

FINAL

ABERNETHY WAY EXTENSION STUDY

232 STREET TO 256 STREET

November 18, 2019 | Project #: 2111-03980-00 | Submitted to: City of Maple Ridge



McElhanney Ltd.
Suite 2300 - 13450 102 Avenue
Surrey BC, V3T 5X3

Contact: Bernard Abelson, PEng, MEng, TOPS
Project Manager
604-424-4935 | babelson@mcelhanney.com

CONTENTS

CONTENTS	III
TABLES	IV
FIGURES	IV
APPENDICES	IV
EXECUTIVE SUMMARY	V
1. INTRODUCTION	1
1.1. Overview	1
1.2. Corridor Objectives	1
1.3. Project Objectives	1
1.4. Project Scope	1
1.5. Study Area	2
1.6. Previous Studies and City References	3
2. 240 STREET EXTENSION FEASIBILITY STUDY	4
2.1. Overview	4
2.2. 240 Street Extension Concept design	4
2.3. INFLUENCE OF THE PROPOSED DEVELOPMENT	7
3. EXISTING CONDITIONS	9
3.1. Overview	9
3.2. Site Context	9
3.3. Archaeological Overview Assessment	11
3.4. Environmental Review	11
3.5. Geotechnical Desktop Review	13
3.6. Creek Crossings Review	13
4. OPTION REFINEMENT AND SHORTLISTING	14
4.1. Overview	14
4.2. Alignment Options Considered	14
4.3. Option Shortlisting	15
5. TRAFFIC FORECASTS AND LANING	19
5.1. Overview	19
5.2. Analysis Approach	19
5.3. Forecast Traffic Volumes Pre & POST OCP Amendment	23
5.4. Laning Assessment	24
6. COST ESTIMATE	27
6.1. Overview	27
6.2. Cost Estimate Summary	29
7. PUBLIC ENGAGEMENT	30
7.1. Overview	30
7.2. Engagement Process	30
7.3. Survey Results	30
8. EVALUATION OF SHORTLISTED OPTIONS	34
8.1. Overview	34
8.2. MAE Summary	34
9. CONCLUSIONS & RECOMMENDATIONS	36
9.1. Overview	36
9.2. Summary	36
9.3. Recommendations and Next Steps	36

TABLES

Table ES - 1: Multiple Account Evaluation (comparison of options relative to each other).....	vii
Table 1: Compensation Areas	12
Table 2: Change in Total Trips Due to OCP Amendments	22
Table 3: 2050 AM (PM) Peak Traffic Forecast.....	23
Table 4: Lane Capacities by Facility and Area Type (Highway Capacity Manual).....	24
Table 5: Summary of Recommended Number of Lanes for each Roadway Segment	24
Table 5: Cost Estimate Summary	29
Table 6: Multiple Account Evaluation (comparison of options relative to each other).....	35

FIGURES

Figure ES - 1: Alignment and Segment Options Considered.....	v
Figure ES - 2: Three Shortlisted Options	vi
Figure ES - 3: Shortlisted Option	viii
Figure 1: Area Overview (from the 2014 STP).....	2
Figure 2: Proposed 240 Street Extension Concept Cross Section	5
Figure 3: Plan View of Proposed 240 Street Bridge Crossing	5
Figure 4: Typical 240 Street Superstructure Cross-Section.....	6
Figure 5: Proposed 240 Street Bridge Profile	7
Figure 6 TransLink's Major Road Network.....	9
Figure 7 Study Area Agricultural Land Reserve	10
Figure 8 Schools Located in and Around the Study Area	10
Figure 9: Alignment Options Considered	14
Figure 10: Shortlisted Option 2C.....	16
Figure 11: Shortlisted Option 7	17
Figure 12: Shortlisted Option 10	18
Figure 13: Three Shortlisted Options	18
Figure 14: Population Growth by Traffic Analysis Zone 2016 to 2035 (from the RTM)	20
Figure 15: Employment Growth by Traffic Analysis Zone 2016 to 2035 (from the RTM)	20
Figure 16: OCP Amendments in the North-East of the Study Area	21
Figure 23: Concept Abernethy Way Extension: 232 St to 240 St - Short Term (to 2035): All Options	25
Figure 24: Concept Abernethy Way Extension: 232 St to 240 St - Long Term (after 2035): All Options.....	25
Figure 25: Concept Abernethy Way Extension: 240 St to 256 St: Options 2C and 10	26
Figure 26: Concept 240 St (Abernethy to Dewdney Trunk Rd) and Dewdney Trunk Road (240 St to 252 St): Option 7.....	26
Figure 27: Demographics & Place of Residence or Business	31
Figure 28: Demographics and Interest in Active Transportation	31
Figure 29: Preferred Option Selection	32
Figure 30: Preferred Option by Place of Residence	32
Figure 31: Recommended Abernethy Way Extension and Parallel 124 Ave Connection.....	37

APPENDICES

Appendix A: 2010 Delcan Studies	Appendix B: 240 Street Extension Drawings
Appendix C: Abernethy Way Drawings	Appendix D: Archaeological Overview Assessment
Appendix E: Geotechnical Desk Study Report	Appendix F: Traffic Demand Forecast
Appendix G: Property Summary	Appendix H: Class D Cost Estimate



EXECUTIVE SUMMARY

Abernethy Way is a key east-west arterial in the City of Maple Ridge and is part of TransLink's Major Road Network (MRN) connecting the Golden Ears Bridge to the west and 232 Street to the east. It generally parallels two other major routes in Maple Ridge: Lougheed Highway and Dewdney Trunk Road.

Extending Abernethy Way beyond 232 Street to 256 Street as an alternative to Dewdney Trunk Road was identified in the City's 2014 Strategic Transportation Plan (STP). This would provide better access to future proposed industrial land development in the north east sector of the City. The City has in the past developed corridor alignment options for this extension, and through this study wished to determine the technical feasibility of the corridor and to provide a recommended alignment. This new extension would be Phase 3 (to 240 Street) and Phase 4 (to 256 Street) of the Abernethy Way extension as per the STP.

The study objectives were to assess the feasibility of both the previously identified options as well as identify any new options, before shortlisting options for further assessment. The shortlisted options were then presented to the public for their input, before being compared to each other using a Multiple Account Evaluation (MAE) process. In addition, the study was to determine the technical feasibility of a possible new 240 Street extension over the Alouette River to Fern Crescent.

Thirteen alignment options or segments were reviewed as shown in **Figure ES - 1**, as well as the 240 Street extension.

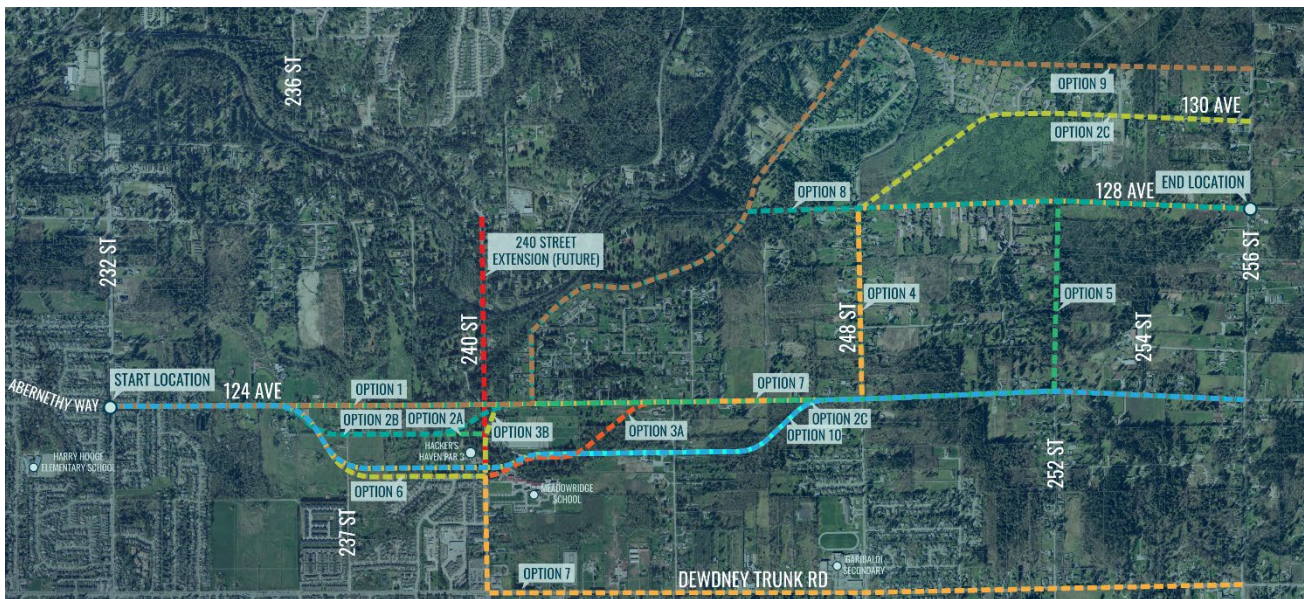


Figure ES - 1: Alignment and Segment Options Considered

Based on criteria such as the number of significant river and creek crossings, road geometry, terrain, cost effectiveness, and community, environmental, geotechnical, and archaeological impacts, three options were shortlisted for more detailed analysis. The three options are described below and have a consistent segment from 232 Street to 240 Street as shown in **Figure ES - 2**.

1. An alignment east of 240 Street to 124 Avenue that then continues along the existing 248 Street and 130 Avenue (Option 2C).

2. An alignment that would connect to and widen 240 Street and Dewdney Trunk Road (Option 7), as well as provide a new link on 124 Avenue between 244 Street and 246 Street.
3. An alignment east of 240 Street that generally follows the 124 Avenue greenfield alignment with a deviation south at Latimer Creek (Option 10).

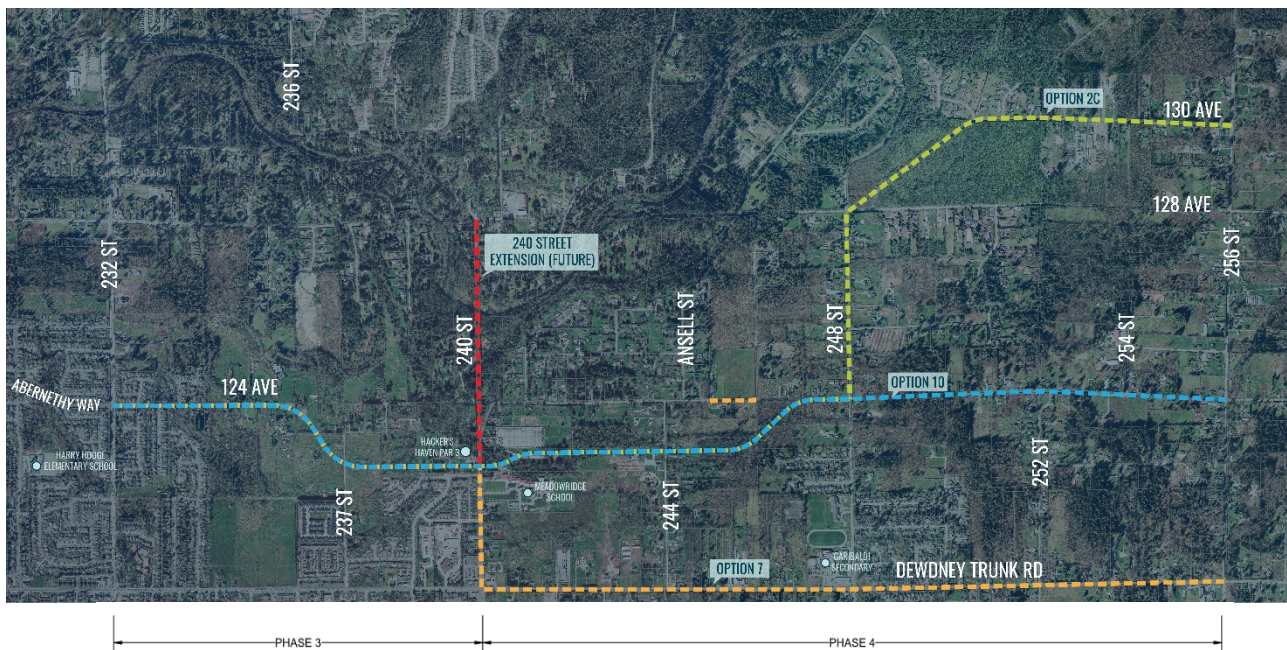


Figure ES - 2: Three Shortlisted Options

The findings of the MAE are shown in [Table ES - 1](#).

Table ES - 1: Multiple Account Evaluation (comparison of options relative to each other)

Criteria	Option 2C		Option 7		Option 10	
	130 Ave. (Upper Route)		Dewdney (Lower Route)		124 Ave. (Middle Route)	
	Influencing Factors		Influencing Factors		Influencing Factors	
Relieves Traffic on Dewdney Trunk Rd & Provides Network Redundancy			<ul style="list-style-type: none"> Includes constructing the road segment Option 7C to provide network redundancy via 248 St and 130 Ave 			
Provides Access to NE Sector of the City						
Consistency with Strategic Transportation Plan (STP) / OCP						
Public Preference						
Directness of Route						
Utilization of Existing Roads & Property Impact						
Environmental Impact	<ul style="list-style-type: none"> Two new Latimer Creek crossings. Compensation Area: ~23,209m² 		<ul style="list-style-type: none"> No major creek crossings. Compensation Area: ~14,402m² 		<ul style="list-style-type: none"> Two new Latimer Creek crossings. Compensation Area: ~35,427m² 	
Possibility of Archaeological Impact						
ALR Impact						
Social / Community Impact, also including impact to schools and through-cutting						
Significant Utility Relocation			<ul style="list-style-type: none"> Traffic safety barriers will be required to avoid some BC Hydro pole relocations 			
Cost Estimate (Class D; \$2019)	<ul style="list-style-type: none"> \$71.8M \$37.3M (240 St Ext) 		<ul style="list-style-type: none"> \$66.0M \$37.3M (240 St Ext) 		<ul style="list-style-type: none"> \$69.4M \$37.3M (240 St Ext) 	
2 pts; 1 pt; 0 pts		14		18		15
Overall						

Based on the technical analysis and desktop and assessments undertaken as part of this study, extensions of both Abernethy Way from 232 Street to 256 Street, and 240 Street to Fern Crescent appear to be technically feasible.

Option 7 (Dewdney Trunk Road), shown in **Figure ES - 3**, is the preferred alignment option based on the MAE findings and was also the preferred option identified at the public Open House.

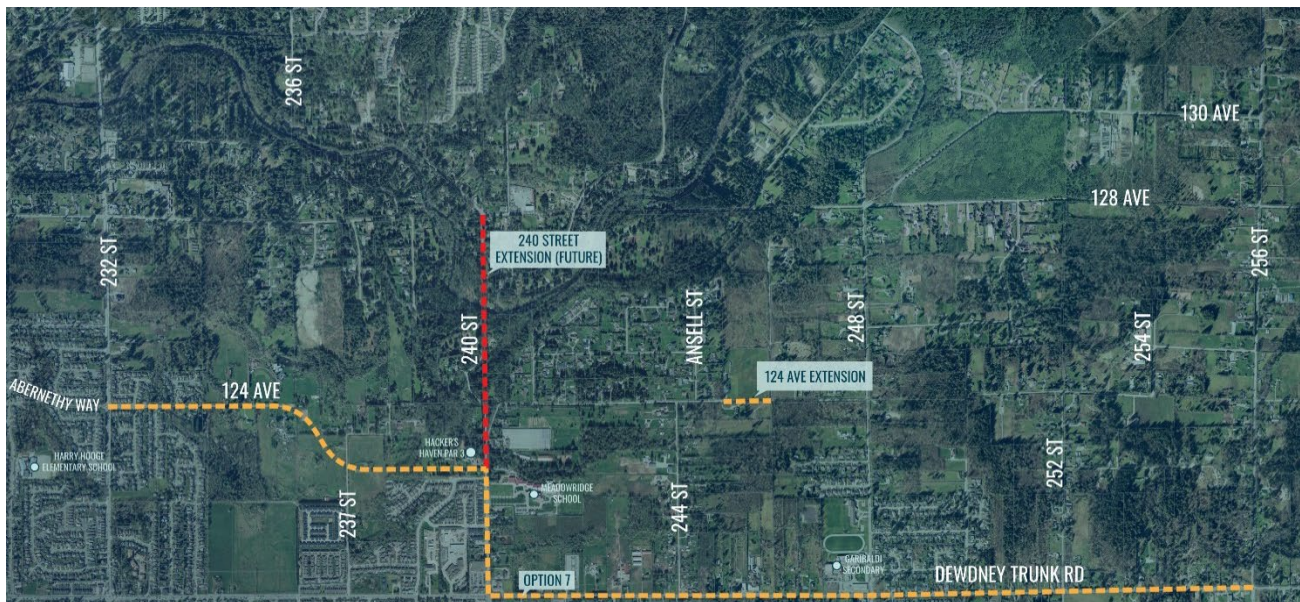


Figure ES - 3: Shortlisted Option

Based on the findings of this study, Option 7 (Dewdney Trunk Road) is recommended as the preferred option to investigate further. The future extension of 240 Street over the Alouette River can proceed as a separate project in future or as preferred by the City. Advancing these two projects to the conceptual design stage will allow some of the remaining unknowns to be determined, including more accurate property acquisition costs, and thereby prepare more reliable cost estimates (Class C or better).

