west of the proposed local centre; and
- Southern connections to be tested at Royal Road and Triangle Road.

3.3.2 North-South Corridor Short List

3.3.2.1 Option Development

Emerging from the long list recommended options (North-South Option G and North-South Option I), four North-South variant options were developed at the short list phase, which as noted above, were based on, and included, components identified in the long list phase which had individual merit.

Table 5: North-South Corridor Short List Options

Option Name	Option Description
North-South 1	*Variant option to the long list North-South I* North-South connection from Royal Road to assumed future connection to Coatesville-Riverhead Highway/SH16 east of the Ngongetepara Stream. Alignment passes to the west of the local centre and adjacent THAB zoning. Largely aligned with Watercare sewer line. Gradient around Royal Road can be optimised.
North-South 2	*Variant option to the long list North-South G* North-South connection from Royal Road to assumed future connection to Coatesville-Riverhead Highway/SH16 west of the Ngongetepara Stream. Alignment passes to the west of the local centre and adjacent THAB zoning. Gradient around Royal Road can be optimised.
North-South 3	*Variant option to the long list North-South I* North-South connection from Triangle Road to assumed future connection to Coatesville-Riverhead Highway/SH16 east of the Ngongetepara Stream. Alignment passes to the east of the local centre and adjacent THAB zoning. Largely aligned with Watercare sewer line.
North-South 4	*Variant option to the long list North-South G* North-South connection from Triangle Road to assumed future connection to Coatesville-Riverhead Highway/SH16 west of the Ngongetepara Stream. Alignment passes to the west of the local centre and adjacent THAB zoning.

Figure 10: North-South Corridor Short List Options

3.3.2.2 Option Assessment

The short list options were then evaluated using MCA and discussions with stakeholders. Technical investigations were also undertaken to understand the feasibility of the options and if there were any road design, construction or integration issues with the surrounding network.

As shown in Figure 10, the North-South corridor options can be divided into two sections. North of the proposed local centre, the options either go to the east or the west of the Ngongetepara Stream. South of the proposed local centre, the options either connect to Royal Road or Triangle Road.

The options to the west of the Ngongetepara Stream were preferred as they were considered to:

- Create a more efficient use of urban zoned land and were more aligned with planned development;
- Establish a more strategic regional connection;
- Minimise ecological impacts on the stream; and
- Have less topographical constraints for construction.

Options connecting to Royal Road were preferred because they were considered to:

- Avoid a building with historic heritage value;
- Not impact on the existing local centre at Triangle Road;
- Provide the best strategic cycling connection; and
- Provide better connections for public transport, active modes and connections to employment land in Whenuapai.

Whilst there were opportunities and constraints for both alignments, the western alignment and Royal Road connection for the North-South route were supported by all stakeholders. Manawhenua expressed concerns about the lack of local connectivity with Northside Drive and a western alignment. However, it was generally acknowledged that the northern part of the North-South alignment had a greater regional connectivity function to connect to Coatesville-Riverhead, with local connectivity and releasing immediate land supply within Redhills being primarily addressed through the future collector network.

3.3.2.3 Further Corridor Refinement – Assessment of North-South Option 2A

Following the technical investigations, MCA assessment and workshop discussions the project team considered it desirable to locate the alignment of the North-South route as close as practicable to the Transpower transmission lines to reduce land fragmentation and improve future land use design within the Redhills area. This refinement was discussed with Transpower and subsequent high-level feedback and potential mitigation measures were received and incorporated into the design.

North-South Option 2 was considered to be the best performing option for wider connections so was used as the basis for assessing the refinement. A new North-South Option 2A was therefore proposed, locating the route further west to more closely follow the Transpower transmission lines between the proposed local centre and the Redhills Precinct northern boundary, as shown in Figure 11. All other aspects of North-South Option 2 remained the same.

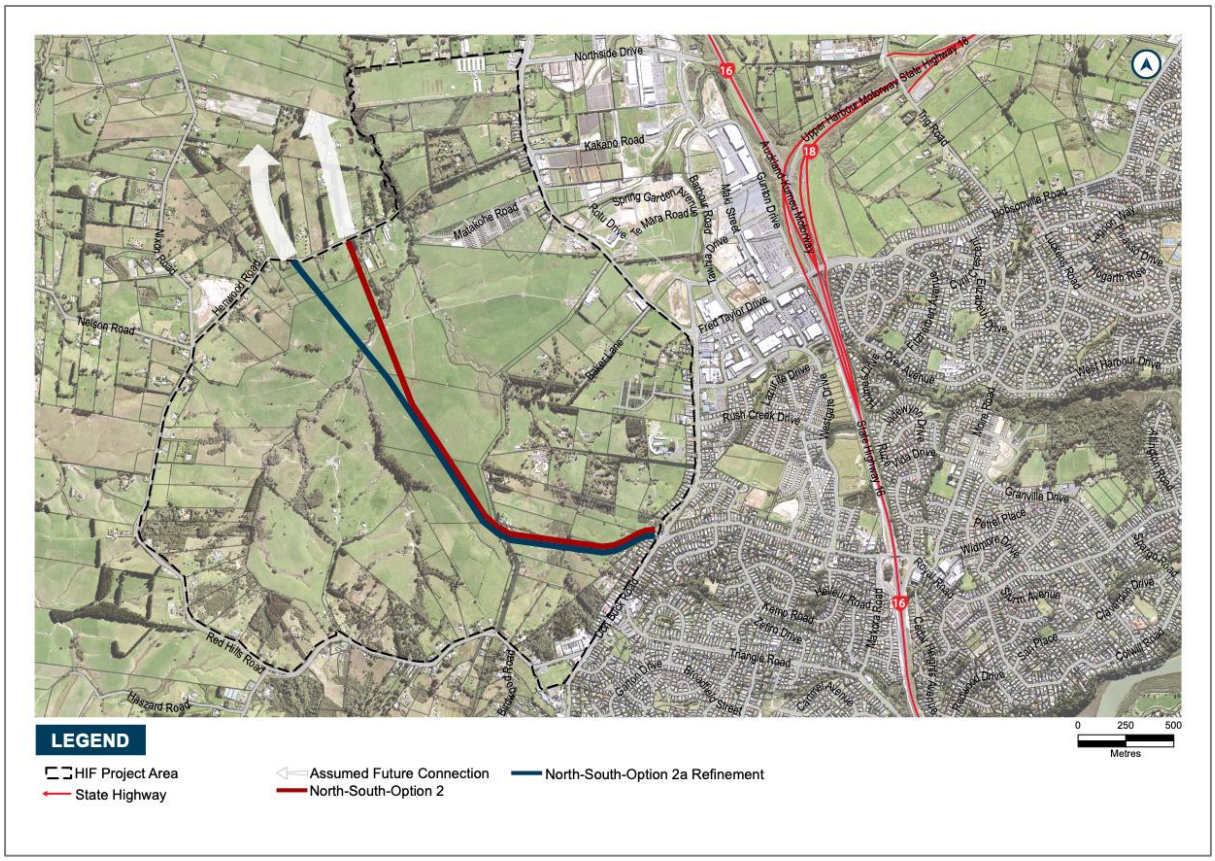

Figure 11: North-South Corridor Short List Options Refinement

The specialists were then asked to assess North-South Option 2A against North-South Option 2. Key points are as follows:

- Both options achieved the same strategic transport connections.
- The co-location of North-South Option 2A with Transpower transmission lines created the following outcomes:
    - A more efficient use of land for housing, and therefore a slight advantage in housing yield;
    - Better implementability (being the consideration of factors that would influence the likely implementation success of the project e.g. funding, technical factors and potential to be granted consent/approval for the works) as it provided an opportunity to integrate with the existing transmission lines;
    - Reduced impacts on landscape values by co-locating infrastructure; and
    - Improved ecological outcomes through less stream crossings and being located further west of the Ngongetepara tributary.
- North-South Option 2A produced a less desirable outcome for walking and cycling due to the steeper terrain.

