



Executive Summary

ES.1 Introduction

In June 2016, The City of Calgary (The City) retained ISL Engineering and Land Services Ltd. (ISL) to prepare a functional planning study (FPS) for the Sarcee Trail and Richmond Road SW interchange.

This FPS was an outcome of the 2015 West and South West Ring Road Downstream Traffic Impacts (TT2015-0828) Report by The City, which identified the Sarcee Trail and Richmond Road intersection as a location of high interest (see Figure ES.1). The Downstream Traffic Impacts Report confirmed that an interchange at Sarcee Trail and Richmond Road would reduce Richmond Road traffic volumes, and provide benefit to Sarcee Trail in both the short and long term, with or without the West Calgary Ring Road in place. At the time of this FPS, the Southwest Calgary Ring Road (SWCRR, from Macleod Trail to Highway 8) is anticipated to be open in Fall 2021, while the timing of the West Calgary Ring Road (WCRR, from Highway 8 to Highway 1) is pending confirmation.

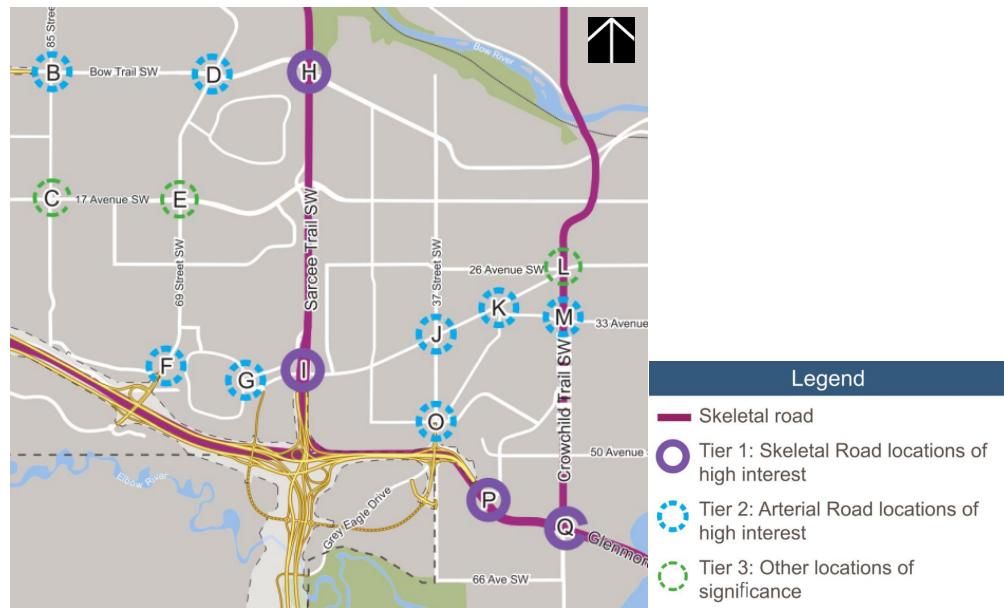


Figure ES.1 West and South West Ring Road Downstream Traffic Impacts – Key Locations Map

In 2008, The City completed the Sarcee Trail Corridor Study, which included recommendations for a Parclo AB interchange with basketweave ramps at Sarcee Trail and Richmond Road (see Figure ES.2). A subsequent review of the recommended plan at Sarcee Trail and Richmond Road with the latest SWCRR design revealed challenges with the tie-in for Sarcee Trail north of the SWCRR and with the profiles of the basketweave ramps as the study did not examine the vertical profiles of the basketweave ramps in depth. As a result, an update to the previous interchange plans was initiated to determine access to adjacent properties, protect the right-of-way (ROW) required, and ensure proper tie-in to the new Glenmore Trail and Sarcee Trail interchange which will be constructed as part of the SWCRR project. There is also a need to

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ensure the interchange plans align with the long-term vision and principles as identified in the 2009 Calgary Transportation Plan (CTP) while meeting Alberta Transportation standards within the Transportation and Utility Corridor (TUC).

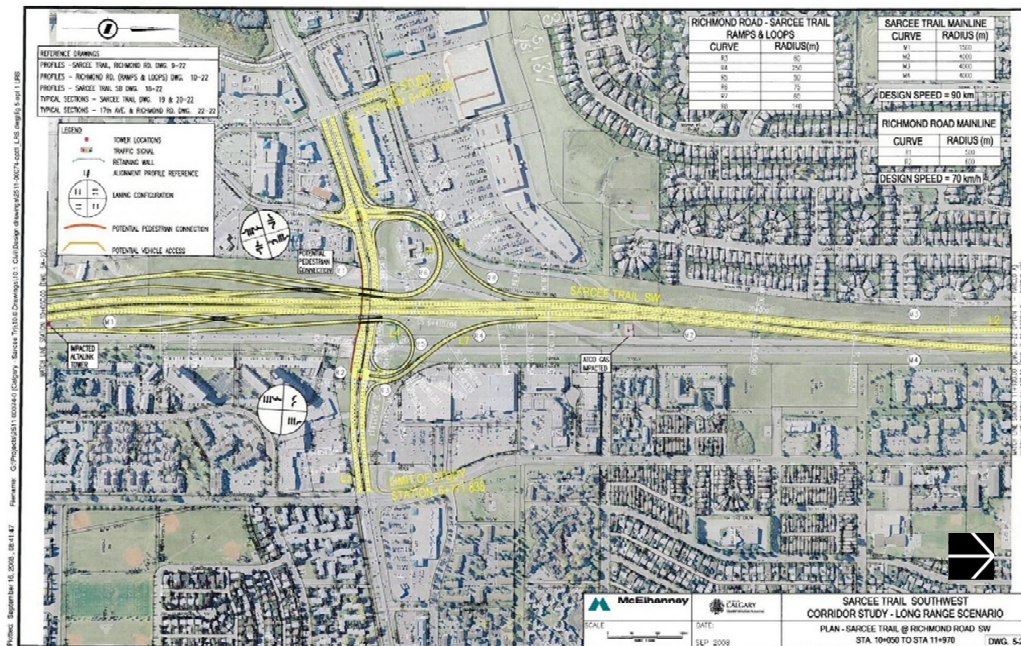


Figure ES.2 2008 City of Calgary Sarcee Trail Corridor Study Plan at Richmond Road

ES.2 Study Area

The Study Area for this FPS includes the intersections of Sarcee Trail and Richmond Road, and Stewart Green SW (east) and Richmond Road to the west, and 50/51 Street SW and Richmond Road to the east. The north and south project limits are south of 26 Avenue SW and north of Glenmore Trail SW, respectively. The area map of the overall Study Area is shown on Exhibit ES-1.

