



RANGE ROAD CORRIDOR STUDY

CONCEPTUAL DESIGN REPORT

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URBAN
S Y S T E M S

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1.0 INTRODUCTION

The City of Whitehorse is conducting a study to develop a conceptual design for the Range Road Corridor between Mountain View Drive and Two Mile Hill Road. The conceptual design will be for a multi-modal corridor designed for all ages, abilities, and modes of travel. The City has retained Urban Systems to develop the conceptual design.

The conceptual design study looked at opportunities to improve conditions for walking, cycling and transit along the corridor, while accommodating vehicle movements and traffic operations. This project is intended to complement and integrate with the intersection improvements at Range Road and Two Mile Hill Road, which looked at assessing improvements to the intersection for all modes. Improvements at this intersection are also considering options to improve walking and cycling, in addition to transit and driving, to make the intersection easier and safer.

This report provides a summary of the conceptual design study, including an overview of existing conditions, options development and evaluation, and conceptual design and cost estimates for the preferred option. The concepts and evaluation results presented in this report are based on technical analysis, input received from three stakeholder group workshops, collaboration with City staff, and feedback from a virtual public open house.

1.1 STUDY GOALS AND OBJECTIVES

The following goals and objectives were identified for the Range Road conceptual design study:

- Provide a conceptual design for multi-modal transportation within the Range Road corridor between Two Mile Hill and Mountain View Drive
- Provide seamless active transportation connectivity between this corridor and adjacent active transportation routes

1.2 STUDY PROCESS

The conceptual design study was developed through four (4) key phases. Figure 1-1 illustrates the process and key tasks associated with each phase:



Figure 1-1: Study Process

2.0 BACKGROUND INITIATIVES

The Range Road corridor forms an important connection in the City's active transportation network and has been identified for improvements in a range of plans and processes. Facilities for walking and cycling will connect with multi-use trails along Range Road south (Airport Trail), Two Mile Hill Road and Range Road North. This section summarizes the planning context and other related background initiatives for this project.

In 2018, the City of Whitehorse prepared a Bicycle Network Plan, outlining a long-term vision for cycling in Whitehorse. Range Road was identified as a future separated bicycle path for people of all ages and abilities (AAA) in the Bicycle Network Plan. Through the recent Official Community Plan (OCP) process, residents in the Takhini neighbourhood have expressed interest in traffic calming of Range Road, with vehicle speeding being an ongoing concern both with residents and the Takhini School. Further, the City's Transit Master Plan has proposed increased routes on Range Road, with buses envisioned to operate in both directions along with Yukon University becoming a primary transit hub.

A School Mobility Review conducted in 2018 pointed out that the wide shoulders for on-street parking on Range Road may encourage higher driving speeds. It was recommended in that study that curb extensions to be considered at multiple locations along the corridor.

Other relevant initiatives to this project include the Whitehorse Transportation Demand Management Plan (2014). It is relevant to this study in improving travel options through improved active transportation options, future transit improvement considerations, and support for employment and users through alternate travel modes.

In addition, an extension of the multi-use path on Range Road south of the Two Mile Hill Road intersection has been identified by City Engineering Services Staff for design and construction in 2021.

3.0 EXISTING CONDITIONS

The study area for this project extends along Range Road between Mountain View Drive and Two Mile Hill Road, which is approximately 1.8km in length. The corridor bisects the neighbourhoods of Takhini North and West from Takhini East. As shown in **Figure 3-1**, major destinations on or adjacent to Range Road include private residences, Yukon University, Takhini Elementary School, Pepsi Softball Complex, Broomball, Takhini Arena, Government of Yukon offices, Fisheries and Oceans Canada, and two new multi-family complexes currently under construction.

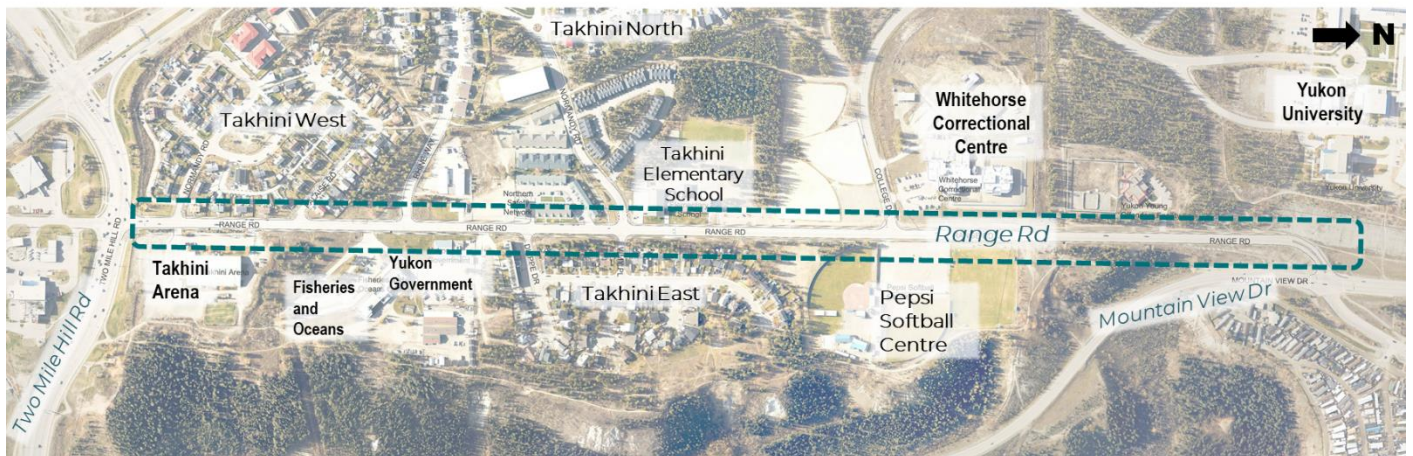


Figure 3-1: Study area overview

The corridor is classified as a neighbourhood collector road, with two motor vehicle lanes, transit operating in the northbound direction, curbside parking on both sides of the street, and sidewalks on both sides of the street for the majority of the corridor. There are currently no designated cycling facilities. As shown in **Figure 3-2**, the existing parking lanes on either side are delineated by a white painted line.

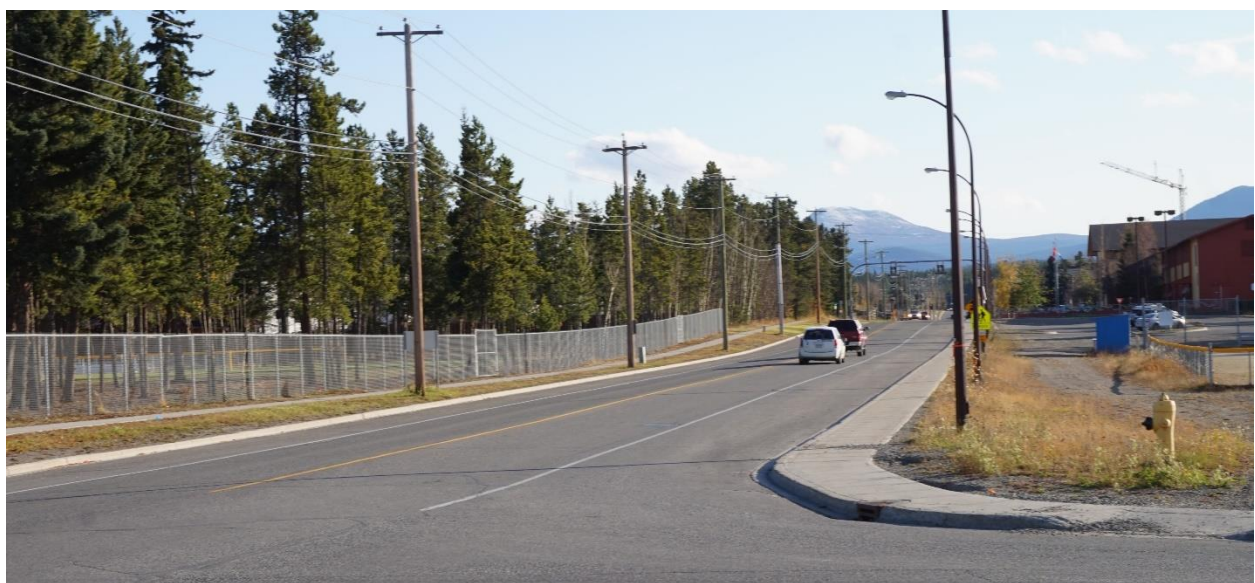


Figure 3-2: Range Road Cross Section (Looking South)

Average daily traffic volumes along Range Road are approximately 6,000 vehicles per day, based on intersection turning movement counts conducted at Mountain View Drive (May 2019), Dieppe Drive (May and June 2019) and Two Mile Hill Road (May 2020).

The average speed of vehicular traffic has also been studied between University Drive and Normandy Road (north) in May 2019, May 2018 and June 2016. Average speeds were recorded for each hour of the day. The data shows that the average speed during school zone hours is slower than other times in the day; however, the average speed on the corridor is still above the speed limit by 10 to 27%.

The existing road right-of-way is approximately 20 metres wide. There are sidewalks along most of the corridor, except for a gap along the east side of the street north of the softball complex. In addition to the crosswalks at the Mountain View Drive and Two Mile Hill Road intersections, there are two existing crosswalks located at Normandy Road (south) and Takhini Elementary School. There is no dedicated cycling facility; people biking were observed to generally ride on-street or on the sidewalks.

Range Road is current served by transit routes #5 and 6 in the northbound direction only. There are 4 bus stops along the corridor, located at Normandy Road (south), Rhine Way, Takhini Elementary School, and the Yukon Young Offenders Facility. Three buses are served per hour during morning and afternoon peak hours, while one bus is served per hour during the midday period.

Historically, low parking utilization was observed for on-street parking at most times of the day, with the exception of high utilization for specific events held at Takhini Arena and the Softball Centre. Off-street parking is provided at all facilities along the Range Road study area. During a September 2020 site visit, on-street parking usage was observed at the locations highlighted in red in **Figure 3-3**. Short term parking activity was observed at Takhini Elementary school, mainly north of the existing marked crosswalk, during morning drop-off and afternoon pick-up periods.

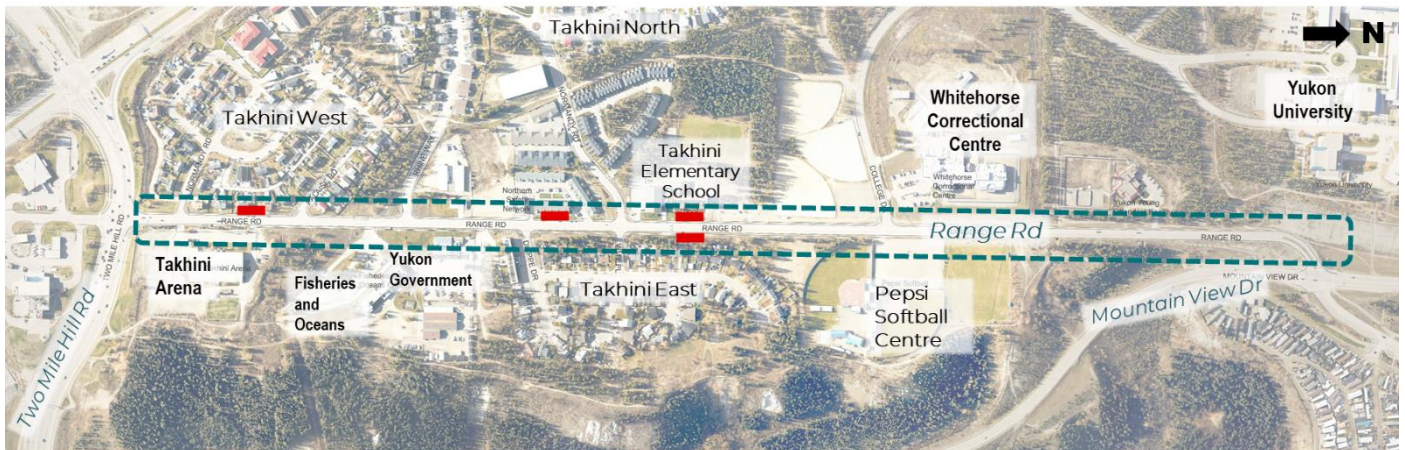


Figure 3-3: Locations observed with on-street parking usage

4.0 STAKEHOLDER WORKSHOPS

In late October 2020, a series of three virtual stakeholder workshops were held to collect feedback on issues and concerns of the community, as part of the Phase 1 engagement ahead of the conceptual design development and the virtual public open house in November 2020.

Each of the stakeholder workshops were each focused on different stakeholder groups, as follows:

- **Workshop #1: Facility Operators** on October 21st included representatives from Whitehorse Corrections Facility, Downtown Days Daycare, Transportation Engineering (YG), Takhini Arena, Yukon University, and Takhini Elementary School – with a total of 6 attendees excluding the City and consultant team.
- **Workshop #2: Neighbourhood and User Groups** on October 21st included representatives from Whitehorse Walks, Whitehorse Urban Cycling Coalition, Takhini North Community Association, Takhini East, and Takhini Elementary School – with a total of 8 attendees excluding the City and consultant team.
- **Workshop #3: City Departments** on October 26th included staff from Engineering Services, Planning and Sustainability Services, Parks and Community Development, Lands and Building Services, Transit, Operations, Bylaw Services, and Water and Waste Services – with a total of 11 attendees excluding the consultant team.

Through a priority rankings exercise, the stakeholder groups identified the following top three priorities as the focus areas for the Range Road corridor improvements:

- Improve safety for all modes
- Improve active transportation network connections
- Maintaining vehicle traffic flow

Other priority options included accessibility, cycling comfort, parking and loading, pedestrian comfort, and safe travel to school. Additionally, three other priorities of “low cost in investment and maintenance”, “lower speed and noise of traffic” and “winter functionality” were suggested during the user group workshop but were not voted into the top three priorities.

Stakeholders were asked what issues and opportunities should be considered for the design of Range Road during the three workshops. Some of the highlights include:

- Opportunities for Pedestrian Improvements:
 - Reduce gaps in the number of crosswalks through additional marked crosswalks
 - Opportunities for traffic calming and speed management
- On-street and Event Parking:
 - Concerns about increased parking demands with future developments
 - Perception of high parking demand, while actual parking demand on both sides is low, with the exception of large events at Takhini Arena or at the Softball Centre
- Improving Connections to Yukon University
- Broader network improvements to other desire lines including the Sage Trail (also referred to as TransCanada Trail or Escarpment Trail)
- Considerations for winter maintenance
 - Concerns from City Operations on viability of retaining on-street parking on a Priority 1 snow clearing street, noting all other Priority 1 streets (apart from Downtown streets) do not retain on-street parking.

5.0 DESIGN DISCUSSION

Based on the background information review, stakeholder workshop input, and collaboration with City staff, two cross-section options were developed for the Range Road corridor improvements. For the conceptual design, both options were assumed to primarily take place within the existing curb-to-curb space to provide dedicated cycling facilities and to better define the corridor for all users through road space reallocation. Reducing lane widths also helps promote slower driving speeds and reduces crossing distance, which in turn improves safety for vulnerable road users.

Conceptual design plans for the two options can be found in **Appendix A**. The following sections provides a discussion on the two design options and other proposed improvements along the corridor.

5.1 DESIGN OPTION 1

Design Option 1 features a bidirectional protected bicycle lane on the west side of Range Road, with a 1.0 metre wide buffer for protection from traffic and to serve as snow storage space in the winter. The bicycle lane is 3 metres wide, which provides sufficient width for the City's current snow removal equipment used for trails and pathways. On-street parking is retained along the west side between Two Mile Hill Road and University Drive and along the east side between University Drive and Mountain View Drive.