3.3.2.4 Recommended Option

Overall, the recommended North-South route was North-South Option 2A (Figure 12) as this route provided the best connections with the transport network to achieve the key objectives for the release of land supply and integration with the surrounding network. As discussed, this follows the same route as North-South Option 2, except the northern section follows the alignment of the Transpower transmission lines.

Figure 12: North-South Corridor Recommended Option

4 Consideration of Alternative Routes

As noted above, the process taken to considering alternatives for the RATN was sequential and iterative, with each stage of assessment being informed by the previous stage of assessment and an increasing level of detail and refinement occurring depending on the stage of assessment. As such, the recommended corridor options from the AC DBC were taken forward into a route refinement and assessment phase as part of the SG DBC.

4.1. Overview of Assessment Framework

Following design refinements and further options development, specialists were engaged to assess route options using the MCA process. By this time, the Supporting Growth Programme had finalised a programme wide Supporting Growth Programme MCA framework, in consultation with AT, Waka Kotahi and Manawhenua. The MCA criteria included investment objectives (as discussed further below) and the four well-beings: Cultural, Social, Environmental and Economic. Several sub-criteria were developed under each well-being grouping.

The MCA was not the sole means of assessing options but was complementary to the decision-making process, which also incorporated input from AT, Manawhenua, feedback from the consultation and engagement process, subject-matter experts and the project team. The MCA criteria were tailored to suit the specific issues relevant to the Redhills area, consistent with the Supporting Growth Programme MCA and the earlier corridor assessment framework. A rationalisation process was undertaken to identify any criteria in the Supporting Growth Programme MCA criteria for which scoring may be inappropriate and/or unnecessary – either due to duplication of the criteria with the investment objectives or the inability of any particular criteria to differentiate between options. These criteria are set out at Appendix 2.

4.1.1 Scored Criteria

Technical experts were appointed to undertake assessments of the options in their area of expertise.

The Supporting Growth Programme MCA used a graduated scoring scale, ranging from -5 for Very High Adverse Effects to +5 Very High Positive Impacts to score options against the MCA framework.

Scoring was completed by technical experts and discussed at several MCA workshops. Prior to each workshop, experts were provided with a briefing pack, which contained the MCA criteria and scoring guidelines, an overview of each of the options, and a pre-scoring worksheet where they documented their approach and key assumptions that informed their scoring. On the day of a workshop, the draft scores and commentary were challenged in a group setting. The experts then considered the issues raised in discussion and finalised their scores.

4.1.2 Non-Scored Criteria

In addition to the scored criteria, there were four non-scored criteria considered as part of the Supporting Growth Programme MCA framework. These criteria were less suited for scoring through the MCA scoring framework, and were instead considered through a descriptive (qualitative) assessment which can be used to help to direct decision making (in combination with the scored criteria). A description of the non-scored criteria (as specified by the Supporting Growth Programme MCA framework) is provided in Table 6.

Table 6: Non-Scored Criteria

Criteria	Description
Stakeholder feedback	Stakeholder feedback for each option identifying scale/validity of objections, identified preference/proposed changes to options etc. Feedback provided by other key partners/stakeholders.
Policy analysis	Options alignment with the strategic policy framework including the AUP:OP and Auckland Plan with consideration to provisions that derive from section 6 of the RMA. Ensure the strategic framework assessment does not consider detailed issues raised in the effects criteria.
Value for money	Provide an estimate of likely value for money in conjunction with transport outcomes and construction costs.
Manawhenua	Optioneering commentary including (but not limited to) identification of cultural issues or any other matter related to an option, providing input commentary on criteria scoring, identification of cultural issues etc.

4.1.3 Investment Objectives

As described in section 2.3 for the purpose of undertaking an assessment of options, the investment objectives were refined for this phase of assessment. These investment objectives were developed with a view to supporting the NoR processes that would follow. Table 7 outlines the Redhills specific investment objectives for this stage.

Table 7: Redhills Specific Investment Objectives

Investment Objectives	Sub-criteria
Investment Objective 1 Create appropriate access to the Redhills live zoned land that leads to desirable urban form outcomes and enables the release of land for housing, initially by 2021, and over a 30-year period, in line with the FULSS.	• Network connectivity and integration • Intersection performance • Traffic performance (LOS) • Housing yield • Timing of infrastructure • Severance effects • Direct access
Investment Objective 2 Reduce reliance on private vehicles by providing travel choices for all trip purposes, thereby contributing to region-wide mode shift targets, over a 30-year period.	• Mode share • Public transport prioritisation • Cycling provision • Gradient

4.1.4 Intersection Assessment

Each intersection option across both the North-South and East-West alignments formed part of an existing road option and had therefore been broadly assessed using the MCA framework. To assist in the decision-making process for the design of each intersection a further refined MCA framework was developed, comprised of a limited set of MCA criteria appropriate for the scale of variation in each proposed intersection form. The key factors for the assessment were the footprint and function of each intersection option. Accordingly, along with the investment objective scoring, the following

criteria were selected for their ability to differentiate between the proposed intersection forms (discussed in section 4.3):

Table 8: Intersection Assessment MCA Criteria

Criteria	Commentary
Urban design	Providing design insight between intersection forms and associated external impact on surrounding community.
Land requirement	Confirm the extent of impact on surrounding properties, including the number and type of properties affected.
Landscape/visual	Consider the visual impacts associated with the design variants.
Construction cost/risk	Detail the likely cost and risk profile between both intersection forms.
Safety	Safety for all transport users, including private vehicles, public transport, pedestrians, cyclists, and other road corridor users.

4.2. Review of Options

Prior to route refinement occurring however, the previous corridor option development and assessments (sections 3.2 and 3.3) undertaken during the AC DBC were further challenged by the project team to ensure the process that had been undertaken to date was robust.

4.2.1 North-South Options Review

The northern section of the North-South corridor recommended option (section 3.3.2.4) extended from the proposed Redhills local centre to a connection with the Coatesville-Riverhead Highway to the north. The northern section was the subject of Environment Court appeals (as discussed at section 3.2.2.3) The Supporting Growth team considered that further assessment of alternatives for this northern section needed to be undertaken, including around the use of the existing Red Hills Road/Nixon Road/Taupaki Road connection, in light of the appeals before the Environment Court. It was also noted that this part of the alignment required further investigation regarding the relationship with the stream network. On this basis, the project team decided to remove this section of the corridor from the accelerated HIF work and include it in the wider North West programme for further consideration.

In relation to the southern section of the North-South corridor, the project team determined that sufficient consideration of alternatives had been undertaken in the previous option development and assessment process (section 3.3), including a detailed assessment of the alternative Royal Road and Triangle Road connections, and therefore no additional assessment was required. As such the AC DBC recommended option for the southern section of the North-South corridor (section 3.3.2.4) was moved forward into route refinement.