Included as part of this preferred option in the widening to four lanes of the section of 240 Street from Dewdney Trunk Road to the new Abernethy Way extension in the vicinity of the Hackers Haven, just north of the existing Abernethy Way intersection. This is consistent with the future proposed extension of 240 Street north to Fern Crescent, and the eventual possible inclusion of 240 Street between Dewdney Trunk Road and Fern Crescent in TransLink's Major Road Network. The 240 Street connection to the Abernethy Way extension will also help better balance traffic on the section of Dewdney Trunk Road west of 240 Street and on 232 Street between to Dewdney Trunk Road and Abernethy Way. In the next design stage where road upgrades are in close proximity to schools, mitigation measures should be considered in the design.

To meet the objective of providing an alternative route to Dewdney Trunk Road, completing the link of 124 Avenue between 244 Street and 246 Street is recommended. This will then provide an alternative route for local and emergency vehicle traffic connecting 240 Street to 256 Street via 124 Avenue, 248 Street and 130 Avenue. It is proposed this route be heavy vehicle restricted.

As part of the next design stages, further public engagement is also recommended.



1. INTRODUCTION

1.1. OVERVIEW

The 128 Avenue / Abernethy Way corridor is a key east-west arterial route in the City of Maple Ridge (the City) with a direct connection to the Golden Ears Bridge through Golden Ears Way at the west boundary and 232 Street at its current eastern boundary. Abernethy Way is a winding road that is currently part of TransLink's Major Road Network (MRN) and generally parallels two other major east-west connectors to the south: Lougheed Highway and Dewdney Trunk Road.

1.2. CORRIDOR OBJECTIVES

Extending Abernethy Way to 240 Street as a long-term improvement option and eventually to 256 Street as an alternative route to Dewdney Trunk Road were identified in the City's 2014 Strategic Transportation Plan (STP). The primary objectives of the corridor are to:

1. Extend Abernethy Way from 232 Street to 256 Street to provide improved access to the industrial and employment lands in north east sector of Maple Ridge, as per the City's Official Community Plan (OCP) and the STP.
2. Provide an improved connection to a possible future extension of 240 Street north to access the Silver Valley area.
3. Improve both local and regional traffic flow (which includes access to the Golden Ears Provincial Park).
4. Provide redundancy in the road network and an alternative emergency route.

1.3. PROJECT OBJECTIVES

The objectives of this study are to:

1. **Assess the technical feasibility of extending 240 Street north to Fern Crescent to access the Silver Valley area and Golden Ears Provincial Park.** The study considers a preferred crossing option of the Alouette River taking into account hydrotechnical and environmental factors.
2. **Assess the technical feasibility of various options of the Abernethy Way extension from 232 Street to 256 Street.** The study considers alignments, road connections, construction costs, property impacts, structural, archaeological, environmental, drainage and social impacts using previously prepared alignment options as the starting point.
3. **Evaluate each option and identify a preferred option.** The study brings together quantitative and qualitative analysis in a structured Multiple Account Evaluation (MAE) framework.
4. **Provide information to support informed debate.** The study provides information about how the various options to extend Abernethy Way would compare to each other, highlighting both the pros and cons of each.

1.4. PROJECT SCOPE

To achieve the corridor and project objectives, the following tasks were performed:

1. Gather and review existing information and studies that might influence decision making
2. Conduct a field review

3. Evaluate previously prepared alignment options and identify any new options
4. Determine forecast traffic volumes to advise the corridor cross section
5. Conduct desktop studies and field assessments of archaeological, environmental, drainage, structural, geotechnical, and property impacts
6. Evaluate alternative options relative to each other
7. Conduct public engagement
8. Identify a preferred corridor alignment

In addition, a feasibility study of the extension of 240 Street north across the Alouette River was also done. This report details the study findings.

1.5. STUDY AREA

The study area is generally bounded by 232 Street to the west, Dewdney Trunk Road to the south, 256 Street to the east, and 124 Avenue / 130 Avenue to the north. The area overview is shown in **Figure 1**. Looking at the study area relative to the rest of the City, the need for a possible additional east-west connection is evident, as well as a north-south .

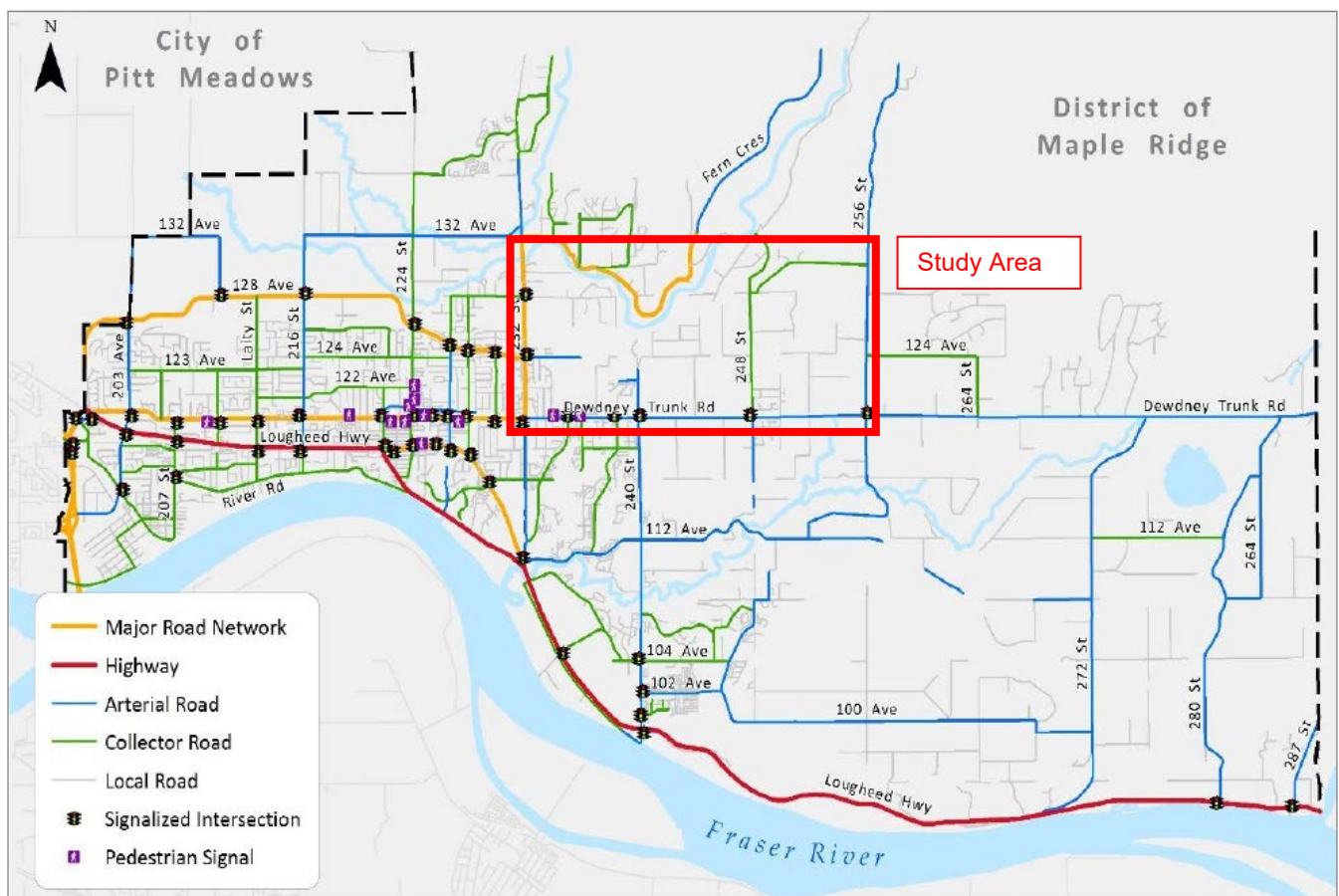


Figure 1: Area Overview (from the 2014 STP)

1.6. PREVIOUS STUDIES AND CITY REFERENCES

Previous studies and references pertaining to the Abernethy Way extension are detailed below.

1.6.1. Previous Abernethy Way Extension Studies

Previous Abernethy Way extension studies were undertaken by Delcan (now Parsons) between 2008 and 2010. These include:

- A memo dated November 17, 2008 – This memo summarizes the original seven options which were used as the starting point of this study.
- A memo dated August 25, 2009 – This memo provided a project update and summarized the extent of works completed.
- A letter dated March 31, 2010 – This letter summarized a meeting that was held with TransLink regarding possible funding for the extension.
- A draft technical brief dated September 2010 – This brief provided a Multiple Account Evaluation which showed Option 3, Option 4a, and Option 6 as being the highest rated.
- Draft plan and profile drawings of the alignment options dated November 14, 2008 – These alignments served as the starting point for this study.

1.6.2. Strategic Transportation Plan

The Strategic Transportation Plan (STP) includes discussion on the existing 128 Avenue / Abernethy Way corridor and its extension. The STP proposes the upgrade of this corridor be split into four phases:

- **Phase 1: 210 Street to 224 Street** – This segment was not included in this study. Phase 1 was to widen this segment of 128 Avenue / Abernethy Way from two lanes to four lanes as well as provide upgrades including traffic signals and left-turn lanes. This upgrade has since been constructed.
- **Phase 2: 224 Street to 232 Street** – This segment was also not included in this study. The STP discusses widening this segment from two lanes to four lanes and provide intersection upgrades. A separate City led project to widen this portion is underway; however, the scope has since changed to intersection upgrades only after an evaluation determined the widening is not yet warranted.
- **Phase 3: 232 Street to 240 Street** – This segment is also included in this study. The STP discusses this future connection as a four-lane roadway with a signalized intersection at 240 Street. The STP notes that this is considered a long-term improvement (approximately 10 to 20 years).
- **Phase 4: 240 Street to 256 Street** – This segment is included in this study. The STP notes that Phase 4 was considered and is not identified as a part of the long-term strategy since the OCP did not anticipate redevelopment of the area. It also notes that if development were to occur, the City may revisit this option further. This segment has; however, been considered in this study since decisions regarding Phase 3 options can impact the availability and viability of Phase 4 alignments, and the City issued an OCP Amendment for the north east sector which is discussed further in the *Traffic Forecasting* section of this report.

1.6.3. Previous 240 Street Extension Studies

In 2008, Associated Engineering (AE) prepared a bridge crossing concept of the Alouette River. A review of that report was done given the changing local context, and preliminary assessments and recommendations provided regarding environmental impacts, hydrology impacts, rationale for the previous bridge concept, and navigable waters regulation. An initial structural review of the bridge concept was also done, and an order of magnitude cost estimate prepared.



2. 240 STREET EXTENSION FEASIBILITY STUDY

2.1. OVERVIEW

The City received a development application for a proposed new residential subdivision between the northern limit of 240 Street and the Alouette River. The developer had prepared several layout options, including two roadway alignment options extending 240 Street through the proposed subdivision and across the Alouette River connecting to 128 Avenue. All options include filling the south flood plain of the Alouette River with a bridge crossing of approximately 170m.

Given these options and the previous work done, an independent study was done of the developer's design concept focused on the bridge concept design to determine a planning level cost estimate. For this, a report prepared by Northwest Hydraulic Consultants (NHC) in March 2018 was relied upon to assess the flooding impact from the proposed development to estimate the hydraulic design parameters for developing a bridge concept.

It was assumed that the developer will be responsible for environmental impacts, permitting, and restoration habitat associated with the subdivision impact, and these were therefore excluded from the scope of the study.

2.2. 240 STREET EXTENSION CONCEPT DESIGN

2.2.1. Roadway Alignment

A conceptual 240 Street alignment was prepared based on the developer's 2018 alignment and profile (Option 1B) and is provided in [Appendix B](#). South of the Alouette River, connections to 124 Avenue and 241 Street driveways will be maintained via a proposed access road between 240 Street and 241 Street. Properties west of 240 Street will have access via a new proposed access road from 240 to the former 240 Street alignment. On the north side of the Alouette River, the existing intersection of 240 Street and Fern Crescent is proposed to be closed due to both its skew with the proposed new roadway and the grade differential between the two roadways. Residences along Fern Crescent would access their properties via the intersection of 128 Avenue and Fern Crescent, with the western limit of Fern Crescent becoming a cul-de-sac.

The proposed alignment has a maximum gradient of 8% and a two-lane local urban road cross section ([Figure 2](#)) with a multi-use pathway and sidewalk. More refinement will be required in subsequent design stages to review alternatives to this concept, cost estimate, its optimization and refinement, and to determine property impacts.

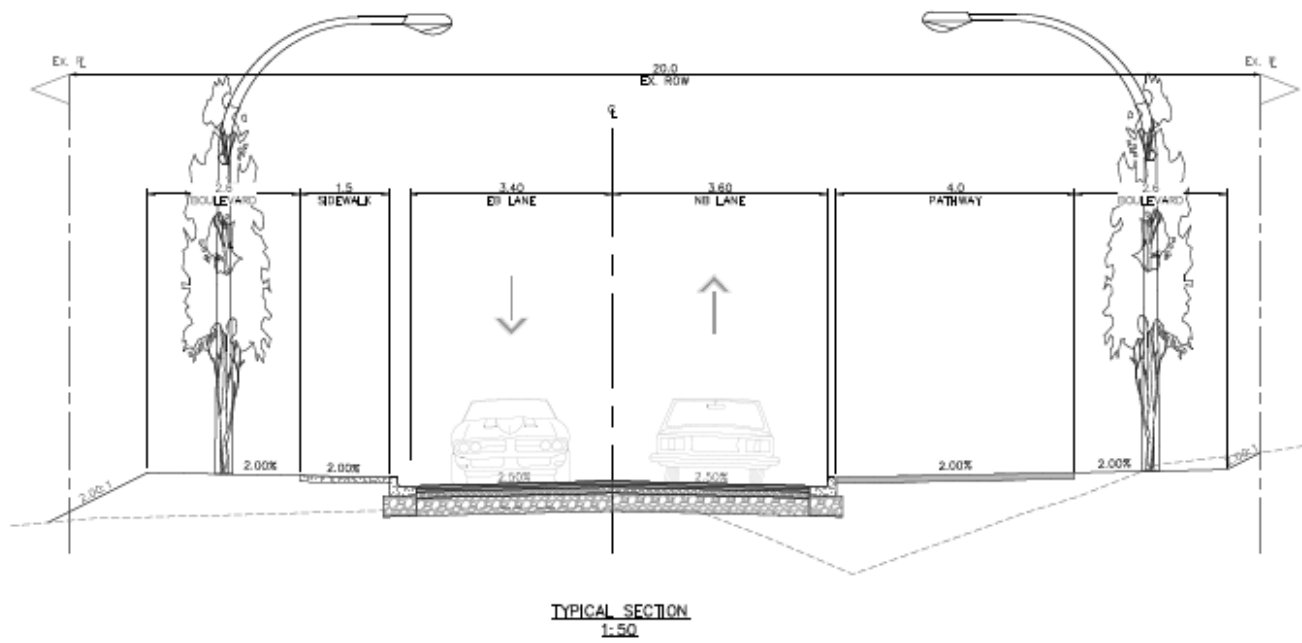


Figure 2: Proposed 240 Street Extension Concept Cross Section

2.2.2. Bridge Concept

Based on the alignment and profile prepared, a new bridge will be required through the new subdivision and over the Alouette River. The location and alignment of the proposed bridge and 240 Street extension is shown in **Figure 3**.



Figure 3: Plan View of Proposed 240 Street Bridge Crossing

The new bridge crosses the Alouette River immediately downstream from a natural widening where the river makes a sweeping 180-degree turn through a floodplain. Due to the topography at the north escarpment and the channel alignment, the bridge abutments and piers will be skewed. Although a skew of approximately 35-degrees is shown in the concept, the skew of the piers should match the river alignment to reduce the potential for scour immediately downstream of the piers. An appropriate skew should be determined during the next design stage and determined by a hydrotechnical assessment.