The Study Area is in an existing built area of Calgary and is surrounded by commercial and residential developments that are heavily vehicle reliant as shown on Exhibit ES-1. There are commercial developments in all four quadrants: Signal Hill Shopping Centre (northwest), Westhills Shopping Centre (southwest), Richmond Square Shopping Centre (northeast), and London Place West Shopping Centre (southeast). In the southeast quadrant, the Study Area is in proximity to residential areas including the Boardwalk high-rise apartments and other multi-family sites within the community of Glamorgan. Other existing constraints or considerations in the Study Area include The City road ROW, the TUC boundary, utilities (ENMAX and AltaLink transmission towers, ATCO Pipelines, the ATCO regulator station, City-owned deep utilities, and The City water pump station), the Progress Energy Poppy Memorial, and the Greenway pathway as shown on Exhibits ES-2 to ES-6.

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ES.2.1 Sarcee Trail

Sarcee Trail is designated as a Skeletal Road from Glenmore Trail to 16 Avenue NW. Sarcee Trail currently has four core lanes and will be expanded to six core lanes in this project to accommodate 30-year horizon traffic volumes and to tie in to the future Glenmore Trail and Sarcee Trail interchange which will have six core lanes in the long-term plan.

ES. 2.2 Richmond Road

Richmond Road is designated as an Arterial Street west of Sarcee Trail and a Neighborhood Boulevard east of Sarcee Trail. Richmond Road has five core lanes within the Study Area (three westbound and two eastbound), with additional lanes for turning movements. It is part of the Cycling Network and Primary Transit Network in the 2009 CTP.

On a practical level, to provide design consistency across the interchange, the Arterial standard for Richmond Road will extend east to the 50/51 Street SW intersection, and then transition to the Neighborhood Boulevard standard further to the east.

ES.3 Stakeholder Engagement Process

The City led communication and engagement for the FPS. At the onset of the FPS, a communications and public engagement plan was created for the FPS. The FPS targeted Public and City Internal Stakeholders, as well as Alberta Transportation as part of the communications and stakeholder engagement plan.

ES.3.1 Public Stakeholder Engagement

Public stakeholders engaged included Community Associations, Commercial Property Owners, and tenants on City-owned property, in addition to the general public during Public Open Houses and Public Information Sessions.

During the Public and Stakeholder Engagement phase, The City hosted two public open houses on November 21 and 26, 2016. The purpose of these sessions was to provide members of the public with an opportunity to learn about the FPS, have questions answered by the FPS team members, and obtain their feedback regarding the FPS. Key outcomes from these open houses and the online engage portal page included the prioritization of evaluation criteria to evaluate the short-listed interchange concepts, as well as an understanding of specific stakeholder concerns related to these evaluation criteria, and confirmation that stakeholders were in favour of the need for an interchange at Sarcee Trail and Richmond Road.

During the Draft Recommendation Plan Report Back phase, The City hosted two public information sessions on May 30 and 31, 2017, at the Glamorgan Community Centre. The purpose of these sessions was to provide members of the public with an overview of the proposed recommended ultimate plan, provide information regarding how input from the November open houses impacted the proposed interchange design, have questions answered by the FPS team members, and allow the FPS team to obtain any final issues or concerns regarding the proposed design. Stakeholder feedback at the information sessions was collected through a comment wall where stakeholders were provided with post-it notes, and asked to stick any additional comments, questions or concerns to a poster board, as well as through event evaluation forms. Key outcomes from these information sessions and the online engage portal page included confirmation that the recommended interchange design is the preferred concept and that stakeholders were in favour of the need for an interchange at Sarcee Trail and Richmond Road.

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ES.3.2 Internal Stakeholder Engagement

In addition to public stakeholders, City business units were engaged throughout the project. Key outcomes from Internal Stakeholder Engagement included confirmation of the recommended interchange concept, implementation of pathway and transit enhancements along Richmond Road, and input on geometric design elements.

ES.3.3 Alberta Transportation Engagement

Alberta Transportation and their consultant, CH2M (owner's engineer for the SWCRR at the time of this study), were engaged to coordinate the interchange design with the Glenmore Trail and Sarcee Trail interchange located just south of the Study Area. The alignment of Sarcee Trail for this project was developed early on to ensure that it matched the alignment of Sarcee Trail according to plans for the SWCRR received from Alberta Transportation. At the time of this study, the SWCRR was in the design phase of P3 implementation, with the design of the tie-in (both vertical and horizontal) subject to change. Additional review of the south tie-in with the finalized SWCRR plans will be required when the project moves on to detailed design.

ES.4 Traffic Forecasting and Analysis

The City of Calgary provided traffic data for the traffic operations analysis, including intersection turning movement data for weekday AM, weekday PM, and Saturday peak periods, as well as 2024 and 2048 EMME forecasting data from the Regional Transportation Model (RTM).

As it is unknown if the WCRR will be in place before 2024, the City generated volume plots for two scenarios of 2024 forecast, one with and one without the WCRR. The plots showed that with the provision of the WCRR, traffic volumes would be higher on the SWCRR and generally lower on Sarcee Trail and Richmond Road. To be conservative, this study assumed the SWCRR will be open to traffic by 2024 and the WCRR will be open to traffic by 2048.

The 2048 AM and PM Peak Forecast Traffic Volumes were compared with the 2024 AM and PM Peak Forecast Traffic Volumes. It was found that the 2048 forecast volumes are higher than 2024 forecast volumes except for SB Sarcee Trail in the AM peak and NB Sarcee Trail in the PM peak, as shown in Figure ES.3. This is because the provision of the WCRR by 2048 could potentially divert a significant portion of long-distance commuter traffic away from Sarcee Trail to WCRR.

As 2048 forecast traffic volumes are higher than 2024 forecast traffic volumes at the two interchange junctions, the 2048 horizon traffic analysis results would govern, and 2024 horizon traffic analysis is not required to verify performance of the potential long-term interchange concepts. Therefore, only 2048 design volumes were derived and analyzed.