4.2.2 East-West Options Review

The project team considered that further work was required to understand the design and function of the Dunlop Road and Baker Lane dual arterial corridors and their intersections of the East-West corridor recommended option (section 3.2.2.4). Two options were developed that provided alternative intersection prioritisation within the wider East-West arterial corridor as shown in Table 9.

Table 9: East-West Dunlop Road and Baker Lane Alternative Intersections

Option Name	Option Description
New East-West Road Option A	Enables Baker Lane as the main route for general traffic, and Dunlop Road intersecting the East-West corridor/Baker Lane as the main route for public transport. This alignment formed part of the East-West corridor recommended option (section 3.2.2.4).
New East-West Road Option B	Enables Dunlop Road as the main corridor and provides public transport priority along Dunlop Road, with Baker Lane intersecting the East-West corridor/Dunlop Road. The option was designed to straighten out Dunlop Road and improve the intersection form.

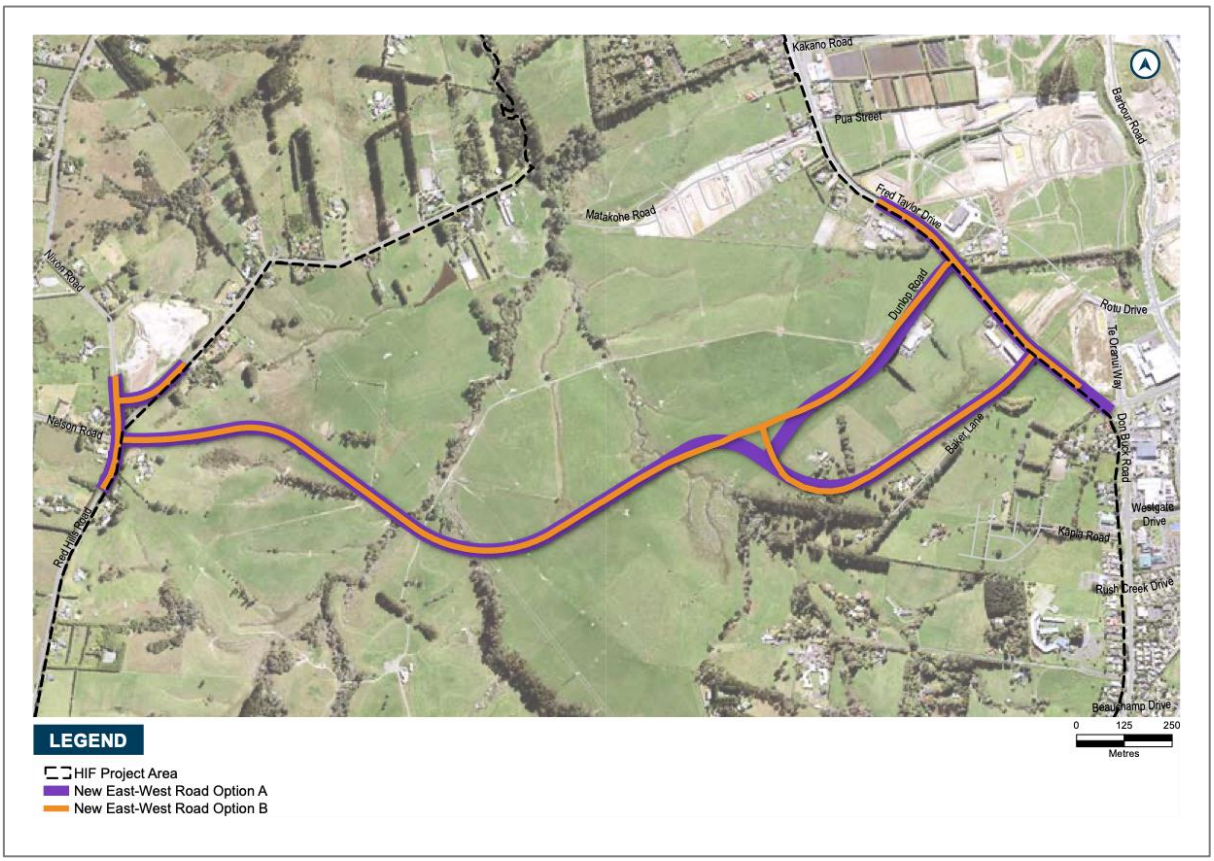

Figure 13: East-West Route Alternatives

In addition to East-West Options A and B, the project team also considered different designs for intersection form (roundabout v signalisation) at the following locations:

- North-South arterial and Don Buck Road/Royal Road intersection;
- East-West arterial and Red Hills Road/Nixon Road/Nelson Road intersection;
- Baker Lane/Fred Taylor Drive intersection; and
- Dunlop Road/Fred Taylor Drive intersection.

4.2.2.1 Investment Objectives Assessment

East-West Option A and Option B were assessed against the relevant sub-criteria from the investment objectives. Option A scored positively for all sub-criteria, while Option B was neutral.

Option A enabled Dunlop Road to act as the main east-west public transport link, with Baker Lane attracting the majority of the general traffic movements. This option was considered to be well integrated with the planned transport network to the east and west of Dunlop Road (which included an east-west corridor that provided for public transport movements between the proposed Redhills local centre and the Westgate Metropolitan Centre and future RTN.

Option A provided for more efficient and reliable public transport prioritisation because general traffic volumes are more likely to use Baker Lane, leaving Dunlop Road to be utilised as an important public transport connection. This is a more desirable outcome than Option B which sees higher traffic volume along Dunlop Road. Option B was not considered to be well integrated with surrounding transport network plans and was likely to adversely impact public transport patronage and the achievement of mode shift targets.

4.2.2.2 Scored Criteria

East-West Option A and B were differentiated by a limited number of criteria. This included urban design, with Option A scoring positively as it would contribute positively to connectivity, local and regional way-finding, and flexibility in development, and would be legible and of appropriate scale.

In contrast, Option B scored negatively in relation to urban design due to its poor integration with the public and private realms, poorly defined way-finding, and inflexibility to support connectivity opportunities. These differences were attributed to the changes in form and function of the Dunlop Road arterial within the wider East-West corridor, and the consequential poor integration with the future Redhills local centre and existing Westgate metropolitan centre, including the potential for Option B to undermine the intended public transport function of Dunlop Road.

4.2.2.3 Non-Scored Criteria

The following feedback and assessment was undertaken for the non-scored criteria:

- **Stakeholder feedback:** AT has been in discussions with the developers who own land in the area of Dunlop Road and Baker Lane regarding the alignment options. From a general development perspective, it was determined to be beneficial to not have two corridors traversing the land of a single land owner/developer, and to provide enough development opportunities on each property adjacent to the corridors. As the landowner plans develop, there may be opportunities to be involved in master planning exercises with the developers. This would enable greater flexibility and will allow AT to integrate with other infrastructure and development layout needs and constraints. Overall, Option A was preferable over Option B as it minimised the fragmentation of developer land, allowing for more developable land for housing.
- **Policy Analysis:** Both Option A and B were considered to be generally consistent with the AUP:OP policy framework.

- **Value for Money:** A high-level assessment was undertaken which determined that costs and benefits for both Option A and B would be similar. Option B was identified as having less public transport benefits due to delays caused by the increased attractiveness to general traffic as a result of the alignment layout.
- **Manawhenua:** Manawhenua provided support for Option A and the use of Dunlop Road as a public transport link between the proposed Redhills local centre and the Westgate Metropolitan centre and the future rapid transit station.