The slope of the existing escarpment at the north abutment is very shallow (between 6H:1V and 7H:1V) and the bridge length could potentially be shortened by up to 15m through regrading this slope (reduced length based on a 3H:1V slope). Since a geotechnical assessment was not done as part of this scope to determine the maximum stable slope based on the soil profile, the bridge length was determine using the existing escarpment slope at the north side and a 3H:1V slope at the south side (assuming all new fill).

The proposed bridge cross-section consists of a 10.2m wide roadway (two 3.6m lanes and two 1.5m shoulders), a 4m clear-width multi-use pathway (MUP) on the east side, and a 1.5m clear-width sidewalk on the west side, both separated from traffic by standard cast-in-place concrete parapets. The total bridge width including an allowance for fences is approximately 17m. Pedestrian and bicyclist height steel railings are assumed to be mounted on the parapets adjacent to the sidewalk and MUP and a fence of appropriate height installed at the outside edge of the deck. A typical superstructure cross-section is shown in **Figure 4**.

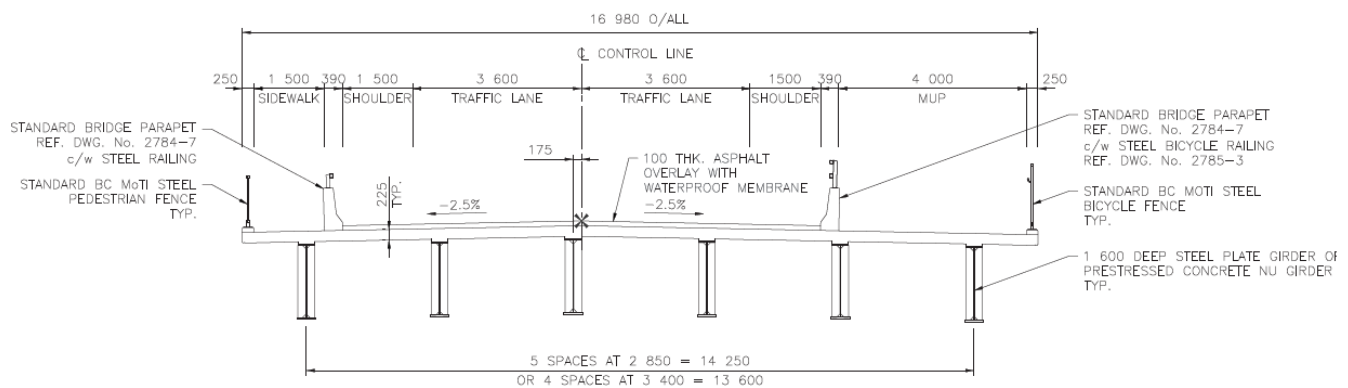


Figure 4: Typical 240 Street Superstructure Cross-Section

The concept bridge design is based on a five-span (28m-38m-38m-38m-28m) continuous bridge across the river with an overall span length of 170m. This is significantly shorter than the 440m in the previous 2008 report, primarily due to the proposed development infill which acts as a causeway and shortens the bridge length considerably. This reduction results in a significant reduction in the cost of the bridge structure. The proposed span configuration will allow the use of either steel girders or prestressed concrete girders which can be confirmed in the next design stage. A bridge profile is shown in **Figure 5**.

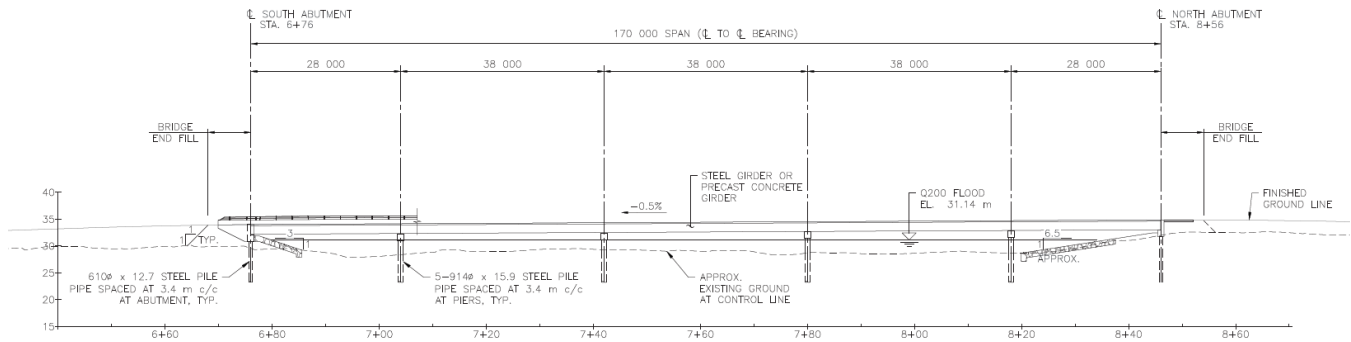


Figure 5: Proposed 240 Street Bridge Profile

2.2.3. Additional Bridge Design Elements

The recommended flood elevation for a 200-year return period event (Q200) is 31.14m based on the NHC report. The Q200 elevation incorporated the effects of the new subdivision infringing upon the floodplain area. As the water velocity through the floodplain is slow, the effect of the Q200 elevation in the primary channel of the river was not significant. Based on the recommendations from the Canadian Highway Bridge Design Code (CHBDC) S6-14, a minimum soffit clearance of 1m between the underside of the bridge superstructure and the Q200 flood elevation is recommended.

Based on the roadway profile, Q200 elevation, and minimum soffit clearance, the maximum superstructure depth is approximately 2150mm. Accounting for a 100mm thick asphalt wearing surface, a 225mm thick structural cast-in-place concrete deck, an allowance for haunch height, and a 2.5% cross-fall over the width of the deck; the maximum girder depth is approximately 1600mm. This depth enables multiple superstructure options, including the use of six lines of standard 'NU' precast I-girders or steel plate I-girders spaced at approximately 2.85m or five lines of steel plate I-girders spaced at approximately 3.4m center-to-center.

As this concept design did not include supplemental geotechnical investigations or desktop studies, the conceptual substructure and foundations design is based on the conclusions of the previous 2008 study. This study relied upon the geotechnical investigations upstream of the proposed crossing and recommended the use of either 610mm diameter by 12.7mm wall thickness piles driven to a depth of 40m or 914mm diameter by 15.9mm wall thickness piles driven to a depth of about 30m to 35m.

Based on the larger reactions at the piers, the new bridge concept is assumed to be founded on 610mm diameter piles at the abutments and 914mm diameter piles at the piers. The required number of piles is based on the anticipated reactions; however, this will need to be confirmed during the next design stage.

A general arrangement of the bridge concept is included in [Appendix B](#).

2.3. INFLUENCE OF THE PROPOSED DEVELOPMENT

Construction of the proposed subdivision development does not appear to have a detrimental impact on the City's ability to construct a 240 Street bridge crossing of the Alouette River. While the proposed development infills a sizeable area of the land area overtopped during a Q200 flood event and which has a minor impact on the flood elevation immediately at the proposed bridge location, the subdivision essentially acts as a causeway which serves to shorten the bridge length considerably. This is reflected in the change in anticipated elevated bridge length from 440m in the previous 2008 report to the approximately 170m crossing based on this study. This reduction results in a significant reduction in the cost of the bridge structure.

Because geotechnical investigations have not been conducted on site (with the intention to fill and construct a bridge crossing), there is inherent risk and unknowns with the design and construction requirements for the approach embankment fills leading up to the bridge crossing. For example, lightweight fill treatments and / or preload on 240 Street may be appropriate to limit settlement of the structure. It is therefore recommended to conduct a geotechnical investigation as part of the next design stage which will also allow refinement of the cost estimate.

Similarly, an environmental assessment has not yet been completed. Instream works proposed in this bridge concept will trigger various notifications and approvals with the regulators. Understanding the associated impacts and timelines will be an important next step in determining a schedule and budget for the project.



3. EXISTING CONDITIONS

3.1. OVERVIEW

This section describes the existing conditions in the study area which require consideration in the evaluation of technically feasible options for the Abernethy Way extension. Data was gathered primarily through desktop study and field visits.

3.2. SITE CONTEXT

A key issues and challenges map is included in the drawings in [Appendix C](#). This map includes photos showing the existing conditions and site context.

In addition, the existing section of Abernethy Way up to 232 Street is part of TransLink's Major Road Network (MRN), as are Dewdney Trunk Road up to 240 Street, and 240 Street south to Lougheed Highway. Fern Crescent to the north is also on the MRN as it provides access to a provincial park. These corridors are shown in [Figure 6](#). The MRN supports the safe and efficient movement of people and goods across the region, encompassing 675 kilometers of major arterial roads that carry multimodal commuter, transit, and truck traffic. It connects the provincial highway system with the local road network, and some corridors also serve cyclists and pedestrians. TransLink, in partnership with municipalities, plans the regions MRN and TransLink contributes funding for its on-going operation, maintenance and rehabilitation, however ownership and operational responsibility for the MRN remains with the respective municipalities. TransLink also shares the cost of road, cycling, and pedestrian improvement projects with municipal partners and other stakeholders to expand options for driving, cycling, and walking across the region. Given this context, it is feasible that the extension of Abernethy Way at least up to 240 Street could also become part of the MRN in future, as well 240 Street between Dewdney Trunk Road and its future extension northwards to Fern Crescent.

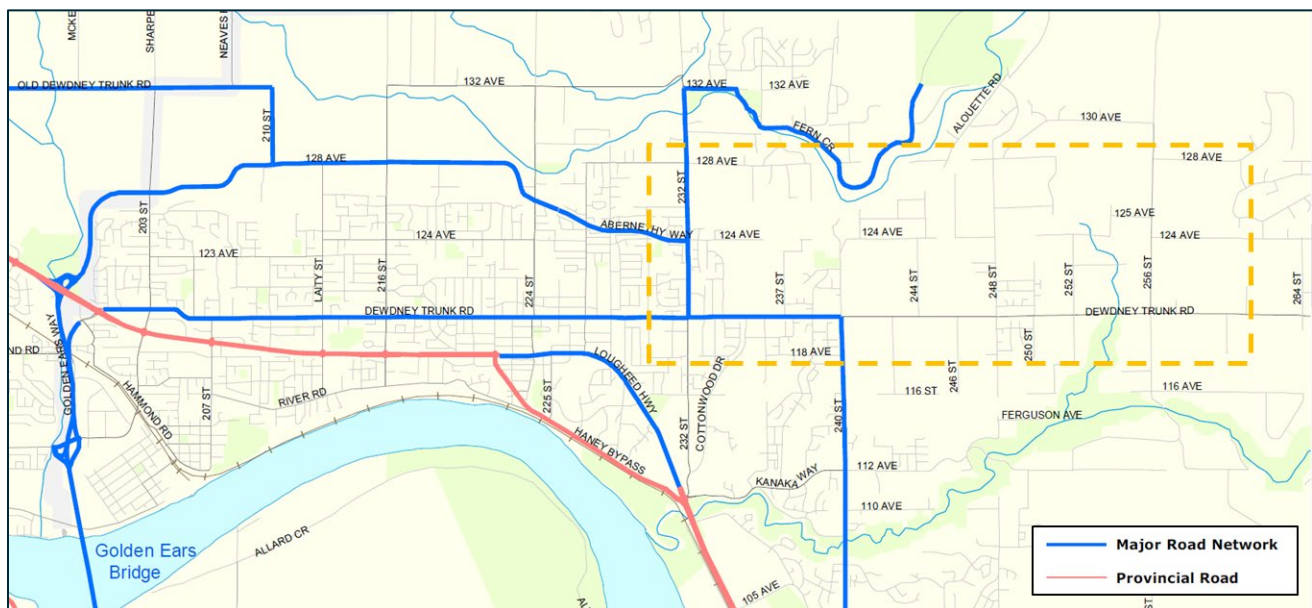


Figure 6 TransLink's Major Road Network

The study area is also substantially made up of Agricultural Land Reserve (ALR) as seen by the green shaded areas in **Figure 7**. The ALR is a collection of agricultural land in across BC in which agriculture is recognized as the priority. It is intended to permanently protect valuable agricultural land from being lost. To remove land from the ALR, an application is submitted to the Agricultural Land Commission (ALC) for review. Two recent applications in the study area were rejected. Given this context, it is unlikely that any sizeable portion of land in the study area would be redeveloped, therefore traffic generation from within the study area onto a future extension of Abernethy Way would be low.

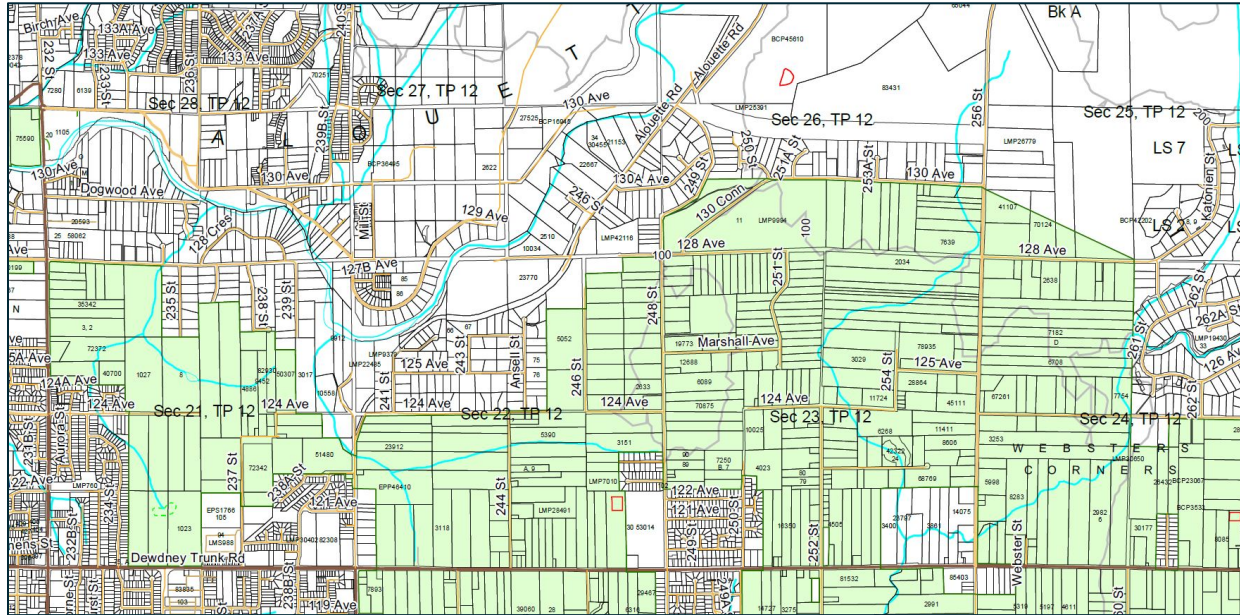


Figure 7 Study Area Agricultural Land Reserve

There are several schools in the study area, the majority of which front onto Dewdney Trunk Road as seen in **Figure 8**. Other schools surrounding the study area are also shown. As a result, there is student pedestrian traffic on the road network that should have suitable facilities provided.

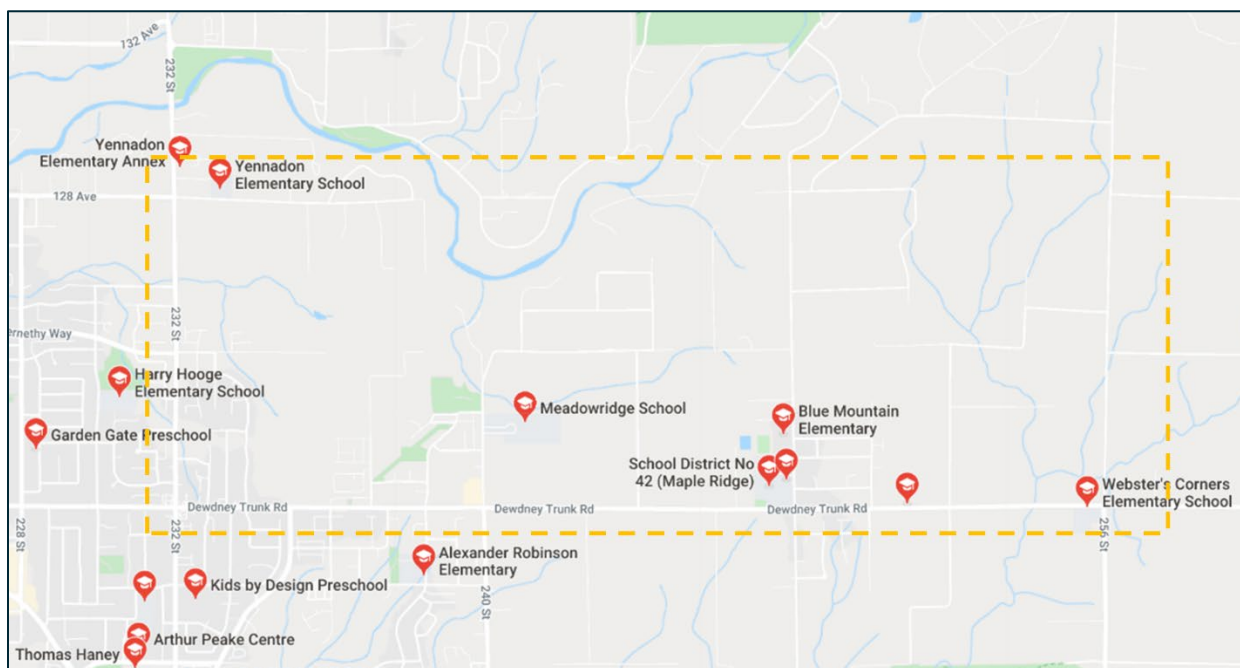


Figure 8 Schools Located in and Around the Study Area

3.3. ARCHAEOLOGICAL OVERVIEW ASSESSMENT

An Archaeological Overview Assessment (AOA) was prepared by Antiquus Archaeological Consultants Ltd. for the proposed Abernethy Way extension based on several desktop studies and field visits. A copy of the report and addendum can be found in [Appendix D](#). Site potential notes have been added to the drawings in [Appendix C](#).