Option 1: Bi-directional Protected Bike Lane on West Side

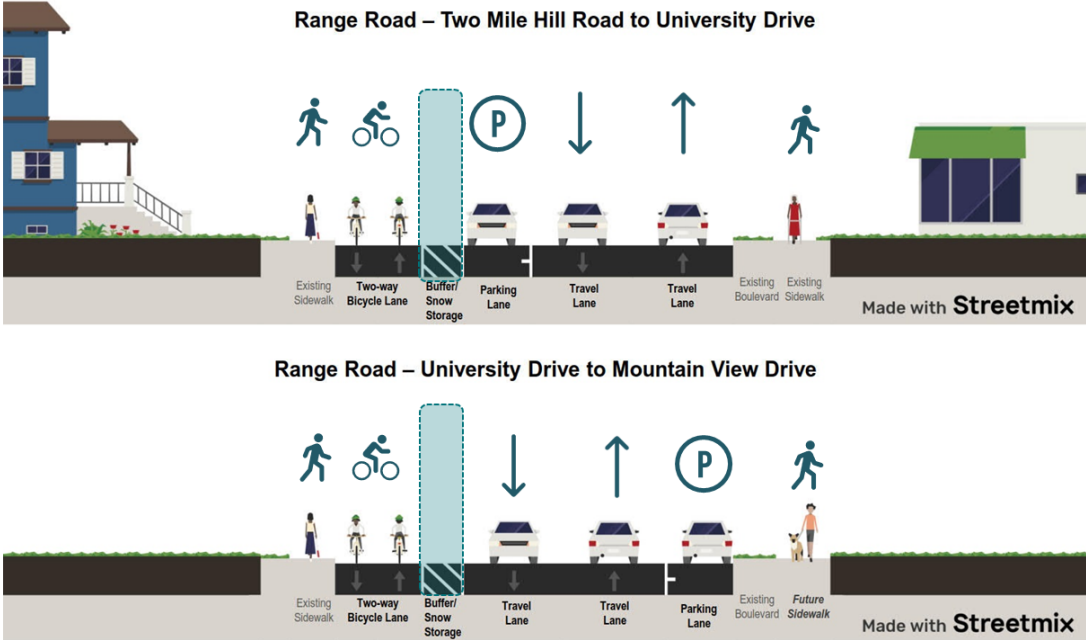


Figure 5-1: Design Option 1 Cross Section

Depending on the final configuration of the Two Mile Hill Road intersection improvements, this option allows for raised concrete median islands to provide a traffic calming effect at the intersection approach. The bicycle lane transitions to a multi-use pathway south of Normandy Road (south) towards the Two Mile Hill Road intersection.

At the Rhine Way and University Way intersections, Option 1 features a new northbound left-turn lane to improve traffic operations with an opposing median island for traffic calming. Left turn lanes are also provided at Normandy Road (north) / Vimy Place for both northbound and southbound traffic.

Additionally, the bi-directional protected bicycle lane connects directly to the existing off-street multi-use pathway north (east) of Mountain View Drive, as well as the proposed off-street multi-use pathway south of Two Mile Hill Road.

5.2 DESIGN OPTION 2

Design Option 2 features a unidirectional protected bicycle lane on each side of Range Road, with a narrow (0.3 metres) buffer for protection from traffic and a wider buffer (0.9 metres) adjacent to the parking lane to buffer from the door zone. The narrow buffer creates limitations to the type of physical buffer treatment can be used, and the amount of space available for snow storage. The protected bicycle lanes are also constrained to absolute minimum widths at 1.5 metres wide, making the snow removal procedures more complex.

The protected bicycle lanes on both sides of Range Road transition to multi-use pathways south of Normandy Road (south) towards the Two Mile Hill Road intersection. Left turn bays or median islands cannot be provided throughout the corridor within the existing curb-to-curb width with this option. The bicycle lanes end at Mountain View Drive, and northbound cyclists are required to cross the street to continue on the multi-use pathway on the west side of Range Road.

Option 2: Uni-directional Protected Bike Lanes

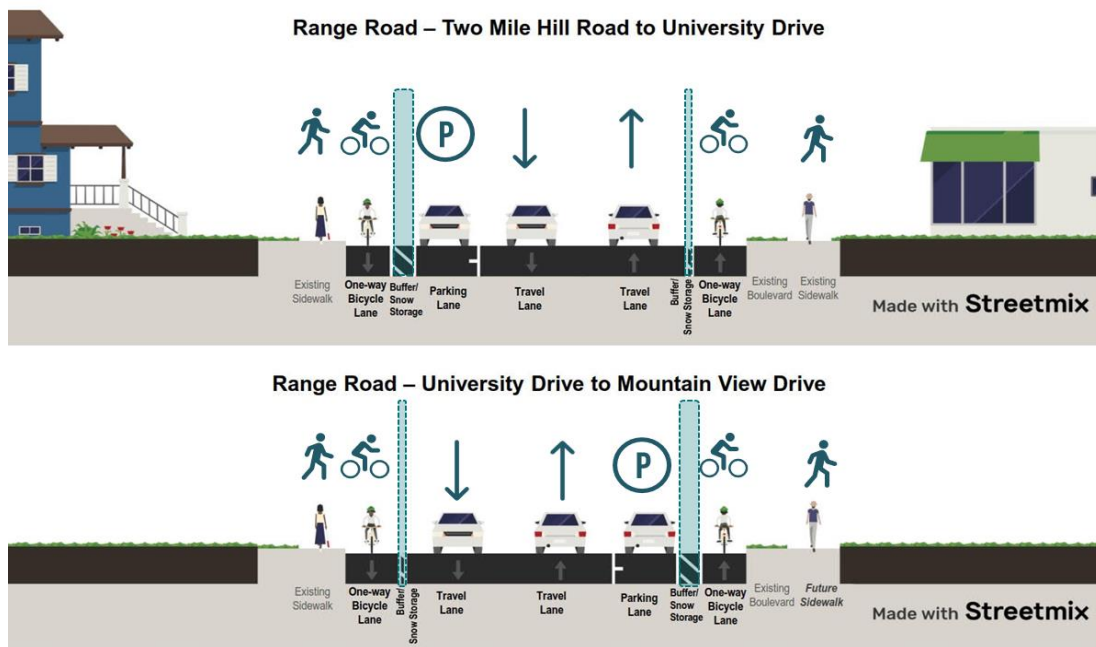


Figure 5-2: Design Option 2 Cross Section

5.3 OTHER IMPROVEMENTS

Crosswalks

The existing crosswalk at Normandy Road (south) is proposed to be removed, and a new marked crosswalk to be installed at Falaise Road. This provides improved spacing from the crosswalk at Two Mile Hill Road, which is currently less than 70m away from the existing marked crosswalk. The proposed location improves visibility with curb extensions to shorten the crossing distance and fulfills a desire line to access the Escarpment trail behind Takhini arena. On-street parking is available along the west side fronting the new developments by Rhine Way.

At Takhini Elementary, it is proposed that the crosswalk location be relocated north to align with the school's northern entrance which was observed to have more student activity. A curb extension at this location would be provided to shorten the crossing distance and improve sightlines by restricting parking directly adjacent to the crosswalk. A new marked crosswalk with curb extensions is proposed for the Millennium Trail crossing.

Enhanced crossing treatments such as pedestrian activated rapid rectangular flashing beacons (RRFBs) will be reviewed as part of the City's Transportation Study, which is currently under development.

Roundabouts

At Normandy Road (north) and University Way, an alternative option to the proposed left-turn lanes could be to feature a roundabout located at the centre of the intersection, which requires vehicles to travel through the intersection in a counter-clockwise direction around the island. This traffic calming measure has been shown to increase safety at intersections by managing speeds and conflicts. It also eliminates the need for dedicated turning lanes.

Sidewalk and Trail Improvements

A boulevard separated sidewalk is proposed as a future improvement to extend the sidewalk network along the east side past University Drive towards Mountain View Drive. It is noted that the existing right-of-way is limited fronting the Pepsi Softball Centre, and would require an easement to provide an extension of the boulevard separated sidewalk along that property. North of this section, the sidewalk extension would need to take into account the existing hydro poles and the steep topography leading up to Mountain View Drive.

Access Modifications

Opportunities to consolidate or relocate driveway entrances to private properties should be explored to reduce or eliminate the number of potential conflicts with the proposed bicycle facilities or potentially increase on-street parking supply. For instance, the Takhini Arena entrance and egress configuration should also be examined in conjunction with the Two Mile Hill intersection improvements to improve traffic flow and safety along Range Road. At the Pepsi Softball Centre, the southern access could be moved to align with University Drive. The south access to Takhini School (staff parking lot) could be relocated to exit onto Normandy North and eliminating the access to Range Rd directly.

For approved and future redevelopments along Range Road, driveway access points should also take into consideration the proposed facilities and types of users along the corridor, including ingress and egress for people biking, as well as potential conflicts and mitigation measures to encourage slower speeds and improved visibility through appropriate curb return radii and maintaining sightlines.

6.0 MULTIPLE ACCOUNT EVALUATION

A Multiple Account Evaluation (MAE) was conducted to provide a qualitative summary for the comparison of the segments with different options. The evaluation table for these options was conducted using a multi-criteria evaluation framework that included the following criteria where applicable:

- **Available Space** – Degree to space available to accommodate the proposed options.
- **Network Connectivity** – Degree to which each option establishes or improves connections to existing and future bicycle facilities that are in the planning or design phases
- **Safety** – Degree to which each option is anticipated to improve safety for all road users
- **Intersections and Conflict Zones** – Degree to which each option interacts with intersections and conflict zones (driveways / accesses etc.)
- **Winter Maintenance** – Degree of impacts potential maintenance challenges related to snow removal.
- **Access to Destinations** – Degree to which each option provides access to key destinations.
- **Motor Vehicle Traffic Operations** – Degree of Impact on traffic operations relative to the intended road network classification and function of the street.
- **Transit Operations** – Degree to which each option integrates with transit.
- **Pedestrian Comfort** – Impact on pedestrian environment, including crossings, sidewalk conditions and mobility/accessibility.
- **Cycling Comfort** – Impact on cycling environment, including crossings, level of protection, and treatments at conflict areas.
- **Parking / Loading / Access** – Degree of impact to on-street parking and driveway access.
- **Property Impacts** – Degree of impacts to private properties.
- **Utility Impacts** – Degree of impacts to utilities, light poles, etc.
- **Relative Cost** – Relative cost of each concept

The evaluation criteria were developed in collaboration with City staff, and no specific weighting was assigned to each criterion. The options and evaluation results were presented to the participants of the webinar, and additional input received from public helped inform recommendations on the preferred options, along with refinements to these options. In the summary MAE table, each criterion is compared amongst the options and colour coded as shown below:

Better
Slightly Better
Neutral / Satisfactory
Slightly Worse
Worse

Table 1: Multiple Account Evaluation Table

	Option 1 Bi-directional Protected Bike Lane on West Side	Option 2 Uni-directional Protected Bike Lanes on Both Sides
Available Space	<ul style="list-style-type: none"> Utilizes existing curb-to-curb space Parking is retained on one side of the street Provides minimum 1.0m buffer space between vehicle lane and bike lane for protection and snow storage 	<ul style="list-style-type: none"> Utilizes existing curb-to-curb space Parking is retained on one side of the street Only 0.3m buffer space provided between vehicle lane and bike lane, and 0.9m buffer space between bike lane and parking lane for protection and snow storage Bicycle lanes are constrained to minimums at 1.5m
Network Connectivity	<ul style="list-style-type: none"> Directly connects to the proposed MUP on Range Road south of Two Mile Hill Road as well as the existing MUP east of Mountain View Drive 	<ul style="list-style-type: none"> People cycling northbound from south of Two Mile Hill Road and to north of Mountain View Drive will need to cross Range Road twice
Safety	<ul style="list-style-type: none"> Dedicated facility for people biking, protected by 1.0m painted buffer Bi-directional bicycle traffic on two-way street can introduce safety challenges at driveways and unsignalized crossings. 	<ul style="list-style-type: none"> Dedicated facilities for people biking, protected by minimum 0.3m buffer adjacent to vehicle lane and 0.9m buffer for door zone buffer adjacent to parking More predictable for drivers as direction of cycling is the same as direction of motor vehicle traffic
Intersections and Conflict Zones	<ul style="list-style-type: none"> 5 intersections along the corridor, in addition to 11 driveways No transit stop conflicts with current northbound routes 	<ul style="list-style-type: none"> 5 intersections on the west side and 2 intersections on the east side along the corridor, in addition to 11 driveways on the west side and 6 driveways on the east side Conflicts with transit stop for current northbound routes
Winter Maintenance	<ul style="list-style-type: none"> 3.0m bike lane makes for less complex snow removal procedures 1.0m buffer for snow storage 	<ul style="list-style-type: none"> More complex snow removal procedures for narrower one-way bike lanes Limited space for snow storage
Access to Destinations	<ul style="list-style-type: none"> Direct access to Takhini West, Takhini North, Takhini Elementary School, and Yukon University Destinations along the east, including Takhini East neighbourhood require to cross Range Road to access bike facility 	<ul style="list-style-type: none"> Northbound cyclists destined for Takhini West, Takhini North, Takhini Elementary School, or Yukon University will need to cross Range Road

	Option 1 Bi-directional Protected Bike Lane on West Side	Option 2 Uni-directional Protected Bike Lanes on Both Sides
Motor Vehicle Traffic Operations	<ul style="list-style-type: none"> • One travel lane maintained in either direction at 3.5m • Left turn bays added at three intersections 	<ul style="list-style-type: none"> • One travel lane maintained in either direction at 3.5m • Slight intersection delays with no addition of left turn bays
Transit Operations	<ul style="list-style-type: none"> • Transit required to stop in lane at stops 	<ul style="list-style-type: none"> • Transit required to stop in lane at stops • More reconstruction required to accommodate bicycle lane at existing transit stops
Pedestrian Comfort	<ul style="list-style-type: none"> • Designated space for pedestrian; bike lane on the west side also acts as a buffer between pedestrian and vehicular traffic 	<ul style="list-style-type: none"> • Designated space for pedestrian; bike lane on the west side also acts as a buffer between pedestrian and vehicular traffic
Cycling Comfort	<ul style="list-style-type: none"> • 3.0m wider bi-directional bike lane with wider minimum 1.0m buffer • Two-way bicycle travel 	<ul style="list-style-type: none"> • 1.5 – 1.8m narrower uni-directional bike lane with narrower 0.3m buffer adjacent to vehicle lane and 0.9m buffer for door zone buffer adjacent to parking
Parking/Loading/Access	<ul style="list-style-type: none"> • Parking is maintained on one side of the street; no impact on loading and access 	<ul style="list-style-type: none"> • Parking is maintained on one side of the street; no impact on loading and access
Property Impacts	<ul style="list-style-type: none"> • No impact 	<ul style="list-style-type: none"> • No impact
Utility Impacts	<ul style="list-style-type: none"> • Lighting improvements may be required 	<ul style="list-style-type: none"> • Lighting improvements may be required on both sides
Relative Cost	<ul style="list-style-type: none"> • Largely utilizes existing curb to curb space • Cost of addition of curb extensions, median islands, bicycle lane buffer on one side, re-surfacing and re-crowning, and pavement markings 	<ul style="list-style-type: none"> • Largely utilizes existing curb to curb space • Cost of addition of curb extensions, median islands, bicycle lane buffer on both sides, re-surfacing and re-crowning, and pavement markings

7.0 PREFERRED OPTION SELECTION

Based on the multiple account evaluation, Phase 2 engagement public input, and discussions with City staff, a preferred option was selected for the corridor improvements. The following section provides a summary of the factors into selecting the preferred option, as well as additional considerations for the next stage of design.

As part of the Range Road corridor study Community Engagement Process, City of Whitehorse residents were invited to provide input on the design options being considered. The detailed online survey summary report is included in **Appendix C**. Respondents were asked what their overall level of support was for the two cross section options through a star rating system. As shown in **Table 2**, the two options were close in ranking, but overall the bidirectional option was favoured.

Table 2: Public Support Summary Comparison

Option	Strong Support (5 or 4 stars)	Neutral	Low Support (2 or 1 star)
Option 1 – Bidirectional Protected Bicycle Lane on West Side	48%	19%	33%
Option 2 – Unidirectional Protected Bicycle Lanes	42%	20%	38%

Similar to the stakeholder working group input on priorities for the Range Road corridor, respondents to the public survey selected the following top three priorities: Vehicular / Transit Traffic Flow (55%), Safety (54%), and Active Transportation Network Connections (54%).