4.2.2.4 Recommended Route

Overall, based on the assessment and analysis documented above, East West Option A was considered to be the preferred option for the East-West route in Redhills.

Figure 14: East-West Recommended Option

4.3. Redhills Intersections

Following identification of the preferred options for both the North-South and East-West alignments, the four intersection locations identified through the options assessment, being the North-South arterial/Don Buck Road/Royal Road intersection, the Dunlop Road/Fred Taylor Drive intersection, the Baker Lane/Fred Taylor Drive intersection and the East-West arterial/Red Hills Road/Nixon Road/Nelson Road intersection were assessed on the basis of alternative designs (roundabouts vs. signalisation).

4.3.1 Investment Objectives Assessment

Overall, signals were assessed as performing better than roundabouts at all intersections except for the Red Hills Road/Nixon Road/Nelson Road intersection. Both signals and roundabouts were considered to be able to integrate with the surrounding network, however roundabouts were deemed to present issues for network legibility and safety for pedestrians and cyclists. Signalised intersections are easier to navigate and more clearly enable pedestrian movements than roundabouts – assuming formalised crossings are provided at all arms, whereas roundabouts are less legible and navigable for pedestrians due to the inability to incorporate a specific phase for pedestrians.

The Red Hills Road/Nixon Road/Nelson Road intersection differs from the other intersections as it is located on the rural-urban fringe at the western edge of the Redhills area. A roundabout at this location can signal the transition between the urban and rural areas and encourages road users to moderate their speed as they move between the rural and urban road networks. Signals could be used at this intersection; however, a roundabout was preferred as it would better integrate with the adjacent semi-rural network. Traffic volumes at this intersection were also forecast to be lower than the other three intersections, making crossing opportunities easier for pedestrians and cyclists.

4.3.2 Scored Criteria

Overall, signals scored better than roundabouts under the urban design criteria as they provide an integrated and efficient interface between public and private realm spaces, flexibility in their ability to support other connectivity enhancement opportunities, consistency of scale with the anticipated adjacent land uses and support priority principles in relation to pedestrian and cycle networks.

Roundabouts generally have larger land requirement impacts, with an exception being the North-South/Don Buck Road/Royal Road intersection (as the size of the realigned intersection meant the signalised intersection also resulted in a moderately negative land impact).

User safety was the only other distinguishing criteria, with signals scoring better at all intersections except the Red Hills Road/Nixon Road/Nelson Road intersection, where the roundabout option scored more favorably for safety.

4.3.3 Recommended Intersections

Based on the analysis and assessment documented above, the following options were recommended at each intersection:

Signalisation

- North-South arterial/Don Buck Road/Royal Road intersection
- Dunlop Road/Fred Taylor Drive intersection
- Baker Lane/Fred Taylor Drive intersection

Roundabout

- East-West arterial/Red Hills Road/Nixon Road/Nelson Road intersection

5 AC DBC and SG DBC Options Review

The options assessments in the AC DBC and SG DBC were undertaken prior to the introduction of the National Policy Statement for Freshwater Management 2020 (NPS-FM). A further review of the options considered in each DBC was subsequently undertaken with a focus on the impacts on natural wetlands.

It was found:

- The AC DBC and SG DBC confirmed the need for strategic transport connections at Nixon Road to the west, Dunlop Road and Baker Lane to the east, and Royal Road to the south.
- The AC DBC established the benefits of the new arterial corridors abutting the future Redhills local centre (as opposed to bisecting it), as avoiding severance issues, and providing for better integration with future land use, which is expected to be characterised by small scale businesses serving the needs of the local community.
- The AC DBC process resulted in the North-South corridor running to the west of the future local centre to avoid impacts on the wetlands immediately to the east. The East-West corridor alignment was progressed to the north of the future local centre as this achieved better integration for land use and transport, reducing the severance of the THAB zone around the local centre. In the review of this option, it was noted that situating the East-West corridor to the south of the local centre would have resulted in impacts on the wetlands located immediately to the east. Refer to Figure 15 below.

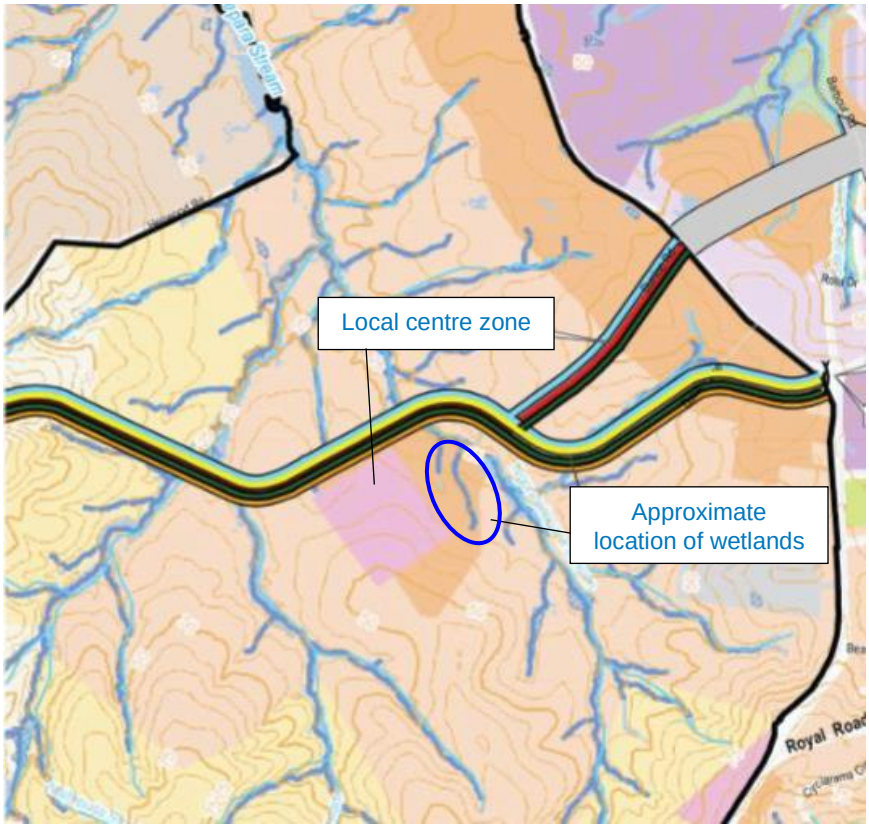

Figure 15: East-West Corridor and wetlands east of the Local Centre

- The review found that the strategic connections and relationship to the future local centre largely determine the form of the RATN. Impacts on wetlands could not be entirely avoided given the need for arterial transport corridors to traverse the Redhills area, to enable its development, however, the preferred North-South and East-West corridors were refined to reduce wetland impacts where possible.
- On this basis, it was concluded that the preferred North-South and East-West alignment as identified by the SG DBC should be progressed.

Subsequently an opportunity was identified to refine the design of the preferred option to reduce wetland impacts. The alignment of the North-South corridor immediately west of the Don Buck Road / Royal Road intersection was amended, introducing a curve to enable the corridor to run closer to the rear of the existing residential properties on Don Buck Road. This pulled the alignment back from two wetland features, reducing the extent of impact. It is possible that the alignment could be refined further at detailed design stage to entirely avoid wetland impacts in these two locations.