Using a low, medium, or high rating to reflect the likelihood of discovering items of archaeological significance, the assessment identified fifteen locations considered to have medium to high potential for archaeological impact. Two mitigation strategies are presented for these potential sites:

- Option 1: Complete avoidance of areas with medium or greater site potential. This is generally the preferred method since it is the simplest and least costly choice, however is not always feasible.
- Option 2: If a route falls within a medium or greater site potential, further investigations in the conceptual, preliminary and detailed design stages should be conducted through an Archaeological Impact Assessment (AIA).

There are some areas where medium or greater site potentials cannot be avoided such as at Coho Creek just east of 232 Street on Abernethy Way. As a result, an AIA is recommended during the conceptual, preliminary and detailed design stage once a preferred option has been selected.

3.4. ENVIRONMENTAL REVIEW

3.4.1. Commitment to Sustainable Development

The OCP identifies sustainability as a key objective and driver in decision-making. Regulatory considerations are critical in evaluating potential effects of proposed capital projects. Mitigation of effects through compensation is usually less preferred and often more costly, than can be achieved through alternate route planning and avoidance of impacts.

3.4.2. Desktop Review

A desktop environmental review was completed to provide a high-level assessment of potential impacts to watercourses and associated riparian areas. The review was centered around work that is likely to be regulated by the Ministry of Forests, Lands, Natural Resource Operations, and Rural Development (FLNRORD) and / or Fisheries and Oceans Canada (DFO) and would therefore require regulatory approvals. The review focused on work that would be in and around new and existing stream crossing locations.

The preferred alignment, when selected, will require detailed survey through established channel assessment procedures. This will provide the level of detail necessary to quantify impacts of the ultimate design and thus inform regulatory and compensatory requirements.

Preliminary information was collected from various databases including the Province's Habitat Wizard, Fisheries Information Summary System (FISS), City's GIS data, and other information deemed to be important in Data BC, iMAPBC, Community Atlas, and City of Maple Ridge Open Data.

Opinions on fish passage requirements at culvert locations (both new and existing) were based on several factors including but not limited to:

- Upstream reach conditions (such as the presence of ditches and open watercourses).
- Information related to historical fish presence/observation.
- Evaluation of natural or man-made barriers to fish and whether such barriers could be overcome with intervention.

- Location of a proposed crossing relative to stream order (i.e. lower order headwater location vs. higher order stream reaches such as those with a distinct channel).
- Evidence of stream permanence, and habitat complexity.

City-supplied Light Detection and Ranging (LiDAR) data was also analyzed to supplement the review with detailed terrain data. This analysis provided a means to reasonably delineate watercourses such as ditches, natural streams, ravine and channel slopes and associated riparian areas.

Supplied LiDAR was used in ArcGIS to create a digital elevation model along the proposed alignment corridors. A slope algorithm was applied to the model to generate a slope map in percent rise. A polygon representing a slope greater than 3:1 was extracted from the slope map; this served to effectively model the channel slopes and top of bank for streams and ditches. Mapped streams received a setback buffer of 5m, 15m, or 30m based on a relative measure of sensitivity. Ditches received a setback buffer of 5m. These setbacks should be confirmed with the City during future design stages. The road pavement edge was considered to be a permanent existing development and therefore any setback buffers extending onto a paved road surface were trimmed accordingly.

Temporal boundaries for potential stream and riparian effects were limited to the full 24m extent of the proposed right-of-way. Terrestrial sensitivity data available within a 100m buffer from the proposed alignment was reviewed.

Importantly, characterizing effects associated with greenfield areas such as forested land or land that has otherwise not undergone development and left largely in a naturalized state, was not included as part of this desktop environmental scope. These undeveloped areas should be further investigated for the presence of sensitive flora and fauna, wetland areas, and other sensitivities that may be revealed in detailed site assessment and which are protected by applicable environmental statute.

The following regulations were considered in the review:

- City of Maple Ridge no net habitat loss and 2:1 offsetting / compensation policy.
- FLNRORD notification for road crossings provided for less than 2m fill condition, approvals for ditch infilling / relocation, provincial environmental mitigation policy.
- DFO self-assessment and / or project review required when greater details are available such as in detailed design.

Based on the analysis outlined above, **Table 1** provides an estimate of riparian and channel areas that may require mitigation through offsetting.

Table 1: Compensation Areas

TYPE OF HABITAT	AREA (m ²)		
	OPTION 2C	OPTION 7	OPTION 10
Riparian Area Stream	531	2,586	14,347
Stream Channel (riparian area on channel slope + instream)	243	2,259	3,390
Ditch Riparian Area	17,029	7,530	13,617
Ditch Channel	5,406	2,027	4,073
Total Area	~23,209	~14,402	~35,427

3.5. GEOTECHNICAL DESKTOP REVIEW

Braun Geotechnical Ltd. conducted a geotechnical desktop study and site reconnaissance for the alignment options. The report is provided in [Appendix E](#).

Published surficial geology indicates the site is underlain by soils of the Fort Langley formation which comprises of gravel and sand & stony clayey silt to silty sand. Avoidance of the Latimer Creek ravine is desirable from a geotechnical perspective. Options which do cross the Latimer Creek ravine would require a bridge with a driven piled foundation and would require review for possible slope erosion. A preliminary minimum pavement structure would include 150mm of asphalt on 100mm of 19mm minus crushed granular base on 450mm of 75mm minus select granular subbase.

Geotechnical work in future conceptual, preliminary and detailed design stages should include:

- Geotechnical subsurface exploration and reporting.
- Detailed stream crossing designs.
- Structural assessment of the existing pavement areas and confirmation on pavement design section based on forecast traffic data.
- Detailed Geotechnical Assessment of slopes.
- Detailed slope stability analysis and development of retaining wall designs.

3.6. CREEK CROSSINGS REVIEW

Upon field review and examining the profiles from previously prepared studies, it is evident that some options would require substantial bridge crossings at Latimer Creek. Latimer Creek is a deep ravine with challenging geotechnical and environmental issues. The ravine gets significantly deeper (~16m) and wider (~170m) on the 124 Avenue alignment. The cost of a bridge structure crossing was estimated to be greater than \$20M. Options which deviate south of the ravine could avoid the need for a bridge which would be considerably more cost-effective and less impactful.

Some of the initial option alignments have crossings of Latimer Creek on the east side of 240 Street. Preliminary review indicates a corrugated steel plate arch structure could be used for this crossing given the required span and depth; however, it should be confirmed in conceptual, preliminary and detailed design.

There is an existing two-lane bridge on Dewdney Trunk Road just west of 256 Street. Widening this bridge to four lanes will require either widening, twinning or replacing of the bridge at significant cost. As a result, if widening Dewdney Trunk Road were a shortlisted option it would be reasonable to only extend the four-laning of to just west of this crossing.



4. OPTION REFINEMENT AND SHORTLISTING

4.1. OVERVIEW

This section describes all the options that were considered to connect Abernethy Way from 232 Street to 256 Street. It describes the process that was taken to develop the initial options as well as consideration for shortlisting options.

4.2. ALIGNMENT OPTIONS CONSIDERED

Overall, 13 options were considered as shown in [Figure 9](#). Of these, seven were from the previous Delcan prepared options, and six additional options were identified. Note that an end to end corridor alignment is made up of an amalgamation of option segments as seen in the figure. Further specifics of each option are provided the drawings in [Appendix C](#).

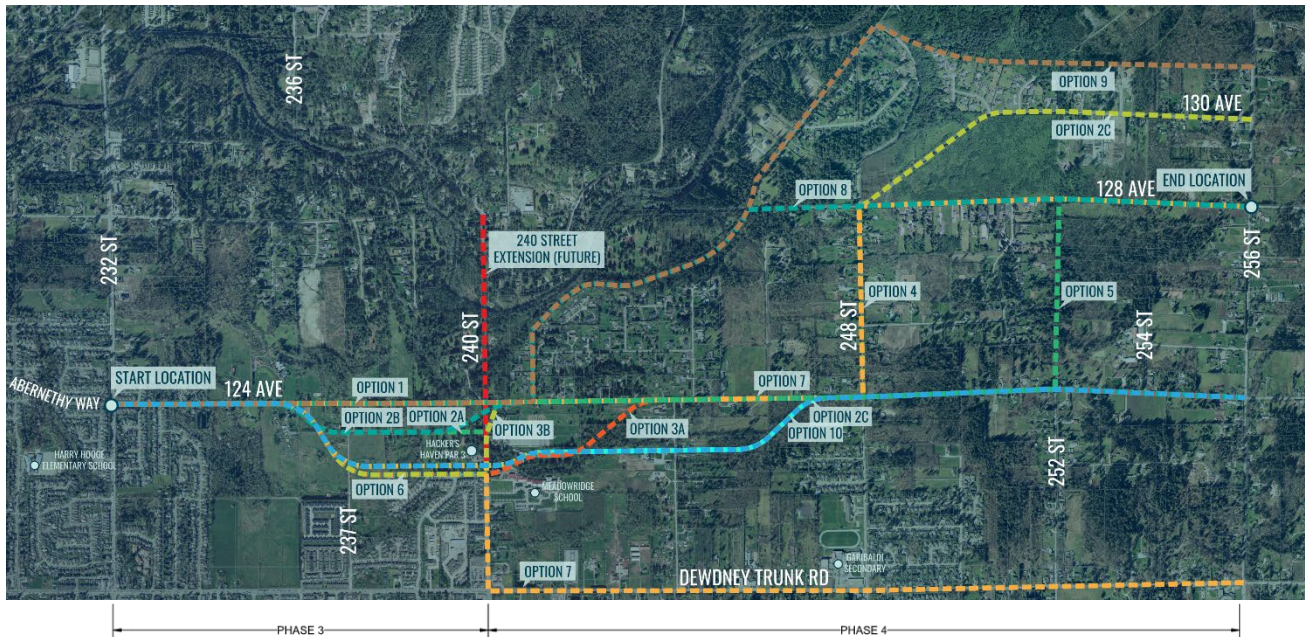


Figure 9: Alignment Options Considered

Each option is described below:

- **Option 1:** Option 1 follows a direct east-west alignment along 124 Avenue from 232 Street to 256 Street. This option crosses Latimer Creek which is a significant ravine at the crossing location.
- **Option 2A:** Option 2A follows a similar alignment to Option 1; however, it deviates south at the Latimer Creek crossing to a narrower, but still significant, crossing location.
- **Option 2B:** Option 2B follows a similar alignment to Option 2A; however, includes improved horizontal curve geometry at 240 Street.
- **Option 2C:** The key feature of Option 2C is that it makes use of the existing road along 248 Street north of 124 Avenue, the 130 Connector, and 130 Avenue to 256 Street.

- **Option 3A:** Option 3A makes use of the existing section of Abernethy Way just west of 240 Street by deviating south of the Hacker's Haven Golf Course. East of 240 Street, the alignment deviates back up to the 124 Avenue alignment by crossing the narrower section of Latimer Creek north of Meadowridge School.
- **Option 3B:** Option 3B is similar to Option 3A; however, it makes use of the existing culvert crossing at Latimer Creek and follows the existing 240 / 241 Street geometry north of Abernethy Way.
- **Option 4:** Option 4 makes use of 248 Street north of 124 Avenue and then 128 Avenue east to 256 Street.
- **Option 5:** Option 5 extends 252 Street north of 124 Avenue and then heads east to 256 Street.
- **Option 6:** Option 6 is similar to Option 3A; however, the transition back up to the 124 Avenue alignment was moved further east to reduce impact to the Academy Park / Ansell neighbourhoods.
- **Option 7:** Option 7 widens both Dewdney Trunk Road to four lanes and 240 Street between Dewdney Trunk Road and Abernethy Way extension. It also includes a short connection of 124 Street between 244 Street and 246 Street.
- **Option 8:** Option 8 makes use of the City-owned right-of-way along 241 Street north of 124 Avenue and continues east along 128 Avenue. Due to the extreme topography along this corridor with steep slopes, this option was determined not feasible.
- **Option 9:** Option 9 is similar to Option 8; however, it makes use of Alouette Road and the corridor north of 130 Avenue to get east to 256 Street. Like Option 8, this alignment was eliminated early on due to extreme topography with steep slopes.
- **Option 10:** Option 10 is similar to Option 6; however, instead of using the existing Abernethy Way south of Hacker's Haven golf course, it would purchase the southern portion of Hacker's Haven golf course. This would improve the alignment east of 240 Street.

4.3. OPTION SHORTLISTING

A review was completed to narrow down the 13 considered options up to three shortlisted for further detailed analysis. The criteria applied to evaluate the options were:

- Number of significant river and creek crossings required
- Suitable and safe road geometry
- Terrain suitability
- Cost effectiveness
- Community impacts
- Environmental, geotechnical, and archaeological impacts

The following sections provide more specific reasoning why each option was shortlisted or not.

4.3.1. Options 1, 2A, and 2B

Due to the topography at the Latimer Creek ravine, a bridge would be required. Although these options provide the most direct routes, the bridge required would add more than \$20M to the total cost which could be avoided with a more southerly option such as Options 6 or 10. Avoidance of the Latimer Creek ravine is also favourable from an environmental, geotechnical, and archaeological standpoint. For these reasons, **Options 1, 2A, and 2B were not shortlisted.**

4.3.2. Option 2C

Option 2C was shortlisted because it makes use of a large portion of existing roadway along 248 Street and 130 Avenue. This is beneficial from several reasons, including reduced cost, reduced geotechnical, archaeological, and environmental risks, and less property impacts. At the 248 Street / 130 Avenue intersection, there would be a five-leg intersection which would need to be designed in the conceptual design stage, for which a roundabout is proposed. This

route is however not direct, requiring 90° turns and intersections. The end to end corridor for this option is shown in [Figure 10](#).



Figure 10: Shortlisted Option 2C

4.3.3. Options 3A and 3B

Option 3A would require several driveways in the Ansell neighbourhood to have direct access on the proposed roadway as well as require additional intersections to reestablish access to the neighbourhood. Option 3B is more circuitous and has challenging geometry both at the intersection of 240 Street and 241 Street and the horizontal curve where 241 Street turns into 124 Avenue.

A hybrid of Option 3B was assessed to determine the feasibility of a new T-intersection at the 124 Avenue right-of-way and 240 Street, thereby avoiding the 241 Street deviation. At this intersection location the elevation of 240 Street is below that of 124 Street. To achieve the maximum preferred 8% gradient on 124 Street would require significant excavations, with retaining walls, and property impacts. This impact combined with the community impacts of Option 3A resulted in **Options 3A and 3B not being shortlisted**.

4.3.4. Options 4 and 5

Option 4 is preferable to Option 5 from a cost, geotechnical, environmental, and archaeological standpoint since Option 4 requires upgrading the existing section of 248 Street where Option 5 requires building a new roadway along 252 Street. However, Option 2C also makes use of the existing 248 Street but also makes use of the existing 130 Avenue where Options 4 and 5 require building a new roadway extending 128 Avenue to 256 Street. Because of this, Option 2C was preferred, and **Options 4 and 5 were not shortlisted**.

4.3.5. Option 6

Option 6 is located on the existing section of Abernethy Way west of 240 Street. Although it would be preferred to use this existing section of roadway from a cost perspective, this alignment would significantly impact local residents and require two intersections to access the neighbourhood within 250 m of the 240 Street intersection. This intersection density is inconsistent with the requirements of an arterial roadway, or they would have to be right-in, right-out intersections. It would be preferred to establish the existing Abernethy Way as a frontage road, parallel to the proposed new extension to better limit community impact. A frontage road scenario is included in Option 10, and as a result **Option 6 was not shortlisted**.