When comparing the two conceptual design options, Option 1 provides greater benefits to maintaining vehicular traffic flow, as dedicated left-turn lanes can be provided at key intersections. In terms of safety, although both options provide improvements through dedicated cycling facilities, Option 1 on a two-way street can introduce safety challenges at driveways and unsignalized crossings where turning vehicles may not typically expect two-way bicycle traffic. However, this can be mitigated through measures such as providing signage, education, and appropriate sightlines and lighting to ensure visibility of people biking to turning vehicles. For network connections to other active transportation facilities, by having a two-way bicycle facility along the west side, Option 1 directly connects to the proposed pathway on Range Road south as well as the existing pathway east of Mountain View Drive, whereas Option 2 would require users heading northbound to cross Range Road at these major intersections.

Additionally, winter maintenance was a strongly supported design consideration identified from the public survey, with over three-quarters (78%) of respondents noting winter maintenance as a key component to the proposed improvements. As discussed in previous sections, the available buffer space in Option 1 provides more room for snow storage, and the width of the bidirectional bicycle lane is more manageable with the City’s current snow removal equipment used for trails and pathways.

8.0 COST ESTIMATES

Two implementation cost estimates were prepared for the bidirectional protected bicycle lane improvements based on two sub-options, as summarized in **Appendix D**:

- **Option 1A** which assumes an on-street protected bicycle lane separated by pre-cast concrete barriers; and
- **Option 1B** which assumes reconstruction of the west side of the corridor to provide a sidewalk level separated bicycle pathway.

The Class 'D' cost estimates are conceptual in nature and is based on topographic assumptions noted from the desktop review and site investigation.

The total estimated order-of-magnitude cost based on the conceptual stage of design is approximately **\$4.7M for Option 1A** and **\$5.2M for Option 1B**, including contingency and engineering. Operations and maintenance costs have not been included in this estimate.

The cost estimates completed for the two implementation options generally assume the following:

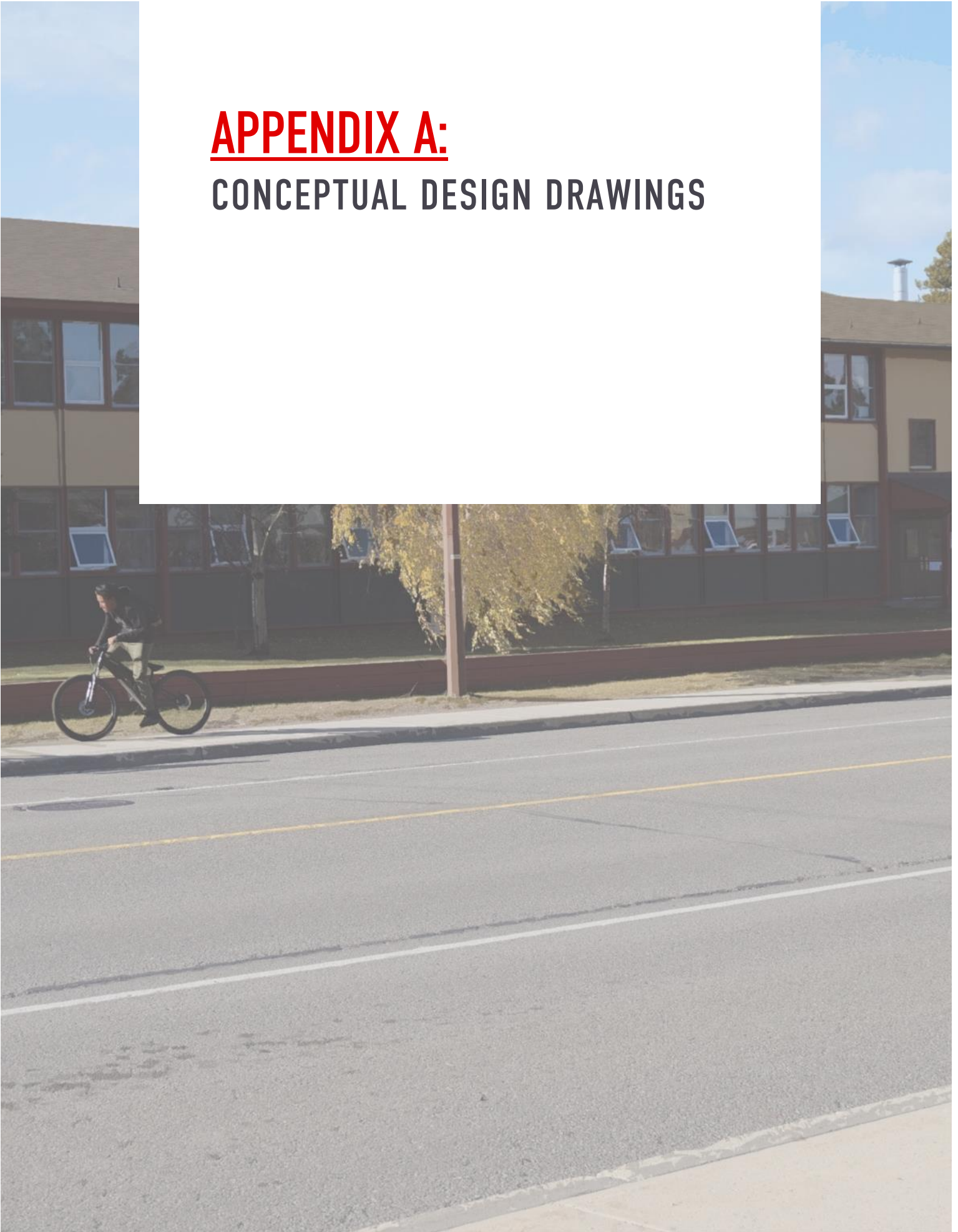
- Removals and relocations
- Resurfacing of the full existing roadway pavement along Range Road (50mm depth)
- On-street bicycle lane for Option 1A and raised asphalt bicycle pathway for Option 1B
- New concrete curb & gutter for curb radii reduction and transitions from on-street bicycle lane to off-street pathway / bicycle lane
- Removal of existing curb and gutter and new concrete curb & gutter along west side of Range Road for Option 1B
- Pre-cast concrete barriers for Option 1A buffer, and concrete boulevard for Option 1B buffer.
- Pavement markings and signage
- Allowances for new pedestrian level streetlighting on one side
- Allowances for drainage (catch basins) and hydrant removals/relocations
- Allowances for mobilization and traffic management
- Engineering and Contingency allowances
- Exclusions:
 - Property acquisition costs are not included
 - Third party and municipal utilities upgrades or replacements
 - Landscaping, trees and site furnishings
 - Geotechnical, environmental or archeological specific requirements.
 - Permitting or fees

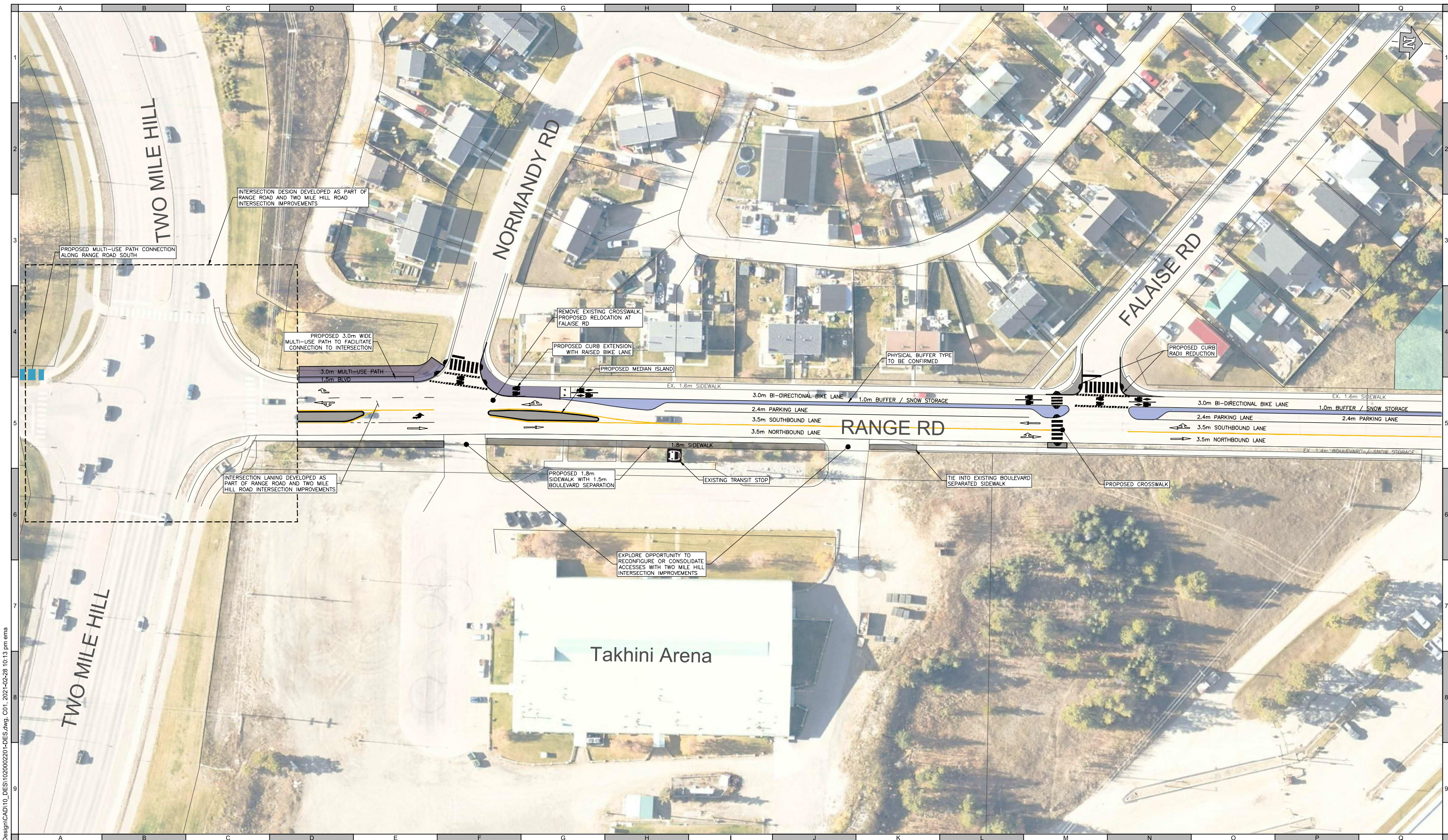
9.0 NEXT STEPS

This report summarizes the existing conditions, options development and evaluation, and preferred conceptual design option for improvements to Range Road between Two Mile Hill Road and Mountain View Drive. The City is interested advancing the design and implementation in the future and will be reviewing the proposed improvements along with other capital works. The following next steps are anticipated to move the design into implementation in the future:

- **Implementation Options** – Based on the MAE results, feedback from City staff (including Planning, Engineering, and Operations), and comments received in the at the Public Open House, there was support for the proposed complete streets improvements to the Range Road corridor. The City could explore several implementation options or a phased approach:
 - **In the near-term**, the City can explore a rapid implementation option coinciding with planned multi-use pathway extensions along Range Road south and north. This could be carried out using a combination of flexible delineator posts and temporary barriers over the summer season as a temporary condition to collect feedback and data on the proposed improvements, which could ultimately feed into a permanent design.
 - **In the medium-term**, the City can consider implementation through restriping and addition of precast concrete barriers to reallocate the existing road space.
 - **For a future condition**, the City can continue to advance a full corridor redesign to provide a sidewalk level separated bicycle pathway, complete with opportunities for a treed boulevard.
- **Consultation with Corrections Centre** – The City has noted possible discussions with the Corrections Centre property owners to explore easement opportunities to permit the bi-directional cycling facility to transition to a shared Type 1 trail north of University Drive to Mountain View Drive. This option creates an opportunity for a wide landscaped buffer to allow for trees and corridor beautification.
- **Functional / Detailed Design** – It is anticipated that the conceptual designs can be used to advanced into functional / detailed design. The detailed design of the Range Road and Two Mile Hill Road intersection should take into account the preferred option design and integrate the bidirectional bicycle facility, crosswalk improvements, and access modification considerations.
- **Additional Considerations** – At this conceptual design stage, several additional items were identified to require further confirmation in the next stages of design development or is unknown at this stage. This includes:
 - Further exploration of roundabout design at University Drive and Normandy North;
 - Confirmation of future transit plans and stop locations; and
 - Trail Upgrade opportunities to the Sage Trail (also referred to as TransCanada Trail or Escarpment Trail).

APPENDIX A:
CONCEPTUAL DESIGN DRAWINGS





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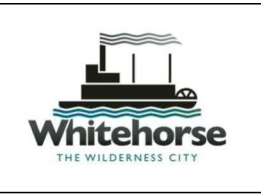
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Range Road Corridor Conceptual Design
 Option 1 - Bi-directional Bike Lane

Sheet Number 1 of 5
 Project Number 1020.0022.01 Drawing Number C01 Revision



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Option 1 - Bi-directional Bike Lane
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 Project Number 1020.0022.01 Drawing Number C02 Revision



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Range Road Corridor Conceptual Design
 Option 1 - Bi-directional Bike Lane

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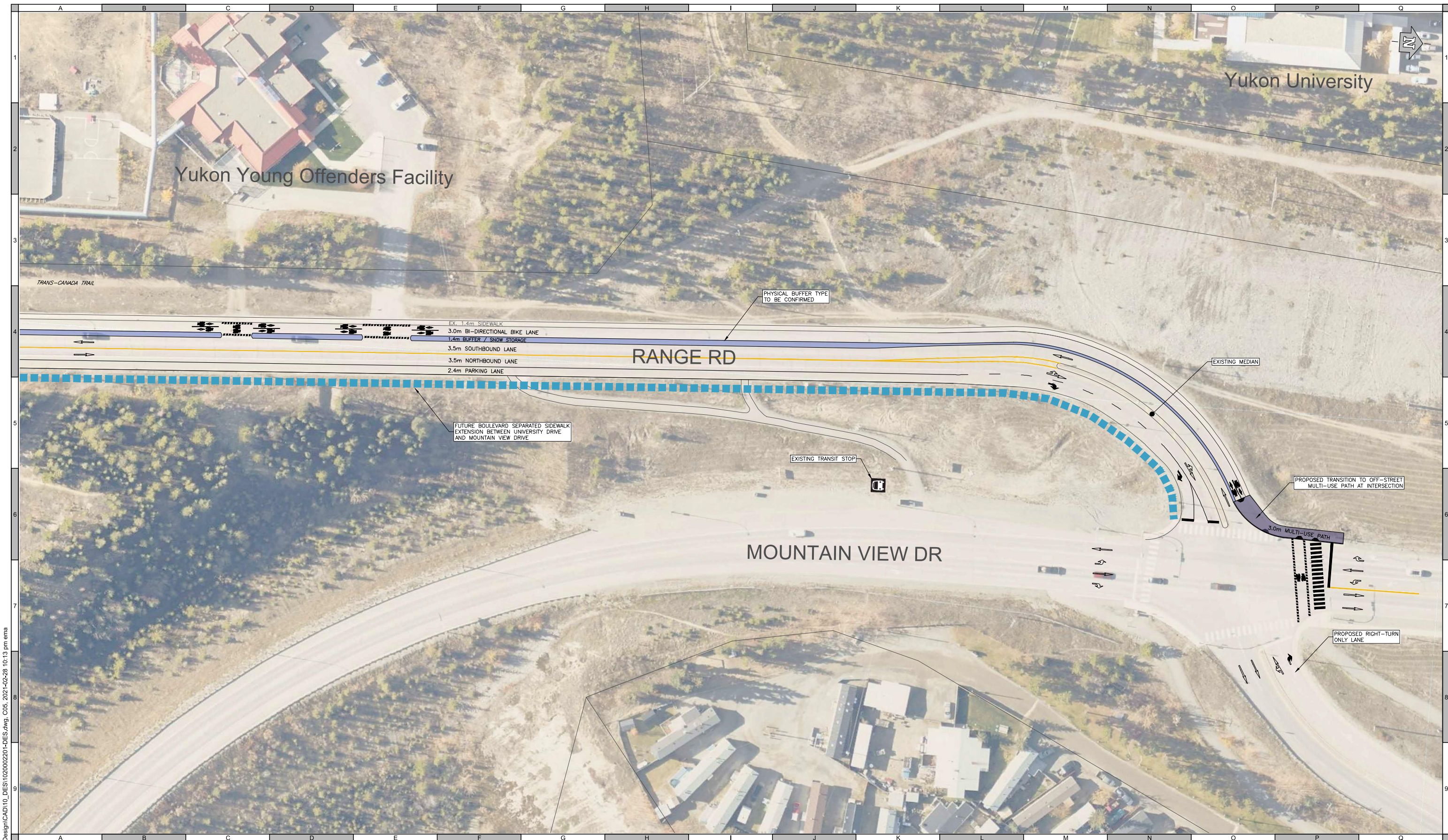
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Range Road Corridor Conceptual Design
 Option 1 - Bi-directional Bike Lane