Several adjustments were made to the 2048 forecast traffic data to arrive at the 2048 design volumes, including:

- Volume adjustment at Signal Hill and Westhills Shopping Centres;
- Volume adjustment at London Place Daycare;
- Volume adjustment at Tsuut'ina Nation based on proposed commercial developments (Tsuut'ina Park Development, Tsuut'ina Crossing Development, and Tsuut'ina Centre Development); and
- Traffic volume balancing.

Traffic operation analyses of the interchange concepts was completed using Synchro and VISSIM.

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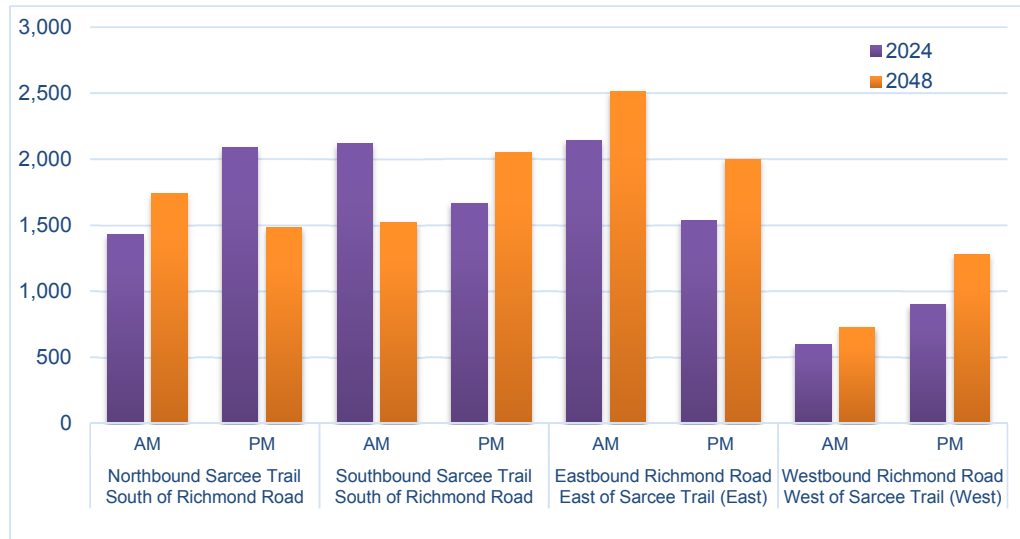


Figure ES.3: 2024 and 2048 Forecasting AM and PM Traffic Volume Comparison

ES.5 Interchange Concepts and Evaluation

Evaluation and selection of the optimum interchange configuration at Sarcee Trail and Richmond Road was completed in a two-step process as follows:

1. Preliminary Interchange Concepts – up to seven concepts were initially generated and underwent screening-level assessment to produce a three short-list for detailed evaluation; and
2. Short-listed Interchange Concepts – the three short-listed concepts were developed to a higher level of detail and evaluation in order to arrive at a recommended ultimate plan.

The three short-listed interchange concepts included a Parclo AB interchange (with no basketweave ramps), Diamond interchange, and a Hybrid Parclo A interchange as shown in Figure ES.4.

The interchange concepts were evaluated based on a Triple Bottom Line approach that considered factors in the economic, social, and environmental categories. The evaluation criteria in each category had input from City business units and the public. Following identification of the key differentiators between the interchange concepts, City stakeholders were engaged to provide input on the recommended interchange concept. Class 4 cost estimates were assembled for the short-listed interchange concepts. At the evaluation phase, the Parclo AB interchange concept was estimated at \$90 million, the Diamond interchange concept at \$130 million, and the Hybrid Parclo A interchange concept at \$105 million.

The number one public-ranked priority identified in the engagement process was vehicle accommodation in general. Modelling of the short-listed interchange concepts showed that the performance of the Diamond interchange concept was lower than the other concepts as it maintains the existing number of traffic signals and weaving issues on Richmond Road, and has more weaving segments along Sarcee Trail. The Parclo AB and Hybrid Parclo A interchange concepts performed similarly in terms of vehicle accommodation. While traffic operations differed between the interchange concepts, volumes on Richmond Road beyond the interchange area were similar between all concepts.

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Based on the aggregated evaluation process, the Hybrid Parclo A interchange concept is the recommended ultimate plan for the Sarcee Trail and Richmond Road interchange, as shown in Figure ES.3. Key reasons for the recommendation included:

- The Hybrid Parclo A interchange concept ranked the best in the Public - High Ranked Priority evaluation criteria. It had the least number of evaluation criteria that were ranked as “least favourable”, and fared well in the Public - Lower Ranked Priority evaluation criteria. Where it was less favourable than the Parclo AB interchange concept, the difference is generally small or readily addressed by additional design measures.
- The Diamond interchange concept is the least preferred concept as it ranked poorly overall in all evaluation criteria categories. Its only advantage is that it does not directly affect the Petro-Canada site in the NW quadrant (no building impact).
- The Parclo AB interchange concept is not preferred as it ranks lower on the Public - High Ranked Priority evaluation criteria. The loop ramp in the NE quadrant (NB Sarcee Trail to Richmond Road ramp) has a small radius that would cause undesirable speed changes coming off Sarcee Trail (80 km/h to 40 km/h on the ramp). In addition, community and business access from the loop ramp is not direct as drivers would have to turn left to go right and vice-versa; an area stakeholders were very clear in providing feedback that they would not find this alternative to be an acceptable outcome.