6 Stormwater Assessment

Alternative stormwater designs were considered for the RATN to inform the necessary designation boundaries. The stormwater options considered were directed by minimum stormwater outcomes and the engineering constraints of the RATN area. While the evaluation of stormwater alternatives involved technical input from a range of other (non-engineering) disciplines, the primary decision-making process was driven by key engineering considerations which directed the feasibility and suitability of the options available.

As such, the MCA framework was not considered to be an effective decision-making tool for this purpose. Instead, the assessment of stormwater design alternatives used the following process:

1. Identification of the expected minimum stormwater outcomes for the Project (Stormwater Design Philosophy Principles);
2. Analysis of key (engineering and non-engineering) constraints and design considerations which influence the potential stormwater design solutions; and
3. Qualitative evaluation of the potential stormwater design options available to achieve the desired stormwater outcomes within the context of the key constraints and considerations.

The following sub-sections outline this process in relation to the RATN.

6.1. Stormwater Design Philosophy Principles

The key principles of the stormwater design philosophy which were adopted for the consideration of stormwater design alternatives are outlined in Table 10.

Table 10: Stormwater Design Philosophy Principles

Topic	Stormwater Design Philosophy Principles
Designation Boundary	• Establish a conceptual stormwater design to inform the designation boundary for the RATN. • Provide sufficient space to allow the future stormwater design solution to be further developed during subsequent stages of the RATN.
Stormwater Quality	• Avoid the potential impacts of stormwater runoff from new high contaminant generating impervious areas through the treatment of stormwater in accordance with GD01: Stormwater Management Devices Guide (**GD01**), where practicable.
Stormwater Quantity	• Avoid adverse effects on the operation and structural integrity of other infrastructure in a 100 year rainfall event. • Avoid increase in inundation affecting upstream and downstream properties in a 100 year rainfall event. • Adopt on-site stormwater solutions for the retention/detention of runoff from new impervious areas where practicable.
Operation and Maintenance	• Adopt whole of life considerations in the selection and design of the treatment devices – including design life, maintenance cost, and operational effectiveness. • Adopt water sensitive design principles (as specified by GD04: Water Sensitive Design Guide (**GD04**)) where practicable.

Construction	• Minimise construction effects where practicable by:
	  • Limiting cut/fill requirements by locating stormwater devices in locations which utilise the natural topography of the RATN area; and
	  • Minimising the construction footprint of the RATN by locate stormwater devices as close as possible to the transport corridor.

Ecology and Hydrology	• Avoid direct impacts on existing watercourses by locating stormwater devices offline, where practicable. • Avoid indirect impacts on the catchment hydrology by minimising changes to the general flow of groundwater and overland flow within the catchment.
Climate Change	• Avoid the potential impacts of climate change by designing to account for increased Average Recurrence Interval storm events as outlined in the Auckland Council Code of Practice for Land Development and Subdivision Chapter 4 – Stormwater (2015).
Private Property	• Minimise permanent impacts on private property by locating stormwater devices within the transport corridor where practicable. • Minimise impacts on established urban areas by locating stormwater devices in greenfield areas where these are available.

6.2. Constraints and Considerations

Table 11 provides an analysis of the key (engineering and non-engineering) constraints and design consideration which influence the potential stormwater design alternatives.

Table 11: Key Constraints and Design Considerations

Constraint	Description
Corridor Width	• The general cross-section for the RATN corridors provides sufficient space to establish rain gardens/swales.
Topography	• The RATN is located along an undulating landscape with sections of the alignment in excess of 8% grade. This may restrict the practicality of using rain gardens/swales. • The topography of the surrounding catchment is undulating with numerous high and low points which limits the practicality of locating stormwater devices.
Infrastructure capacity	• There is no existing stormwater infrastructure within Redhills. • The existing stormwater infrastructure along Don Buck Road and Royal Road has limited capacity.
Watercourse and hydrology	• There are existing watercourses and wetlands located on the periphery of the RATN. • There are overland flow paths crossing the RATN area and surrounding catchment.
Land use	• The existing transport corridor along Don Buck Road and Royal Road is constrained by existing residential land use which limits the availability of space adjacent to the corridor.

	• The current land use in Redhills is rural in character but has been zoned for a range of residential and business land uses under the AUP:OP. While this provides less of a constraint compared to the existing urban environment, the Project is seeking to support growth and therefore developable land adjacent to the corridors should be maximised. Additionally, Integration with the future urban land use in this greenfield area needs to be accommodated.

6.3. Stormwater Design Options

GD01 was used to guide the range of potential stormwater devices which were considered for the RATN. The range of potential stormwater devices each provide differing methods for managing the effects of stormwater runoff with the aim of achieving one or more of the following:

- Managing the impacts of stormwater quality and quantity
- Mimicking or replicating natural runoff and flow
- Meeting the stormwater quality requirements of the AUP:OP
- Aligning with water sensitive design principles (GD04).

Stormwater devices can generally be considered to provide one or both of the following functions:

1. Treatment of stormwater runoff to manage contaminants; and/or
2. Retention and/or detention of stormwater runoff to manage flow.

Table 12 provides a list of the potential stormwater devices which were considered for the RATN and identifies the primary function(s) of each device.

Table 12: Potential Stormwater Devices and Function

	Treatment	Retention/Detention
Stormwater Wetland(s)/Pond(s)	✓	✓
Rain Gardens/Swales	✓	✓
Filtration Devices	✓	✗
Detention Tanks	✗	✓
Pervious Paving	✓	✓
Existing Network	✓	✓

Table 13 provides an analysis of the suitability of each of the potential stormwater management device options with respect to the RATN area and stormwater design philosophy taking into account both treatment and retention/detention functions.

Table 13: Consideration of Potential Stormwater Options

Treatment Options	Comments
Stormwater Wetland(s)/Pond(s)	Constructed wetlands provide water quality and quantity management. Plants and microbes within a wetland can remove, metabolise or inactivate pollutants. Wetlands can be designed for detention of the 90th/95th percentile flows, and for attenuation up to the larger 100 year storm events for flood mitigation. Wetlands are normally placed in the lower areas of a catchment as a final stage of the treatment suite. Wetlands can at later design stages be combined with at source bioretention devices located on the proposed arterial routes. This can improve longevity and the required maintenance works. Wetlands can provide additional Manawhenua values and incorporate water quality treatment without any additional requirement of a stormfilter device/s. The key constraint to the use of a wetland is the availability of sufficient space. As much of the RATN is surrounded by greenfield land which is identified for urbanisation this area is considered suitable for locating a wetland.
Rain Gardens/Swales	Rain gardens/swales are generally a favourable stormwater treatment option for transport corridors as they can often be incorporated into the design of the transport corridor and provide an effective treatment option with relatively low maintenance cost. The general corridor cross-section for the RATN corridors provides sufficient space to incorporate rain gardens/swales into the corridor. However, the Project is seeking to support growth and therefore developable land adjacent to the corridors should be maximised. Provision of wider corridors for swales would not be as supportive of this objective. Rain gardens/swales provide a hydrological function by reducing runoff volumes (through retention) and detaining runoff flows. However, they generally have limited capacity to attenuate larger events and generally need to be supplemented with additional stormwater devices for this function. Rain gardens/swales may be viable within the medium strip of the corridor where there is sufficient space and these are not required for transport functions. Rain gardens/swales are ineffective at providing treatment at grades which are in excess of 8%, and retention//detention at grades in excess of 4%. Parts of the RATN have a slope greater than 4% and parts have a slope greater than 8%, therefore rain gardens/swales will be ineffective along these sections of the alignment and alternative treatment options would be required in these sections.
Stormwater Filters	Stormwater filters can provide effective treatment where it is possible to provide a bypass for events greater than the water quality storm event. There is sufficient corridor width to provide underground stormwater filters within the RATN corridors. These devices require ongoing maintenance in accordance with the manufacturers' specification. The devices have limited lifespans and need to be replaced periodically. In comparison to other treatment device options this ongoing maintenance cost and limited life span make this option comparatively cost inefficient. Stormwater filters also do not provide any form retention/detention function and additional stormwater devices are also required to provide this function. Accordingly, stormwater filters are generally less favourable unless there are significant constraints which prohibit the use of other devices.