Sheet Number	4 of 5
Project Number	1020.0022.01
Drawing Number	C04
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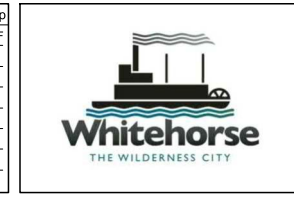
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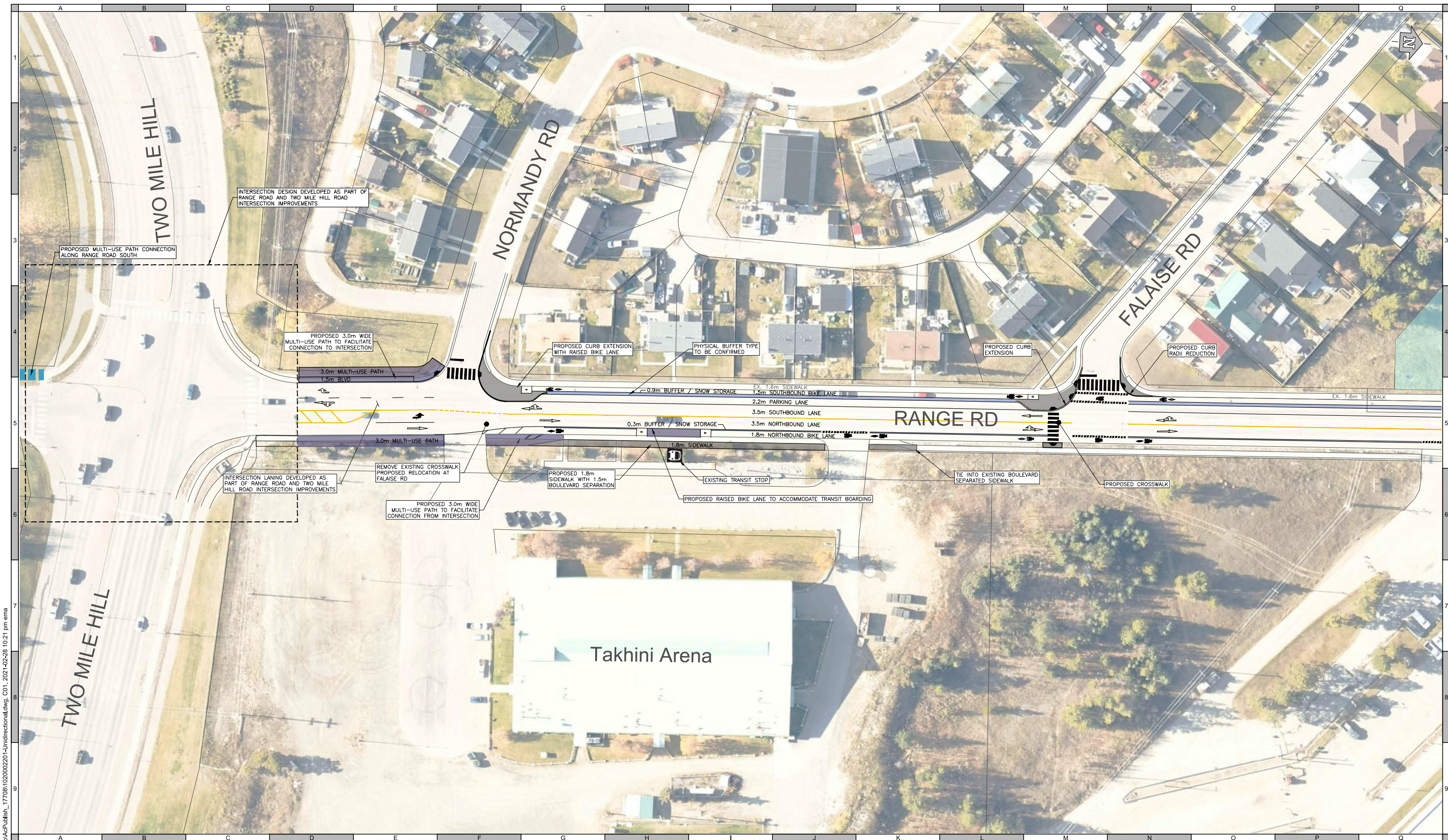
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Range Road Corridor Conceptual Design
 Option 1 - Bi-directional Bike Lane

Sheet Number 5 of 5
 Project Number 1020.0022.01
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Range Road Corridor Conceptual Design
Option 2 - Uni-directional Bike Lane

Sheet Number 1 of 5
 Project Number 1020.0022.01
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Range Road Corridor Conceptual Design
 Option 2 - Uni-directional Bike Lane

Sheet Number 2 of 5
 Project Number 1020.0022.01
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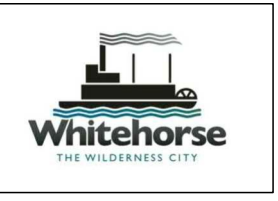
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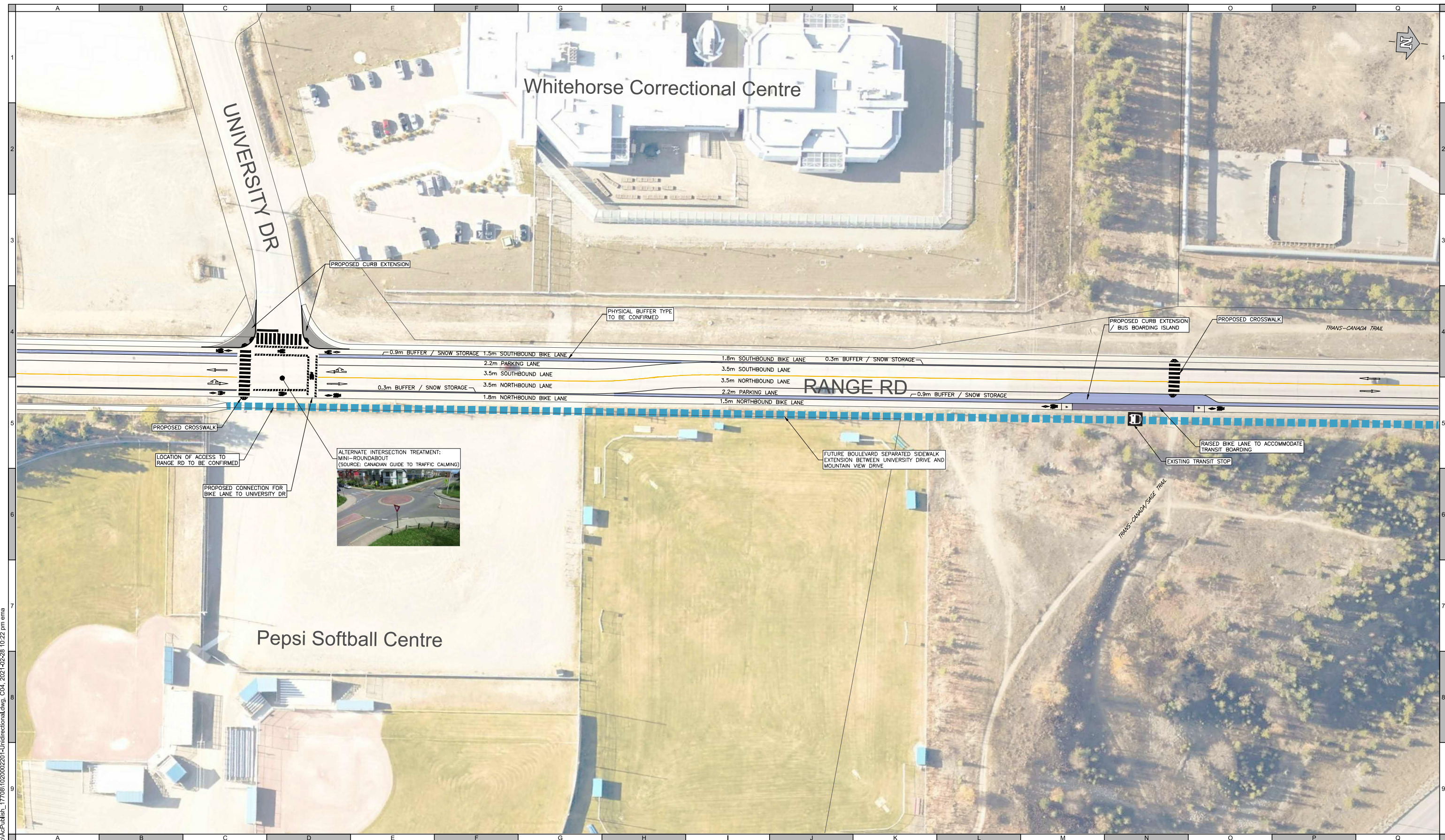
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Range Road Corridor Conceptual Design
 Option 2 - Uni-directional Bike Lane

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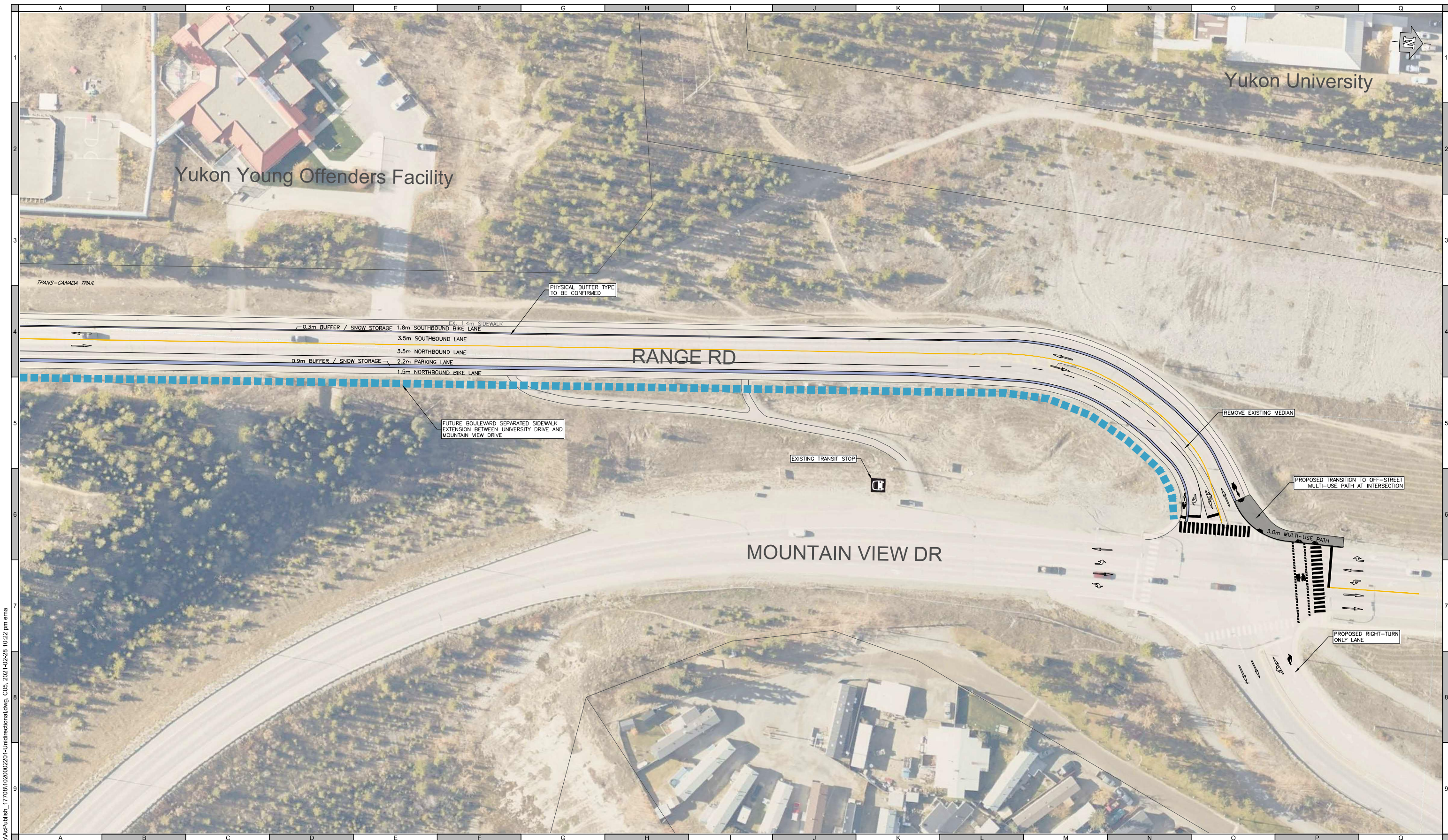
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Range Road Corridor Conceptual Design
 Option 2 - Uni-directional Bike Lane

Sheet Number 4 of 5
 Project Number 1020.0022.01
 Drawing Number C04
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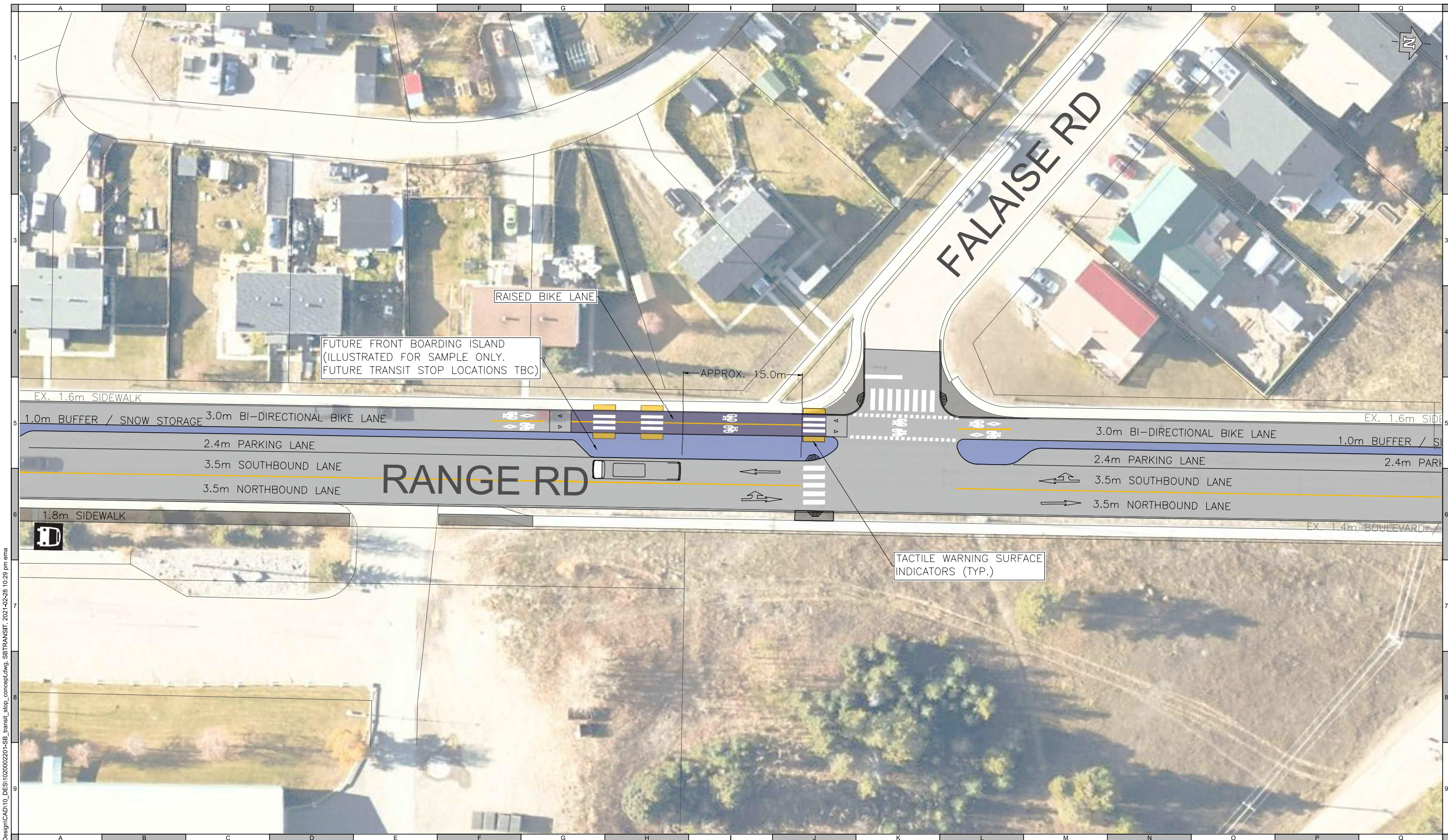
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 Option 2 - Uni-directional Bike Lane