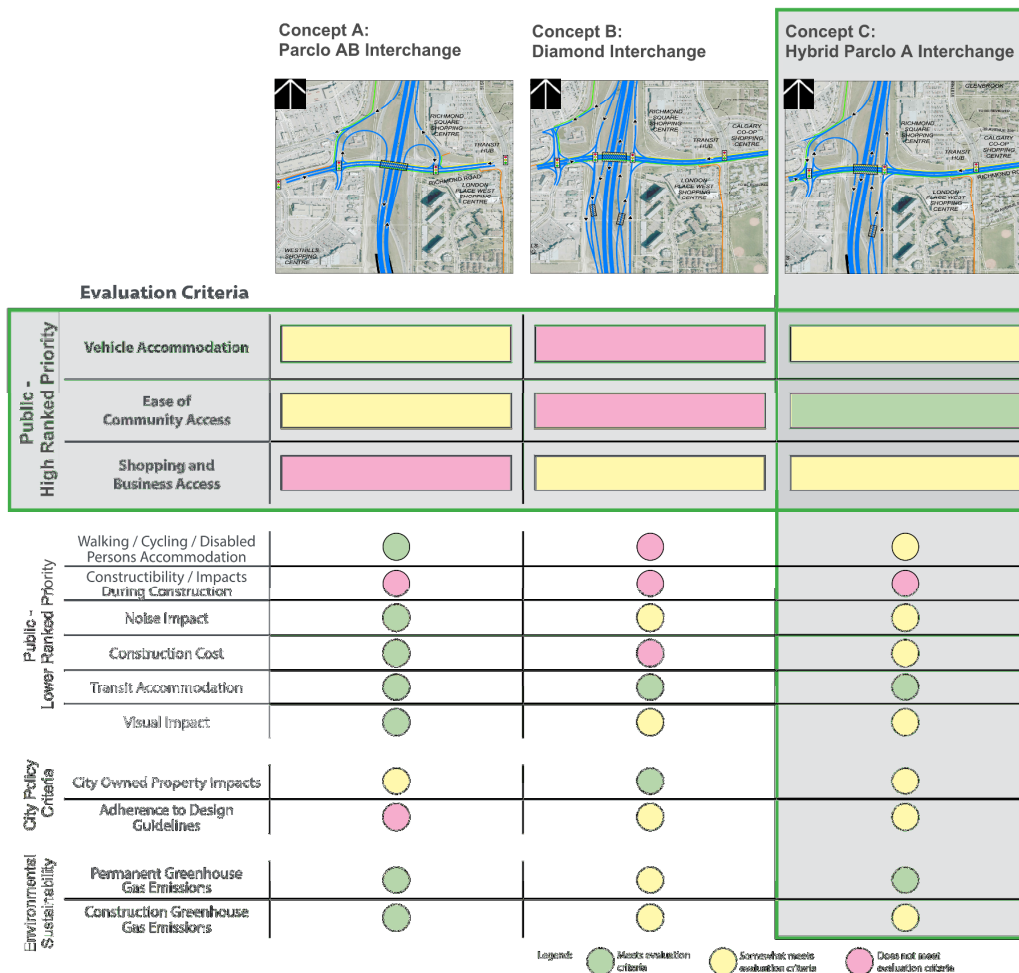


Figure ES.4 Interchange Evaluation Results

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Generally, the Hybrid Parclo A interchange concept is a well-balanced solution that combines the best aspects of other concepts that have been considered at Sarcee Trail and Richmond Road.

The Hybrid Parclo A interchange was presented to the public during the Phase 3 Public information session where the Public generally agreed with the selection of the interchange type and showed support for the interchange.

ES.6 Recommended Ultimate Plan

The recommended ultimate plan is a Hybrid Parclo A interchange with diamond ramps in the NB direction and a single Parclo A loop ramp in the NW quadrant as shown on Exhibit ES-5 and ES-6. Perspective sketches and recommended typical sections are included on Exhibit ES-7, 8, and 9. Features of the interchange with corresponding benefits have been highlighted in Table ES.1:

Table ES.1 Recommended Ultimate Plan Features and Benefits

Feature	Benefit
Sarcee Trail has six core lanes through the interchange with the at-grade intersection at Richmond Road removed	<ul style="list-style-type: none"> Allows for free-flow conditions along skeletal road Sarcee Trail, which will accommodate 30-year forecast traffic volumes. Addresses concerns of the proximity of the SWCRR to the existing intersection at Sarcee Trail and Richmond Road. Sarcee Trail through traffic will no longer be conflicting with Richmond Road through traffic. Improves travel time to and from adjacent communities and shopping centres. Reduces GHG emissions from vehicles idling along Sarcee Trail. Encourages use of Sarcee Trail, which reduces shortcutting traffic through surrounding communities.
Bridge carrying Richmond Road over Sarcee Trail by partially raising Richmond Road and partially depressing Sarcee Trail	<ul style="list-style-type: none"> Allows for relatively flat grades along both Sarcee Trail and Richmond Road due to the existing area topography. Matches current SWCRR design at Sarcee Trail, which is also depressed. Reduces noise impacts. Allows for ease of construction.
Tie in to the SWCRR at Glenmore Trail and Sarcee Trail	<ul style="list-style-type: none"> Achieves proper tie-ins to both Stage 1 and Ultimate configurations of the SWCRR. Provides opportunities for construction savings if construction of the interchange were to be constructed with the SWCRR.
Northbound basketweave bridge	<ul style="list-style-type: none"> Eliminates vehicle weaving between NB Sarcee Trail and WB Glenmore Trail.
Direct southbound ramp to Signal Hill Shopping Centre	<ul style="list-style-type: none"> Direct access to Signal Hill Shopping Centre is maintained from SB Sarcee Trail. Improves safety, road operations, and accommodates transit access from Signal Hill Centre SW to Stewart Green SW (east) with the use of a roundabout at the end of the ramp.
Ramps in the NW quadrant that aligns the west junction with Stewart Green SW (east)	<ul style="list-style-type: none"> Provides enhanced access to Westhills Shopping Centre. Removes one traffic light along Richmond Road at the existing SB Sarcee Trail and Richmond Road intersection. Improves weaving along Richmond Road from Stewart Green SW (east) to the east interchange junction.

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Feature	Benefit
Sarcee Trail alignment is centered within City road ROW, north of Richmond Road	<ul style="list-style-type: none"> Avoids impacts to the Progress Energy Poppy Memorial, which has 9,000 poppies installed through volunteer and community initiatives. Avoids impact to the pedestrian bridge crossing Sarcee Trail, located north of 26 Avenue SW. Avoids impact to the ATCO Pipeline station. Avoids impact to The City water pump station.
Multi-modal accommodation – pathways	<ul style="list-style-type: none"> 4 m wide and direct multi-use pathway north and south of Richmond Road provides high quality service for pathway users and increases pathway capacity. Supports multimodal activity from Signal Hills and Westhills Shopping Centres (Major Activity Centre) and Richmond Square Shopping Centre (Community Activity Centre). Provides high quality connections to the Rotary/Mattamy Greenway. Introduces high-entry angle yield condition right turns at applicable right turns along Richmond Road within the Study Area to improve safety for pedestrians crossing right turns without the use of signals or infrastructure that results in increased O&M costs.
Multi-modal accommodation – transit	<ul style="list-style-type: none"> Transit queue jumps and transit priority signal at three locations in the WB direction and one location in the EB direction. Allows transit buses to proceed ahead of traffic and reach their destinations faster, which allow for improved transit service and consistency of bus timings.
Fits within road ROW and City-owned land.	<ul style="list-style-type: none"> No private property impacts.