Pervious Paving	Pervious pavement will not be suitable for traffic areas of high acceleration, decelerating or turning. This option will not comply with the pavement and structural requirements of the RATN.
Existing Public Stormwater Network	There is no existing stormwater treatment within Redhills, therefore this is not a viable option.

6.4. Stormwater Recommendations

Based on the above assessments, the recommended stormwater system for the RATN will be comprised of constructed wetlands to provide water quality and quantity management.

The selection of these constructed wetlands will inform the designation boundary for the RATN, with the final design of the wetlands and primary stormwater system to be determined at the later detailed design phase when regional resource consents are sought.

7 Alternative Methods

7.1. Introduction

The Supporting Growth Programme seeks to identify and protect the required transport network to support Auckland's projected growth over the next three decades. The RATN is likely to be delivered over the next three decades. AT has decided to use a designation as the method to both protect the RATN over the coming decades and allow for the future construction, maintenance and operation of the RATN. Section 171 of the RMA requires an assessment of alternative methods, in addition to routes and sites.

Other possible methods to achieve the RATN include:

- Landowner/developer negotiation;
- Precinct plan or further plan change;
- Obtaining resource consents;
- Alternation to existing designations;
- Traditional property acquisition; or
- A combination of the above.

HIF funding is available for parts of the RATN, including NoR2a (Dunlop Road), NoR2b (Baker Lane) and part of NoR2 (to the intersection with the North-South Project). These projects are likely to be implemented in the short term (within 5 years), while the remainder of the RATN is anticipated to be constructed at a later date.

7.2. Key Risks and Considerations

The following provides an overview of the key considerations which have influenced the preferred methodology for delivering the RATN.

- **Development Pressure**: Redhills is zoned for a range of residential and business land uses under the AUP:OP to enable urban development of the area. A number of developers with landholdings in Redhills are known to be working towards development in the immediate future.
- **Fragmented Land Ownership:** The northern part of the Redhills area is owned by a single landowner. However, the southern half of Redhills is owned by numerous land owners, with fragmented and constrained land holdings around the Don Buck Road/Royal Road intersection. The fragmented nature of the land holdings to the south means there is a low likelihood of the entire RATN being implemented as part of a wider land development project.
- **Redhills Precinct Plan**: The Redhills Precinct Plan in the AUP:OP (I610 Redhills Precinct) provides an indicative arterial network for Redhills (I610.10.1. Redhills Precinct: Precinct Plan 1) which generally aligns with the RATN.
- **Construction Timing**: HIF funding is limited to particular parts of the RATN. It is likely the RATN will be delivered in stages, potentially by different landowners in conjunction with AT.
- **Existing Fred Taylor Drive Designation:** Two existing transport designations apply to parts of the RATN – Fred Taylor Drive Transport Corridor (1433, AT) and Road Widening – State Highway 16 (Westgate to Whenuapai) (1468, AT). Together these designations

provide for a transport corridor at least 30m wide along Fred Taylor Drive between Don Buck Road and the Brigham Creek roundabout.

7.3. Route Protection Mechanisms

Table 14 provides an assessment of the suitability of each of the available methods.

Table 14: Consideration of methods to achieve the RATN

Mechanism	Consideration	Suitability
Designation	A NoR to designate land for a public work under the RMA provides a strong level of route protection from incompatible development particularly where development pressure is anticipated along the corridor. Once confirmed it also provides authorisation to undertake and maintain the works. A NoR has interim route protection effect as soon as the notice is lodged with Council which ensures the corridors will be protected from incompatible development from that date, enabling a cohesive interim protection for linear networks like roads. This effectively manages risk of development within the corridor that may otherwise hinder the proposed work. This is particularly important as Redhills is anticipated to undergo significant urbanisation as signalled by the AUP:OP and Redhills Precinct Plan. A number of large-scale residential developments are already underway. A designation, if confirmed, is included in the relevant district plan as a publicly visible layer. This provides visibility to the public about the intended land use and project extent. It also provides certainty to other infrastructure providers, developers and landowners about the future network location, enabling coordinated development planning. A designation enables streamlined delivery of a corridor following detailed design, by consenting the project requirements under the district plan and allowing OPWs to be sought at a later date. Designations also provide landowners with particular rights under the RMA to require acquisition if they can no longer have reasonable use of their properties. Further, a designation does not preclude AT from reaching agreements with landowners to deliver parts of the RATN as the Redhills area develops.	**Strong**
Land owner/ developer negotiation	Landowner or developer negotiations can include private parties purchasing land and vesting roads that support development, or development agreements whereby a developer agrees to “set aside land for future transport corridor” and/or construction at a future point. Infrastructure Funding Agreements (IFA) are the preferred form of landowner/ developer agreement to enable delivery of transport infrastructure. IFAs provide route protection where a developer agrees to design and implement a project. For landowner agreements to be efficient, the aspirations and timing of each party must be aligned. Securing agreements with some developers to deliver parts of the RATN may be likely, as a number of them are already underway with planning and bulk earthworks. However, where a developer has no immediate plans to develop, there is limited incentive to enter into longer term agreements to provide route protection for the network.	**Moderate**

Mechanism	Consideration	Suitability
	Landownership in other parts of the RATN is more fragmented; therefore, this method relies on individual property owners, who may not be developers (with sufficient capital or expertise) to enter into agreements. Private property owners with no development aspirations that are not part of a broader scheme may not have capacity or desire to negotiate such agreements. Additionally, it is not compulsory for landowners to enter into agreements, for linear corridors requiring a consistent network, agreement must be secured along the length of the route. A piecemeal approach significantly reduces the utility of this method for route protection purposes.	
Precinct Plan or further Plan Change	The RATN is already indicatively shown in the Redhills Precinct Plan in the AUP:OP (generally in accordance with the RATN as shown in the Assessment of Environmental Effects). The activity status for development within the Precinct encourages applications in general accordance with the Redhills Precinct Plan, and the provisions relating to the transport network were the subject of Environment Court appeals discussed earlier (section 3.2.2.3). Landowners may seek non-complying consents that do not deliver the indicative network shown in the Redhills Precinct. The inclusion of the RATN in the Redhills Precinct Plan in the AUP:OP does not provide protection from development and does not authorise the construction of the RATN. Alternatively, a new Corridor Overlay could be included in the Unitary Plan to provide for the RATN. AUP:OIP overlays can provide certainty to the community by publicly identifying the network, however they do not protect the land necessary for the works. Any overlays would require a plan change, this may not be an approach accepted by Council as the AUP:OP overlays are generally focussed on RMA Section 6 and 5 matters (e.g., heritage, significant ecological areas). There are existing infrastructure overlays in the AUP:OP for noise (e.g., Airport Noise Overlay, City Centre Port Noise Overlay) as well as the National Grid Corridor Overlay, which is most reflective of how an overlay may appear for a transport corridor. However, it is noted that the National Grid is also served by the NPS on electricity transmission which sets out key protections from the adverse impacts of third-party development. There is currently no NPS which would provide the required protection for key transport corridors. Progressing a 'Transport Corridor Overlay' within the AUP:OIP is not considered as a viable route protection method for the RATN.	**Moderate**
Obtaining resource consents	Resource consent granted under a district plan gives approval to use or develop land. A resource consent, if granted, is not shown publicly in a district plan meaning the public would have limited awareness of its existence. It does not protect land or provide rights of exclusion that would hinder incompatible land use. It would be possible to progress the RATN via district resource consents (along with necessary regional consents). This process would require a complex assessment against a range of district plan rules, resulting in a more complex application process and less cohesive conditions set.	**Weak**