Sheet Number 5 of 5
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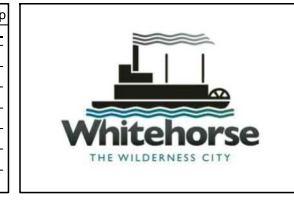
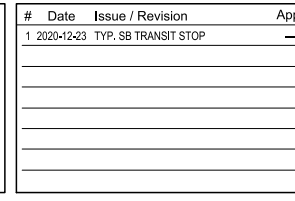
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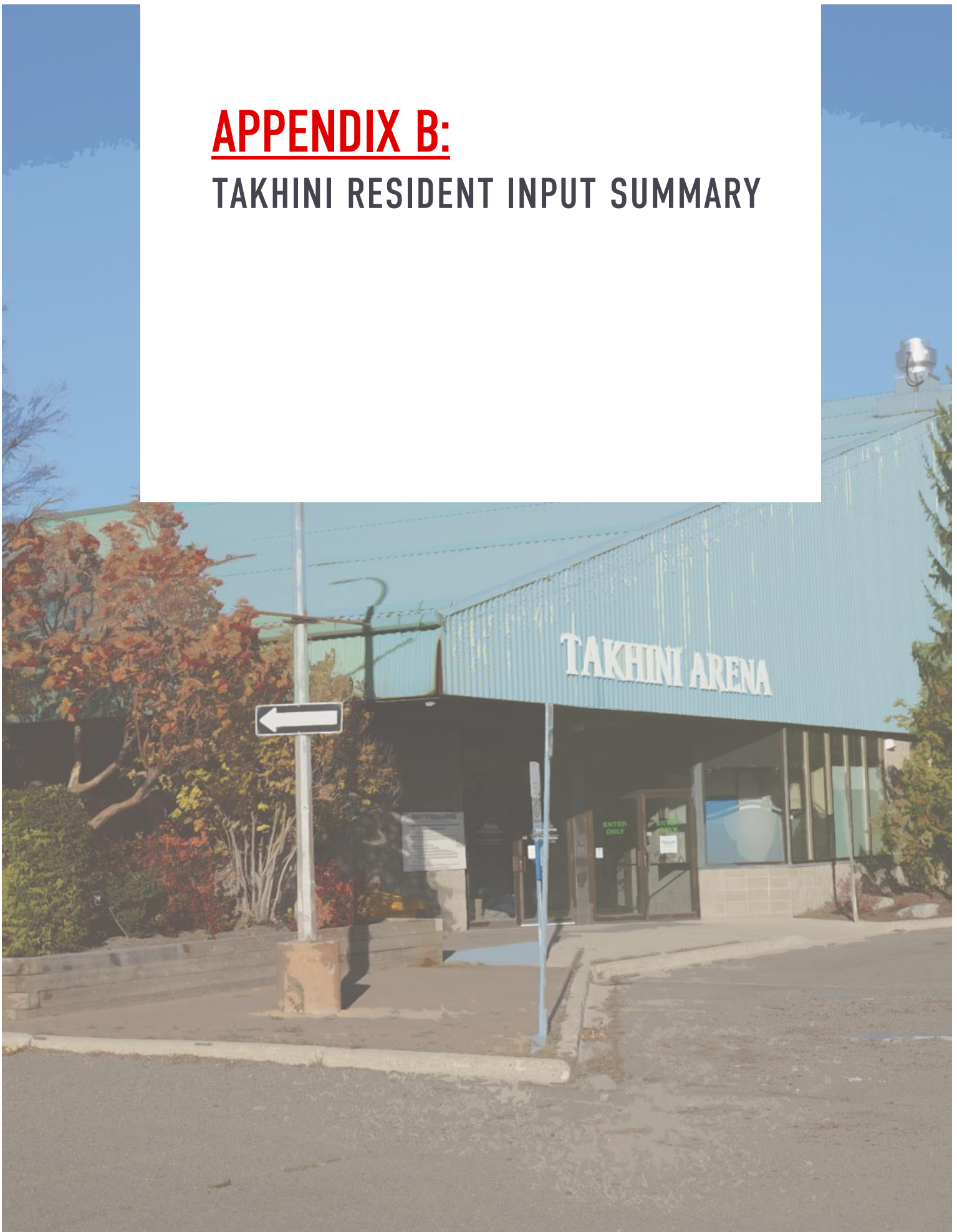
Range Road Corridor Conceptual Design
 Option 1 - Typical Southbound Transit Stops

Sheet Number 1 of 1
 Project Number 1020.0022.01
 Drawing Number C01
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APPENDIX B:

TAKHINI RESIDENT INPUT SUMMARY



Takhini Resident Input to Range Road Corridor Study

October 19, 2020 – DRAFT

The following document summarizes input provided by Takhini residents to the Range Road Corridor Study, facilitated through an online survey and emails from residents. This input is provided in response to an email invitation from the City of Whitehorse to the Takhini North Community Association to participate in a workshop for “Neighbourhood and User Groups” on October 21, 2020.

It should be noted that the Takhini North Community Association is not an official organization, but rather an informal email list and Facebook group. Therefore, to ensure proper representation of resident’s views, the survey results and this summary were provided back to the community for review and comment prior to submission to the City of Whitehorse.

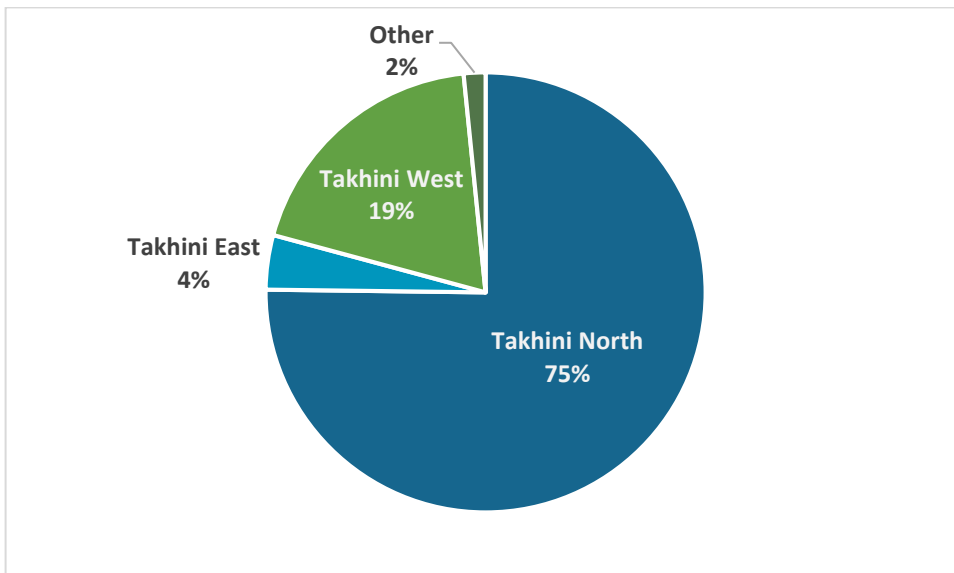
The survey and summary were facilitated by Takhini residents Tyler Heal (tyler.heal@gmail.com) and Daniel Sokolov (daniel@falco.ca).

Survey Methodology

An online survey was conducted from October 15-18, and advertised through the Takhini North and Takhini West Facebook groups, Takhini North email list, and word of mouth. Survey questions and a summary of responses are listed below. The full list of all responses is attached, along with a copy of the survey layout and questions.

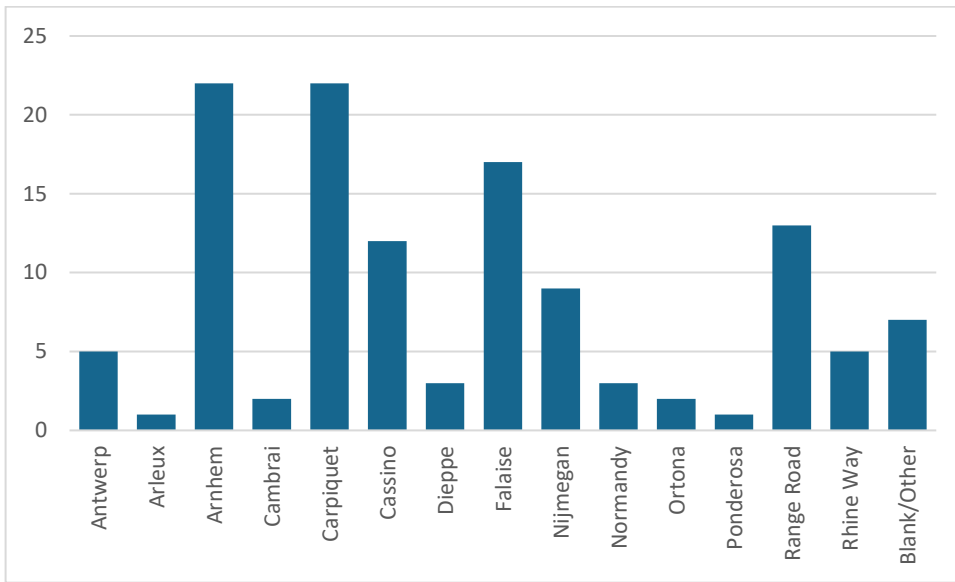
A total of 125 responses were received, representing ~9% of the total population of Takhini¹.

Q1: Are you a resident of Takhini?

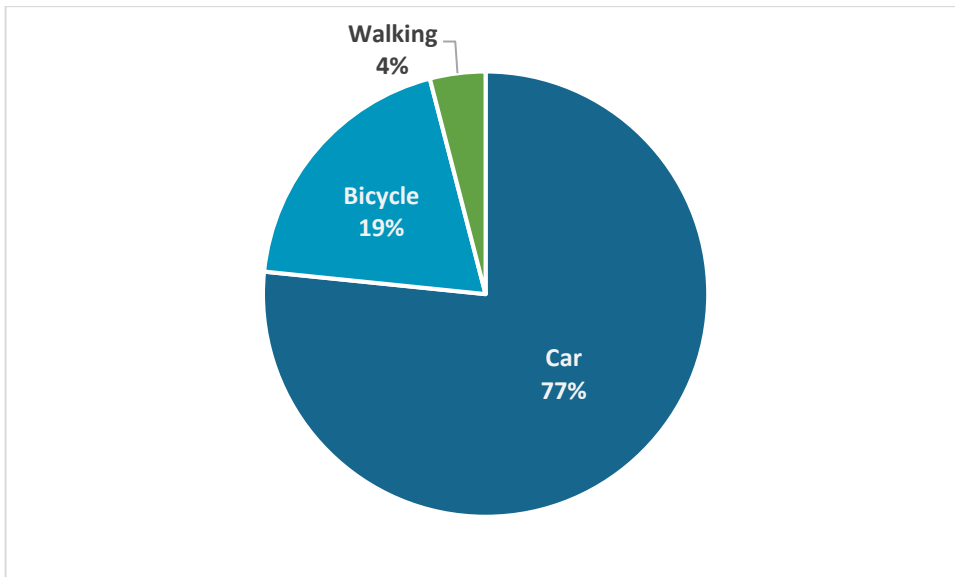


¹ Estimated as 1,439 residents in Q1 2020 by Yukon Bureau of Statistics: https://yukon.ca/sites/yukon.ca/files/ybs/populationq1_2020.pdf

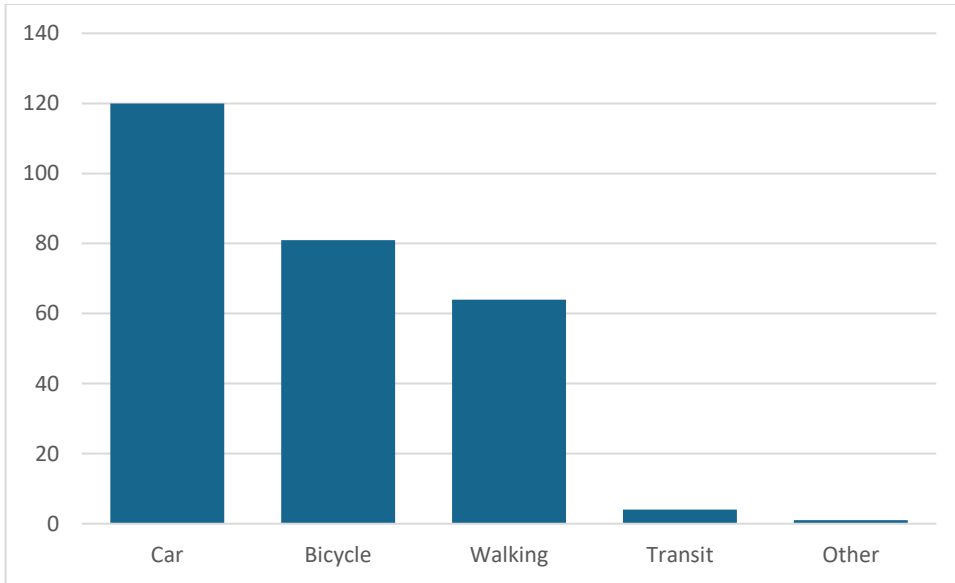
Q2: What street do you live on?



Q3: What is your primary mode of travel on Range Road?

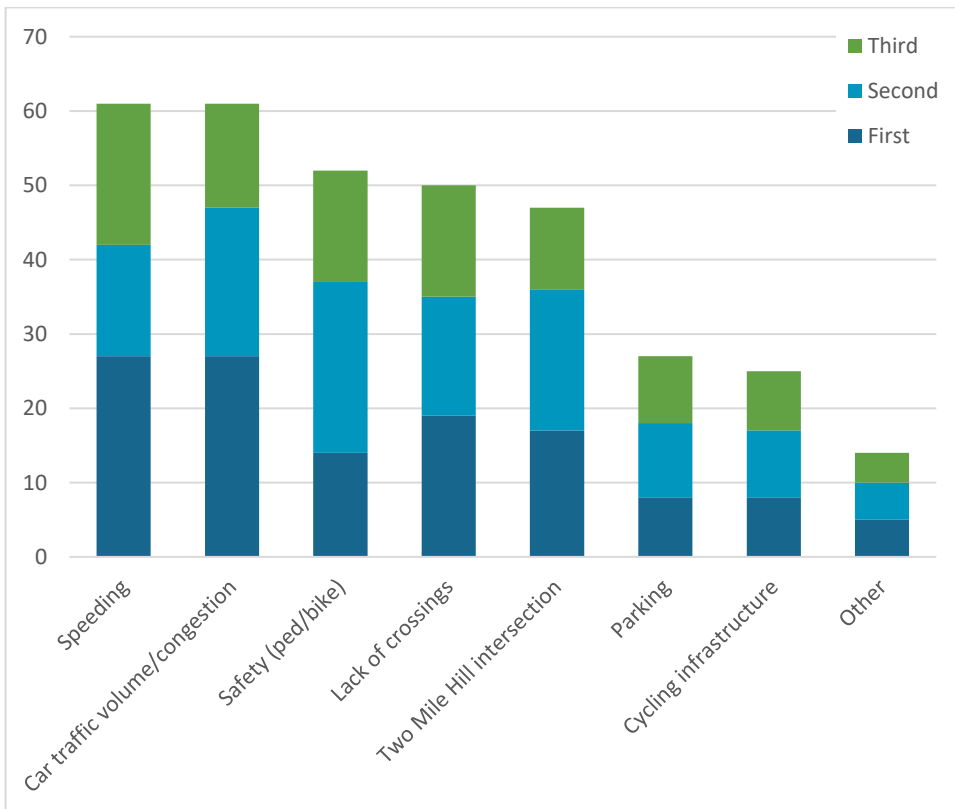


Q4: What other modes of travel do you use (at least once per week) along Range Road?