Generally, the recommended ultimate plan is a well-balanced solution that combines the best aspects of other concepts that have been considered at Sarcee Trail and Richmond Road. Remaining challenges include:

- A number of utility impacts, including AltaLink and ENMAX transmission towers, ATCO Pipelines, and City-owned deep utilities.
- Technical design compromises due to the proximity of the two interchanges on Sarcee Trail at Richmond Road and Glenmore Trail (SWCRR).
- Elevated interchange ramps adjacent to the east property line at Glamorgan which results in perceived noise and visual impacts.

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ES.6.1 Cost Estimate

A Class 4 cost estimate (-40 to +75%) was prepared for the recommended ultimate plan, resulting in a cost estimate range of \$64,000,000 to \$185,000,000. A 20% contingency line item was included due to the cost estimate level of detail. Engineering and testing was estimated at 15% of the construction subtotal including contingency. Unit prices reflect recent comparable projects in Calgary.

Table ES.2 Recommended Ultimate Plan Class 4 Cost Estimate

Description	Cost
Removals	\$1,883,000
Earthworks	\$2,823,000
Pavement	\$16,822,000
Concrete	\$2,899,000
Structures	\$28,985,000
Traffic and Wayfinding	\$4,775,000
Detours and Staging	\$4,965,000
Utilities	\$13,363,000
Landscaping	\$278,000
Construction Subtotal	\$78,053,000
Contingency (20%)	\$15,611,000
Engineering and Testing (15%)	\$14,050,000
Order of magnitude construction estimate	\$106,000,000

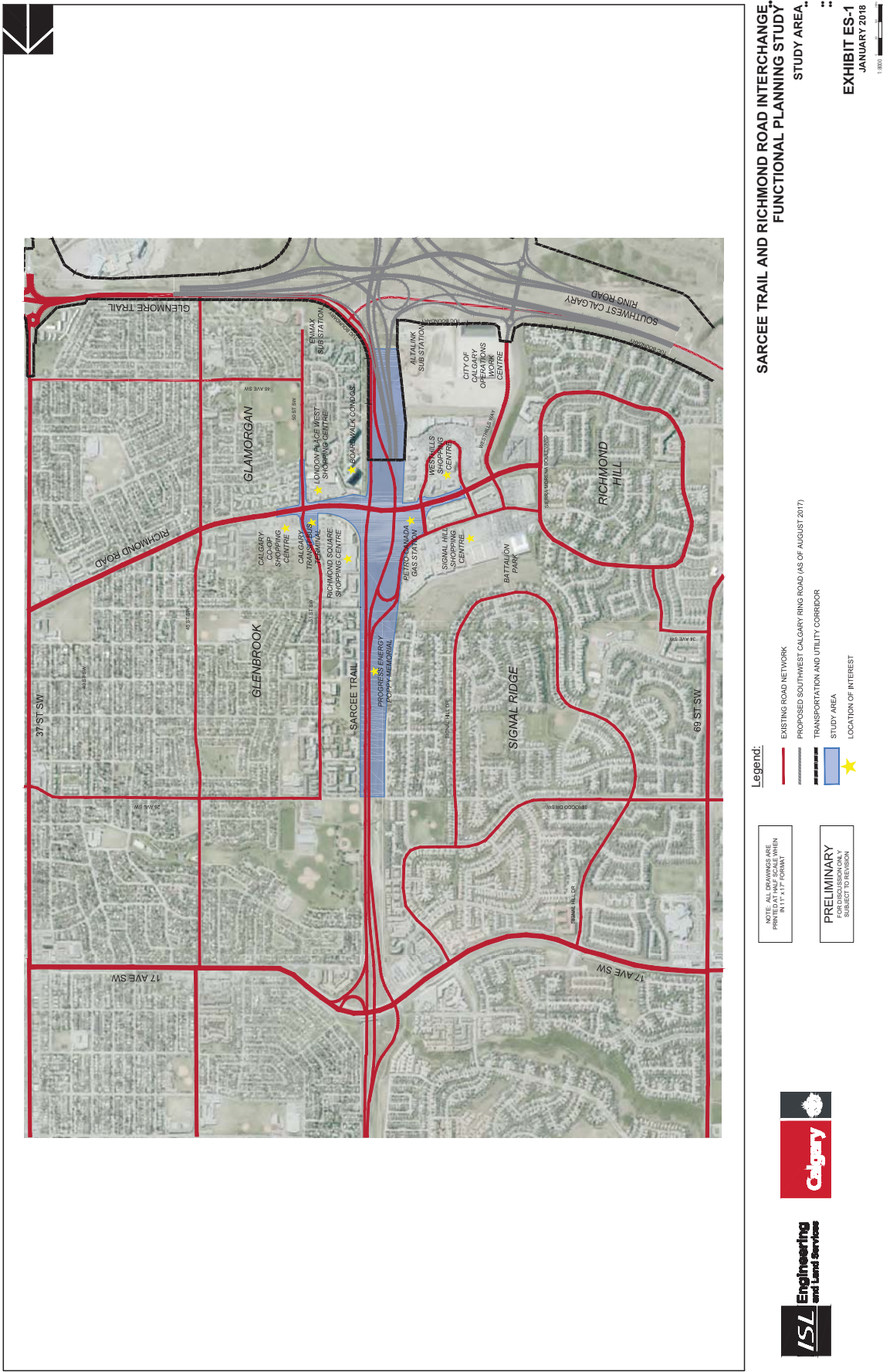
Key considerations of the cost estimate include:

- The Study Area is located between 26 Avenue SW to Glenmore Trail SW from north to south, and Stewart Green SW (east) to 50/51 Street SW from east to west.
- The recommended ultimate plan realigns existing Sarcee Trail in order to tie-in to the SWCRR, as the SWCRR points Sarcee Trail west of its existing alignment at Richmond Road.
- The recommended ultimate plan has been designed for 2048 design traffic volumes.
- There are two bridges; one at Sarcee Trail and Richmond Road and a NB basketweave bridge, as well as MSE retaining walls.
- Sarcee Trail is approximately 2.4 km in the Study Area with Sarcee Trail widened from two cores lanes to at least three core lanes; Sarcee Trail has more than three lanes (four northbound and five southbound) south of Richmond Road to allow for auxiliary lanes.
- The Sarcee Trail alignment impacts several ENMAX and AltaLink transmission towers, ATCO Pipelines, and City-owned deep utilities. There are opportunities to decrease cost of utility relocations with the implementation of The City's Municipal Consent and Access Agreement (MCAA) cost allocation, which divides utility relocation costs between The City and the Utility based on the type of infrastructure and the number of years it has been installed.