Mechanism	Consideration	Suitability
Alteration to existing designations	The existing Fred Taylor Drive designations provide for widening of that particular road corridor beyond the existing carriageway. These designations could be varied to provide for the upgrade of the Fred Taylor Drive part of the RATN, but this does not provide for the protection or delivery of the majority of the RATN.	**Weak**
Traditional property acquisition	Traditional property acquisition to acquire the necessary land for the RATN was considered. Land is typically purchased a few years before a project goes to construction and delivery, based on detailed design plans. Purchasing property at this stage ahead of detailed design may result in too much or too little land being required and may not enable construction areas to be protected which are required temporarily to construct the corridors. Like developer negotiations, traditional property purchase would not provide route protection until acquisition, where multiple owners are present this is unlikely to be achieved in a timely or consistent manner.	**Weak**

7.4. Recommendations

A designation is the most efficient and effective mechanism for enabling construction, operation and maintenance of the RATN as it will:

- Provide certainty to all parties by defining use and extent of the RATN
- Set aside the required area and restrict activities or use that may prevent or hinder the identified RATN being realised
- Enable ongoing interim use of the required land by owners where it will not hinder the RATN
- Allow detailed design to be undertaken prior to project delivery
- Provides authorisation under the district plan to undertake the works, and maintain and operate the transport corridor.

8 Conclusion

A wide range of alternatives have been investigated for addressing the future transport needs of the Redhills area. A key driver for the consideration of alternatives was to avoid adverse effects where practicable. That evaluation confirmed that the following options would provide a balance of strong transport and urban outcomes for Redhills and the wider North West area, while minimising potential adverse effects:

- A North-South arterial corridor, connecting from the upgraded and signalised Don Buck Road/Royal Road intersection in the south and connecting to the East-West arterial corridor to the west of the proposed local centre and adjacent THAB zoning. This corridor is situated to the West of the Ngongetepara Stream and aligned with the existing Transpower transmission lines that traverse the Redhills area.
- An East-West arterial corridor, connecting from the upgraded (roundabout) Red Hills Road/Nixon Road/Nelson Road intersection to the east and connecting to Fred Taylor Drive to the west. The section of the corridor to the east of the proposed local centre includes two dual arterial corridors; Dunlop Road (with public transport prioritisation) and Baker Lane.

The assessment of alternatives has been based on a comprehensive and replicable optioneering process. As such, it is considered that adequate consideration has been given to alternative sites, routes or methods for undertaking the work, satisfying the requirements of section 171(1)(b) of the RMA.

Appendix 1. MCA – corridor assessment

Investment Objectives	Measures	
Performance against objectives	Investment Objective 1 *Increase the supply of transport infrastructure serviced land for housing in Redhills and Whenuapai, appropriately integrated with adjacent land uses, initially by 2021 and over a 30-year period, in line with the Future Urban Land Supply Strategy.*	
	Investment Objective 2 *Develop liveable, connected communities at Redhills and Whenuapai through an integrated and resilient transport system which, over 30 years, will enable efficient access to jobs and core services, reduce private vehicle mode share and provide travel choices.*	
Implementability	**Sub-criteria**	**Measures**
Consentabilty	Consentabilty	What is the level of complexity in gaining statutory approvals and scale/significance/costs of mitigation? Is a new designation or alteration required? Consideration of conflicting/ overlapping designations. Qualitative assessment of the number of consents required and consideration of the zoning and Plan objectives and policies.
Affordability	Operational/ Maintenance	Are there any factors that might affect the ability to operate or maintain the option over its projected life without major additional costs?
	Financial	Funding and likely BCR.
Stakeholders/ Customers	Stakeholders/ Customers	Expectation of this option to relevant stakeholders/customers (how aligned or otherwise is the option with these expectations)? Scale/validity of anticipated objections from stakeholders/customers related to this option (risk)? Alignment to strategic plans and policies (Central Government, Auckland Council, CCOs).
Assessment of Effects		
Transport	User safety	Safety for all transport users, including: • Private vehicles • Walkers/cyclists
	Transport system integration	Are there any wider transport system effects (i.e. impacts on other strategic connections and/or the existing transport network) and how well does the option meet the forecast transport demand?
Construction (temporary impacts)	Construction impacts on utilities and lifeline infrastructure	Requirements for relocation/design of alternative major infrastructure, including consideration of Safety impacts of such requirements and risk of continuity of service over construction.
	Construction costs	Assessed cost for construction of options including: • Complexity and risk in construction • Complexity in programme • Cost and complexity of undertaking works on contaminated land (including health and safety)

	Construction impacts	Impacts on people and businesses from disruption from traffic, dust, noise (including from a quality of life/amenity point of view and economic impacts on businesses).
Socio-economic	Urban Design: Land use futures	To what extent will there be impacts on the orderly development of land (within the corridor, adjacent to it and impacted by it – i.e. consider all 3 scales), in relation to: • Underlying urban structure (block and street pattern) • Size and shape of potential development parcels to enable appropriate building typologies • Ability to consolidate residual land • Access that does not prevent neighbouring development
	Social cohesion	Will the option impact on Connectivity/Accessibility for the public including access to: • Jobs • Other communities or within the same community (i.e. social cohesion) • Shops/services/other community and cultural facilities/'attractors' Will the options impact on existing community facilities and open space?
	Human Health	Are there any sensitive land uses nearby or clearly planned (childcare centres, hospitals, rest homes, marae, schools)? Will the option impact human health relating to: • Air Quality • Contaminated land • Noise and vibration
	Economic	Impacts on existing economic opportunities that are anticipated for future development (consideration will be given to economic activities that will change because of planned land use development).
Natural Environment	Landscape/ visual	Will the option have visual effects on the environment? The extent of effects on: • the natural landscape and features such as streams, coastal edges, natural vegetation and underlying topography – acknowledging planned changes to area considering urban land use/zoning • natural character and outstanding natural features/landscapes including geological features (mapped and protected features)
	Water quality	Impact of operational stormwater in regard to quantity and quality (including life supporting capacity).
	Ecology	Extent of effects on: • significant indigenous vegetation • significant habitats of indigenous fauna • indigenous biodiversity • stream ecology (recognising integration of ecology with future urban land use zoning and realistic future of some elements, such as intermittent streams)
Heritage	Heritage	Extent of effects on: • sites and places of valued heritage buildings and places • sites and places of archaeological value