4.3.6. Option 7

Option 7 was shortlisted since it makes use of existing established infrastructure along 240 Street and Dewdney Trunk Road. Dewdney Trunk Road would be widened to four lanes to increase capacity versus providing an alternative route to Dewdney Trunk Road. Although Dewdney Trunk Road would remain the only major east-west connector in the study area with this option, local connections would be proposed in conjunction to complete the local network in the area. A connector along 124 Avenue between Ansell Street and 246 Street is proposed to provide a local, possibly truck restricted link between 232 Street and 256 Street along 240 Street, 124 Avenue, 248 Street, and 130 Avenue. The extents of this route would be from Abernethy Way at 232 Street to west of the bridge at 256 Street and is shown in **Figure 11**.



Figure 11: Shortlisted Option 7

4.3.7. Options 8 and 9

Although there is a City-owned right-of-way along these alignments, **Options 8 and 9 were not shortlisted** due to extreme topography, including significant corridor lengths of approximately 1:1 side slopes through the full width of the corridor and 40 m elevation changes at 37% grades.

4.3.8. Option 10

Option 10 was shortlisted since it roughly follows the 124 Avenue alignment and is the most direct of all the options. It avoids Latimer Creek crossings west of 240 Street and avoids developments / subdivisions as much as possible. The extents of this route would be from Abernethy Way at 232 Street to 124 Avenue at 256 Street and is shown in **Figure 12**.

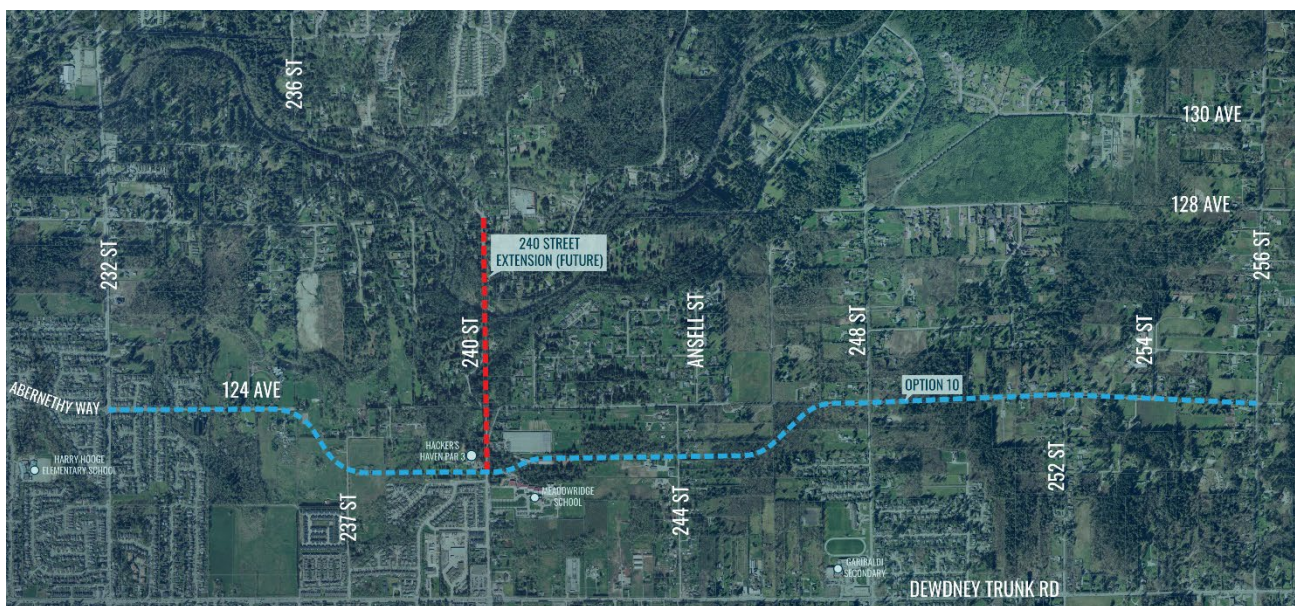


Figure 12: Shortlisted Option 10

4.3.9. Three Shortlisted Options

In summary, the three options shortlisted for more detailed analysis have a consistent segment from 232 Street to 240 Street as shown in **Figure 13**, and are described as follows:

1. An alignment east of 240 Street to 124 Avenue that then continues along the existing 248 Street and 130 Avenue (Option 2C).
2. An alignment that would connect to and widen 240 Street and Dewdney Trunk Road (Option 7), and a local connection on 124 Avenue between 244 Street and 246 Street.
3. An alignment east of 240 Street that generally follows the 124 Avenue greenfield alignment with a deviation south at Latimer Creek (Option 10).

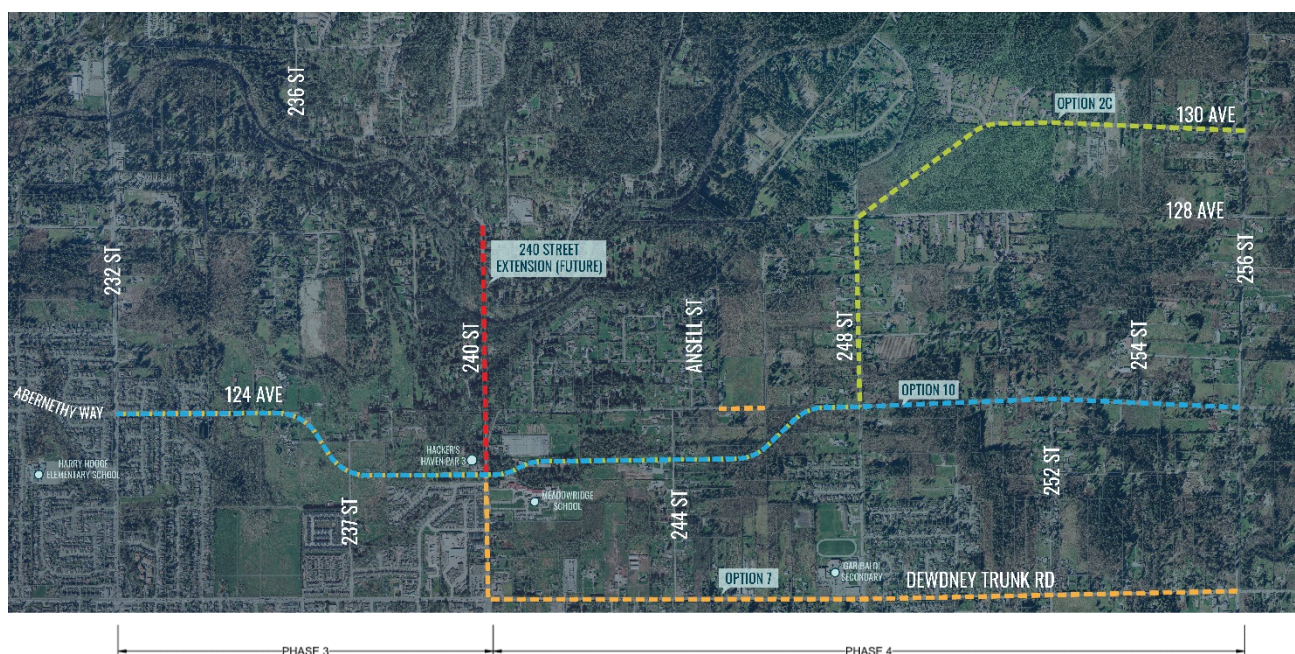


Figure 13: Three Shortlisted Options



5. TRAFFIC FORECASTS AND LANING

5.1. OVERVIEW

This section presents the forecast of the traffic volumes that are anticipated to use the Abernethy Way extension. The forecast was developed using the Regional Transportation Model (RTM) version 3.2 received from TransLink. The RTM is a four-step EMME transportation demand model which depicts travel on the roadway infrastructure and transit services in the entire Metro Vancouver area.

In addition to replicating the multimodal transportation services, the RTM represents the region as 1,700 traffic analysis zones (TAZ), 44 of them within the City of Maple Ridge. Demographic information such as population, employment, households, school enrollment and auto ownership are contained in each zone and for each horizon year that is modelled.

The RTM contains assumptions for the base years 2017, 2035 and 2050 consistent with land use assumptions provided by Metro Vancouver. Network infrastructure assumptions for major projects are provided by TransLink and include MoTI projects. The assumptions provided in the RTM were applied.

5.2. ANALYSIS APPROACH

5.2.1. Base Case Travel Demand

As the RTM is a regionally focused tool, a review of the 2017 road network assumptions contained in the base model was performed and generally found to be consistent with present conditions within Maple Ridge. An indicative travel time validation was done for the AM, MD (mid-day) and PM peak periods comparing the model travel times to travel times measured using the Google Maps API for Lougheed Highway, Dewdney Trunk Road, and Abernethy Way. The travel times for all corridors were within the observed travel times from Google Maps and considered suitable for an indicative evaluation of the future corridor demand. The level of network detail was deemed sufficient to represent user choice to access the Abernethy Way extension.

5.2.2. Projected Travel Demand

Demographic Growth Assumptions

Population and employment growth for the region was assumed from the information in the RTM. A review of these assumptions noted that the majority of the growth anticipated in the current regional plan within Maple Ridge is concentrated to the west of the 232 Street corridor and provides limited growth potential further east. This limits the amount of future travel demand expected to be drawn to the Abernethy Way extension. The population and employment growth heat maps are shown in [Figure 14](#) and [Figure 15](#) respectively.

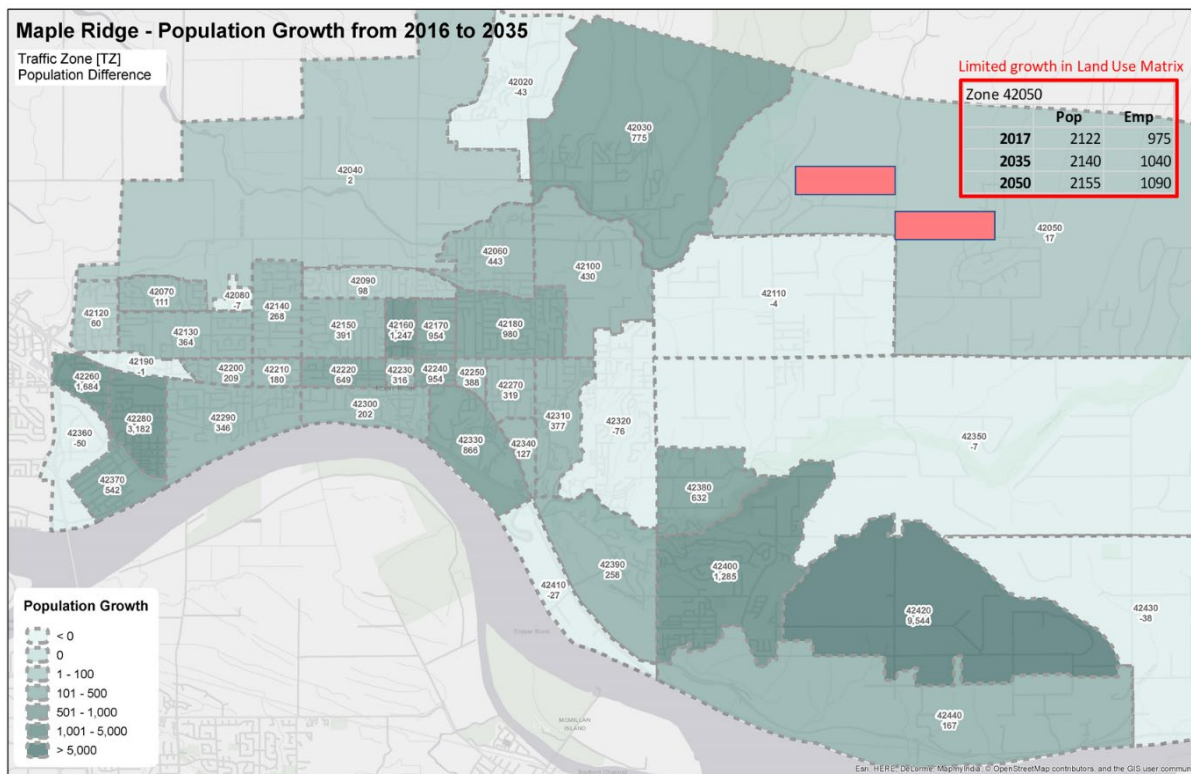


Figure 14: Population Growth by Traffic Analysis Zone 2016 to 2035 (from the RTM)

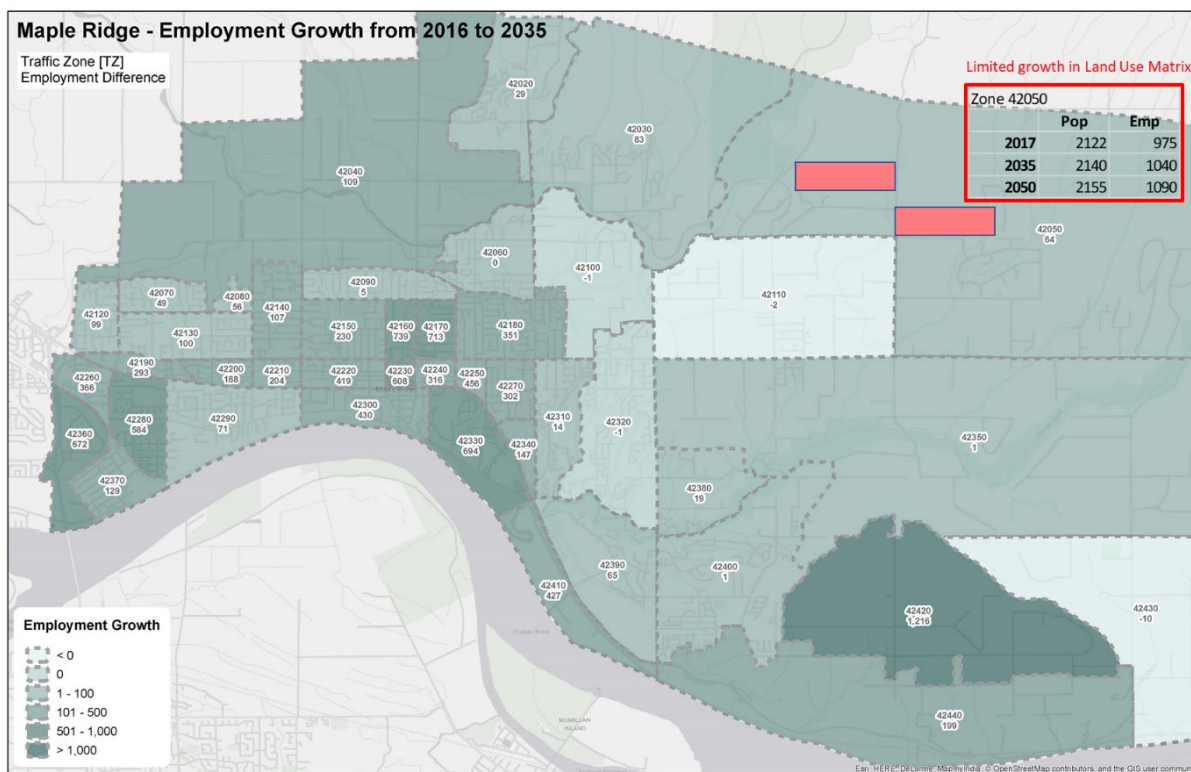


Figure 15: Employment Growth by Traffic Analysis Zone 2016 to 2035 (from the RTM)

Also highlighted in **Figure 14** and **Figure 15** are the significant areas to the north-east of the study corridor, in and around the Kanaka Business Park, that were rezoned by way of an OCP amendment to industrial uses. The rezoned areas are shown in **Figure 16**. The City advised the anticipated types of land use in these areas are likely to be as follows:

- Gravel extraction
- Industrial uses (which includes processing, fabricating, assembling, storage, transporting, servicing, etc.)
- Waste transfer stations
- Industrial repair
- Industrial trade schools
- Industrial vehicle sales
- Heavy equipment sales
- Indoor recreational facilities