ES.7 Summary and Recommendations

A comprehensive functional planning process was completed for the Sarcee Trail and Richmond Road interchange. Through a technical evaluation grounded in public and stakeholder priorities, a Hybrid Parclo A interchange is recommended as the optimum interchange concept for the Sarcee Trail and Richmond Road interchange.

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Legend:

- CITY OF CALGARY ROAD RIGHT-OF-WAY
- TRANSPORTATION AND UTILITY CORRIDOR
- CITY-OWNED PROPERTY
- COMMERCIAL PROPERTY

NOTE: ALL DRAWINGS ARE PRINTED AT HALF SCALE WHEN AT 1:1 SCALE

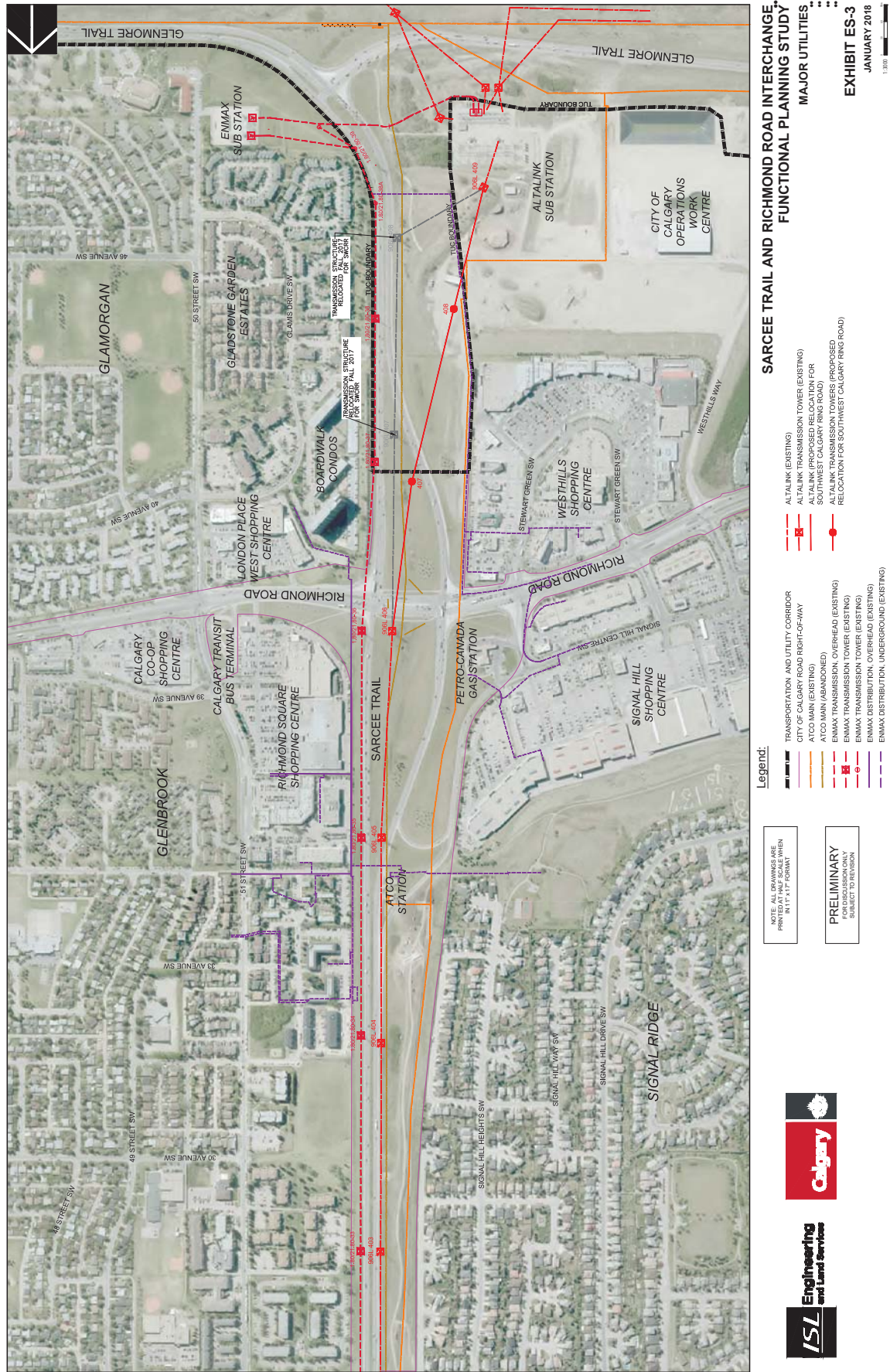
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SARCEE TRAIL AND RICHMOND ROAD INTERCHANGE FUNCTIONAL PLANNING STUDY ROAD RIGHT-OF-WAY

JANUARY 2018




EXHIBIT ES-2

Sarcee Trail and Richmond Road Interchange Functional Planning Study Executive Summary



The map displays the proposed transit system for the Glenbrook and Signal Ridge areas of the City of Calgary. The system is represented by a network of green lines, with blue lines indicating existing infrastructure. The map includes labels for various locations: Glamorgan, Glenbrook, Signal Ridge, Westhills, and Altalink. It also shows major roads like Richmond Road, Sargee Trail, and Westhills Way. Key features include the City of Calgary Operations Centre, Westhills Shopping Centre, Signal Hill Shopping Centre, and the Petro-Canada Gas Station. The map is overlaid with a network of green lines representing the proposed transit system, with blue lines indicating existing infrastructure. A legend in the bottom right corner explains the symbols used for the transit system.