Q5: What are your top 3 concerns on Range Road?

Responses to this question were grouped by category of concern, as summarized in the chart below. The City should review the long-form responses in addition to this summary, as there are several specific locations and items of feedback that would be useful in preparing the design concepts.



The following specific issues were raised by 5 or more respondents:

- Cars using parking lane/ informal "bike lane" to pass, or turn right onto Two Mile
- Need for speed enforcement and traffic calming
- Traffic congestion at peak periods: difficult to get onto Range Road from neighbourhood streets, long traffic queues at Two Mile Hill light
- Marked, separated, or AAA bike lanes
- Lighting / better marking of Takhini Arena crosswalk
- Concern about increase in parking/traffic/conflicts with 84-unit seniors and 45-unit condo buildings currently under construction
- Lack of neighbourhood commercial spaces / "third spaces"
- Poor transit facilities and no crossing at existing bus stop
- Incompatibility of high speed and high volume of cars mixing with vulnerable road users (children at Takhini Elementary, walking/biking across street, cyclists not separated)
- Mountain View Drive intersection light timing

Q6: Are there any specific connections or intersection improvements you'd like to see to improve cycling or pedestrian connections to/across Range Road?

The items raised in response to this question are generally similar to those specific issues noted above under Q5. The most commonly noted improvements/connections (with more than 5 responses) are:

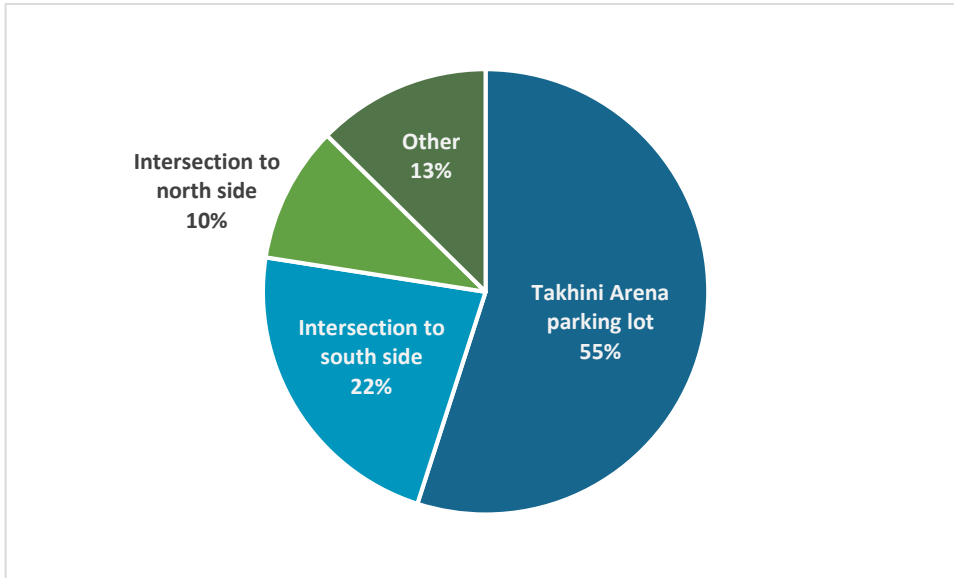
- Crosswalks or improvements to crosswalks at bus stop (Rhine Way), Takhini Arena, and Takhini Elementary / Normandy: **25 responses**
- Improvement to Two Mile Hill intersection for cyclists and pedestrians: **18**
 - *Including: improved markings, longer light times for pedestrians, protection for cyclists*
- Separated bike path on Range Road: **15**
- Dedicated left turn signal for southbound Range Road traffic at Two Mile Hill: **5**

The City should also review the long-form responses attached.

Q7: If you cycle down Range Road to Two Mile Hill Road, what is your preferred connection

Some respondents noted a seasonal dependency, as the south side bike path on Two Mile Hill is not useable during winter. Some respondents also noted other routes that avoid Range Road.

It should be noted that a majority of respondents currently use the Takhini Arena parking lot to access the bike paths down Two Mile Hill – this information should be passed on to the team working on the Two Mile Hill intersection improvements, as this connection was a surprise to them when it was raised during the public presentation on the design concepts.



Q8: Anything else you would like us to share with the City?

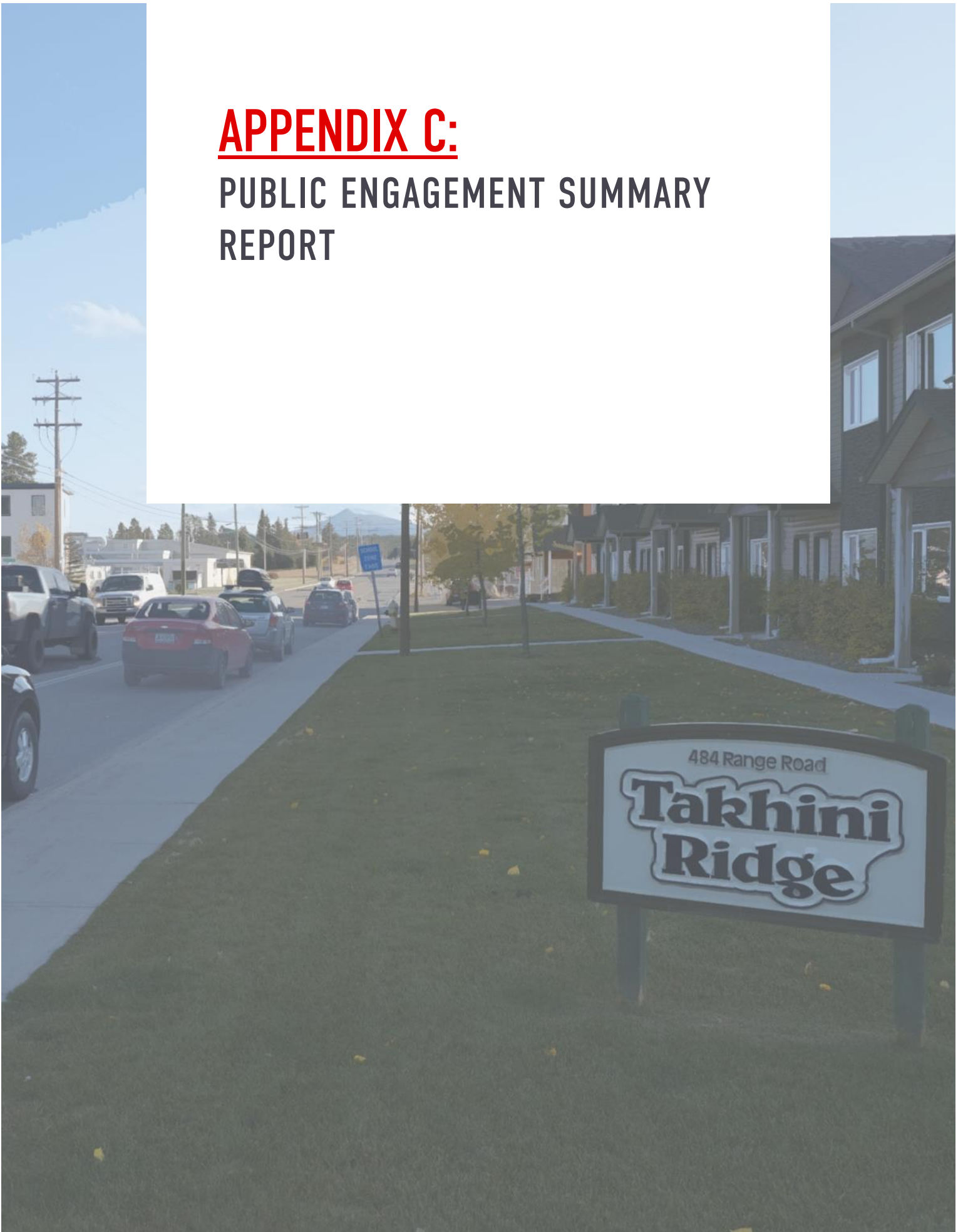
Following are specific items not raised elsewhere:

- Sensors at lights don't detect motorcycles
- Improvements to the south side cycle path on Two Mile Hill and opening it for winter
- Improvements to the intersection of Mountain View Drive with Range Road
- Completion of the multi-use path on the portion of Range Road south of Two Mile Hill
- Commercial space integrated in neighbourhood that residents can walk to
- Do not want to see extra cost burden to Range Road residents (i.e. LIC)
- Improved transit routes and connections

The City should also review the long-form responses attached.

APPENDIX C:

PUBLIC ENGAGEMENT SUMMARY REPORT



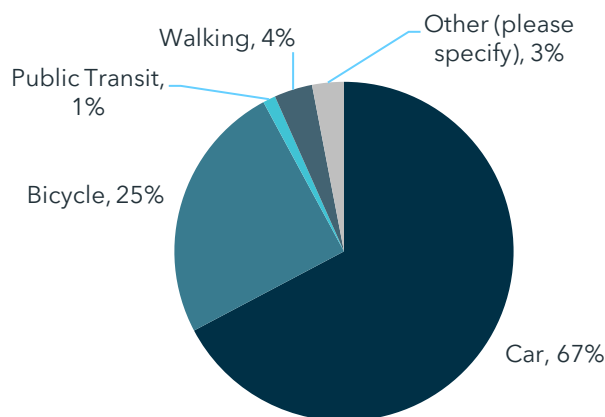
Online Survey Summary Report

As part of the Range Road corridor study engagement process, City of Whitehorse residents were invited to provide input on the design options being considered. The online survey was available through the City’s website and promoted through social media and other marketing tactics from November 17 to December 2, 2020. In total, 165 survey responses were collected, including 2 direct email comments. The following is a summary of what we heard from those who participated in the online survey.

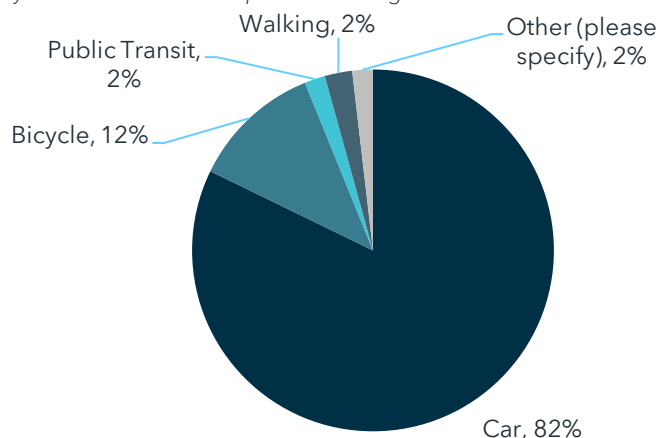
1.1 Typical mode of transportation

Respondents were asked to specify their main mode of transportation during the spring and summer, and during the fall and winter. As shown on the graphs below, travel by car is the main mode of transportation throughout the year, but there is a 15% increase in travel by car during the fall and winter months. Cycling was the second most popular mode of transportation, with 25% of respondents saying that cycling is their main mode of transportation during the spring and summer. However, this number drops by more than half to 12% during the fall and winter. Respondents who answered “Other” specified that they have an equal division between driving, cycling, walking, and public transit.

What is your main mode of transportation during the spring and summer?

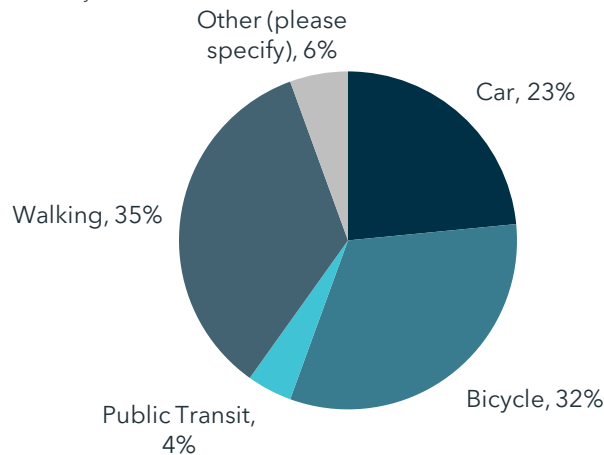


What is your main mode of transportation during the fall and winter?



While most people will have a primary mode of transportation, many also utilize other forms of transportation. This question was put to respondents, and walking, cycling, and driving were the most utilized secondary modes of transportation. Again, respondents who answered "Other" specified that they utilize a mix of driving, cycling, walking, and public transit.

Aside from your main mode of transportation what other modes of transportation do you use?

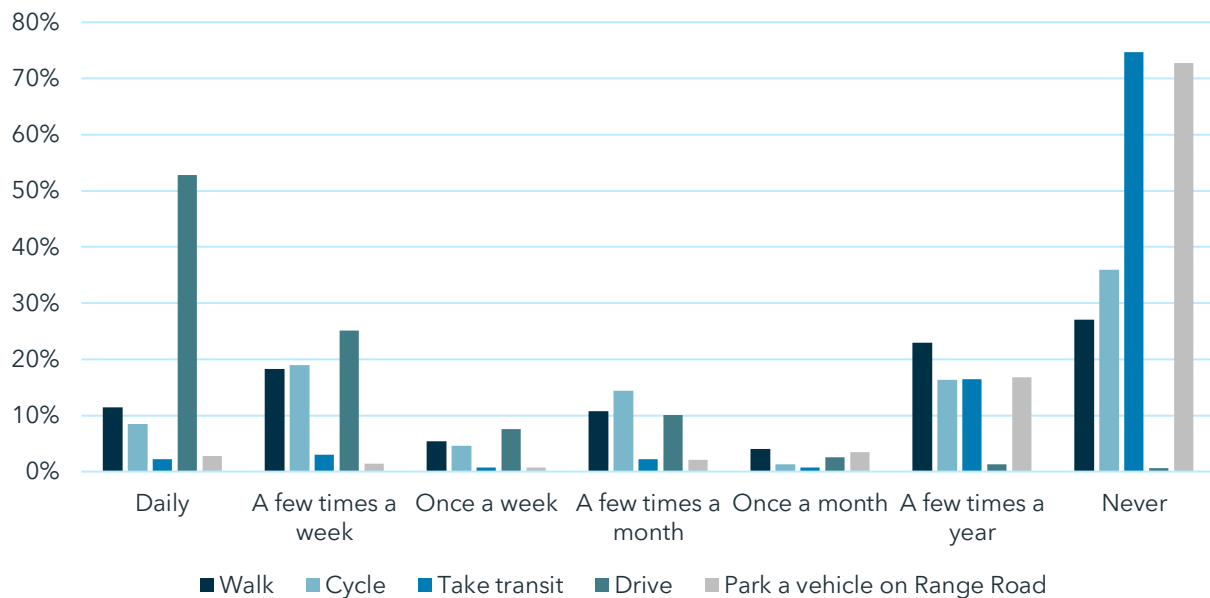


Specific to cycling, respondents were asked if they own or plan to purchase an e-bike. 72% of respondents do not own or plan to purchase an e-bike, while 22% are planning to purchase an e-bike, and 6% currently own one.