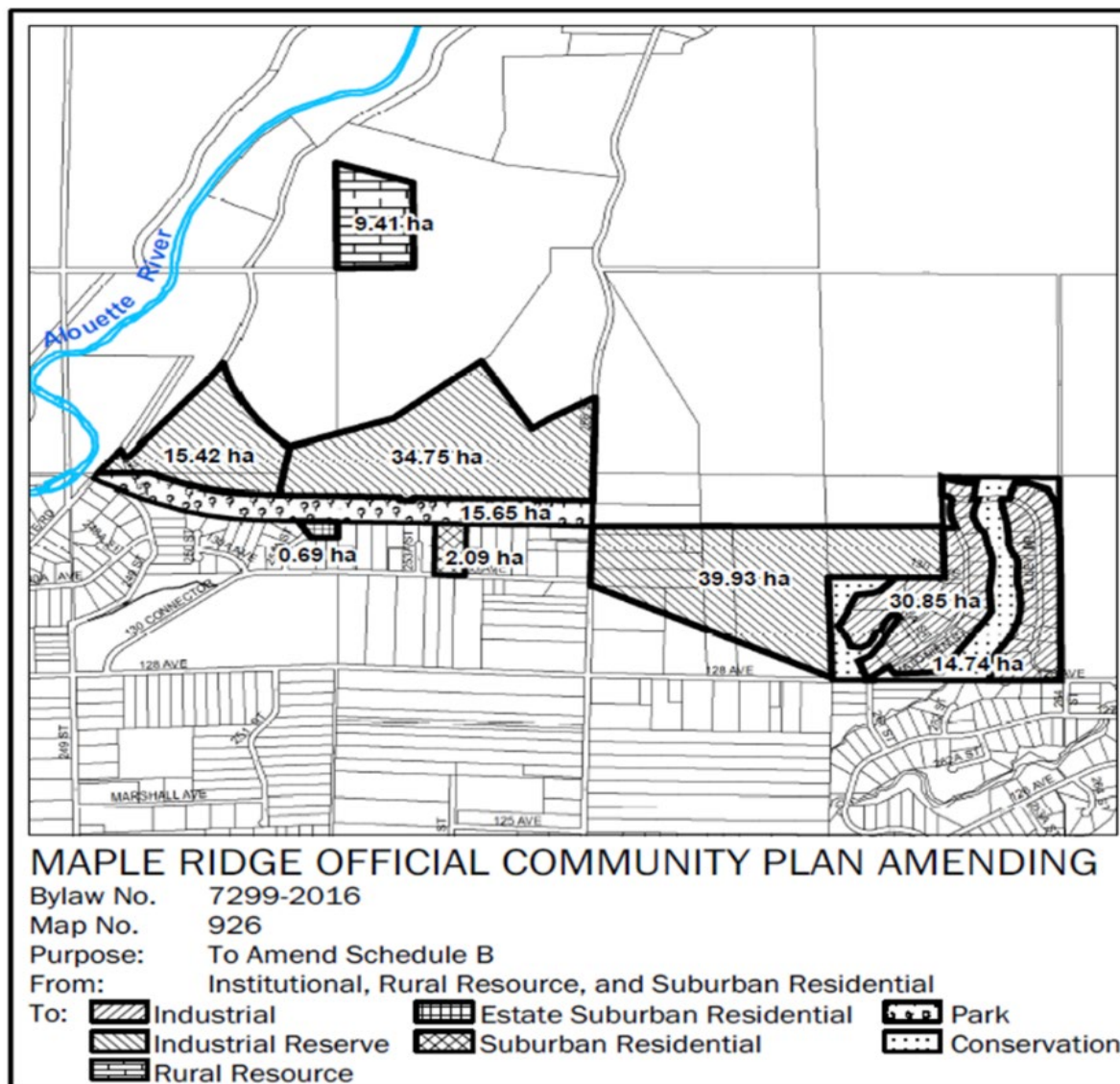


Figure 16: OCP Amendments in the North-East of the Study Area

The small changes in population and employment growth in the affected traffic analysis zones between 2017 and 2050 (as seen in [Figure 14](#) and [Figure 15](#)) suggest that this rezoning has not been incorporated into the current growth assumptions in the RTM model. As a result, a manual adjustment was done in addition to the regional demand forecast results. To translate these land use changes into trips Institute of Transportation Engineers (ITE) Trip Generation Rates were applied comparing the previously assumed land uses versus the amended. A Floor Area Ratio (FAR) of 0.2 was applied to the amended land use based on visual inspection of the current land use in the affected area, its semi-rural location, and taking into consideration the low probability of full buildout of the sites shown in [Figure 16](#). Even a FAR of 0.1 seems reasonable, however in discussion with the City a FAR of 0.2 was agreed to and is a more conservative approach.

The number of houses per 1000 sq.ft was estimated based on a visual count from Google Maps east of 248 Street, west of 256 Street and north of 130 Street. This resulted in 0.0157 houses per 1000 sq.ft, or 1.69 houses per Ha.

The resultant additional number of trips in the AM and PM peak hours for the previous and revised land uses in shown in [Table 2](#). These adjustments were then applied to the model's estimated traffic forecasts. As seen in the table, an additional 850 total trips are estimated to be generated by the OCP amendment.

Table 2: Change in Total Trips Due to OCP Amendments

Previous Land Use											
Existing Land Use	Land Use Code	Size (Hectares)	Unit	Size sq. ft	Period	Rate	% In	% Out	Trips In	Trips Out	Total Trips
Institutional		2.09	Undeveloped								
		2.09									
Suburban Housing (Partially Developed)	210 (Single-Family Detached Housing)	39.93	Dwelling Units	7	AM	0.76	26	74	1	4	5
	210 (Single-Family Detached Housing)	39.93	Dwelling Units	7	PM	1	64	36	4	3	7
Industrial	130 (Industrial Park)	30.85	1000 Sq.ft	664	AM	0.41	87	13	237	35	272
	130 (Industrial Park)	30.85	1000 Sq.ft	664	PM	0.4	21	79	56	210	266
Institutional		0.69	Undeveloped								
		0.69									
Institutional		34.75	Undeveloped								
		34.75									
Suburban Residential		15.42	Undeveloped								
		15.42									
Institutional		9.41	Undeveloped								
		9.41									

Notes: FAR was applied in the size formula.

Total AM	238	39	277
Total PM	60	213	273

Revised Land Use											
Future Land Use	Land Use Code	Size (Hectares)	Unit	Size sq. ft	Period	Rate	% In	% Out	Trips In	Trips Out	Total Trips
Surburan Real Estate	210 (Single-Family Detached Housing)	2.09	Dwelling Units	4	AM	0.76	26	74	1	2	3
	210 (Single-Family Detached Housing)	2.09	Dwelling Units	4	PM	1	64	36	3	1	4
Industrial Reserve	130 (Industrial Park)	39.93	1000 Sq.ft	860	AM	0.41	87	13	307	46	353
	130 (Industrial Park)	39.93	1000 Sq.ft	860	PM	0.4	21	79	72	272	344
Industrial	130 (Industrial Park)	30.85	1000 Sq.ft	664	AM	0.41	87	13	237	35	272
	130 (Industrial Park)	30.85	1000 Sq.ft	664	PM	0.4	21	79	56	210	266
Estate Suburban Residential	210 (Single-Family Detached Housing)	0.69	Dwelling Units	1	AM	0.76	26	74	0	1	1
	210 (Single-Family Detached Housing)	0.69	Dwelling Units	1	PM	1	64	36	1	0	1
Industrial Reserve	130 (Industrial Park)	34.75	1000 Sq.ft	748	AM	0.41	87	13	267	40	307
	130 (Industrial Park)	34.75	1000 Sq.ft	748	PM	0.4	21	79	63	236	299
Industrial Reserve	130 (Industrial Park)	15.42	1000 Sq.ft	332	AM	0.41	87	13	118	18	136
	130 (Industrial Park)	15.42	1000 Sq.ft	332	PM	0.4	21	79	28	105	133
Rural Resource	130 (Industrial Park)	9.41	1000 Sq.ft	203	AM	0.41	87	13	72	11	83
	130 (Industrial Park)	9.41	1000 Sq.ft	203	PM	0.4	21	79	17	64	81

Notes: This trip generation assumes all areas are developed. FAR was applied in the size formula.

Total AM	1002	153	1155
Total PM	240	888	1128

Change in Trips (Previous vs. Revised Land Use):

	Trips In	Trips Out	Total Trips
Total AM	764	114	878
Total PM	180	675	855

Travel Demand Assumptions

The model was run with the current network assumptions in the RTM and with two network options for the 2035 and 2050 horizon years:

1. The extension of Abernethy Way east of 232 Street to 256 Street. Since the analysis model used is a regional model, the actual alignment of the extension will not affect the forecast travel demand.
2. Abernethy Way extension with the addition of the new connection on 240 Street north across the Alouette River linking to the Silver Valley neighbourhood.

5.3. FORECAST TRAFFIC VOLUMES PRE & POST OCP AMENDMENT

Traffic volumes for the AM and PM peak hours were extracted for 2017, 2035 and 2050 to evaluate the traffic growth from land use changes and the traffic diversion when the Abernethy Way extension is introduced into the network.

The OCP Amendment generated traffic (from [Table 2](#)) was manually added to the 2050 forecast volumes, the assumed timeline for the build out of the planned land uses. The majority of these additional trips are industrial related and would be passing through primarily residential land uses along all of the Abernethy Way extension alignment options. Option 7 reroutes these industrial trips to Dewdney Trunk Road via 240 Street and provides for a local road connection from 240 Street to 256 Street. Since the RTM traffic volumes already include the trips generated by the initial land use assumptions, further adjustments were made to the forecast volumes to eliminate double counting.

The resultant forecast traffic volumes on the various segments for the three shortlisted options are shown in [Table 3](#) for the 2050 AM and PM peak hours. The total traffic volumes are shown in [Appendix F](#).

Table 3: 2050 AM (PM) Peak Traffic Forecast

EXTENSION SECTION	DIRECTION	2050 HORIZON YEAR (VPH)	OCP ADJUSTMENT (2050) (VPH)	2050 TOTAL TRAFFIC FORECAST (VPH)
Abernethy Way West of 232 St	EB	300 (730)	500 (50)	800 (780)
	WB	700 (450)	70 (400)	770 (850)
Abernethy Way 232 St to 240 St	EB	250 (350)	550 (100)	800 (450)
	WB	400 (200)	80 (450)	480 (650)
Options 2C & 10 East of 240 St	EB	100 (150)	600 (150)	700 (300)
	WB	200 (150)	90 (500)	290 (650)
Option 7 (Dewdney Trunk Rd) East of 240 St	EB	450 (600)	600 (150)	1050 (750)
	WB	700 (450)	90 (500)	790 (950)
240 St North of Abernethy Way	NB	260 (140)	-	260 (140)
	SB	160 (140)	-	160 (140)
240 St South of Abernethy Way	NB	440 (630)	-	440 (630)
	SB	750 (420)	-	750 (420)

5.4. LANING ASSESSMENT

Table 4 is an extract from the Highway Capacity Manual and shows estimated travel lane traffic volume capacities for various types of roadway facilities through different areas. The table suggests a maximum lane capacity of 700 vehicles per lane per direction on a Suburban Arterial with 10% Heavy Vehicles, which by 2050 likely best describes the corridor under investigation and assuming full build-out of the OCP Amendment. Based on this volume threshold, **Table 5** shows the proposed number of travel lanes for each of the shortlisted options. The existing two-lane cross section east of 252 Street should be retained as widening this section of Dewdney Trunk Road to 256 Street would require the replacement or twinning of the bridge crossing the Alouette River, which expense would only be justified when there is greater certainty on the traffic volumes forecast in future years.

Table 4: Lane Capacities by Facility and Area Type (Highway Capacity Manual)

Facility Type	Area Type	Free-Flow Speed (mph)	G/C	HCM PC Capacity (veh/ln)	90% PC Capacity (veh/ln)	80% PC Capacity (veh/ln)
Freeway	Downtown	55	n/a	2250	2000	1800
	Urban	60	n/a	2300	2100	1800
	Suburban	65	n/a	2350	2100	1900
	Rural	70	n/a	2400	2200	1900
Arterial	Downtown	25	0.45	860	800	700
	Urban	35	0.45	860	800	700
	Suburban	45	0.41	780	700	600
	Rural Multi-Lane	55	n/a	2100	1900	1700
	Rural 2-Lane	55	n/a	1600	1400	1300
Collector	Downtown	25	0.41	780	700	600
	Urban	30	0.41	780	700	600
	Suburban	35	0.37	700	600	600
	Rural Multi-Lane	45	n/a	1900	1700	1500
	Rural 2-Lane	45	n/a	1600	1400	1300

Arterial/Collector assume 1900 ideal sat flow rate

Table 5: Summary of Recommended Number of Lanes for each Roadway Segment

ROADWAY	SEGMENT	FACILITY & AREA TYPE	RECOMMENDED CROSS SECTION
Abernethy Way Extension	232 Street to 240 Street (Phase 3): All Options	Suburban Arterial	2 Lanes (Interim), 4 lanes (Ultimate)
	240 Street to 256 Street (Phase 4): Options 2C and 10	Suburban Arterial	2 lanes
240 Street	North of Abernethy Way Extension (240 Street Bridge Extension): All Options	Suburban Collector	2 lanes
	South of Abernethy Way Extension to Dewdney Trunk Road (Phase 4): Option 7	Suburban Arterial	4 lanes
Dewdney Trunk Road	240 Street to east of 252 Street (Phase 4): Option 7	Suburban Arterial	4 lanes
	East of 252 Street to 256 Street (Existing Conditions)	Suburban Arterial	2 lanes

5.4.3. Proposed Cross Sections for Each Shortlisted Option

For all shortlisted options the proposed cross section from 232 Street to 240 Street is a 24m right-of-way with a rural two-lane roadway in the short term (prior to 2035) and a four-lane urban roadway in the long term (2035 to 2050). The right-of-way for the long-term condition should be secured in the short term to allow for the construction of the long-term cross section without requiring additional property acquisition. The concept short term cross section is shown in [Figure 23](#) while the concept long term cross section is shown in [Figure 24](#).

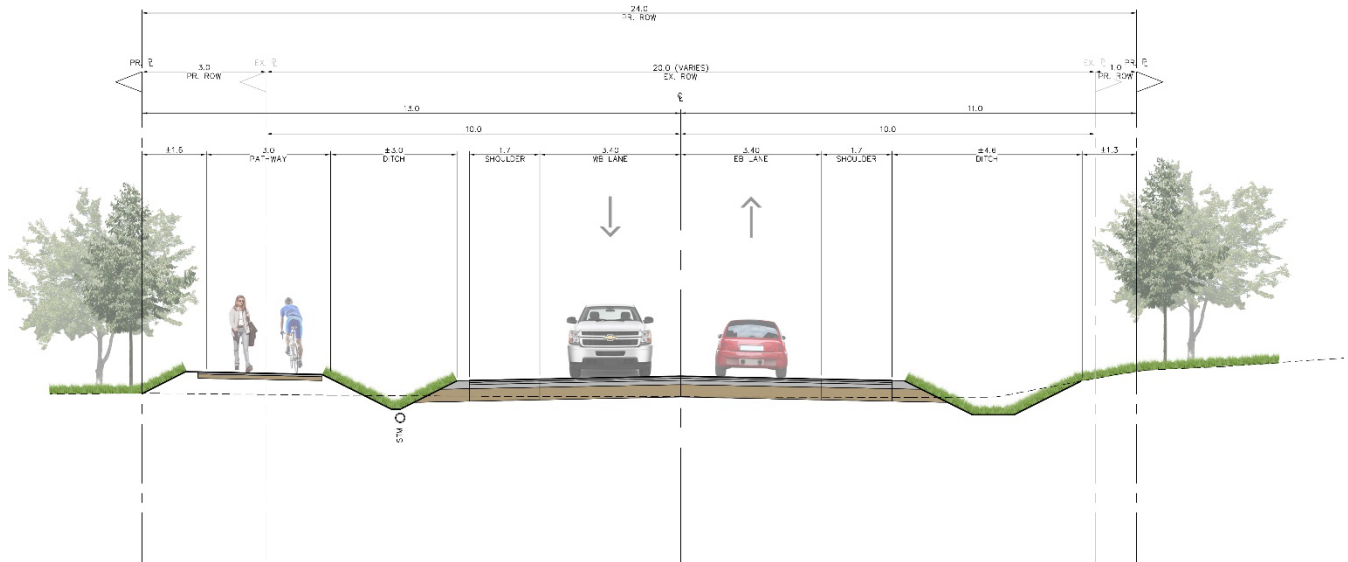


Figure 17: Concept Abernethy Way Extension: 232 St to 240 St - Short Term (to 2035): All Options

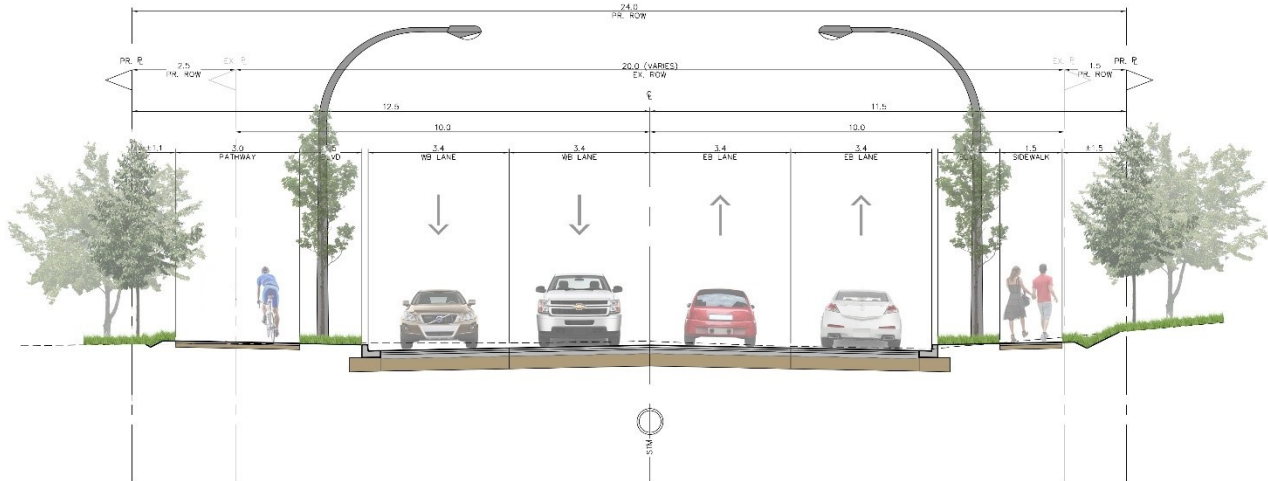


Figure 18: Concept Abernethy Way Extension: 232 St to 240 St - Long Term (after 2035): All Options

For Options 2C and 10 the proposed cross section of Abernethy Way extension from 240 Street to 256 Street is a two-lane rural cross section within a 24m right-of-way as shown conceptually in [Figure 25](#). Property acquisition is required to achieve this cross section, the specifics of which will be determined in the next design stages.