Legend:

-  TRANSPORTATION AND UTILITY CORRIDOR
-  CITY OF CALGARY ROAD RIGHT-OF-WAY
-  WATERMAIN
-  SANITARY SEWER
-  STORM SEWER

NOTE: ALL DRAWINGS ARE
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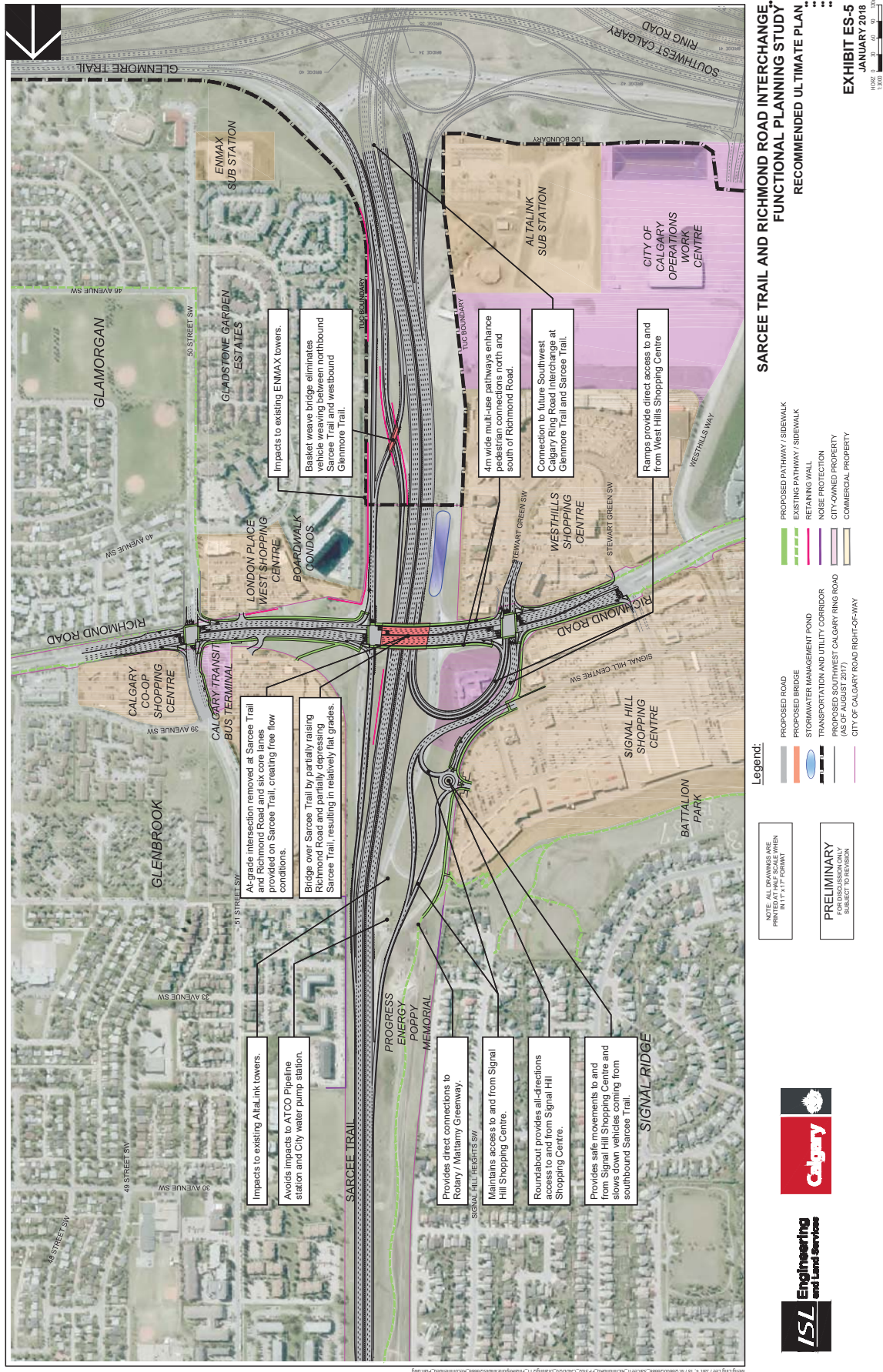
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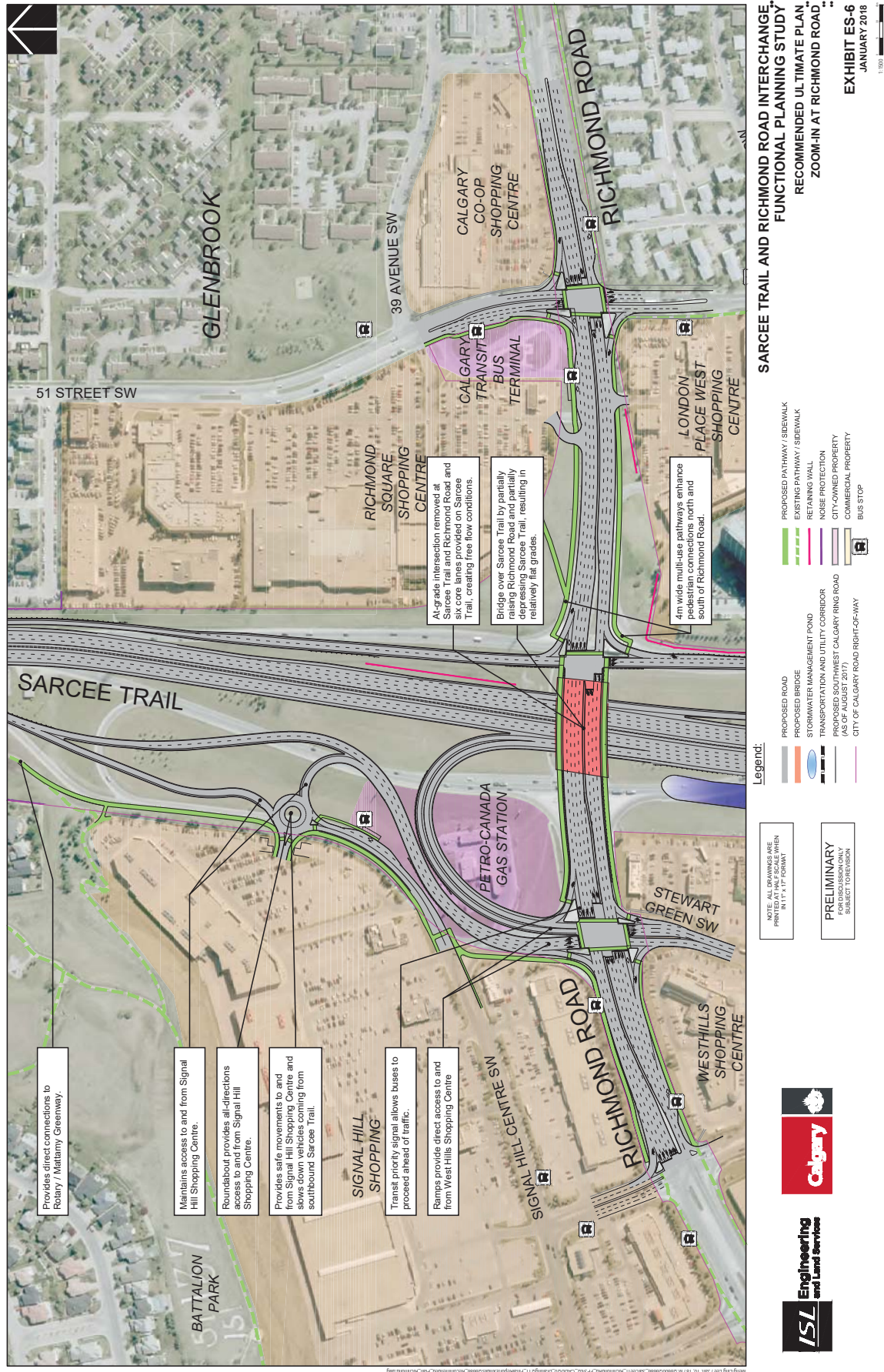
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and Land Services