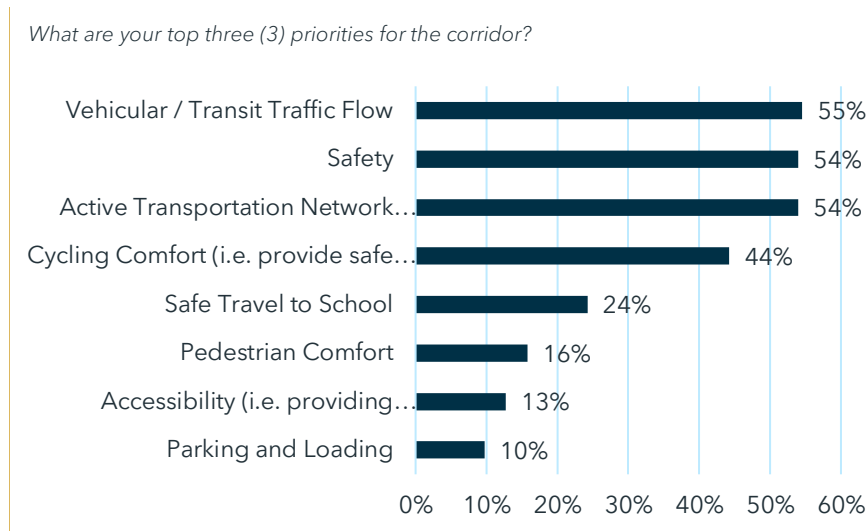
1.2 Range Road Corridor Usage

Next, respondents were asked how they currently use the Range Road corridor. As shown on the graph below, 53% of respondents drive along Range Road on a daily basis, and either walk (18%) or cycle (19%) along the corridor a few times a week. Majority of respondents never take transit (75%) or park a vehicle (73%) along Range Road.

How often do you do the following activities along the corridor?



Respondents were asked about their top priorities for the corridor. They were presented with 8 options and were able to select up to three priorities. The three most selected priorities included vehicular and transit traffic flow (55%), Safety (54%), and Active Transportation Network Connections (54%).

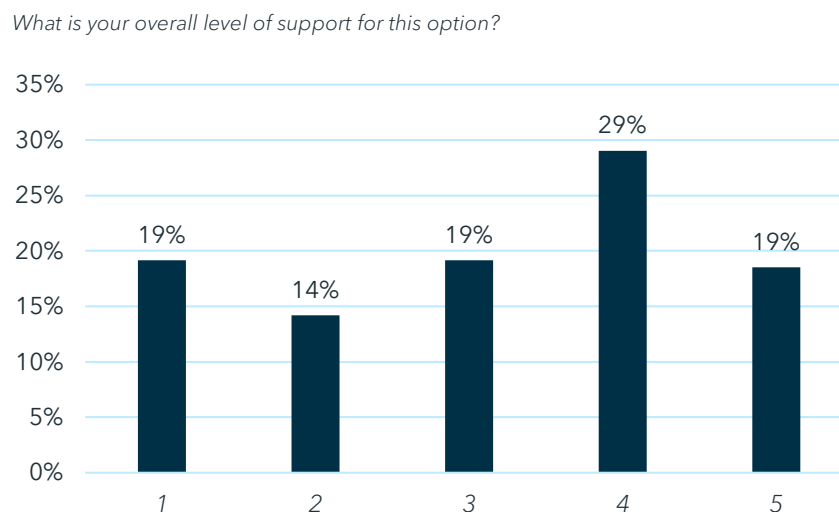


1.3 Concept Options

Based on priorities identified in earlier stakeholder engagement, two concept options were developed. Respondents were asked about their overall views of the proposed options, and their responses are summarized below.

OPTION 1: BI-DIRECTIONAL PROTECTED BIKE LANE ON WEST SIDE

Respondents were asked what their overall level of support was for Option 1 through a star rating system, one star representing no or low support and five stars for strong support. As shown in the graph below, 48% of respondents rated this option with four or five stars.



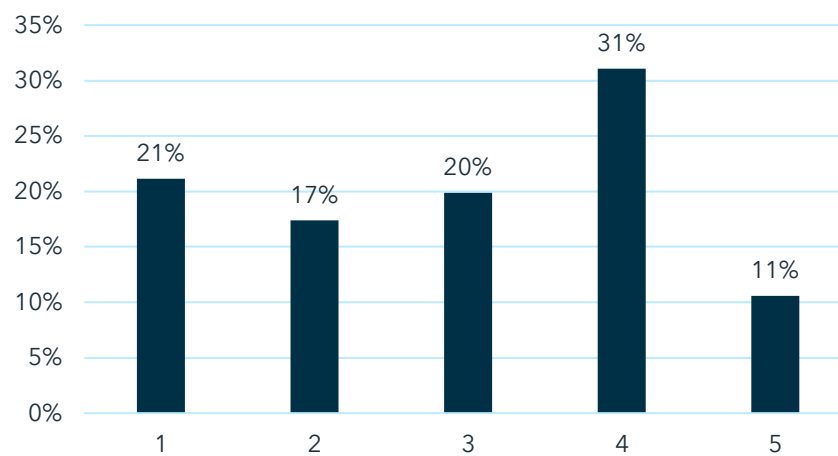
When asked what they *liked* about Option 1, 129 respondents provided feedback. The most mentioned features were the protected bike lanes and the bi-directional bike lanes on only one side of the street. Respondents also liked having parking on one side of the street and that the designs accounted for snow storage. Other positively identified features from Option 1 included new and wider sidewalk, improved safety for pedestrians and cyclists, and infrastructure improvements, including the left turn bay.

When asked what they *dislike* about Option 1, we received 116 responses. The most mentioned dislike was the bi-directional bike lane. Respondents noted that this type of bike lane is confusing and feels unsafe when needing to cross intersections or make left hand turns. Respondents also wanted to see the bike lanes more clearly separated from pedestrians and vehicle traffic. Other frequently mentioned concerns included the design not addressing or improving existing traffic flow issues and inadequate snow storage. Respondents believe that the snow piles will encroach on the bike or travel lanes, narrowing the useable road space.

OPTION 2: UNI-DIRECTIONAL PROTECTED BIKE LANES

Respondents were asked to rate their overall level of support for Option 2 through a star rating system, one star representing no or low support and five stars for strong support. As shown in the graph below, 42% of respondents rated this option with four or five stars.

What is your overall level of support for this option?



Respondents were asked what they *liked* about Option 2, and we received 118 comments. The most mentioned feature was the uni-directional bike lanes on both sides of the street. Many respondents said that it makes more sense, and they feel safer riding with the flow of traffic. Respondents were also in favour of having protected bike lanes in general and believe that Option 2 improves safety for both pedestrians and cyclists.

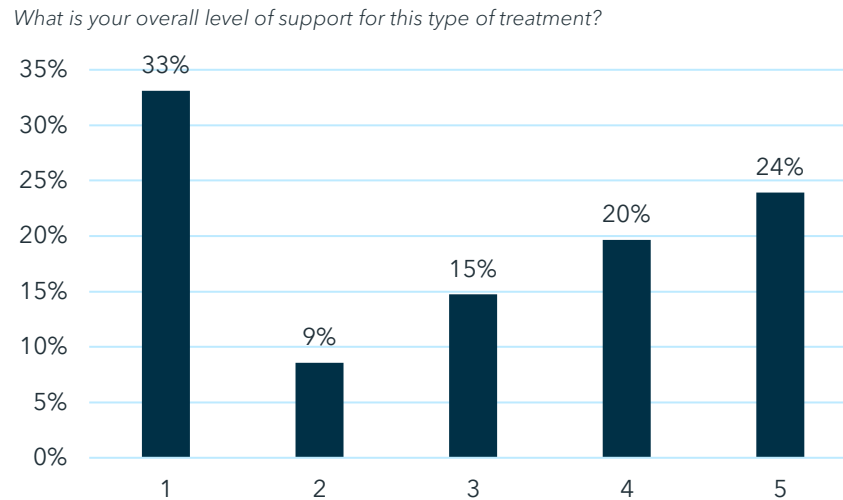
When asked that they *dislike* about Option 2, we received 118 comments. Respondents said that they did not like having bike lanes on both sides of the street and feel that the bike lanes are too narrow and too close to vehicle traffic. Respondents also noted that the snow storage space seemed small and believe that the bike lanes will end up being used as parking or filled with snow. Similar to Option 1, respondents wanted to see the bike lanes more clearly separated from pedestrians and vehicle traffic with physical barrier. Direct email comments expressed that the narrow buffer in Option 2 may not be practical for physical separation or snow storage, and concerns of vehicle dooring with proposed minimum dimensions for the parking lane.

1.4 Design Treatments

The following five design treatments were presented: mini-roundabout, two potential paved paths options, curb extensions, crosswalk improvements, and winter maintenance. Respondents were asked about their overall support for each design treatment. Their responses are summarized below.

MINI-ROUNDBABOUT

When presented with the mini-roundabout design treatment, 44% of respondents rated their level of support with four or five stars, while 42% submitted a rating of one or two stars.

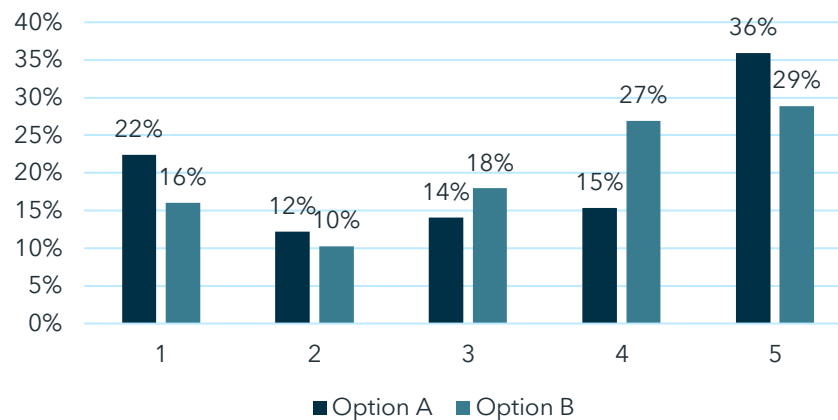


130 respondents commented on the mini-roundabout design treatment. Respondents who support the mini-roundabout treatment feel that roundabouts work well and help to slow traffic and create safer roads for cyclists and pedestrians. Respondents who do not support this treatment said that road users do not know how to properly navigate roundabouts and they impede the flow of traffic.

TWO POTENTIAL PAVED PATHS OPTIONS

Respondents were presented with two potential paved path options. Option A proposed upgrading the escarpment trail and Option B proposed replacing the existing sidewalk directly along the east side of Range Road. Option A received more five star ratings, but Option B received more overall positive support from respondents, with 56% rating four or five stars.

What is your overall level of support for this type of paved trail connection?

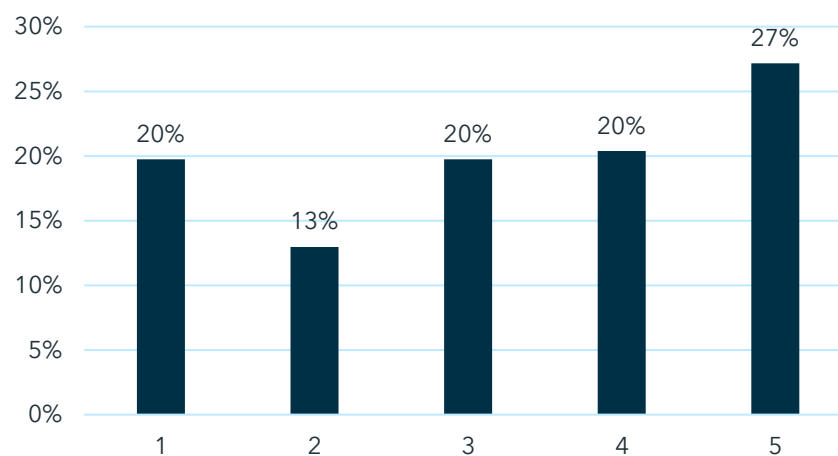


We received 113 comments for the two potential paved path options. Respondents generally prefer the option of having a paved trail that is separated from the vehicle traffic, but they are concerned that the naturalized character of the Sage Trail/Trans Canada Trail will be destroyed by becoming a paved trail.

CURB EXTENSIONS

Respondents were asked about their overall support for curb extensions. 47% of respondents supported this design treatment with ratings of four or five stars, and 33% of respondents showed low support for this option with one and two star ratings.

What is your overall level of support for this design treatment?

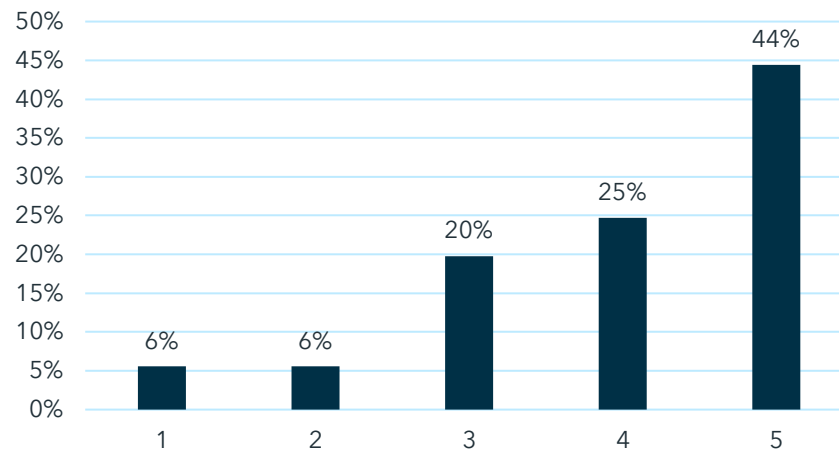


From 111 respondent comments, we saw that those in support of curb extensions believe this treatment will help to slow traffic and make the roads safer for pedestrians. Respondents who selected one or two star ratings said that curb extensions would impede the flow of traffic on the already busy road, and that the extensions would be an added hazard in the winter when they are obstructed by snow.

CROSSWALK IMPROVEMENTS

Crosswalk improvements was one of the most supported design treatments, with 69% of respondents selecting four or five star ratings, and 12% selecting one or two stars.

What is your overall level of support for these design treatment?

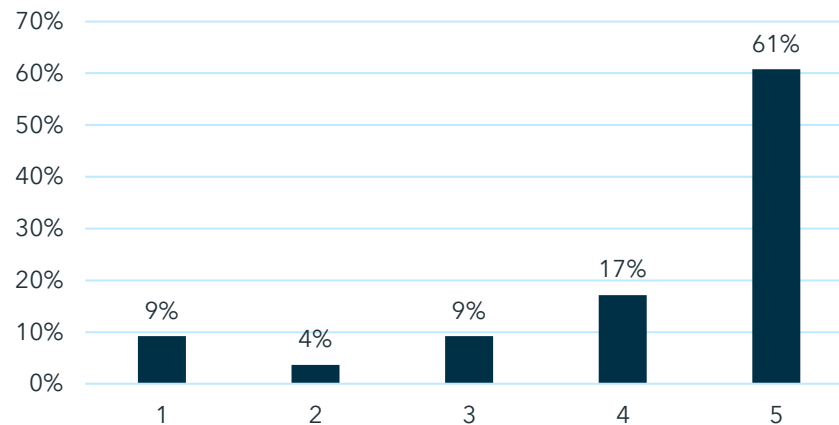


There were 112 respondent comments regarding crosswalk improvements. Respondent comments supporting the crosswalk improvements noted that this design treatment will improve pedestrian safety, especially around the school. They also want to see flashing beacons at the crosswalks to make pedestrians as visible as possible.

WINTER MAINTENANCE

Winter maintenance was the most positively supported design consideration, with 78% of respondents choosing a four or five star rating. Only 13% of respondents showed low support for this design treatment, with one and two star ratings.

How important to you is a design that permits winter maintenance of the pedestrian and cycling facilities along the Range Road corridor?

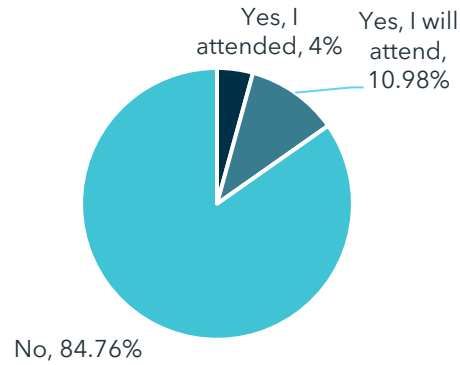


We received 119 comments, and the feedback from respondents who selected four or five star ratings suggests that if the paths were better maintained, there would be more cycling and walking along the corridor year round. When paths are not well maintained, respondents said that it has safety impacts for all road users, as pedestrians and cyclists start travelling in vehicle travel lanes.