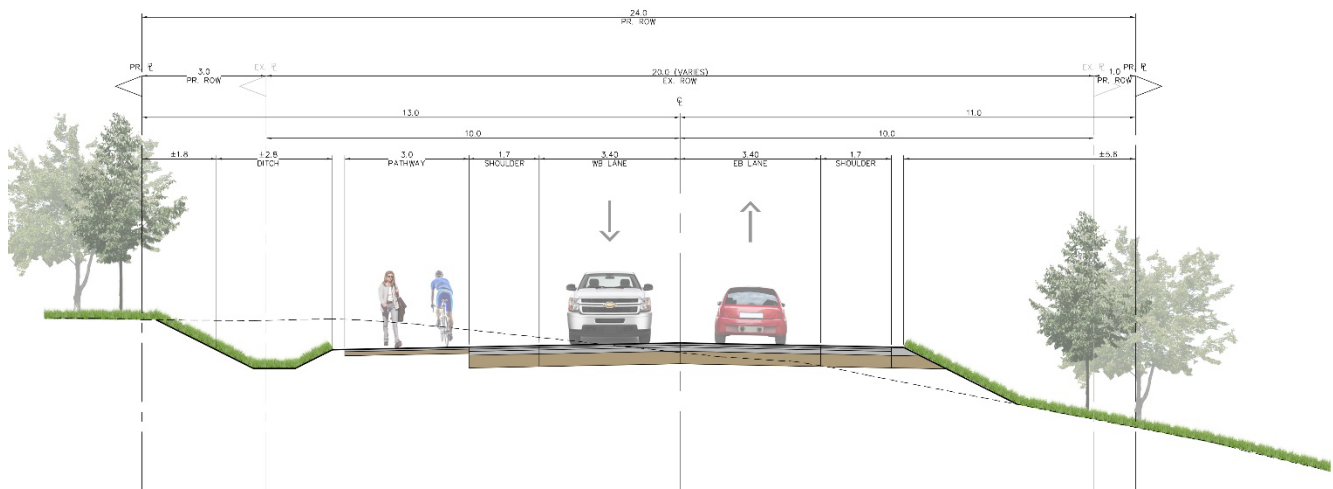


Figure 19: Concept Abernethy Way Extension: 240 St to 256 St: Options 2C and 10

For Option 7 the proposed cross section of 240 Street between Abernethy Way and Dewdney Trunk Road, and Dewdney Trunk Road between 240 Street and 252 Street is a four-lane urban cross section within a 24m right-of-way as shown conceptually in **Figure 26**. Property acquisition is required to achieve this cross section, the specifics of which will be determined in the next design stages.

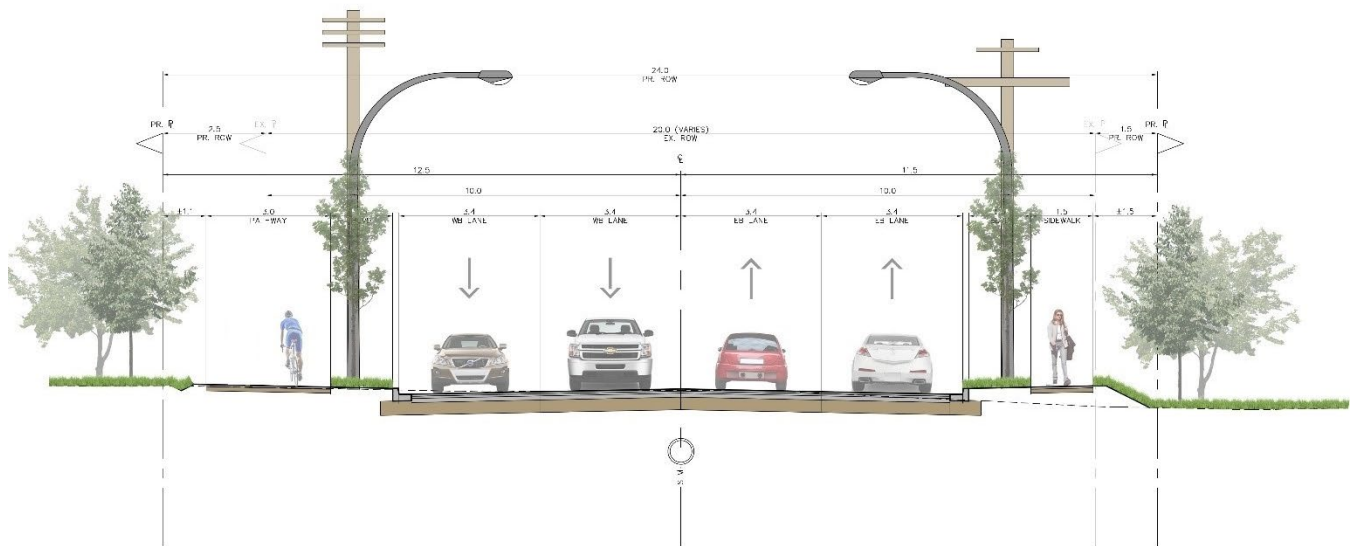


Figure 20: Concept 240 St (Abernethy to Dewdney Trunk Rd) and Dewdney Trunk Road (240 St to 252 St): Option 7



6. COST ESTIMATE

6.1. OVERVIEW

Cost estimates for the three shortlisted options are presented in this section.

6.1.1. Unit Rates

Average unit rates were selected from recent projects including the 232 Street: 132 Avenue to Silver Valley Road Design and Construction Project in Maple Ridge as well as various projects in nearby Langley. These rates were used to create an average linear road rate for each proposed typical cross section which was then applied to each option.

6.1.1. Drainage Considerations

Due to the number of creek crossings on each shortlisted option, to better prepare a corridor cost estimate a preliminary hydrologic and hydraulic analysis was done using the rational method. This determined catchment areas and flows to advise preliminary culvert sizing for these creek crossings. Although the site areas are larger than recommended for the rational method, it is generally considered overly conservative and should be refined by modelling in more detailed design stages. The preliminary sizing is shown in the notes on the drawings found in [Appendix C](#). A field review was also done to review the various crossings for topography to determine if a culvert or arch structure is more appropriate. Below is a summary of the preliminary culvert crossings. Note that these sizes are subject to change following a more detailed hydraulic analysis during the next design phases of the project:

- **Coho Creek Crossings:** Coho creek is east of 232 Street and crosses Abernethy Way twice. The west 750mmØ culvert (Crossing 1) is proposed to be upgraded to a 1400mmØ CSP culvert and is fish sensitive (All Options). The east 600mmØ culvert (Crossing 2) is proposed to be upgraded to a 1200mmØ CSP culvert (All Options).
- **Latimer Creek Crossings:** The west 600mmØ culvert near Hacker's Haven golf course (Crossing 4D) is proposed to be upgraded to a 1000mmØ CSP culvert (All Options). The crossings east of 240 Street don't have existing culverts but are proposed to use a corrugated plate arch structure (Crossing 7) and a 1200mmØ CSP culvert (Crossing 8). Both of these crossings are fish sensitive (Option 2C and 10).
- **Webster's Creek:** The culvert on 130 Avenue west of 256 Street at Webster's Creek (Crossing 17) is proposed to be upgraded from an 870x980 culvert to a 2440x1270 culvert (Option 2C). This crossing is fish sensitive.
- **Zirk Brook:** The existing culvert crossing Zirk Brook is a 2500x1720 culvert (Crossing 9). This culvert is proposed to be upgraded to a 3500x1750 culvert (Option 10). This crossing is fish sensitive.

6.1.2. Property Impacts

Based on average property value ranges for various zonings and lot characteristics, estimated property impact costs were determined and are included in the overall cost estimate. An average price of \$85 per square meter was used for ALR lands and \$560 per square meter for non-ALR lands. This price includes the negotiation fees and purchase of properties.

A conservative approach was taken which assumed total buyouts in cases where the alignment bisected a property (especially ALR) or went through a building structure. There is a possibility that acquisition costs could be limited to just the road right-of-way area itself through negotiation with the impacted landowner.

A summary of property costs (excluding the 240 Street Extension) is provided in [Appendix G](#). A more detailed cost estimate of property impacts is recommended during subsequent design stages of the preferred route as ALR lands in particular can vary greatly in cost to acquire depending on the location and use.

For the 240 Street extension, property estimates are based on BC Assessment, plus \$10K per lot for acquisition costs; the City should confirm property acquisition costs.

6.1.3. Engineering and Supervision

15% of the construction cost was used to estimate engineering services throughout design and construction phases. This would include conceptual, preliminary and detailed design, legal and topographic survey, geotechnical investigation, pavement analysis, environmental impact assessment, site staff, contract administration, and environmental monitoring.

6.1.4. BC Hydro Pole Relocation Costs

BC Hydro has transmission poles on both sides of Dewdney Trunk Road (Option 7). There is risk involved with this pricing since each pole is approximately \$45K to relocate as advised by BC Hydro, however they also advised that this estimate can vary considerably (+100% / -35%). Based on initial review, allowance was made for eight pole relocations in this estimate, but any additional relocations identified during conceptual and preliminary design stages would increase the cost estimate. Initial review of the pole locations provided by Hydro indicates that the eight relocations included in the cost estimate is a reasonable assumption.

6.1.5. Contingencies

Due to the high-level planning completed under this study, a contingency allowance of 40% was included to account for items and conditions unknown at this stage of the project. Additional items could include but are not limited to sub-excavation in soft soils, additional haul for embankment materials or gravels, environmental mitigation, archeological remediation, third-party utility costs, and market escalation.

6.1.6. Accuracy and Assumptions

The cost estimate prepared is a Class D estimate based on high-level planning and should be considered as an order of magnitude cost only and likely within a $\pm 40\%$ accuracy range. The cost analysis was developed for the purposes of comparing alignment options to one another and it is therefore subject to change during subsequent design stages. The cost estimates were based on the following assumptions:

- Property acquisition is for 24m right-of-way for all three shortlisted options.
- For Option 7 (Phase 4), excludes possible road upgrade on 256 Street from Dewdney Trunk Road to 124 Street. This possible upgrade should be revisited in the concept design stage.
- Assuming sufficient existing pavement structure for re-use and overlay along routes with existing asphalt.
- Environmental compensation area pricing has not been included; however, approximate compensation areas have been determined in the MAE to assess relative environmental impact associated with each route. Costs associated with these areas will be determined during the next design stages and are dependent on adjacent available lands, right-of-way, and other site-specific opportunities.
- Bridge structures upon initial assessments are not required for all three shortlisted options and therefore no cost has been allocated for bridge structures. Only culverts have been included.
- Watermain and sanitary sewer improvements have not been included in the cost estimates.
- Earthwork and road structure quantities are based on the geotechnical pavement recommendations. The pavement structure could change following geotechnical drilling investigations during preliminary and detailed design.
- No inflation was assumed in the cost estimate to forecast a specific construction year, so all costs are in 2019 dollars.

- Earthworks pricing is based on assumed granular sub surface conditions and no blasting and / or ground improvements have been included in pricing.
- For the 240 Street Extension concept design geotechnical / environmental assessments have not been completed.
- For the 240 Street Extension, utility costs (watermain, storm sewer, sanitary sewer / forcemain, third-party utilities) are not included in the estimate as they are assumed to be paid for by the developer.

6.2. COST ESTIMATE SUMMARY

The Class D cost estimates for the three shortlisted options are shown in **Table 5**. The detailed cost estimates can be found in **Appendix H**.

Table 6: Cost Estimate Summary

OPTION	DESCRIPTION	APPROXIMATE COST (\$ 2019) (refer assumptions)			
		PHASE 3 INTERIM (2-LANE 232 ST TO 240 ST)	PHASE 3 ULTIMATE (4-LANE – 232 ST TO 240 ST)	PHASE 4 (240 ST TO 256 ST)	TOTAL
Abernethy Way Extension (excludes environmental compensation and remediation)					
2C	Upper Route: Abernethy Way extension to 248 Street, 130 Avenue to 256 Street	\$24.3	\$7.4M	\$40.1	\$71.8M
7	Lower Route: Abernethy Way extension to 240 Street, 240 Street, Dewdney Trunk Road (excl. bridge replacement) to 256 Street, 124 Avenue between 244 Street and 246 Street	\$24.3	\$7.4M	\$34.3	\$66.0M
10	Middle Route: Abernethy Way extension to 248 Street, 124 Avenue to 256 Street	\$24.3	\$7.4M	\$37.7	\$69.4M
240 Street Extension					
-	240 Street Extension: Abernethy Way to Fern Crescent	-	-	-	\$37.3M



7. PUBLIC ENGAGEMENT

7.1. OVERVIEW

Having identified three shortlisted options, a public open house was held in order to provide the public with information about the project and to ask attendees to identify their preferred option. The engagement process and survey findings are provided in this section.

7.2. ENGAGEMENT PROCESS

A drop-in format open house event was held on June 25, 2019 at the City Library from 4 pm to 8 pm. The event was advertised in the local newspaper, on social media, and all residents whose properties are located along all the three shortlisted alignments had invitations delivered to their homes. A series of project boards were presented which attendees were asked to review, and City staff and the project team were available to explain the project, answer questions and receive feedback.

Attendees were encouraged to formally submit feedback and answer survey questions before leaving the open house and had the option to return survey forms later at their leisure. The survey form was also made available online, together with the project boards to allow those unable to attend the open house to also provide input. Besides gathering demographic information of respondents, they were asked to rank which of Options 2C, 7, or 10 they preferred in order of preference, and to explain why they ranked them as they did. Their place of residence or business in relation to the option alignments was also asked for.

In total, 237 participants submitted survey responses at the open house and five participants sent in their survey responses by the July 10, 2019 deadline. The surveys were then compiled into a single database and analyzed. The following section details the survey results.

Based on request, separate meetings were also held with representatives of Academy Park and Meadowridge School.

7.3. SURVEY RESULTS

7.3.1. Demographics & Place of Residence or Business

Survey responses indicate that 98% of respondents (227 respondents) live in Maple Ridge and 64% (148 respondents) live on the alignment of these options. Respondents indicated that 56% (129 respondents) have business on the alignment or would use the corridor to commute to work or school. These distributions are shown in [Figure 27](#).