		• sites and places of cultural heritage value
	Manawhenua	Extent of effects on the relationship of Māori to their culture and traditions with their ancestral lands, water, sites, waahi tapu, and other Taonga (tangible and intangible). Extent of effects on Māori landholdings which includes marae, papakāinga and Maori land.
Opportunity Outcomes		
Holistic socio-economic considerations	Urban Design: Access and amenity (of the walking and cycling network)	Do the connections feel safe? • Is the option well overlooked or isolated from other activities and casual surveillance? • To what extent does the option require CPTED measures (e.g. lighting, landscape pruning, straightening of paths, removal of obstacles)? • Does the option help overcome safety concerns (perceptual) associated with cycling? • Are connections direct? • Does the option follow direct routes with minimal detours and waiting times to key destinations and existing infrastructure? • Does the option create severance and delay for pedestrians at key destinations? • Does the option provide connections to key PT interchanges? Are connections comfortable? • Does the option provide an easy gradient for walking and cycling? • Is there shade, shelter from wind; are the edges soft or hard, low or high? • Are connections coherent? • Is the option well integrated into a continuous and consistent cycling network? • Are connections attractive? • Is the option aesthetically pleasing and attracts new users? • Does it integrate with open space and stream corridors?

	Urban Design: Quality of the urban environment	To what extent does the option support (both current and future planned state):
		• An inviting, pleasant and high amenity public realm
		• Active interface between public and private realm (appropriate building entries and openings, front setbacks, streetscape)
		• Open space integration, e.g.
		  • Strong physical and perceptual relationship between activity nodes/ public spaces/public streets
		  • Adequate space for services, street furniture and people
		  • A ‘green web’ of sustainable landscape planting
		  • Reinforcing landscape/vegetation patterns
		  • Context and planned place making considerations e.g.
		  • response to/reading of underlying topography
		  • locating views to landmarks and distinctive natural and/or built features [from the corridor]

		• impact on the outlook, landscape setting and character of existing neighbouring uses • requirements for noise walls or other barriers that may visually close off places • Type and scale of new structures (e.g. Project may be out of scale now but appropriate for desired future character)
	Climate Change	Opportunity to reduce the vulnerability to effects of climate change through siting of the option, thereby reducing requirements for adaptation.
	Social Equitability	Opportunity to increase local training and employment for workplace upskilling and increasing support for disadvantaged communities.
	Greenhouse gas emissions (GHG)	Opportunity to reduce GHG emissions through mode choice; and to reduce GHG emissions through the design and construction phase (i.e. ease of constructability, significance of earthworks resulting in fuel use and GHG emissions generation).
	Use of materials/ waste	Opportunity to reduce the amount of energy-intensive materials used in construction (e.g. asphalt, concrete, steel etc) and reduce the amount of waste produced through materials reuse (e.g. demolition materials from existing roads and structures, waste spoil etc).

Appendix 2. MCA route assessment

Scored criteria

Criteria	Sub-criteria	Description
Heritage	**Heritage**	Extent of effects on sites and places of: • Valued heritage buildings, trees (heritage value) and places • Archaeological value • European cultural heritage value
Socio-economic impacts	**Land use futures**	To what extent will the option impact on the future development of land (within the corridor, adjacent to it and impacted by it – i.e. consider all 3 scales), in relation to: • Underlying existing urban structure (block and street pattern) • Integration with the future land use scenario (aligning housing delivery with infrastructure delivery) • Size and shape of potential development parcels to enable appropriate building typologies • Ability to consolidate residual land • Access that does not prevent neighbouring development
	Urban design	To what extent does the option support (both current and future planned state) a quality urban environment, particularly relating to: • Context and planned place making considerations • An inviting, pleasant and high amenity public realm • Open space integration • Active interface between public and private realm • Scale of long-term impact on amenity and character
	Land requirement	Scale of public/private land (m^2/number of properties/unique status of impacted property) required to deliver the option.
	Social cohesion	Impact on access to: • Employment • Other communities or within the same community • Shops/services/other community and cultural facilities/'attractors' • Severance of the existing community (including consented) • Scale of effect on existing community facilities and open space
	Human health and wellbeing	Will the option potentially affect any sensitive land uses (adjacent residential, childcare centres, hospitals, rest homes, marae and schools)? Particularly: • Air quality • Contaminated land • Noise and vibration • Water quality
Natural environment	**Landscape/ visual**	The extent of effects on: • Streams, coastal edges, natural vegetation and underlying topography – acknowledging planned changes to area considering land use/ zoning

		• Natural character and outstanding natural features/landscapes including geological features (mapped and protected features)
	Stormwater	Impact of operational stormwater (both quantity and quality) on the receiving environment, including: • Life supporting capacity • Potential flooding effects of the option within the catchment • Extent and consequences of likely mitigation measures
	Ecology	Extent of effects on: • Significant indigenous flora • Significant habitats of indigenous fauna • Indigenous biodiversity • Stream/waterway ecology • Coastal environment (e.g. CMA)
Environmental opportunities	**Climate change outcomes**	• Opportunities to improve resilience to effects of climate change and requirement for adaptation e.g.: flooding, sea level rise, storm events, drought/heat wave • Climate Change risk assessment and adaptation options (not just an opportunity/treat as risk and opportunity) • Ability to mitigate greenhouse gas emissions (GHG) emissions – construction and operational; access to renewables; ability to use renewable
Transport	**User safety**	Safety for all transport users, including: • Private vehicles • Public transport • Pedestrian/cyclists/other road corridor users
Construction impacts	**Construction impacts on utilities/ infrastructure**	Requirements for relocation/design of infrastructure, including • Consideration of safety impacts • Risk of continuity of service over construction • Engagement with utility providers • Opportunities for integration with other bulk infrastructure
	Construction disruption	Construction impacts on people and businesses regarding: • Traffic & noise • Earthworks related effects including dust • Quality of life and amenity • Economic impacts on businesses/community/town centres
Construction cost and risk	**Construction costs and risks**	Assessed cost for construction of options including: • Complexity and risk in construction (including consideration of constructability) • Complexity in programme • Cost and complexity of undertaking works on contaminated land (including health and safety)

Criteria from the Supporting Growth Programme framework determined to be unnecessary for the Project specific MCA and reasons why:

Criteria	Commentary
Social equitability	Given the similarity of the options which were being assessed (location, scale, mode, etc.) it was determined that this criterion would not provide a differentiating score and was not assessed. All options have an equal ability to provide for local training and employment for workplace upskilling and apply sustainable procurement methods.
Ecological opportunities	Given the similarity of the options which were being assessed (location, scale, mode, etc.) it was determined that this criterion would not provide a differentiating score. All options have an equal ability to include ecological restoration opportunities.
Transport integration	This criterion was addressed in Investment Objective 1 with a more localised context. It was determined that this criterion would replicate the score of Investment Objective 1 and was not assessed.
Maintenance costs	Given the similarity of the options which were being assessed (location, scale, mode, etc.) it was determined that this criterion would not provide a differentiating score. All options would have comparable maintenance costs.
Operational costs	Given the similarity of the options which were being assessed (location, scale, mode, etc.) it was determined that this criterion would not provide a differentiating score. All options would have comparable operational costs.
Behavioural change/ future technology opportunities	This criterion was addressed in Investment Objective 2 with a more localised context. It was determined that this criterion would replicate the score of Investment Objective 2 and was not assessed.