EXHIBIT ES-4
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Sarcee Trail and Richmond Road Interchange
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Sarcee Trail SW Area
Looking South



Legend:

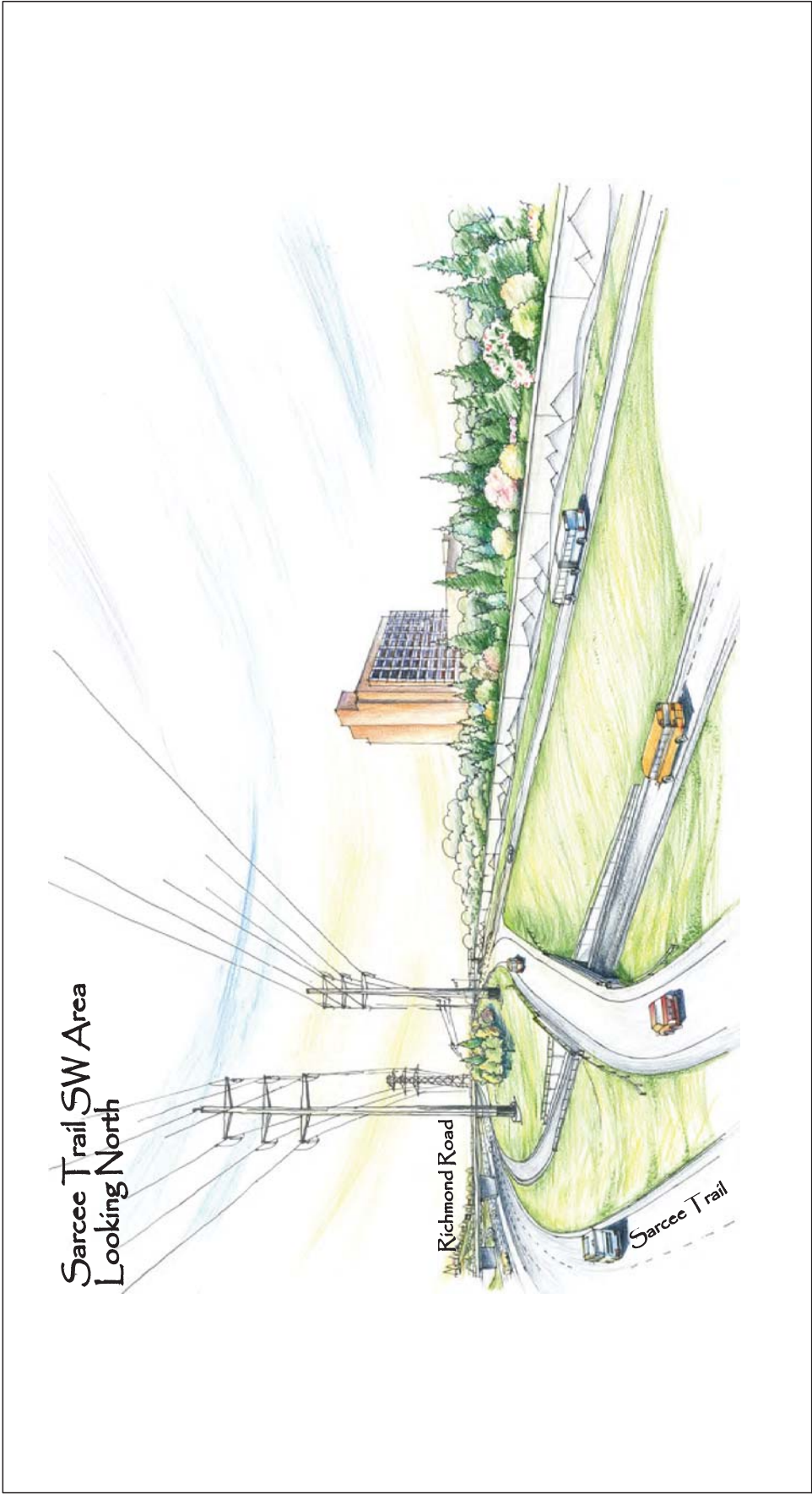
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SARCEE TRAIL AND RICHMOND ROAD INTERCHANGE
FUNCTIONAL PLANNING STUDY
RECOMMENDED ULTIMATE PLAN
PERSPECTIVE SKETCH
SARCEE TRAIL SW AREA LOOKING SOUTH
EXHIBIT ES-7
JANUARY 2018
SCALE: N.T.S.

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Legend:

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SARCEE TRAIL AND RICHMOND ROAD INTERCHANGE
FUNCTIONAL PLANNING STUDY
RECOMMENDED ULTIMATE PLAN
PERSPECTIVE SKETCH
SARCEE TRAIL SW AREA LOOKING NORTH
EXHIBIT ES-8
JANUARY 2018
SCALE: N.T.S.

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