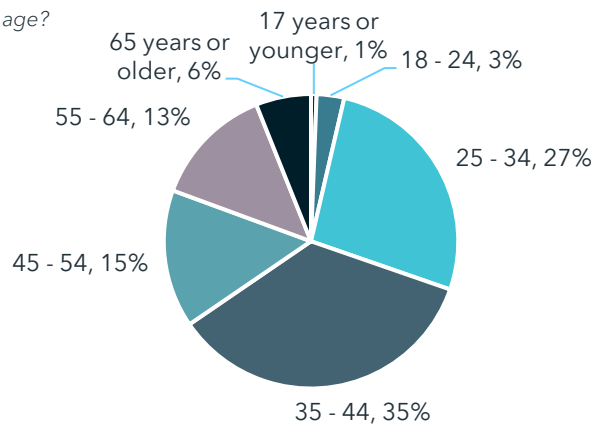
1.5 Demographics

Survey participants were asked the following demographic questions to capture who participated in the survey and identify groups we may have missed and need to seek out during later phases of engagement.

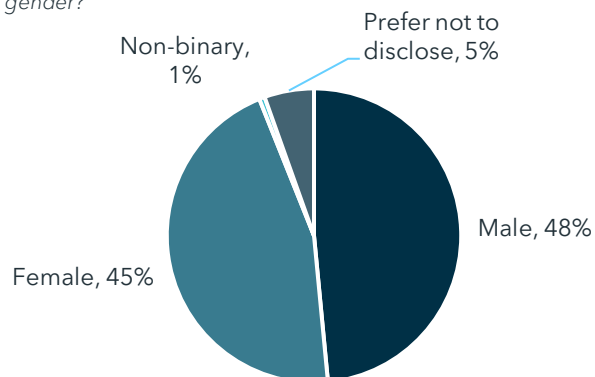
Have you or do you plan on attending the virtual Information Webinar on November 24?



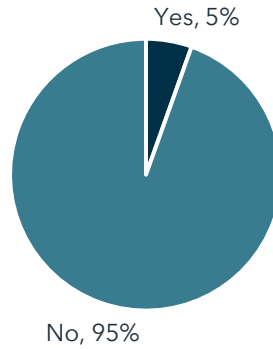
What is your age?



What is your gender?

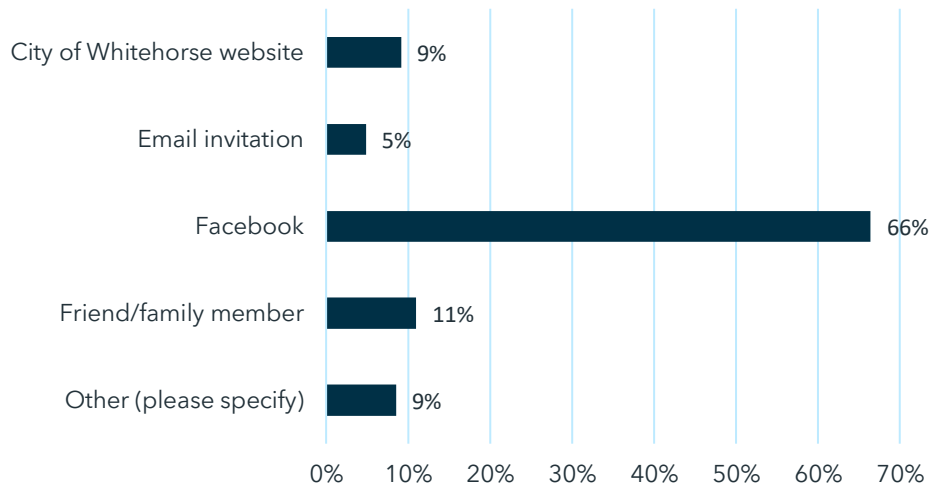


Do you have any mobility challenges that impact your ability to use the corridor?



Respondents who answered that they do have mobility challenges identified that walking is a challenge for them (x5), or that travelling by active means is too difficult or feels unsafe (x2).

How did you hear about this project?



Respondents who selected "other" specified that they heard about the project through Takhini North newsletters or communications (x4), Instagram (x3), or other neighbourhood groups.

APPENDIX D: CLASS 'D' COST ESTIMATES



Class D Road Cost Estimate

Project Range Road (Two Mile Hill Road - Mountain View Drive) Concept
Project Number 1020.0022.01
Client City of Whitehorse
Date 2021-02-28
Completed By E.Ma
Reviewed By B.Fan

ESTIMATE NOTES, ASSUMPTIONS AND LIMITATIONS

Estimate Description

The following estimate is for the Range Road Conceptual Design. This preliminary estimate is a 'Class D' type estimate (order of magnitude) which uses simplified methods of estimate preparation based on a number of assumptions and limitations provided below.

Cost items, quantities and unit prices in the estimates are based on historical cost data from recent tenders for the City and general assumptions and are provided to assist with long-term planning. This preliminary estimate uses 2020 unit rates in CDN dollars. Detail project investigations, studies and designs are required for the project prior to implementation. The following estimate should not be used for the design and construction of any works whatsoever.

Design considerations

We have assumed a precast concrete barrier for the physical buffer treatment in Cost Option 1A (bidirectional protected bike lane at road level) and a concrete boulevard with new curb & gutter in Cost Option 1B (bidirectional bicycle pathway at sidewalk level). Other lower cost options are available (flexible delineator posts, curb stops, etc), but have disadvantages in durability and maintenance. Full pavement resurfacing has been assumed for both options to adjust the crown of the roadway to the proposed centreline. Best practice recommendations for pavement markings (bicycle symbols, crossing markings etc.) has also been included in the cost estimate as painted materials. Inlaid pavement markings have not been included in the cost estimate.

Drainage and Utilities

We have assumed removal of existing and installation of new catchbasins would be required to suit the reconfigured curb returns. We have assumed cutouts or slots can be provided in the bicycle lane buffer to maintain drainage patterns to the existing curb. No estimates for other utilities modifications or upgrades have been included.

Electrical

We have assumed an allowance for signal pole relocations required to accommodate the proposed intersection improvements at the Range Road and Normandy Road (S) intersection. An allowance has been made for pedestrian level lighting addition, based on an approximate spacing along the west side of the corridor, but this should be confirmed with an electrical design and lighting level review.

Estimate does not include:

Environmental mitigation and/or remediation, municipal and utility type charges, legal surveys, GST/PST, permit charges, sub-consultant design & reporting, inspection and certification fees (electrical, geotechnical, environmental, landscape architect) as well as any operations / maintenance budgets.

Contingency does not include:

Engineering design, tender, administration, inspection and certification.

Range Road (Two Mile Hill Road - Mountain View Drive) Class D Estimate
Option 1A - Bike Lane at Road Level

A General						
Description	Unit of Measure	Estimate Quantity	Unit Rate	Total	Notes	
1 Mobilization / Demobilization / Traffic Management	LS	1	15%	\$ 420,000.00		
2 Construction Survey	LS	1	\$ 30,000.00	\$ 30,000.00		
3 Utility Adjustment Allowance	LS	1	\$ 10,000.00	\$ 10,000.00		
			Subtotal	\$ 460,000.00		
B Demolition / Relocation						
1 Cutting and Removal of Asphalt	m2	24700	\$ 10.00	\$ 247,000.00	Entire curb-to-curb area for resurfacing	
2 Cutting and Removal of Concrete curb	L.M.	250	\$ 45.00	\$ 11,250.00	Curb removal for curb extensions	
3 Cutting and Removal of Concrete (sidewalks)	m2	300	\$ 40.00	\$ 12,000.00		
4 Salvage and Relocate Existing Catch Basin or CB Manhole	each	4	\$ 4,000.00	\$ 16,000.00	For curb extensions	
5 Remove Existing CB Leads	L.M.	14	\$ 200.00	\$ 2,800.00	At University Drive	
6 Remove Landscape / Trees / Benches / Signs	m2	400	\$ 30.00	\$ 12,000.00	Small portion at the south end	
7 Relocation of Lamp	each	1	\$ 5,000.00	\$ 5,000.00	West side b/w TMH & Normandy S.	
8 Relocation of School Overhead Flashers	each	1	\$ 30,000.00	\$ 30,000.00		
			Subtotal	\$ 336,050.00		
C Roadworks						
1 Warm Mix Asphalt - 75mm Thick	m2	24500	\$ 60.00	\$ 1,470,000.00	For resurfacing full pavement width	
2 Precast Concrete Barriers	L.M.	1490	\$ 150.00	\$ 223,500.00	Assumed precast concrete barriers	
3 Concrete Median Island	m2	200	\$ 135.00	\$ 27,000.00		
4 Concrete Curb Extension	m2	350	\$ 135.00	\$ 47,250.00		
5 Concrete Sidewalk	m2	300	\$ 110.00	\$ 33,000.00	Small section at the south end	
6 Warm Mix Asphalt - 50mm Thick (Off-street Pathway Paving)	m2	465	\$ 60.00	\$ 27,900.00	For resurfacing bike lane	
7 Curb Letdowns / Bike Ramps	each	39	\$ 1,150.00	\$ 44,850.00		
8 Median Barrier Curb	L.M.	90	\$ 150.00	\$ 13,500.00		
9 Concrete Curb and Gutter	L.M.	305	\$ 150.00	\$ 45,750.00		
10 Granular Base Course (150mm Depth)	m2	1615	\$ 15.00	\$ 24,225.00	Assumed as base for items C3 to C6	
			Subtotal	\$ 1,932,750.00		
D Road Markings						
1 Zebra Crosswalks	Each	14	\$ 2,000.00	\$ 28,000.00		
2 Bicycle Symbols	Each	72	\$ 285.00	\$ 20,520.00		
3 Bicycle Crosswalks	Each	12	\$ 2,500.00	\$ 30,000.00		
4 600mm Stop Bars	L.M.	35	\$ 500.00	\$ 17,500.00		
5 100mm Yellow/White Lines	L.M.	2230	\$ 30.00	\$ 66,900.00	Both solid and dash lines	
6 Turn Bay Arrows	each	6	\$ 500.00	\$ 3,000.00		
7 Supply and Install Signs	each	45	\$ 570.00	\$ 25,650.00	Assumed 1 sign per 40m	
			Subtotal	\$ 165,920.00		
E Storm System						
1 Supply and Install New CB or CBMH	each	0	\$ 2,600.00	\$ -	Relocation cost included above	
			Subtotal	\$ -		
F Provisional Items						
1 Corridor Lighting Allowance	each	45	\$ 7,500.00	\$ 337,500.00	Assumed 1 pedestrian level light standard every 40m	
2 Top Soil and Seed (Boulevard Restoration)	m2	300	\$ 30.00	\$ 9,000.00	Small portion at the south end	
3 Existing Transit Stop Upgrade (Northbound)	each	0	\$ 3,500.00	\$ -	Assume addition of concrete pad in blvd	
4 Future Transit Stop Allowance (Southbound)	each	0	\$ 8,000.00	\$ -	Assume buildout of front boarding island	
			Subtotal	\$ 346,500.00		
SUBTOTAL ESTIMATE				\$ 3,241,000.00		
CONTINGENCY			30%	\$ 972,300.00		
ENGINEERING AND PROJECT MANAGEMENT			15%	\$ 486,150.00		
Total				\$ 4,700,000.00		

Range Road (Two Mile Hill Road - Mountain View Drive) Class D Estimate
Option 1B - Bike Path at Sidewalk Level

A General						
Description	Unit of Measure	Estimate Quantity	Unit Rate	Total	Notes	
1 Mobilization / Demobilization / Traffic Management	LS	1	15%	\$ 470,000.00		
2 Construction Survey	LS	1	\$ 30,000.00	\$ 30,000.00		
3 Utility Adjustment Allowance	LS	1	\$ 10,000.00	\$ 10,000.00		
			Subtotal	\$ 510,000.00		
B Demolition / Relocation						
1 Cutting and Removal of Asphalt	m2	24700	\$ 10.00	\$ 247,000.00	Entire curb-to-curb area for resurfacing	
2 Cutting and Removal of Concrete curb	L.M.	1700	\$ 45.00	\$ 76,500.00	Curb removal for curb extensions	
3 Cutting and Removal of Concrete (sidewalks)	m2	300	\$ 40.00	\$ 12,000.00		
4 Salvage and Relocate Existing Catch Basin or CB Manhole	each	4	\$ 4,000.00	\$ 16,000.00	For curb extensions	
5 Remove Existing CB Leads	L.M.	14	\$ 200.00	\$ 2,800.00	At University Drive	
6 Remove Landscape / Trees / Benches / Signs	m2	400	\$ 30.00	\$ 12,000.00	Small portion at the south end	
7 Relocation of Lamp	each	1	\$ 5,000.00	\$ 5,000.00	West side b/w TMH & Normandy S.	
8 Relocation of School RRFB	each	1	\$ 30,000.00	\$ 30,000.00		
			Subtotal	\$ 401,300.00		
C Roadworks						
1 Warm Mix Asphalt - 75mm Thick	m2	16500	\$ 60.00	\$ 990,000.00	For resurfacing travel + parking lanes	
2 Concrete Buffer	m2	2200	\$ 135.00	\$ 297,000.00		
3 Concrete Median Island	m2	200	\$ 135.00	\$ 27,000.00		
4 Concrete Curb Extension	m2	350	\$ 135.00	\$ 47,250.00		
5 Concrete Sidewalk	m2	300	\$ 110.00	\$ 33,000.00	Small section at the south end	
6 Warm Mix Asphalt - 50mm Thick (Off-street Pathway Paving)	m2	5100	\$ 60.00	\$ 306,000.00	For resurfacing bike lane	
7 Curb Letdowns / Bike Ramps	each	49	\$ 1,150.00	\$ 56,350.00		
8 Median Barrier Curb	L.M.	90	\$ 150.00	\$ 13,500.00		
9 Concrete Curb and Gutter	L.M.	1660	\$ 150.00	\$ 249,000.00		
10 Granular Base Course (150mm Depth)	m2	8450	\$ 15.00	\$ 126,750.00	Assumed as base for items C2 to C6	
			Subtotal	\$ 2,145,850.00		
D Road Markings						
1 Zebra Crosswalks	Each	14	\$ 2,000.00	\$ 28,000.00		
2 Bicycle Symbols	Each	72	\$ 285.00	\$ 20,520.00		
3 Bicycle Crosswalks	Each	12	\$ 2,500.00	\$ 30,000.00		
4 600mm Stop Bars	L.M.	35	\$ 500.00	\$ 17,500.00		
5 100mm Yellow/White Lines	L.M.	2230	\$ 30.00	\$ 66,900.00	Both solid and dash lines	
6 Turn Bay Arrows	each	6	\$ 500.00	\$ 3,000.00		
7 Supply and Install Signs	each	45	\$ 570.00	\$ 25,650.00	Assumed 1 sign per 40m	
			Subtotal	\$ 165,920.00		
E Storm System						
1 Supply and Install New CB or CBMH	each	2	\$ 2,600.00	\$ 5,200.00	Relocation cost included above	
2 Manhole Lift to Surface Level	each	8	\$ 1,000.00	\$ 8,000.00	Manholes that are on the bike lane/buffer	
			Subtotal	\$ 13,200.00		
F Provisional Items						
1 Corridor Lighting Allowance	each	45	\$ 7,500.00	\$ 337,500.00	Assumed 1 pedestrian level light standard every 40m	
2 Top Soil and Seed (Boulevard Restoration)	m2	300	\$ 30.00	\$ 9,000.00	Small portion at the south end	
3 Existing Transit Stop Upgrade (Northbound)	each	0	\$ 3,500.00	\$ -	Assume addition of concrete pad in blvd	
4 Future Transit Stop Allowance (Southbound)	each	0	\$ 8,000.00	\$ -	Assume buildout of front boarding island	
			Subtotal	\$ 346,500.00		
SUBTOTAL ESTIMATE				\$ 3,583,000.00		
CONTINGENCY			30%	\$ 1,074,900.00		
ENGINEERING AND PROJECT MANAGEMENT			15%	\$ 537,450.00		
Total				\$ 5,195,000.00		