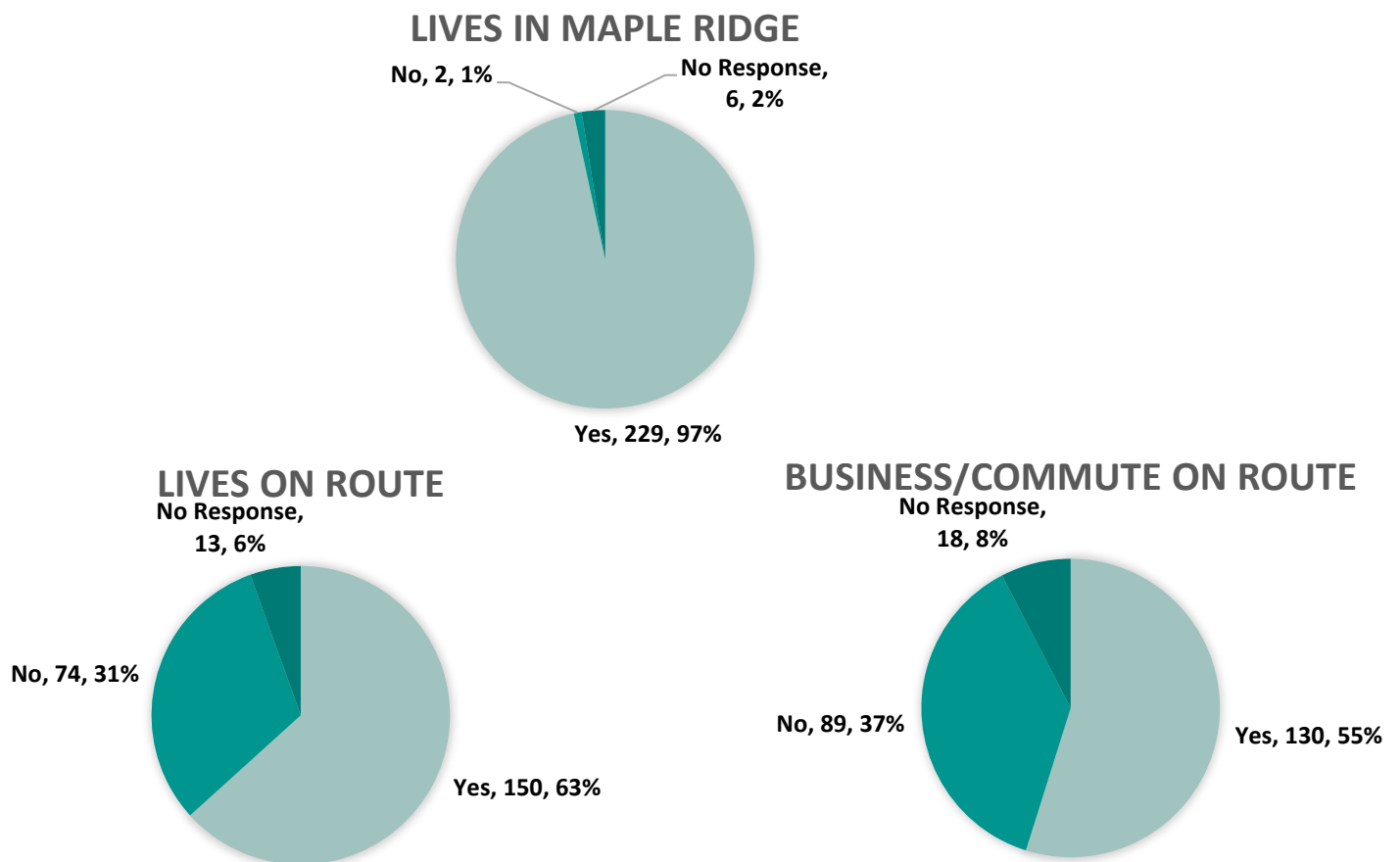


Figure 21: Demographics & Place of Residence or Business

Respondents included representation across a broad range of age cohorts. Around 60% (138 respondents) were between the ages of 50 and 69 years old, while 19% (45 respondents) were under the age of 50 and 18% (42 respondents) were above the age of 70. As is typical of most open houses, the cohort younger than 50 years old was underrepresented, or only 20% (47 respondents), and of these, 10% (23 respondents) were younger than 40 years old. These demographics are shown in [Figure 28](#). Also shown in the figure is that 70% (165 respondents) have an interest in active transportation, highlighting the importance of providing these facilities along the proposed corridor.

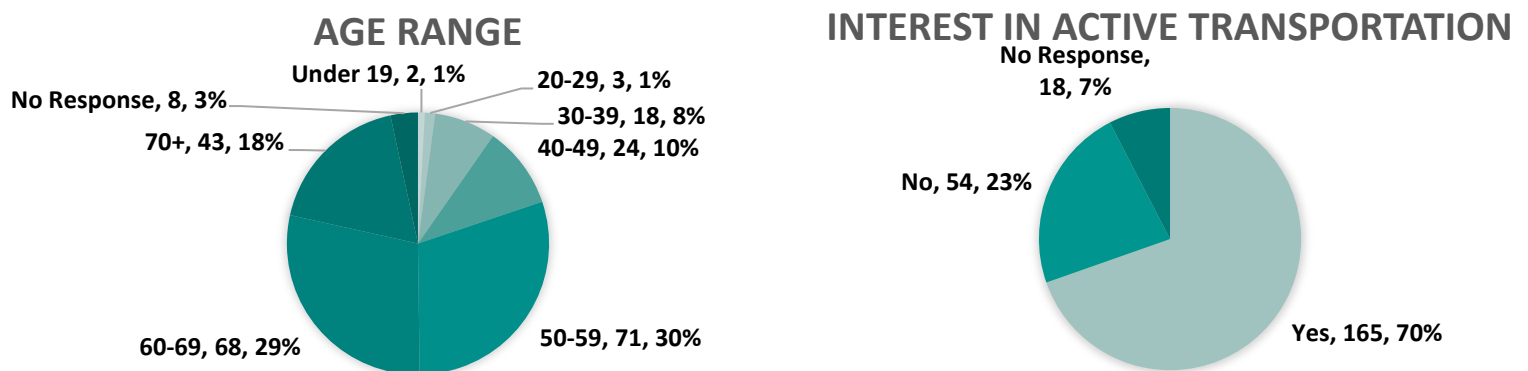


Figure 22: Demographics and Interest in Active Transportation

7.3.2. Preferred Option

Participants were asked to rank their preferred option of the three shortlisted with the responses shown in [Figure 29](#). From the data received, 39% (96 respondents) preferred Option 7, 28% (68 respondents) preferred Option 10, and only 9% (21 respondents) preferred Option 2C. Of note, 24% (57 respondents) did not select a preferred option.

Although selecting a preferred option, some participants indicated in their justification that they do not support moving forward with construction of the corridor.

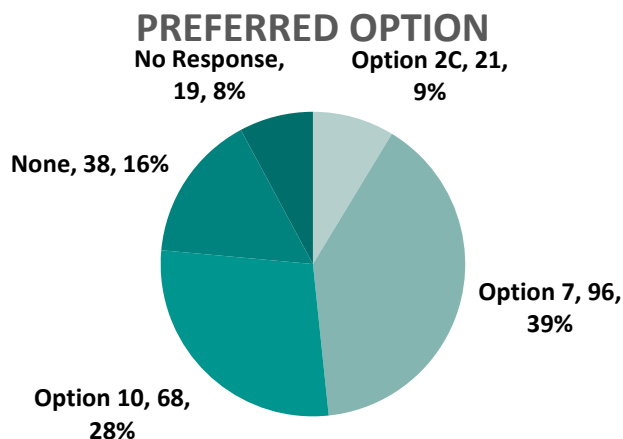


Figure 23: Preferred Option Selection

The preferred option results were then further analyzed on the basis of whether or not the participant lives on the route of the options or not. The results are shown in [Figure 30](#). For respondents that live on the route of the options, Option 7 at 45% (67 respondents) was preferred, followed by 22% (32 respondents) for Option 10. However, of those who do not live on the corridor alignment, Option 10 at 40% (30 respondents) was preferred followed by Option 7 at 34% (25 respondents). See a distribution of the preferred shortlisted option broken out by those participants who do and do not live on the route.

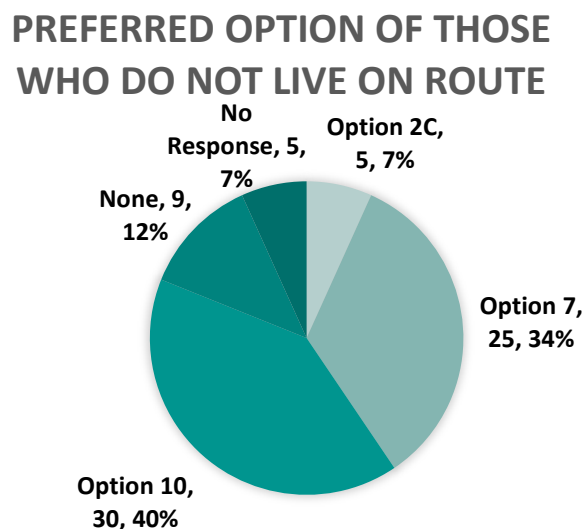
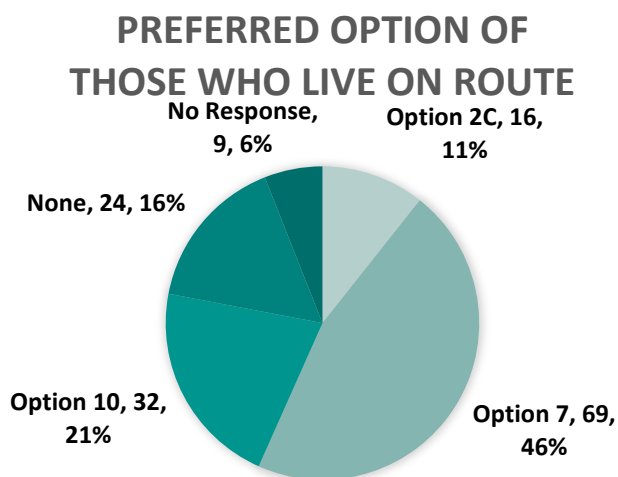


Figure 24: Preferred Option by Place of Residence

7.3.3. Respondent Feedback

165 respondents provided comments on their survey forms. These responses were categorized as detailed below.

- 28% (39 respondents) were concerned with the potential traffic increase and congestion
- 15% (21 respondents) were concerned with the impacts to the surrounding environment
- 15% (21 respondents) were concerned with the safety of students given the number of schools in the area
- 12% (17 respondents) were concerned with the change to the neighbourhood that may happen due to construction of any of the options
- 11% (15 respondents) were concerned with the amount of additional traffic noise
- 9% (13 respondents) were concerned with impacts to their properties and value
- 6% (9 respondents) suggested an alignment option further to the north
- 4% (5 respondents) wanted to ensure that equestrian routes were provided

Verbal concern was also expressed by several attendees about traffic through-cutting on local roads which intersect the new corridor, thereby increasing the impact to the local community.



8. EVALUATION OF SHORTLISTED OPTIONS

8.1. OVERVIEW

A Multiple Accounts Evaluation (MAE) methodology was used to compare the shortlisted options. Due to the inherent bias of applying a scoring or ranking of the options, a simple coloured ball comparison was applied. In some instances, these indicate good, better, best comparisons, or improved, neutral, worse comparisons between the options, and does not undermine the impact of the criterion itself for each option. For example, for Environmental Impact, the green ball does not imply that there will be an improvement to the environment as a result of the project, but only the relative comparison between the options. In addition, since the alignment between 232 St and 240 St is consistent for all options, that segment has effectively been excluded from the evaluation.

8.2. MAE SUMMARY

The resultant MAE is provided in [Table 6](#), with evaluation criteria based on the project objectives, the technical review undertaken during this study, and public feedback. Since the cost estimate is $\pm 40\%$ and is in 2019 dollars, the estimates have been evaluated as equal.

Applying the evaluation, Option 7, the Dewdney Trunk Route option, is the preferred option.

Table 7: Multiple Account Evaluation (comparison of options relative to each other)

Criteria	Option 2C		Option 7		Option 10	
	130 Ave. (Upper Route)		Dewdney (Lower Route)		124 Ave. (Middle Route)	
	Influencing Factors		Influencing Factors		Influencing Factors	
Relieves Traffic on Dewdney Trunk Rd & Provides Network Redundancy			<ul style="list-style-type: none"> Includes constructing the road segment Option 7C to provide network redundancy via 248 St and 130 Ave 			
Provides Access to NE Sector of the City						
Consistency with Strategic Transportation Plan (STP) / OCP						
Public Preference						
Directness of Route						
Utilization of Existing Roads & Property Impact						
Environmental Impact	<ul style="list-style-type: none"> Two new Latimer Creek crossings. Compensation Area: ~23,209m² 		<ul style="list-style-type: none"> No major creek crossings. Compensation Area: ~14,402m² 		<ul style="list-style-type: none"> Two new Latimer Creek crossings. Compensation Area: ~35,427m² 	
Possibility of Archaeological Impact						
ALR Impact						
Social / Community Impact, also including impact to schools and through-cutting						
Significant Utility Relocation			<ul style="list-style-type: none"> Traffic safety barriers will be required to avoid some BC Hydro pole relocations 			
Cost Estimate (Class D; \$2019)	<ul style="list-style-type: none"> \$71.8M \$37.3M (240 St Ext) 		<ul style="list-style-type: none"> \$66.0M \$37.3M (240 St Ext) 		<ul style="list-style-type: none"> \$69.4M \$37.3M (240 St Ext) 	
2 pts; 1 pt; 0 pts		14		18		15
Overall						



9. CONCLUSIONS & RECOMMENDATIONS

9.1. OVERVIEW

This section provides a summary of this report and outlines considerations for future conversations related to the Abernethy Way extension.

9.2. SUMMARY

The objectives of this report were to:

- Assess the technical feasibility of various options of the Abernethy Way extension from 232 Street to 256 Street.
- Evaluate each option and identify a preferred option.
- Provide information to support informed debate.
- Assess the technical feasibility of extending 240 Street north to Fern Crescent to access the Silver Valley area and Golden Ears Provincial Park

Based on the high level engineering and desktop reviews undertaken in this study, both an extension of Abernethy Way from 232 Street to 256 Street appears to be technically feasible, as well as the extension of 240 Street over the Alouette River.

Of the 13 alignment options initially considered for the Abernethy Way extension, three were shortlisted. The phasing, laning and preferred cross section was determined based on forecast traffic demand.

The three shortlisted options were presented to the public at an Open House, at which attendees were asked to rank which of the options they preferred for implementation, as well as to provide any other comments and feedback for consideration. 39% of respondents preferred Option 7, with Option 10 being preferred by 28% of respondents.

A Multiple Account Evaluation (MAE) was used to compare the three shortlisted alignment options against each other, with the findings of the MAE provided in [Table 6](#). The MAE resulted in Option 7, the Dewdney Trunk Route being the preferred option.

9.3. RECOMMENDATIONS AND NEXT STEPS

Based on the findings of this study, **Option 7** (Dewdney Trunk Road) is recommended as the preferred option to investigate further. The future extension of 240 Street over the Alouette River can proceed as a separate project in future or as preferred by the City. Advancing these two projects to the conceptual design stage will allow some of the remaining unknowns to be determined, including more accurate property acquisition costs, and thereby prepare more reliable cost estimates (Class C or better).

Included as part of this preferred option in the widening to four lanes of the section of 240 Street from Dewdney Trunk Road to the new Abernethy Way extension in the vicinity of the Hackers Haven, just north of the existing Abernethy Way intersection. This is consistent with the future proposed extension of 240 Street north to Fern Crescent, and the eventual possible inclusion of 240 Street between Dewdney Trunk Road and Fern Crescent in TransLink's Major Road

Network. The 240 Street connection to the Abernethy Way extension will also help better balance traffic on the section of Dewdney Trunk Road west of 240 Street and on 232 Street between to Dewdney Trunk Road and Abernethy Way. In the next design stage where road upgrades are in close proximity to schools, mitigation measures should be considered in the design.

To meet the objective of providing an alternative route to Dewdney Trunk Road, completing the link of 124 Avenue between 244 Street and 246 Street is recommended. This will then provide an alternative route for local and emergency vehicle traffic connecting 240 Street to 256 Street via 124 Avenue, 248 Street and 130 Avenue. It is proposed this route be heavy vehicle restricted. The end to end recommended corridor is shown in **Figure 31**.

As part of the next design stages, further public engagement is also recommended.



Figure 25: Recommended Abernethy Way Extension and Parallel 124 Ave Connection



APPENDIX A
2010 DELCAN
STUDIES



APPENDIX B

240 STREET EXTENSION FEASIBILITY



APPENDIX C DRAWINGS

APPENDIX C DRAWINGS



APPENDIX D

ARCHAEOLOGICAL OVERVIEW ASSESSMENT



APPENDIX E

GEOTECHNICAL DESK STUDY REPORT



APPENDIX F

TRAFFIC DEMAND FORECAST



APPENDIX G

PROPERTY SUMMARY



APPENDIX H

CLASS D COST ESTIMATE

